Barbara A. Gylys
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Medical Terminology Systems

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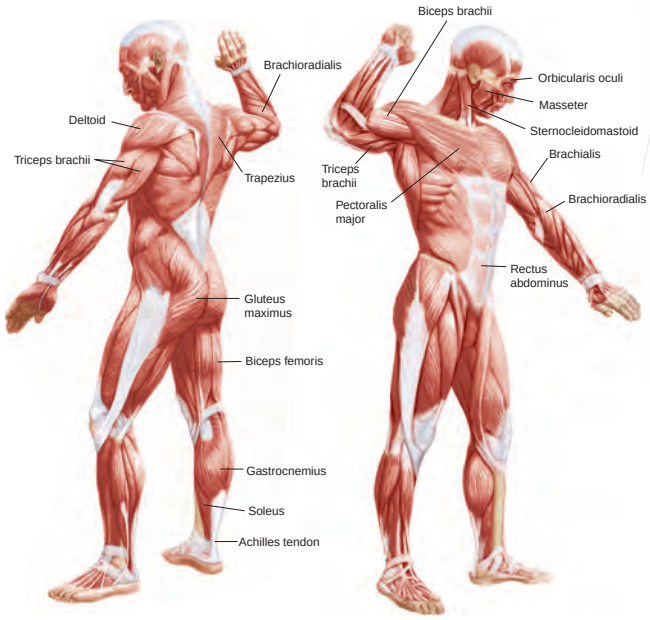

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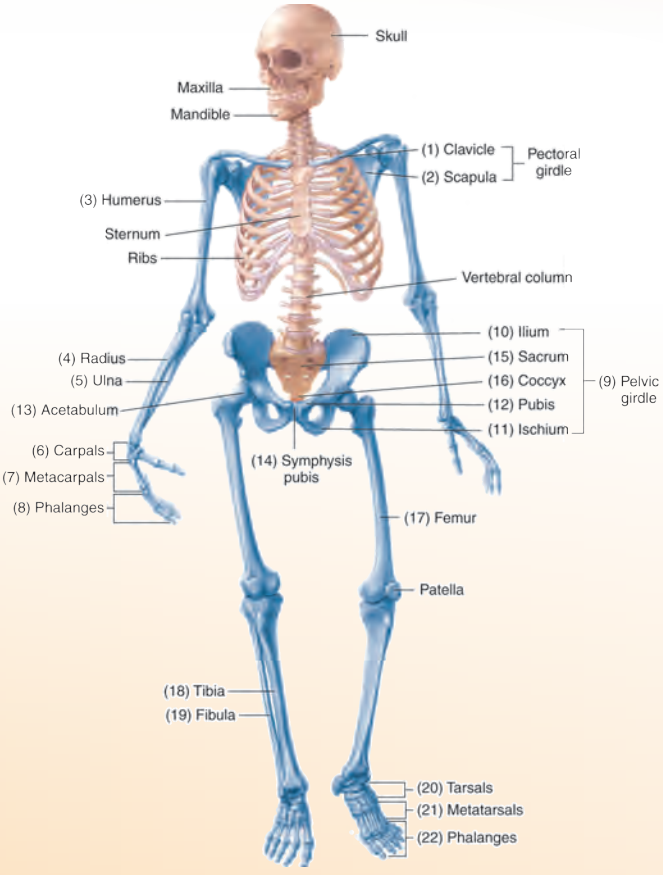

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This Book Is Dedicated with Love

To my best friend, colleague, and husband, Dr. Julius A. Gylys, and to my children, Regina Maria and Dr. Julius Anthony, and to my grandchildren, Andrew Masters, Dr. Julia Halm, Caitlin Masters, Anthony Bishop-Gylys, Matthew Bishop-Gylys, and the little one, Liam Halm

B.A.G.

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Preface

As medical terminology educators, we face common challenges. First, we must present a vast amount of fairly complex information to students of various learning levels and abilities. Second, we need to impress upon them the importance of medical terminology as an essential tool of communication in the health-care industry. Finally, we must help them apply what they have learned to the "real world of medicine."

Building on the success of the sixth edition, which received the prestigious McGuffey Longevity and Excellence Award from the Textbook Authors' Association (TAA), *Medical Terminology Systems: A Body Systems Approach,* 7th edition, continues to live up to its well-established track record of presenting medical word-building principles based on competency-based curricula. Because of the pedagogical success of previous editions, the seventh edition continues its structural design as a textbook–workbook that complements all teaching formats, including traditional lecture, distance learning, and independent or self-paced study. The popular, basic features of the previous edition have been enhanced and expanded. The body systems chapters have been updated to include new diagnostic and therapeutic procedures as well as new pharmaceutical agents in current use. Many new, visually impressive, full-color illustrations have been added to this edition. Artwork throughout the book is specifically designed to present accurate and aesthetically pleasing representations of anatomical structures, disease conditions, and medical procedures. Illustrations augment course content in new and interesting ways and help make difficult concepts clear. Two new learning activities have been incorporated in each body-system chapter.

All modifications and additions in the seventh edition are designed to aid in the learning process and improve retention of medical terms. The following is a brief summary of chapter content:

- **Chapter 1** explains the techniques of medical word-building using basic word elements.
- **Chapter 2** categorizes major surgical, diagnostic, symptomatic, and grammatical suffixes.
- **Chapter 3** presents major prefixes of position, number and measurement, direction, and other parameters.
- **Chapter 4** introduces anatomical, physiological, and pathological terms. It also presents combining forms denoting cellular and body structure, body position and direction, regions of the body, and additional combining forms related to diagnostic methods and pathology. General diagnostic and therapeutic terms are described and provide a solid foundation for specific terms addressed in the body-system chapters that follow.
- **Chapters 5 through 16** are organized according to specific body systems and may be taught in any sequence. These chapters include key anatomical and physiological terms; basic anatomy and physiology; a body systems connections table; combining forms, suffixes, and prefixes; pathology; diagnostic, symptomatic, and related terms; diagnostic and therapeutic procedures; pharmacology; abbreviations; learning activities; and medical record activities. All activities allow self-assessment and evaluation of competency.
- **Appendix A:** The Answer Key contains answers to each learning activity to validate proficiency and provide immediate feedback for student assessment. Although the answer key for the terminology section of each medical record is not included in this appendix, it is available to adopters in the Activity Pack.
- **Appendix B:** Common Abbreviations and Symbols include an updated, comprehensive list of medical abbreviations and their meanings, an updated summary of common symbols, and an updated list of "do-not-use" abbreviations.
- **Appendix C:** The Glossary of Medical Word Elements contains alphabetical lists of medical word elements and their meanings. This appendix presents two methods for word–element indexing—first by medical word element, then by English term.
- **Appendix D:** The Index of Genetic Disorders lists genetic disorders presented in the textbook.
- **Appendix E:** The Index of Clinical, Laboratory, and Imaging Procedures lists radiographic and other diagnostic imaging procedures presented in the textbook.

- **Appendix F:** The Index of Pharmacology lists medications presented in the textbook.
- **Appendix G:** The Index of Oncological Disorders lists oncological disorders presented in the textbook.

Medical Language Lab

Now included in every new copy of *Medical Terminology Systems: A Body Systems Approach,* 7th edition, is access to the ultimate online medical terminology resource for students. The Medical Language Lab is a rich learning environment utilizing proven language development methods to help students become effective users of medical language. To access the Medical Language Lab, students simply go to http://www.medicallanguagelab.com and redeem the access code provided in their new copies of *Medical Terminology Systems: A Body Systems Approach,* 7th edition.

Each lesson in the Medical Language Lab teaches the student how to listen critically for important terms, respond to others using medical terminology, and generate their own terminology-rich writing and speech. By following the activities in each lesson, students graduate from simple memorization to becoming stronger users of medical language.

In addition to critical listening, response, and generation exercises for each lesson, students are supplied with a wide variety of practice activities, which help them to solidify their recall of key terms from the chapter, as well as audio glossary features where students can hear words pronounced and used properly in context.

Designed to work seamlessly with *Medical Terminology Systems: A Body Systems Approach,* 7th edition, each activity in the Medical Language Lab has been crafted with content specific to the textbook. Every chapter in *Medical Terminology Systems: A Body Systems Approach,* 7th edition, has a corresponding lesson in the Medical Language Lab. These pedagogical features help students develop confidence, and every activity on the Medical Language Lab is relevant and useful in helping them understand their textbook.

Instructors benefit from a powerful, yet easy to understand instructor's page, which allows them to decide which chapters and activities will be available to their students. Instructors also control how student scores are reported to them, either through the native Medical Language Lab grade book, or reported to their own BlackBoard, Angel, Moodle, or SCORM-compliant course management solution.

Davis*Plus* Online Resource Center

Although the study of medical terminology demands hard work and discipline, various self-paced activities offer interest and variety to the learning process. A multiplicity of activities and resources are available to adopters of the textbook on Davis*Plus* Instructor and Student Online Resource Center. The Online Resource Center is designed to help teachers teach and students learn medical terminology in an exciting, challenging, and effective fashion. Visit http://davisplus.fadavis.com for the Instructor and Student Online Resource Center to explore the various ancillaries available for instructors and students.

Instructor Online Resource Center

The Davis*Plus* Instructor Online Resource Center provides many updated, innovative instructional activities. These activities make teaching medical terminology easier and more effective. Teachers can use the supplemental activities in various educational settings—traditional classroom, distance learning, or independent or

self-paced studies. The many ancillaries help instructors maximize the benefits of the textbook and include the following:

- Electronic test bank with *ExamView Pro* test-generating software
- PowerPoint presentations for each chapter
- Searchable image bank
- Printable Activity Pack
- Resources in Blackboard, Angel, Moodle, and SCORM formats

Electronic Test Bank

This edition offers a powerful *ExamView Pro* test-generating program that allows you to create custom-made or randomly generated tests in a printable or online format from a test bank of more than 2,500 test items. This expanded test bank contains over twice as many questions as in the previous edition.

PowerPoint Presentations

Bring the book to life in the classroom with the accompanying *Lecture Note* PowerPoint presentations. Each chapter has an outline-based presentation consisting of a chapter overview; main functions of the body system; and selected pathology, vocabulary, and procedures. Full-color illustrations from the book and in-class assessment activities are included.

Image Bank

The image bank contains all illustrations from the textbook. It is fully searchable and allows users to zoom in and out and display a JPG image of an illustration that can be copied into a Microsoft Word document or PowerPoint presentation.

Activity Pack

The Activity Pack has been expanded to meet today's instructional needs and now includes the following:

- *Suggested Course Outlines.* Course outlines are provided to help you plan the best method of covering material presented in the textbook. A newly designed course outline is provided for textbooks packaged with Term*Plus,* the completely revised and updated interactive software. Now it will be easy to correlate instructional software with textbook chapters.
- *Student and Instructor-Directed Activities.* These comprehensive teaching aids have been updated, and new ones have been added for this edition. They offer an assortment of activities for each body-system chapter. Instructors can use these activities as course requirements or supplemental material. In addition, they can assign activities as individual or collaborative projects. For group projects, peer evaluation forms are included.
- *Community and Internet Resources.* This resources section provides an expanded list of resources, including technical journals, community organizations, and Internet sites to complement course content.
- *Supplemental Medical Record Activities.* The supplemental medical record activities have been updated and include student activities that complement and expand information presented in the body-system chapters. As in the textbook, these activities use common clinical scenarios to show how medical terminology is used to document patient care. Medical terms, their pronunciations, and a medical record analysis are provided for each record, along with an answer key. In addition, each medical record highlights a specific body system and correlates it with a medical specialty. Medical records can be used for various activities, including oral reports, medical coding, medical transcribing, or individual assignments.
- *Pronunciations and Answer Keys.* We've continued to provide an answer key for the medical record research activities in the textbook. This key should prove helpful for grading or for class presentations.

Student Online Resource Center

The Davis*Plus* Student Online Resource Center includes many user-friendly activities to help students reinforce material covered in the textbook. At the same time, it is structured to make learning medical terminology an exciting, challenging activity. Resources include medical record activities, audio tutorials, and animations.

Medical Record Activities

Health-care providers in hospitals, medical centers, and private practice facilities dictate various types of medical reports that become part of the medical record. Included are chart notes, history and physical examinations, progress notes, consultation reports, operative reports, discharge summaries, and diagnostic studies. Samples of these types of reports are included in the medical records activities found in the body-system chapters (Chapters 5 to 16). To reinforce these activities, the student online resource center includes a medical records activities section in which the key terms in each report are underlined. As students click the underlined terms, they hear the correct pronunciation of each term. All reports are styled following the guidelines established by the American Association of Medical Transcription (AAMT). This formatting provides an opportunity for students to learn correct styling of various types of medical reports.

Audio Tutorials

The audio tutorials are developed from the "Medical Word Elements" sections of the body-system chapters (Chapters 5 to 16). It is designed to strengthen spelling, pronunciation, and understanding of selected medical terms. In addition to teaching combining forms and pronunciations, it is also useful for students in beginning transcription and medical secretarial courses. They can develop transcription skills by typing each word as it is pronounced. After typing the words, the student can correct spelling by referring to the textbook or a medical dictionary.

Animations

Several animations are included to help students better visualize complex concepts. For example, one animation explores the pathology of gastroesophageal reflux disease (GERD). Another shows the various stages of pregnancy and delivery. These innovative tools help students better understand important processes and procedures as they learn the associated medical terminology.

Other Student Ancillaries

Term*Plus*

Term*Plus* continues to be a powerful, interactive CD-ROM program offered with some texts, depending on the version that has been selected. Term*Plus* is a competency-based, self-paced, multimedia program that includes graphics, audio, and a dictionary culled from *Taber's Cyclopedic Medical Dictionary,* 22nd edition. Help menus provide navigational support. The software comes with numerous interactive learning activities, including:

- Anatomy Focus
- Tag the Elements (drag-and-drop)
- Spotlight the Elements
- Concentration
- Build Medical Words
- Programmed Learning
- Medical Vocabulary
- Chart Notes
- Spelling
- Crossword Puzzles
- Word Scramble

All activities can be graded and the results printed or e-mailed to the instructor. This feature makes Term*Plus* especially valuable as a distance-learning tool, because it provides evidence of student drill and practice completions in various learning activities.

Taber's Cyclopedic Medical Dictionary

The world-famous *Taber's Cyclopedic Medical Dictionary* is the recommended companion reference for this book. Virtually all terms in *Systems* may be found in *Taber's.* In addition, *Taber's* contains etymologies for nearly all main entries presented in this textbook.

We hope you enjoy this new edition as much as we enjoyed preparing it. We think you will find this the best edition ever.

Barbara A. Gylys
Mary Ellen Wedding

Contents at a Glance

Contents

CHAPTER

1

Basic Elements of a Medical Word

Chapter Outline

Objectives

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

- Identify the four word elements used to build medical words.
- Divide medical words into their component parts.
- Apply the basic rules to define and build medical words.
- Locate the pronunciation guidelines chart and interpret pronunciation marks.
- Pronounce medical terms presented in this chapter.
- Demonstrate your knowledge of this chapter by completing the learning activities.

Medical Word Elements

The language of medicine is a specialized vocabulary used by health care providers. Many current medical word elements originated as early as the 4th century B.C., when Hippocrates practiced medicine. With technological and scientific advancements in medicine, new terms have evolved to reflect these innovations. For example, radiographic terms, such as magnetic resonance imaging (MRI) and ultrasound (US), are now commonly used to describe current diagnostic procedures.

A medical word consists of some or all of the following elements:

- word root
- combining form
- suffix
- prefix

How these elements are combined, and whether all or some of them are present in a medical term, determines the meaning of a word. To understand the meaning of medical words, it is important to learn how to divide them into their basic elements. The purpose of this chapter is to cover the basic principles of medical word building and learn how to pronounce the terms correctly. Thus, pronunciations are provided throughout the textbook with the medical terms. In addition, pronunciation guidelines are located on the inside front cover of this book. They can be used as a convenient reference to help pronounce terms correctly.

Word Roots

A **word root** is the foundation of a medical term and contains its primary meaning. All medical terms have at least one word root. Most word roots are derived from Greek or Latin language. Thus, two different roots may have the same meaning. For example, the Greek word ***dermatos*** and the Latin word ***cutane*** both refer to the skin. As a general rule, Greek roots are used to build words that describe a disease, condition, treatment, or diagnosis. Latin roots are used to build words that describe anatomical structures. Consequently, the Greek root ***dermat*** is used primarily in terms that describe a disease, condition, treatment, or diagnosis of the skin; the Latin root ***cutane*** is used primarily to describe an anatomical structure. (See Table 1-1.)

Table 1-1 Examples of Word Roots

This table lists examples of word roots as well as their phonetic pronunciations. Begin learning the pronunciations as you review the information below.

English Term	Greek or Latin Term*	Word Root	Word Analysis
skin	dermatos (Gr)	dermat	**dermat**/itis (dĕr-mă-TĪ-tĭs): inflammation of the skin *A term that identifies a skin disease*
	cutis (L)	cutane	**cutane**/ous (kū-TĀ-nē-ŭs): pertaining to the skin *A term that identifies an anatomical structure*
kidney	nephros (Gr)	nephr	**nephr**/oma (nĕ-FRŌ-mă): tumor of the kidney *A term that describes a kidney disease*
	renes (L)	ren	**ren**/al (RĒ-năl): pertains to the kidney *A term that identifies an anatomical structure*

Table 1-1 Examples of Word Roots—cont'd

English Term	Greek or Latin Term*	Word Root	Word Analysis
mouth	stomatos (Gr)	stomat	stomat/itis (stō-mă-TĪ-tĭs): inflammation of the mouth *A term that describes an inflammatory condition of the mouth*
	oris (L)	or	or/al (OR-ăl): pertaining to the mouth *A term that identifies an anatomical structure*

*It is not important to know the origin of a medical word. This information is provided here to help avoid confusion and illustrate that there may be two different word roots for a single term.

Combining Forms

A **combining form** is created when a word root is combined with a vowel. The vowel, known as a **combining vowel**, is usually an *o*, but sometimes it is an *i*. The combining vowel has no meaning of its own but enables two or more word elements to be connected. Like a word root, a combining form is the basic foundation to which other word elements are added to build a complete medical word. In this text, a combining form will be listed as *word root/vowel* (such as *gastr/o*), as illustrated in Table 1-2.

Table 1-2 Examples of Combining Forms

*This table illustrates how word roots and vowels create combining forms. Learning combining forms rather than word roots makes pronunciations a little easier because of the terminal vowel. For example, in the table below, the word roots **gastr** and **nephr** are difficult to pronounce, whereas their combining forms **gastr/o** and **nephr/o** are easier to pronounce.*

Word Root	+	Vowel	=	Combining Form	Meaning
erythr/	+	o	=	erythr/o	red
gastr/	+	o	=	gastr/o	stomach
hepat/	+	o	=	hepat/o	liver
immun/	+	o	=	immun/o	immune, immunity, safe
nephr/	+	o	=	nephr/o	kidney
oste/	+	o	=	oste/o	bone

Suffixes

A **suffix** is a word element placed at the end of a word that changes the meaning of the word. In the terms tonsill/*itis*, and tonsill/*ectomy*, the suffixes are *-itis* (inflammation) and *-ectomy* (excision, removal). Changing the suffix changes the meaning of the word. In medical terminology, a suffix usually describes a pathology (disease or abnormality), symptom, surgical or diagnostic procedure, or part of speech. Many suffixes are derived from Greek or Latin words. (See Table 1-3.)

Table 1-3 Examples of Suffixes

This table lists examples of pathological suffixes as well as their phonetic pronunciations. Begin learning the pronunciations as you review the information below.

Combining Form	+	Suffix	=	Medical Word	Meaning
gastr/o (stomach)	+	-itis (inflammation)	=	gastritis găs-TRĪ-tĭs	inflammation of the stomach
	+	-megaly (enlargement)	=	gastromegaly găs-trō-MĔG-ă-lē	enlargement of the stomach
	+	-oma (tumor)	=	gastroma găs-TRŌ-mă	tumor of the stomach
hepat/o (liver)	+	-itis (inflammation)	=	hepatitis hĕp-ă-TĪ-tĭs	inflammation of the liver
	+	-megaly (enlargement)	=	hepatomegaly hĕp-ă-tō-MĔG-ă-lē	enlargement of the liver
	+	-oma (tumor)	=	hepatoma hĕp-ă-TŌ-mă	tumor of the liver

Prefixes

A **prefix** is a word element attached to the beginning of a word or word root. However, not all medical terms have a prefix. Adding or changing a prefix changes the meaning of the word. The prefix usually indicates a number, time, position, direction, or negation. Many of the same prefixes used in medical terminology are also used in the English language. (See Table 1-4.)

Table 1-4 Examples of Prefixes

This table lists examples of prefixes as well as their phonetic pronunciations. Begin learning the pronunciations as you review the information below.

Prefix	+	Word Root	+	Suffix	=	Medical Word	Meaning
an- (without, not)	+	esthes (feeling)	+	-ia (condition)	=	anesthesia ăn-ĕs-THĒ-zē-ă	condition of not feeling
hyper- (excessive, above normal)	+	therm (heat)	+	-ia (condition)	=	hyperthermia hī-pĕr-THĔR-mē-ă	condition of excessive heat
intra- (in, within)	+	muscul (muscle)	+	-ar (pertaining to)	=	intramuscular ĭn-tră-MŬS-kū-lăr	pertaining to within the muscle
para- (near, beside; beyond)	+	nas (nose)	+	-al (pertaining to)	=	paranasal păr-ă-NĀ-săl	pertaining to (area) near the nose
poly- (many, much)	+	ur (urine)	+	-ia (condition)	=	polyuria pŏl-ē-Ū-rē-ă	condition of much urine
pre- (before)	+	nat (birth)	+	-al (pertaining to)	=	prenatal prē-NĀ-tăl	pertaining to (the period) before birth

Basic Guidelines

Defining and building medical words are crucial skills in mastering medical terminology. Following the basic guidelines for each will help you develop these skills.

Defining Medical Words

Here are three steps for defining medical words using gastroenteritis as an example.

- **Step 1.** Define the suffix, or last part of the word. In this case, the suffix *-itis* means *inflammation.*
- **Step 2.** Define the first part of the word (which may be a word root, combining form, or prefix). In this case, the combining form ***gastr/o*** means *stomach.*
- **Step 3.** Define the middle parts of the word. In this case, the word root ***enter*** means *intestine.*

When you analyze ***gastroenteritis*** following the three previous rules, the meaning is:

1. inflammation (of)
2. stomach (and)
3. intestine.

Thus, the meaning of **gastroenteritis** is *inflammation (of) stomach (and) intestine.* Table 1-5 further illustrates this process.

Table 1-5 Defining Gastroenteritis

This table illustrates the three steps of defining a medical word using the example gastroenteritis.

Combining Form	Middle	Suffix
gastr/o	enter/	-itis
stomach	intestine	inflammation
(step 2)	(step 3)	(step 1)

Building Medical Words

There are three basic rules for building medical words.

Rule #1

A word root links a suffix that begins with a vowel.

Word Root	+	Suffix	=	Medical Word	Meaning
hepat	+	-itis	=	hepatitis	inflammation of the liver
(liver)		(inflammation)		hĕp-ă-TĪ-tĭs	

Rule #2

A combining form (root + o) links a suffix that begins with a consonant.

Combining Form	+	Suffix	=	Medical Word	Meaning
hepat/o (liver)	+	-cyte (cell)	=	hepatocyte HĔP-ă-tō-sīt	liver cell

Rule #3

A combining form links one root to another root to form a compound word. This rule holds true even if the second root begins with a vowel, as in **osteoarthritis**. Keep in mind that the rules for linking multiple roots to each other are slightly different from the rules for linking roots and combining forms to suffixes.

Combining Form	+	Word Root	+	Suffix	=	Medical Word	Meaning
oste/o (bone)	+	chondr (cartilage)	+	-itis (inflammation)	=	osteochondritis ŏs-tē-ō-kŏn-DRĪ-tĭs	inflammation of bone and cartilage
	+	arthr (joint)	+	-itis (inflammation)	=	osteoarthritis ŏs-tē-ō-ăr-THRĪ-tĭs	inflammation of bone and joint

It is time to review medical word elements by completing Learning Activities 1-1 and 1-2 on page 7-8.

Pronunciation Guidelines

Although pronunciation of medical words usually follows the same rules that govern pronunciations of English words, some medical words may be difficult to pronounce when first encountered. Therefore, selected terms in this book include phonetic pronunciation. Also, pronunciation guidelines can be found on the inside front cover of this book and at the end of selected tables. Use them whenever you need help with pronunciation of medical words.

It is time to review pronunciations, analysis of word elements, and defining medical terms by completing Learning Activities 1-3, 1-4, and 1-5 on page 9-12.

LEARNING ACTIVITIES

The following activities provide a review of the basic medical word elements introduced in this chapter. Complete each activity and review your answers to evaluate your understanding of this chapter.

Learning Activity 1-1

Understanding Medical Word Elements

Fill in the following blanks to complete the sentences correctly.

1. The four elements used to form words are _____.
2. A root is the main part or foundation of a word. In the words arthritis, arthrectomy, and arthroscope, the root is _____.

Identify the following statements as true or false. If false, rewrite the statement correctly on the line provided.

3. A combining vowel is usually an e. True False

_____

4. A word root links a suffix that begins with a consonant. True False

_____

5. A combining form links multiple roots to each other. True False

_____

6. A combining form links a suffix that begins with a consonant. True False

_____

7. To define a medical word, first define the prefix. True False

_____

8. In the term *intramuscular, intra* is the prefix. True False

_____

Underline the word root in each of following combining forms.

9. splen/o (spleen)
10. hyster/o (uterus)
11. enter/o (intestine)
12. neur/o (nerve)
13. ot/o (ear)
14. dermat/o (skin)
15. hydr/o (water)

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ % Score

Learning Activity 1-2

Identifying Word Roots and Combining Forms

Underline the word roots in the following medical words.

Medical Word	Meaning
1. nephritis	inflammation of the kidney
2. arthrodesis	fixation of a joint
3. dermatitis	inflammation of the skin
4. dentist	specialist in teeth
5. gastrectomy	excision of the stomach
6. chondritis	inflammation of cartilage
7. hepatoma	tumor of the liver
8. muscular	pertaining to muscle
9. gastric	pertaining to the stomach
10. osteoma	tumor of the bone

Underline the combining forms below.

11. nephr	kidney
12. hepat/o	liver
13. arthr	joint
14. oste/o/arthr	bone, joint
15. cholangi/o	bile vessel

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ % Score

Learning Activity 1-3

Understanding Pronunciations

Review the pronunciation guidelines (located inside the front cover of this book) and then underline the correct answer in each of the following statements.

1. The diacritical mark ¯ is called a (breve, macron).
2. The diacritical mark ˘ is called a (breve, macron).
3. The ¯ indicates the (short, long) sound of vowels.
4. The ˘ indicates the (short, long) sound of vowels.
5. The combination *ch* is sometimes pronounced like (*k, chiy*). Examples are *ch*olesterol, *ch*olemia.
6. When *pn* is at the beginning of a word, it is pronounced only with the sound of (*p, n*). Examples are *pn*eumonia, *pn*eumotoxin.
7. When *pn* is in middle of a word, the *p* (is, is not) pronounced. Examples are ortho*pn*ea, hyper*pn*ea.
8. When *i* is at the end of a word, it is pronounced like (eye, ee). Examples are bronch*i,* fung*i*, nucle*i*.
9. For *ae* and *oe*, only the (first, second) vowel is pronounced. Examples are burs*ae*, pleur*ae*.
10. When e and es form the final letter or letters of a word, they are commonly pronounced as (combined, separate) syllables. Examples are syncope, systole, nares.

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 10 = _____ % Score

Learning Activity 1-4

Identifying Suffixes and Prefixes

Pronounce the following medical terms. Then analyze each term and write the suffix in the right-hand column. The first suffix is completed for you.

Term	Suffix
1. thoracotomy thōr-ă-KŎT-ō-mē	*-tomy*
2. gastroscope GĂS-trō-skōp	
3. tonsillitis tŏn-sĭl-Ī-tĭs	
4. gastric GĂS-trĭk	
5. tonsillectomy tŏn-sĭl-ĔK-tō-mē	

Pronunciation Help						
	Long Sound	ā — rate	ē — rebirth	ī — isle	ō — over	ū — unite
	Short Sound	ă — alone	ĕ — ever	ĭ — it	ŏ — not	ŭ — cut

Pronounce the following medical terms. Then analyze each term and write the element that is a prefix in the right-hand column. The first prefix is completed for you.

Term	Prefix
6. anesthesia ăn-ĕs-THĒ-zē-ă	*an-*
7. hyperthermia hī-pĕr-THĔR-mē-ă	
8. intramuscular ĭn-tră-MŬS-kū-lăr	
9. paranasal păr-ă-NĀ-săl	
10. polyuria pŏl-ē-ŪR-rē-ă	

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 10 = _____ % Score

Learning Activity 1-5

Defining Medical Words

The three steps for defining medical words are:

1. Define the last part of the word, or **suffix.**

2. Define the first part of the word, or **prefix, word root,** or **combining form.**

3. Define the **middle** of the word.

First, pronounce the term aloud. Then apply the above three steps to define the terms in the following table. If you are not certain of a definition, refer to Appendix C, Part 1, of this textbook, which provides an alphabetical list of word elements and their meanings.

Term	Definition
1. gastritis găs-TRĪ-tĭs	
2. nephritis nĕf-RĪ-tĭs	
3. gastrectomy găs-TRĔK-tō-mē	
4. osteoma ŏs-tē-Ō-mă	
5. hepatoma hĕp-ă-TŌ-mă	
6. hepatitis hĕp-ă-TĪ-tĭs	

Refer to the section "Building Medical Words" on pages 5-6 to complete this activity. Write the number for the rule that applies to each listed term as well as a short summary of the rule. Use the abbreviation WR to designate *word root,* CF to designate *combining form.* The first one is completed for you.

Term	Rule	Summary of the Rule
7. arthr/itis ăr-THRĪ-tĭs	*1*	*A WR links a suffix that begins with a vowel.*
8. scler/osis sklĕ-RŌ-sĭs		
9. arthr/o/centesis ăr-thrō-sĕn-TĒ-sĭs		
10. colon/o/scope kō-LŎN-ō-skōp		
11. chondr/itis kŏn-DRĪ-tĭs		

12. chondr/oma _____ _____
    kŏn-DRŌ-mă
13. oste/o/chondr/itis _____ _____
    ŏs-tē-ō-kŏn-DRĪ-tĭs
14. muscul/ar _____ _____
    MŬS-kū-lăr
15. oste/o/arthr/itis _____ _____
    ŏs-tē-ō-ăr-THRĪ-tĭs

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ % Score

Suffixes

CHAPTER 2

Chapter Outline

Objectives

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

- Define and provide examples of surgical, diagnostic, pathological, and related suffixes.
- Link combining forms and word roots to suffixes.
- Identify surgical, diagnostic, pathological, and related suffixes.
- Identify adjective, noun, and diminutive suffixes.
- Locate and apply guidelines for pluralizing terms.
- Pronounce medical terms presented in this chapter.
- Demonstrate your knowledge of the chapter by completing the learning activities.

Suffix Linking

In medical words, a suffix is added to the end of a word root or combining form to change its meaning. For example, the combining form *gastr/o* means *stomach.* The suffix *-megaly* means *enlargement,* and *-itis* means *inflammation. Gastr/o/megaly* is an enlargement of the stomach. *Gastr/itis* is an inflammation of the stomach.

Whenever you change the suffix, you change the meaning of the word. Suffixes are also used to denote singular and plural forms of a word as well as a part of speech. The following tables provide additional examples to reinforce the rules you learned in Chapter 1. (See Tables 2-1 and 2-2.)

Words that contain more than one word root are known as **compound words.** Multiple roots within a compound word are joined together with a vowel, regardless of whether the second root begins with a vowel or a consonant. Notice that a vowel is used in Table 2-2 between ***gastr*** and ***enter,*** even though the second root, ***enter,*** begins with a vowel.

Keep in mind that the rule for linking multiple roots is slightly different from the rules for linking roots to suffixes. As reinforced from examples in the above table, suffixes that begin

Table 2-1 Word Roots and Combining Forms With Suffixes

This table provides examples of word roots linking a suffix that begins with a vowel. It also provides examples of combining forms (root + o) linking a suffix that begins with a consonant.

Element	+	Suffix	=	Medical Word	Meaning
Word Roots					
gastr (stomach)	+	-itis (inflammation)	=	gastritis găs-TRĪ-tĭs	inflammation of the stomach
hemat (blood)	+	-emesis (vomiting)	=	hematemesis hĕm-ăt-ĔM-ĕ-sĭs	vomiting blood
arthr (joint)	+	-itis (inflammation)	=	arthritis ăr-THRĪ-tĭs	inflammation of a joint
Combining Forms					
gastr/o (stomach)	+	-dynia (pain)	=	gastrodynia găs-trō-DĬN-ē-ă	pain in the stomach
hemat/o (blood)	+	-logy (study of)	=	hematology hē-mă-TŎL-ō-jē	study of blood
arthr/o (joint)	+	-centesis (surgical puncture)	=	arthrocentesis ăr-thrō-sĕn-TĒ-sĭs	surgical puncture of a joint

Table 2-2 Compound Words With Suffixes

This table provides examples of medical terms with more than one word root as well as suffixes linked together with roots when the suffix begins with a vowel.

Combining Form	+	Word Root	+	Suffix	=	Medical Word	Meaning
gastr/o (stomach)	+	enter (intestine)	+	-itis (inflammation)	=	gastroenteritis găs-trō-ĕn-tĕr-Ī-tĭs	inflammation of stomach and intestine
oste/o (bone)	+	arthr (joint)	+	-itis (inflammation)	=	osteoarthritis ŏs-tē-ō-ăr-THRĪ-tĭs	inflammation of bone and joint
encephal/o (brain)	+	mening (meninges)	+	-itis (inflammation)	=	encephalomeningitis ĕn-sĕf-ă-lō-mĕn-ĭn-JĪ-tĭs	inflammation of brain and meninges

with a vowel are linked with a root; suffixes that begin with a consonant are linked with a combining form.

Suffix Types

An effective method in mastering medical terminology is to learn the major types of suffixes in categories. By grouping the surgical, diagnostic, pathological, related, and grammatical suffixes, they will be easier to remember.

Surgical, Diagnostic, Pathological, and Related Suffixes

Surgical suffixes describe a type of invasive procedure performed on a body part. (See Table 2-3.) Diagnostic suffixes describe a procedure performed to identify the cause and nature of an illness. Pathological suffixes describe an abnormal condition or disease. (See Table 2-4.)

Table 2-3 Common Surgical Suffixes

This table lists commonly used surgical suffixes along with their meanings and word analyses.

Suffix	Meaning	Word Analysis
-centesis	surgical puncture	arthr/o/**centesis** (ăr-thrō-sĕn-TĒ-sĭs): puncture of a joint space with a needle and the withdrawal of fluid *arthr/o:* joint ***Arthrocentesis may also be performed to obtain samples of synovial fluid for diagnostic purposes, instill medications, and remove fluid from joints to relieve pain.***
-clasis	to break; surgical fracture	oste/o/**clasis** (ŏs-tē-ŎK-lă-sĭs): surgical fracture of a bone to correct a deformity *oste/o:* bone
-desis	binding, fixation (of a bone or joint)	arthr/o/**desis** (ăr-thrō-DĒ-sĭs): binding together of a joint *arthr/o:* joint ***Arthrodesis fuses bones across the joint space in a degenerated, unstable joint.***
-ectomy	excision, removal	append/**ectomy** (ăp-ĕn-DĔK-tō-mē): excision of the appendix *append:* appendix
-lysis	separation; destruction; loosening	thromb/o/**lysis** (thrŏm-BŎL-ĭ-sĭs): destruction of a blood clot *thromb/o:* blood clot ***Drug therapy is usually used to dissolve a blood clot.***
-pexy	fixation (of an organ)	mast/o/**pexy** (MĂS-tō-pĕks-ē): fixation of the breast(s) *mast/o:* breast ***Mastopexy, an elective surgery, affixes sagging breasts in a more elevated position, commonly improving their shape.***
-plasty	surgical repair	rhin/o/**plasty** (RĪ-nō-plăs-tē): surgical repair of the nose *rhin/o:* nose ***Rhinoplastic is a type of plastic surgery that changes the size or shape of the nose.***
-rrhaphy	suture	my/o/**rrhaphy** (mī-OR-ă-fē): suture of a muscle *my/o:* muscle

(continued)

Table 2-3 Common Surgical Suffixes—cont'd

Suffix	Meaning	Word Analysis
-stomy	forming an opening (mouth)	trache/o/**stomy** (trā-kē-ŏS-tō-mē): forming an opening into the trachea *trache/o:* trachea (windpipe) ***A tracheostomy is an artificial opening created to bypass an obstructed upper airway.***
-tome	instrument to cut	oste/o/**tome** (ŏS-tē-ō-tōm): instrument to cut bone *oste/o:* bone ***An osteotome is a surgical chisel used to cut through bone.***
-tomy	incision	trache/o/**tomy** (trā-kē-ŏT-ō-mē): incision (through the neck) into the trachea *trache/o:* trachea (windpipe) ***Tracheotomy is performed to gain access to an airway below a blockage.***
-tripsy	crushing	lith/o/**tripsy** (LĬTH-ō-trĭp-sē): crushing a stone *lith/o:* stone, calculus ***Lithotripsy is a surgical procedure for eliminating a stone in the kidney, ureter, bladder, or gallbladder.***

It is time to review surgical suffixes by completing Learning Activities 2-1, 2-2, and 2-3.

Table 2-4 Diagnostic, Pathological, and Related Suffixes

This table lists commonly used diagnostic, pathological, and related suffixes along with their meanings and word analyses.

Suffix	Meaning	Word Analysis
Diagnostic		
-gram	record, writing	electr/o/cardi/o/**gram** (ē-lĕk-trō-KĂR-dē-ō-grăm): record of the electrical activity of the heart *electr/o:* electricity *cardi/o:* heart
-graph	instrument for recording	cardi/o/**graph** (KĂR-dē-ō-grăf): instrument for recording electrical activity of the heart *cardi/o:* heart
-graphy	process of recording	angi/o/**graphy** (ăn-jē-ŏG-ră-fē): process of recording blood vessels *angi/o:* vessel (usually blood or lymph) ***Angiography is the radiographic imaging of blood vessels after injection of a contrast medium.***
-meter	instrument for measuring	pelv/i/**meter*** (pĕl-VĬM-ĕ-ter): instrument for measuring the pelvis *pelv/i:* pelvis
-metry	act of measuring	pelv/i/**metry*** (pĕl-VĬM-ĕ-trē): act or process of measuring the dimensions of the pelvis *pelv/i:* pelvis

*The *i* in *pelv/i/meter* and *pelv/i/metry* and the e in *chol/e/lithiasis* and *chol/e/lith* are exceptions to the rule of using the connecting vowel *o*.

Table 2-4 Diagnostic, Pathological, and Related Suffixes—cont'd

Suffix	Meaning	Word Analysis
-scope	instrument for examining	endo/**scope** (ĔN-dō-skōp): instrument for examining within *endo-:* in, within ***An endoscope is a flexible or rigid instrument consisting of a tube and optical system for observing the inside of a hollow organ or cavity.***
-scopy	visual examination	endo/**scopy** (ĕn-DŎS-kō-pē): visual examination within *endo-:* in, within ***Endoscopy is performed to visualize a body cavity or canal using a specialized lighted instrument called an endoscope.***
Pathological and Related		
-algia	pain	neur/**algia** (nū-RĂL-jē-ă): pain of a nerve *neur:* nerve ***The pain of neuralgia usually occurs along the path of a nerve.***
-dynia		ot/o/**dynia** (ō-tō-DĬN-ē-ă): pain in the ear; also called earache *ot/o:* ear
-cele	hernia, swelling	hepat/o/**cele** (hĕ-PĂT-ō-sēl): hernia of the liver *hepat/o:* liver
-ectasis	dilation, expansion	bronchi/**ectasis** (brŏng-kē-ĔK-tă-sĭs): dilation or expansion of one or more bronchi *bronchi:* bronchus (plural, bronchi) ***Bronchiectasis is associated with various lung conditions and is commonly accompanied by chronic infection.***
-edema	swelling	lymph/**edema** (lĭmf-ĕ-DĒ-mă): swelling and accumulation of tissue fluid *lymph:* lymph ***Lymphedema may be caused by a blockage of the lymph vessels.***
-emesis	vomiting	hyper/**emesis** (hī-pĕr-ĔM-ĕ-sĭs): excessive vomiting *hyper-:* excessive, above normal
-emia	blood condition	an/**emia** (ă-NĒ-mē-ă): blood condition caused by a decrease in red blood cells (erythrocytes) *an-:* without, not
-gen	forming, producing, origin	carcin/o/**gen** (kăr-SĬN-ō-jĕn): forming, producing, or origin of cancer *carcin/o:* cancer ***A carcinogen is a substance or agent, such as a cigarette, that causes the development or increases the incidence of cancer.***
-genesis		carcin/o/**genesis** (kăr-sĭ-nō-JĔN-ĕ-sĭs): forming, producing, or origin of cancer *carcin/o:* cancer ***Carcinogenesis is the transformation of normal cells into cancer cells, commonly as a result of chemical, viral, or radioactive damage to genes.***

(continued)

Table 2-4 Diagnostic, Pathological, and Related Suffixes—cont'd

Suffix	Meaning	Word Analysis
-iasis	abnormal condition (produced by something specified)	chol/e/lith**/iasis*** (kō-lē-lĭ-THĪ-ă-sĭs): abnormal condition of gallstones *chol/e:* bile, gall *lith:* stone, calculus ***Cholelithasis is the presence or formation of gallstones in the gallbladder or common bile duct.***
-itis	inflammation	gastr**/itis** (găs-TRĪ-tĭs): inflammation of the stomach *gastr:* stomach
-lith	stone, calculus	chol/e**/lith*** (KŌ-lē-lĭth): gallstone *chol/e:* bile, gall
-malacia	softening	chondr/o**/malacia** (kŏn-drō-măl-Ā-shē-ă): softening of the articular cartilage, usually involving the patella *chondr/o:* cartilage
-megaly	enlargement	cardi/o/**megaly** (kăr-dē-ō-MĔG-ă-lē): enlargement of the heart *cardi/o:* heart
-oma	tumor	neur/**oma** (nū-RŌ-mă): tumor composed of nerve tissue *neur:* nerve ***A neuroma is a benign tumor composed chiefly of neurons and nerve fibers, usually arising from nerve tissue. It may also be a swelling of a nerve that usually results from compression.***
-osis	abnormal condition; increase (used primarily with blood cells)	cyan/**osis** (sī-ă-NŌ-sĭs): dark blue or purple discoloration of the skin and mucous membrane *cyan:* blue ***Cyanosis indicates a deficiency of oxygen in the blood.***
-pathy	disease	my/o/**pathy** (mī-ŎP-ă-thē): disease of muscle *my/o:* muscle
-penia	decrease, deficiency	erythr/o/**penia** (ĕ-rĭth-rō-PĒ-nē-ă): decrease in red blood cells *erythr/o:* red
-phagia	eating, swallowing	dys/**phagia** (dĭs-FĀ-jē-ă): inability or difficulty in swallowing *dys-:* bad; painful; difficult
-phasia	speech	a/**phasia** (ă-FĀ-zē-ă): absence or impairment of speech *a-:* without, not
-phobia	fear	hem/o/**phobia** (hē-mō-FŌ-bē-ă): fear of blood *hem/o:* blood
-plasia	formation, growth	dys/**plasia** (dĭs-PLĀ-zē-ă): abnormal formation or growth of cells, tissues, or organs *dys-:* bad; painful; difficult ***Dysplasia is a general term for abnormal formation of an anatomic structure.***

Table 2-4 Diagnostic, Pathological, and Related Suffixes—cont'd

Suffix	Meaning	Word Analysis
-plasm		neo/**plasm** (NĒ-ō-plăzm): new formation or growth of tissue *neo-:* new ***A neoplasm is an abnormal formation of new tissue, such as a tumor or growth.***
-plegia	paralysis	hemi/**plegia** (hĕm-ē-PLĒ-jē-ă): paralysis of one side of the body *hemi-:* one half ***Hemiplegia affects the right or left side of the body and is usually caused by a brain injury or stroke.***
-ptosis	prolapse, downward displacement	blephar/o/**ptosis** (blĕf-ă-rō-TŌ-sĭs): drooping of the upper eyelid *blephar/o:* eyelid
-rrhage	bursting forth (of)	hem/o/**rrhage** (HĔM-ĕ-rĭj): bursting forth (of) blood *hem/o:* blood ***Hemorrhage refers to a loss of a large amount of blood within a short period, either externally or internally.***
-rrhagia		men/o/**rrhagia** (mĕn-ō-RĀ-jē-ă): profuse discharge of blood during menstruation *men/o:* menses, menstruation
-rrhea	discharge, flow	dia/**rrhea** (dī-ă-RĒ-ă): abnormally frequent discharge or flow of fluid fecal matter from the bowel *dia-:* through, across
-rrhexis	rupture	arteri/o/**rrhexis** (ăr-tē-rē-ō-RĔK-sĭs): rupture of an artery *arteri/o:* artery
-sclerosis	abnormal condition of hardening	arteri/o/**sclerosis** (ăr-tē-rē-ō-sklĕ-RŌ-sĭs): abnormal condition of hardening of an artery *arteri/o:* artery
-spasm	involuntary contraction, twitching	blephar/o/**spasm** (BLĔF-ă-rō-spăsm): twitching of the eyelid *blephar/o:* eyelid
-stenosis	narrowing, stricture	arteri/o/**stenosis** (ăr-tē-rē-ō-stĕ-NŌ-sĭs): abnormal narrowing of an artery *arteri/o:* artery
-toxic	poison	hepat/o/**toxic** (HĔP-ă-tō-tŏk-sĭk): pertaining to an agent (poison) that damages the liver *hepat/o:* liver ***Alcohol and drugs are examples of agents that have destructive effects on the liver.***
-trophy	nourishment, development	dys/**trophy** (DĬS-trō-fē): bad nourishment *dys-:* bad; painful; difficult ***Dystrophy is an abnormal condition caused by improper nutrition or altered metabolism.***

It is time to review diagnostic, pathological, and related suffixes by completing Learning Activities 2-4 and 2-5.

Grammatical Suffixes

Grammatical suffixes are attached to word roots to form parts of speech, such as adjectives and nouns. They are also used to denote a diminutive form, or smaller version, of a word—for example, *tub**ule***, which means a small tube. Many of these same suffixes are used in the English language. (See Table 2-5.)

Table 2-5 Adjective, Noun, and Diminutive Suffixes

This table lists adjective, noun, and diminutive suffixes along with their meanings and word analyses.

Suffix	Meaning	Word Analysis
Adjective		
-ac	pertaining to	cardi/**ac** (KĂR-dē-ăk): pertaining to the heart *cardi:* heart
-al		neur/**al** (NŪ-răl): pertaining to a nerve *neur:* nerve
-ar		muscul/**ar** (MŬS-kū-lăr): pertaining to muscle *muscul:* muscle
-ary		pulmon/**ary** (PŬL-mō-nĕr-ē): pertaining to the lungs *pulmon:* lung
-eal		esophag/**eal** (ē-sŏf-ă-JĒ-ăl): pertaining to the esophagus *esophag:* esophagus
-ic		thorac/**ic** (thō-RĂS-ĭk): pertaining to the chest *thorac:* chest
-ical*		path/o/log/**ical** (păth-ō-LŎJ-ĭ-kăl): pertaining to the study of disease *path/o:* disease *log:* study of
-ile		pen/**ile** (PĒ-nīl): pertaining to the penis *pen:* penis
-ior		poster/**ior** (pŏs-TĒ-rē-or): pertaining to the back of the body *poster:* back (of body), behind, posterior
-ous		cutane/**ous** (kū-TĀ-nē-ŭs): pertaining to the skin *cutane:* skin
-tic		acous/**tic** (ă-KOOS-tĭk): pertaining to hearing *acous:* hearing
Noun		
-esis	condition	di/ur/**esis** (dī-ū-RĒ-sĭs): abnormal secretion of large amounts of urine *di-:* double *ur:* urine
-ia		pneumon/**ia** (nū-MŌ-nē-ă): infection of the lung usually caused by bacteria, viruses, or diseases *pneumon:* air; lung
-ism		hyper/thyroid/**ism** (hī-pĕr-THĪ-royd-ĭzm): condition characterized by overactivity of the thyroid gland *hyper-:* excessive, above normal *thyroid:* thyroid gland

*The suffix *-ical* is a combination of *-ic* and *-al*.

Table 2-5 Adjective, Noun, and Diminutive Suffixes—cont'd

Suffix	Meaning	Word Analysis
Noun		
-iatry	medicine; treatment	pod/**iatry** (pō-DĪ-ă-trē): specialty concerned with treatment and prevention of conditions of the feet *pod:* foot
-ician	specialist	obstetr/**ician** (ŏb-stĕ-TRĬSH-ăn): physician who specializes in the branch of medicine concerned with pregnancy and childbirth *obstetr:* midwife
-ist		hemat/o/log/**ist** (hē-mă-TŎL-ō-jĭst): physician who specializes in the treatment of disorders of blood and blood-forming tissues *hemat/o:* blood *log:* study of
-y	condition; process	neur/o/path/**y** (nū-RŎP-ă-thē): condition of the nerves (related to a) disease *neur/o:* nerve *path:* disease
Diminutive		
-icle	small, minute	ventr/**icle** (VĔN-trĭ-kl): small cavity, as of the brain or heart *ventr:* belly, belly side
-ole		arteri/**ole** (ăr-TĒ-rē-ōl): the smallest of the arteries; also called a minute artery *arteri:* artery ***Arteries narrow to form arterioles (minute arteries), which branch into capillaries (microscopic blood vessels).***
-ule		ven/**ule** (VĔN-ūl): small vein continuous with a capillary *ven:* vein

It is time to review grammatical suffixes by completing Learning Activity 2-6.

Plural Suffixes

Many medical words have Greek or Latin origins and follow the rules of these languages in building singular and plural forms. Once you learn these rules, you will find that they are easy to apply. You will also find that some English endings have also been adopted for commonly used medical terms. When a word changes from a singular to a plural form, the suffix of the word is the part that changes. A summary of the rules for changing a singular word into its plural form is located on the inside back cover of this textbook. Use it to complete Learning Activity 2-7 and whenever you need help forming plural words.

It is time to review the rules for forming plural words by completing Learning Activity 2-7.

LEARNING ACTIVITIES

The following activities provide review of the suffixes introduced in this chapter. Complete each activity and review your answers to evaluate your understanding of the chapter.

Learning Activity 2-1

Building Surgical Words

Use the meanings in the right column to complete the surgical words in the left column. The first one is completed for you. Note: The word roots are underlined in the left column.

Incomplete Word	Meaning
1. episi/o/ *t o m y*	incision of the perineum
2. col _ _ _ _ _ _	excision (of all or part)* of the colon
3. arthr/o/ _ _ _ _ _ _ _ _	surgical puncture of a joint (to remove fluid)
4. splen _ _ _ _ _ _	excision of the spleen
5. col/o/ _ _ _ _ _	forming an opening (mouth) into the colon
6. oste/o/ _ _ _ _	instrument to cut bone
7. tympan/o/ _ _ _ _	incision of the tympanic membrane
8. trache/o/ _ _ _ _ _	forming an opening (mouth) into the trachea
9. mast _ _ _ _ _ _	excision of a breast
10. lith/o/ _ _ _ _	incision to remove a stone or calculus
11. hemorrhoid _ _ _ _ _ _	excision of hemorrhoids

Build a surgical word that means

12. forming an opening (mouth) into the colon: _____
13. excision of the colon: _____
14. instrument to cut bone: _____
15. surgical puncture of a joint: _____
16. incision to remove a stone: _____
17. excision of a breast: _____
18. incision of the tympanic membrane: _____
19. forming an opening (mouth) into the trachea: _____
20. excision of the spleen: _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

*Information in parentheses is used to clarify the meaning of the word but not to build the medical term.

Learning Activity 2-2

Building More Surgical Words

Use the meanings in the right column to complete the surgical words in the left column. The word roots are underlined in the left column.

Incomplete Word	Meaning
1. arthr/o/ _ _ _ _ _	fixation or binding of a joint
2. rhin/o/ _ _ _ _ _ _	surgical repair of the nose
3. ten/o/ _ _ _ _ _ _	surgical repair of tendons
4. my/o/ _ _ _ _ _ _ _	suture of a muscle
5. mast/o/ _ _ _ _	fixation of a (pendulous)* breast
6. cyst/o/ _ _ _ _ _ _ _	suture of the bladder
7. oste/o/ _ _ _ _ _ _	surgical fracture of a bone
8. lith/o/ _ _ _ _ _ _	crushing of a stone
9. enter/o/ _ _ _ _ _	separation of intestinal (adhesions)
10. neur/o/ _ _ _ _ _ _	crushing a nerve

Build a surgical word that means

11. surgical repair of the nose: _____
12. fixation of a joint: _____
13. suture of a muscle: _____
14. fixation of a (pendulous) breast: _____
15. suture of the bladder: _____
16. repair of tendons: _____
17. surgical fracture of a bone: _____
18. crushing stones: _____
19. separation of intestinal (adhesions): _____
20. crushing a nerve: _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

*Information in parentheses is used to clarify the meaning of the word but not to build the medical term.

Learning Activity 2-3

Selecting a Surgical Suffix

Use the suffixes listed below to build surgical words in the right column that reflect the meanings in the left column. You may use the same suffix more than one time.

-centesis	*-ectomy*	*-plasty*	*-tome*
-clasis	*-lysis*	*-rrhaphy*	*-tomy*
-desis	*-pexy*	*-stomy*	*-tripsy*

1. crushing of a stone: lith/o/ _____
2. puncture of a joint (to remove fluid)*: arthr/o/ _____
3. excision of the spleen: splen/ _____
4. forming an opening (mouth) into the colon: col/o/ _____
5. instrument to cut skin: derma/ _____
6. forming an opening (mouth) into the trachea: trache/o/ _____
7. incision to remove a stone or calculus: lith/ _____ / _____
8. excision of a breast: mast/ _____
9. excision of hemorrhoids: hemorrhoid/ _____
10. incision of the trachea: trache/ _____ / _____
11. fixation of a breast: mast/ _____ / _____
12. excision of the colon: col/ _____
13. suture of the stomach (wall): gastr/ _____ / _____
14. fixation of the uterus: hyster/ _____ / _____
15. surgical repair of the nose: rhin/ _____ / _____
16. fixation or binding of a joint: arthr/ _____ / _____
17. to break or surgically fracture a bone: oste/ _____ / _____
18. loosening of nerve (tissue): neur/ _____ / _____
19. suture of muscle: my/o/ _____
20. incision of the tympanic membrane: tympan/ _____ / _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

*Information in parentheses is used to clarify the meaning of the word but not to build the medical term.

Learning Activity 2-4

Selecting Diagnostic, Pathological, and Related Suffixes

Use the suffixes in this list to build diagnostic, pathological, and related words in the right column that reflect the meanings in the left column.

-algia	*-graph*	*-metry*	*-penia*	*-rrhage*
-cele	*-iasis*	*-oma*	*-phagia*	*-rrhea*
-ectasis	*-malacia*	*-osis*	*-phasia*	*-rrhexis*
-emia	*-megaly*	*-pathy*	*-plegia*	*-spasm*
-genesis				

1. tumor of the liver: hepat/ _____
2. pain (along the course) of a nerve: neur/ _____
3. dilation of a bronchus: bronchi/ _____
4. producing or forming cancer: carcin/o/ _____
5. abnormal condition of the skin: dermat/ _____
6. enlargement of the kidney: nephr/o/ _____
7. discharge or flow from the ear: ot/ _____ / _____
8. rupture of the uterus: hyster/ _____ / _____
9. twitching of the eyelid: blephar/ _____ / _____
10. herniation of the bladder: cyst/ _____ / _____
11. bursting forth (of) blood: hem/o/ _____
12. abnormal condition of a stone or calculus: lith/ _____
13. paralysis affecting one side (of the body): hemi/ _____
14. disease of muscle (tissue): my/ _____ / _____
15. difficult or painful swallowing or eating: dys/ _____
16. softening of the bones: oste/ _____ / _____
17. without (or absence of) speech: a/ _____
18. white blood condition: leuk/ _____
19. deficiency in red (blood) cells: erythr/ _____ / _____
20. measuring the pelvis: pelv/i/ _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

Learning Activity 2-5

Building Pathological and Related Words

Use the meanings in the right column to complete the pathological and related words in the left column.

Incomplete Word	Meaning
1. bronchi/ _____	dilation of a bronchus
2. chole/ _____	gallstone
3. carcin/o/ _____	forming or producing cancer
4. oste/ _____ / _____	softening of bone
5. hepat/ _____ / _____	enlargement of the liver
6. cholelith/ _____	abnormal condition of gallstones
7. hepat/ _____ / _____	herniation of the liver
8. neur/o/ _____	disease of the nerves
9. dermat/ _____	abnormal condition of the skin
10. hemi/ _____	paralysis of one half of the body
11. dys/ _____	difficult swallowing
12. a/ _____	without (or absence of) speech
13. cephal/o/ _____	pain in the head; headache
14. blephar/ _____ / _____	twitching of the eyelid
15. hyper/ _____	excessive formation (of an organ or tissue)

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ Score

Learning Activity 2-6

Selecting Adjective, Noun, and Diminutive Suffixes

Use the adjective suffixes in the following list to create a medical term. The first one is completed for you. Note: When in doubt about the validity of a word, refer to a medical dictionary.

-ac *-ary* *-ic* *-tic*
-al *-eal* *-ous* *-tix*

Element	Medical Term	Meaning
1. thorac/	*thoracic*	pertaining to the chest
2. gastr/	_____	pertaining to the stomach
3. bacteri/	_____	pertaining to bacteria
4. aqua/	_____	pertaining to water
5. axill/	_____	pertaining to the armpit
6. cardi/	_____	pertaining to the heart
7. spin/	_____	pertaining to the spine
8. membran/	_____	pertaining to a membrane

Use the noun suffixes in the following list to create a medical term.

-er *-ism* *-iatry*
-ia *-ist*
-is *-y*

Element	Medical Term	Meaning
9. intern/	_____	specialist in internal medicine
10. leuk/em/	_____	condition of "white" blood
11. sigmoid/o/scop/	_____	visual examination of the sigmoid colon
12. alcohol/	_____	condition of (excessive) alcohol
13. pod/	_____	treatment of the feet
14. allerg/	_____	specialist in treating allergic disorders
15. man/	_____	condition of madness

Use the diminutive suffixes in the following list to create a medical term.

-icle *-ole* *-ula* *-ule*

Element	Medical Term	Meaning
16. arteri/	_____	minute artery
17. ventr/	_____	small cavity
18. ven/	_____	small vein

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5.6 = _____ % Score

Learning Activity 2-7

Forming Plural Words

Review the guidelines for plural suffixes (located inside the back cover of this book). Then write the plural form for each of the following singular terms and briefly state the rule that applies. The first one is completed for you.

Singular	Plural	Rule
1. diagnosis	*diagnoses*	*Drop the* is *and add* es.
2. fornix		
3. vertebra		
4. keratosis		
5. bronchus		
6. spermatozoon		
7. septum		
8. coccus		
9. ganglion		
10. prognosis		
11. thrombus		
12. appendix		
13. bacterium		
14. testis		
15. nevus		

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ % Score

Medical Language Lab
Turning terminology into language

Visit the Medical Language Lab at the web site: medicallanguagelab.com. Use it to enhance your study and reinforcement of suffixes with the flash-card activity related to suffixes. We recommend you complete the flash-card activity before moving on to Chapter 3.

Respiratory System

CHAPTER 7

Chapter Outline

Objectives

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

- Locate and describe the structures of the respiratory system.
- Describe the functional relationship between the respiratory system and other body systems.
- Pronounce, spell, and build words related to the respiratory system.
- Describe diseases, conditions, and procedures related to the respiratory system.
- Explain pharmacology related to the treatment of respiratory disorders.
- Demonstrate your knowledge of this chapter by completing the learning and medical record activities.

Anatomy and Physiology

The respiratory system is responsible for the exchange of **oxygen (O_2)** and **carbon dioxide (CO_2)**. Oxygen is essential for life. It is carried to all cells of the body in exchange for CO_2, a waste product. The lungs and airways transport oxygen-enriched air from the atmosphere to the lungs and carry waste CO_2 from the lungs to the atmosphere by a process called **breathing,** also known as **ventilation.** Breathing helps regulate the **pH** (acidity-alkalinity) of the blood, thereby maintaining homeostasis.

Anatomy and Physiology Key Terms

This section introduces important respiratory system terms and their definitions. Word analyses for selected terms are also provided.

Term	Definition
carbon dioxide (CO_2) KĂR-bŏn dī-ŎK-sīd	Tasteless, colorless, odorless gas produced by body cells during metabolism *The blood carries CO_2 to the lungs, which then exhale it.*
cartilage KĂR-tĭ-lĭj	Tough, elastic connective tissue that is more rigid than ligaments but less dense than bone *The tip of the nose and the outer ear are composed of cartilage.*
cilia SĬL-ē-ă	Hairlike structure *Cilia in the trachea move particles upward to the pharynx, where they are removed by coughing, sneezing, or swallowing. This mechanism is called the* cilia escalator. *Habitual smoking destroys the cilia escalator.*
diffuse dĭ-FŪZ	To move or spread out a substance at random, rather than by chemical reaction or application of external forces
mucous membrane MŪ-kŭs MĔM-brān *muc:* mucus *-ous:* pertaining to	Moist tissue layer lining hollow organs and cavities of the body that open to the environment; also called *mucosa*
oxygen (O_2) ŎK-sĭ-jĕn	Tasteless, odorless, colorless gas essential for human respiration *O_2 makes up about one-fifth (by volume) of the earth's atmosphere.*
pH	Symbol that indicates the degree of acidity or alkalinity of a substance *Increasing acidity is expressed as a number less than 7; increasing alkalinity as a number greater than 7, with 7 being neutral.*
septum SĔP-tŭm	Wall dividing two cavities *The nasal septum separates the two nostrils.*
serous membrane SĒR-ūs MĔM-brān *ser:* serum *-ous:* pertaining to	Thin layer of tissue that covers internal body cavities and secretes a fluid that keeps the membrane moist; also called *serosa*

Pronunciation Help

Long Sound	ā — rate	ē — rebirth	ī — isle	ō — over	ū — unite
Short Sound	ă — alone	ĕ — ever	ĭ — it	ŏ — not	ŭ — cut

Upper Respiratory Tract

The breathing process begins with inhalation. (See Figure 7-1.) Air is drawn into the (1) **nasal cavity,** a chamber lined with **mucous membranes** and tiny hairs called **cilia**. Here, air is filtered, heated, and moistened to prepare it for its journey to the lungs. The nasal cavity is divided into a right and left side by a vertical partition of **cartilage** called the **nasal septum**.

Olfactory neurons are receptors for the sense of smell. They are covered with a layer of mucus and located deep in the nasal cavity, embedded among the epithelial cells lining the nasal tract. Because they are located higher in the nasal passage than air normally travels during breathing, a person must sniff or inhale deeply to identify weak odors. Air passes from the nasal cavity to the throat **(pharynx),** a muscular tube that serves as a passageway for food and air. The pharynx consists of three sections: the (2) **nasopharynx,** posterior to the nose; the (3) **oropharynx,** posterior to the mouth; and the (4) **laryngopharynx,** superior to the larynx.

Within the nasopharynx is a collection of lymphoid tissue known as (5) **adenoids** (pharyngeal tonsils). The (6) **palatine tonsils,** more commonly known as **tonsils,** are located in the oropharynx. They protect the opening to the respiratory tract from microscopic organisms that may attempt entry by this route. The (7) **larynx** (voice box) contains the structures that make vocal sounds possible. A leaf-shaped structure on top of the larynx, the (8) **epiglottis,** seals off the air passage to the lungs during swallowing. This function ensures that food or liquids do not obstruct the flow of air to the lungs. The larynx is a short passage that joins the pharynx with the (9) **trachea** (windpipe). The trachea is composed of smooth muscle embedded with C-shaped rings of cartilage, which provide rigidity to keep the air passage open.

Lower Respiratory Tract

The trachea divides into two branches called (10) **bronchi** (singular, **bronchus**). One branch leads to the (11) **right lung** and the other to the (12) **left lung.** The inner walls of the trachea and bronchi are composed of **mucous membrane (mucosa)** embedded with cilia. This membrane traps incoming particles, and the cilia move the entrapped material upward into the pharynx, where it is expelled by coughing, sneezing, or swallowing. Like the trachea, bronchi contain C-shaped rings of cartilage.

Each bronchus divides into smaller and smaller branches, eventually forming (13) **bronchioles.** At the end of the bronchioles are tiny air sacs called (14) **alveoli** (singular, **alveolus**). An alveolus resembles a small balloon because it expands and contracts with inflow and outflow of air. The (15) **pulmonary capillaries** lie next to the thin tissue membranes of the alveoli. Carbon dioxide **diffuses** from the blood within the pulmonary capillaries and enters the alveolar spaces, while O_2 from the alveoli diffuses into the blood. After the exchange of gases, freshly oxygenated blood returns to the heart. Oxygen is now ready for delivery to all body tissues.

The lungs are divided into lobes: three lobes in the right lung and two lobes in the left lung. The space between the right and left lungs is called the (16) **mediastinum.** It contains the heart, aorta, esophagus, and bronchi. A **serous membrane**, the **pleura,** covers the lobes of the lungs and folds over to line the walls of the thoracic cavity. The membrane lying closest to the lung is the (17) **visceral pleura;** the membrane that lines the thoracic cavity is the (18) **parietal pleura.** The space between these two membranes is the (19) **pleural cavity.** It contains a small amount of lubricating fluid, which permits the visceral pleura to glide smoothly over the parietal pleura during breathing.

Ventilation depends on a pressure differential between the atmosphere and chest cavity. A large muscular partition, the (20) **diaphragm,** lies between the chest and abdominal cavities. The diaphragm assists in changing the volume of the thoracic cavity to produce the needed pressure differential for ventilation. When the diaphragm contracts, it partially descends into the abdominal cavity, thus decreasing the pressure within the chest and drawing air into the lungs **(inspiration).** When the diaphragm relaxes, it slowly reenters the thoracic cavity, thus increasing the

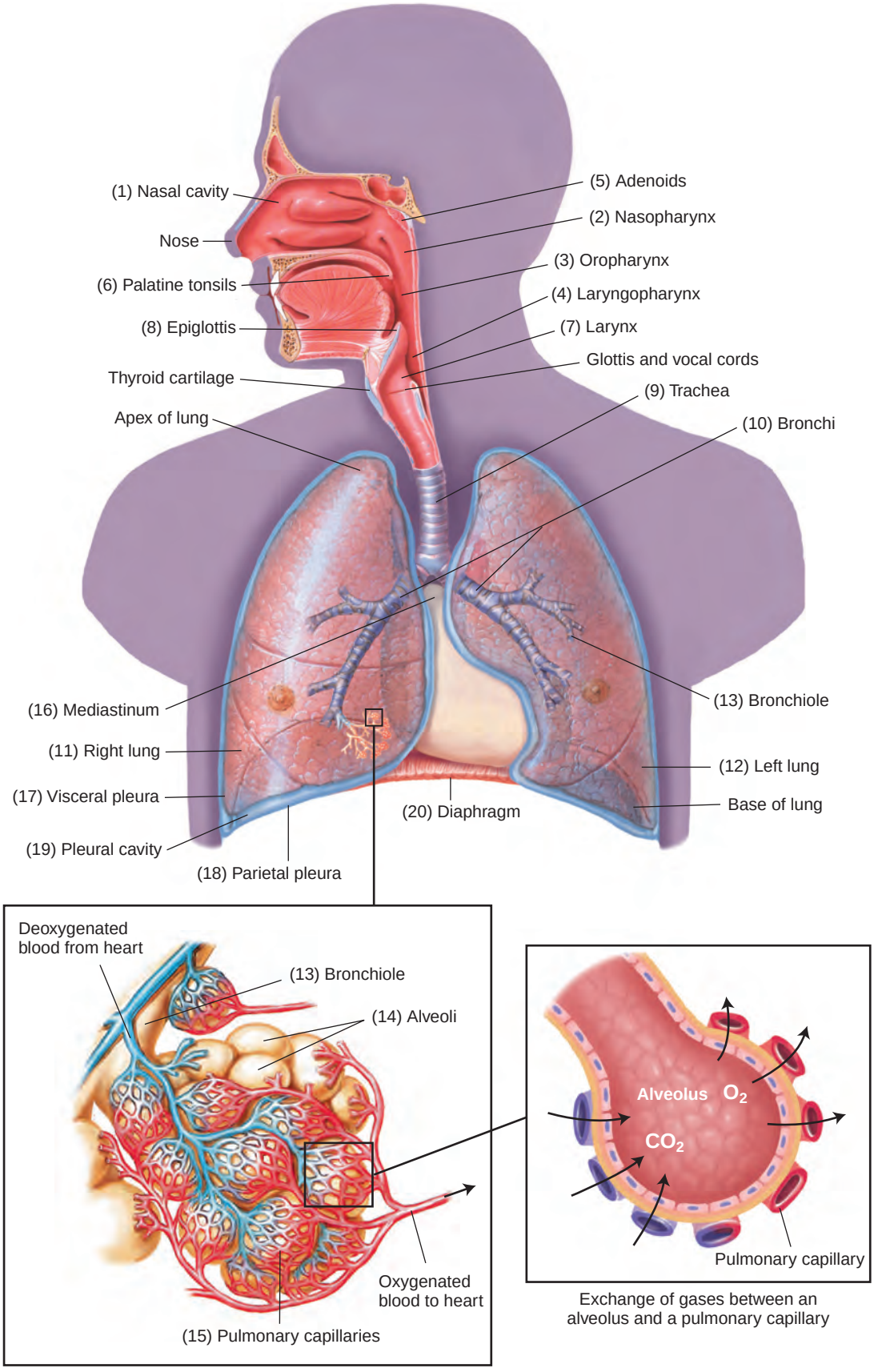


Figure 7-1 Anterior view of the upper and lower respiratory tracts.

pressure within the chest. As pressure increases, air leaves the lungs **(expiration).** The intercostal muscles assist the diaphragm in changing the volume of the thoracic cavity by elevating and lowering the rib cage. (See Figure 7-2.)

Respiration

Respiration is the process by which O_2 is taken from air and carried to body cells for their use, while CO_2 and water, the waste products generated by these cells, are returned to the environment. Respiration includes four separate processes:

- **pulmonary ventilation,** more commonly called **breathing**, is a largely involuntary action that moves air into (inspiration) and out of (expiration) the lungs in response to changes in blood O_2 and CO_2 levels and nervous stimulation of the diaphragm and intercostal muscles
- **external respiration,** which is the exchange of O_2 and CO_2 between the alveoli and the blood in the pulmonary capillaries
- **transport of respiratory gases,** which occurs when blood, aided by the cardiovascular system, transports CO_2 to the lungs and O_2 to body cells
- **internal respiration,** which is the exchange of O_2 and CO_2 between body cells and the blood in systemic capillaries.

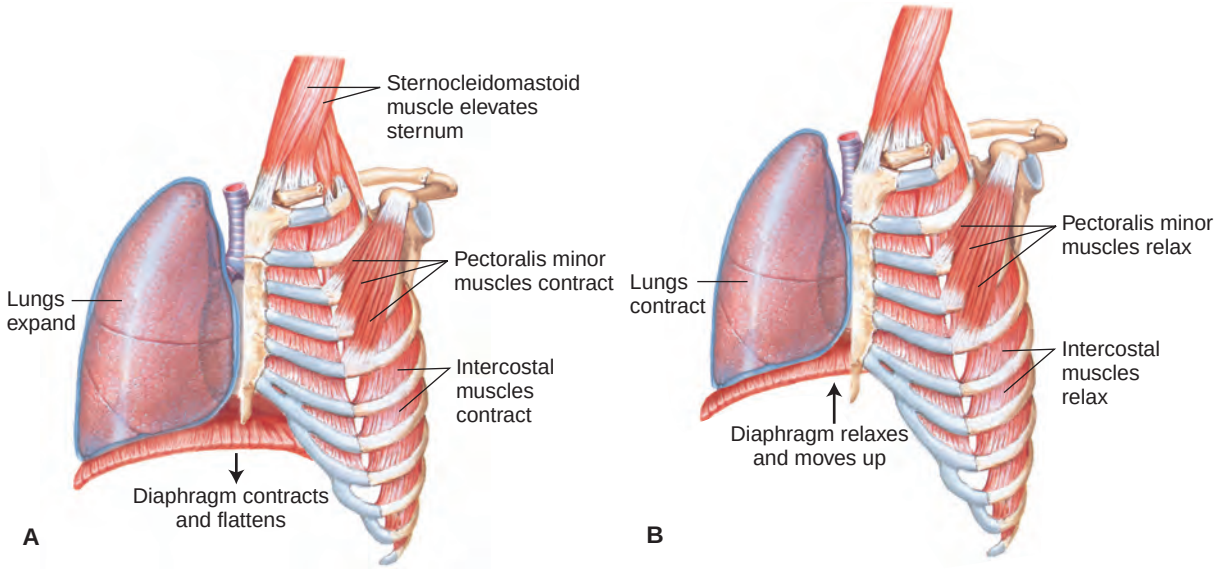
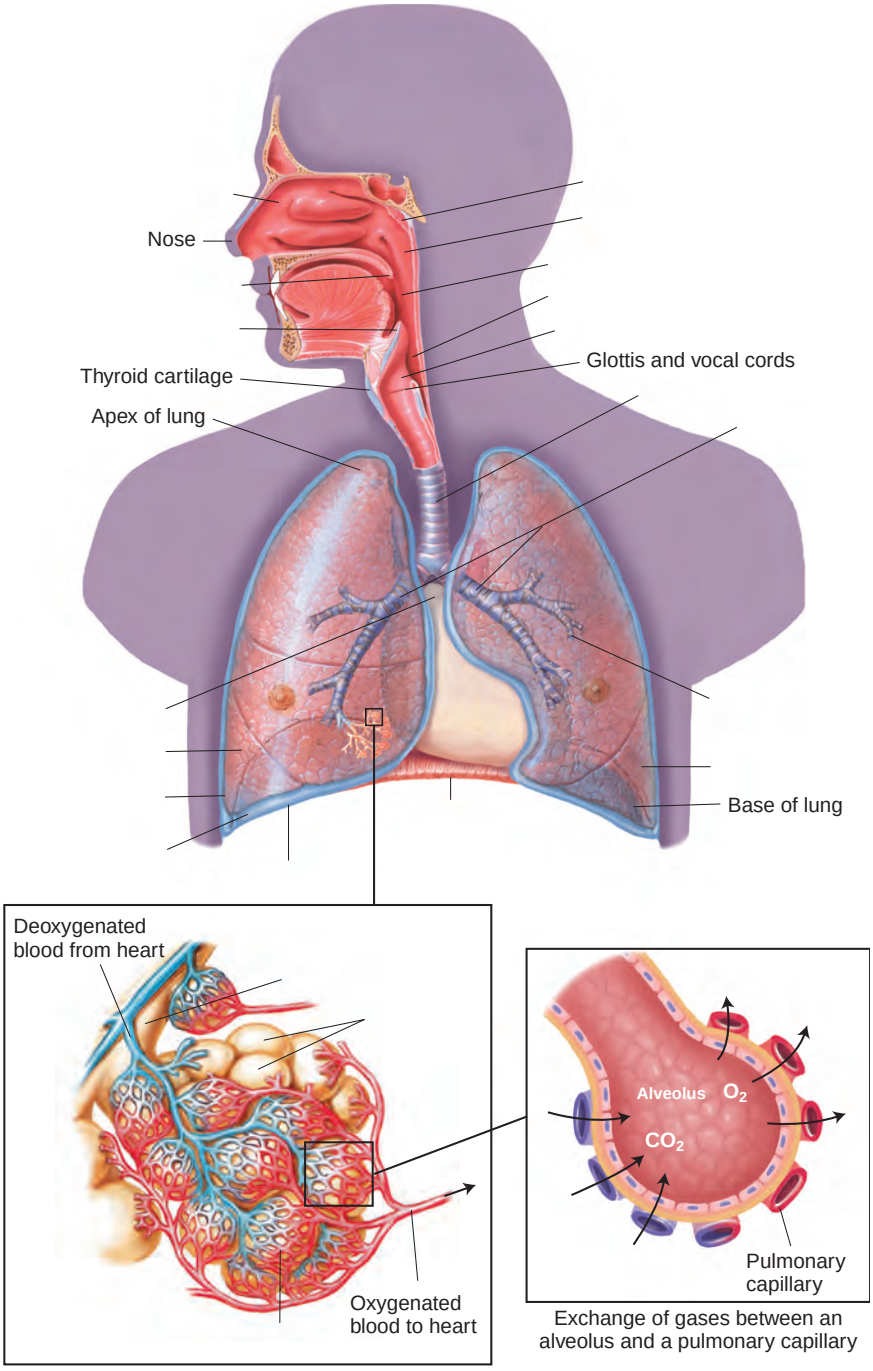


Figure 7-2 Breathing muscles. **(A)** Inspiration. **(B)** Expiration.

Anatomy Review

To review the anatomy of the respiratory system, label the illustration using the terms listed below.

adenoids
alveoli
bronchi
bronchiole
diaphragm
epiglottis
laryngopharynx
larynx
left lung
mediastinum
nasal cavity
nasopharynx
oropharynx
palatine tonsils
parietal pleura
pleural cavity
pulmonary capillaries
right lung
trachea
visceral pleura



Exchange of gases between an alveolus and a pulmonary capillary

Check your answers by referring to Figure 7-1 on page 168. Review material that you did not answer correctly.

CONNECTING BODY SYSTEMS—RESPIRATORY SYSTEM

The main function of the respiratory system is to provide oxygen to the entire body and expel carbon dioxide from the body. Specific functional relationships between the respiratory system and other body systems are summarized below.

Blood, Lymph, and Immune

- Tonsils, adenoids, and other immune structures in the respiratory tract protect against pathogens that enter through respiratory passageways.

Cardiovascular

- Respiratory system provides O_2 and removes CO_2 from cardiac tissue.

Digestive

- Respiratory system provides O_2 needed for digestive functions.
- Respiratory system removes CO_2 produced by the organs of digestion.
- Respiratory and digestive systems share the trachea, an anatomic structure of digestion.

Endocrine

- Respiratory system helps maintain a stable pH required for proper functioning of the endocrine glands.

Female Reproductive

- Respiratory rate increases in response to sexual activity.
- Fetal respiration occurs during pregnancy.

Integumentary

- Respiratory system furnishes O_2 and disposes of CO_2 to maintain healthy skin.

Male Reproductive

- Respiratory rate increases in response to sexual activity.
- Respiratory system helps maintain pH for gonadal hormone function.
- Oxygen is supplied to reproductive structures to maintain viable sperm.

Musculoskeletal

- Respiratory system provides O_2 for muscle contraction.
- Respiratory system eliminates CO_2 produced by muscles.
- Respiratory system provides O_2 for bone development.

Nervous

- Respiratory system provides O_2 for brain, spinal cord, and sensory organ functions.
- Respiratory system helps maintain a stable pH for neural function.

Urinary

- Respiratory system supplies O_2 and removes CO_2 to maintain proper functioning of urinary structures.
- Respiratory system assists the urinary structures in regulating pH by removing CO_2.

Medical Word Elements

This section introduces combining forms, suffixes, and prefixes related to the respiratory system. Word analyses are also provided.

Element	Meaning	Word Analysis
Combining Forms		
Upper Respiratory Tract		
nas/o	nose	**nas/**al (NĀ-zl): pertaining to the nose *-al:* pertaining to
rhin/o		**rhin/**o/plasty (RĪ-nō-plăs-tē): surgical repair of the nose *-plasty:* surgical repair *Rhinoplasty is performed to correct birth defects or for cosmetic purposes.*
sept/o	septum	**sept/o/**plasty (SĔP-tō-plăs-tē): surgical repair of the septum *-plasty:* surgical repair *Septoplasty is commonly performed to correct a deviated septum.*
sinus/o	sinus, cavity	**sinus/o/**tomy (sī-nŭs-ŎT-ō-mē): incision of any of the sinuses *-tomy:* incision *Sinusotomy is performed to improve ventilation or drainage in unresponsive sinusitis.*
adenoid/o	adenoids	**adenoid/**ectomy (ăd-ĕ-noyd-ĔK-tō-mē): excision of adenoids *-ectomy:* excision, removal
tonsill/o	tonsils	peri/**tonsill/**ar (pĕr-ĭ-TŎN-sĭ-lăr): pertaining to (the area) around the tonsils *peri-:* around *-ar:* pertaining to
pharyng/o	pharynx (throat)	**pharyng/o/**scope (făr-ĬN-gō-skōp): instrument for examining the pharynx *-scope:* instrument for examining
epiglott/o	epiglottis	**epiglott/**itis (ĕp-ĭ-glŏt-Ī-tĭs): inflammation of the epiglottis *-itis:* inflammation *Because the epiglottis seals the opening to the lungs, inflammation can lead to severe airway obstruction and death. Epiglottitis is treated as a medical emergency.*
laryng/o	larynx (voice box)	**laryng/o/**plegia (lă-rĭn-gō-PLĒ-jē-ă): paralysis of the (vocal cords and) larynx *-plegia:* paralysis
trache/o	trachea (windpipe)	**trache/o/**plasty (TRĀ-kē-ō-plăs-tē): surgical repair of the trachea *-plasty:* surgical repair *Tracheoplasty is performed to correct a narrow or stenotic trachea.*

Element	Meaning	Word Analysis
Lower Respiratory Tract		
bronchi/o	bronchus (plural, bronchi)	**bronchi/**ectasis (brŏng-kē-ĔK-tă-sĭs): dilation of the bronchi *-ectasis:* dilation, expansion *Bronchiectasis is associated with various lung conditions and is commonly accompanied by chronic infection.*
bronch/o		**bronch/o/**scope (BRŎNG-kō-skōp): instrument for examining the bronchus or bronchi *-scope:* instrument for examining *A bronchoscope is a flexible tube that is passed through the nose or mouth to enable inspection of the lungs and collection of tissue biopsies and secretions for analysis.*
bronchiol/o	bronchiole	**bronchiol/**itis (brŏng-kē-ō-LĪ-tĭs): inflammation of the bronchioles *-itis:* inflammation
alveol/o	alveolus; air sac	**alveol/**ar (ăl-VĒ-ō-lăr): pertaining to the alveoli *-ar:* pertaining to
pleur/o	pleura	**pleur/o/**centesis (ploo-rō-sĕn-TĒ-sĭs): surgical puncture of the pleural cavity; also called *thoracocentesis* or *thoracentesis* *-centesis:* surgical puncture
pneum/o	air; lung	**pneum/**ectomy (nūm-ĔK-tō-mē): excision of (all or part of) a lung *-ectomy:* excision
pneumon/o		**pneumon/**ia (nū-MŌ-nē-ă): condition of the lungs *-ia:* condition *The usual causes of pneumonia are infections due to bacteria, viruses, or other pathogenic organisms.*
pulmon/o	lung	**pulmon/o/**logist (pŭl-mŏ-NŎL-ŏ-jĭst): specialist in the study (and treatment) of lungs (and respiratory diseases) *-logist:* specialist in the study of
Other		
anthrac/o	coal, coal dust	**anthrac/**osis (ăn-thră-KŌ-sĭs): abnormal condition of coal dust (in the lungs); also called *black lung disease* *-osis:* abnormal condition; increase (used primarily with blood cells) *Anthracosis is a chronic occupational disease found in coal miners and those associated with the coal industry.*
atel/o	incomplete; imperfect	**atel/**ectasis (ăt-ĕ-LĔK-tă-sĭs): incomplete expansion of the lung; also called *airless lung* or *collapsed lung* *-ectasis:* dilation, expansion

(continued)

Element	Meaning	Word Analysis
coni/o	dust	pneum/o/**coni/**osis (nū-mō-kō-nē-Ō-sĭs): condition of dust in the lungs *pneum/o:* air; lung *-osis:* abnormal condition; increase (used primarily with blood cells) *Pneumoconiosis is usually caused by mineral dusts of occupational or environmental origin. Forms of pneumoconiosis include silicosis, asbestosis, and anthracosis.*
cyan/o	blue	**cyan/**osis (sī-ă-NŌ-sĭs): abnormal condition of blueness *-osis:* abnormal condition; increase (used primarily with blood cells) *Cold temperatures, heart failure, lung diseases, and smothering cause unusual blueness of the skin and mucous membranes due to the build-up of carbon dioxide in the blood.*
lob/o	lobe	**lob/**ectomy (lō-BĔK-tō-mē): excision of a lobe *-ectomy:* excision *Lobectomies are performed when a malignancy is confined to a single lobe of any lobed organ, such as the lungs, liver, and thyroid gland.*
orth/o	straight	**orth/o/**pnea (or-THŎP-nē-ă): breathing in a straight (or upright position) *-pnea:* breathing *Various lung disorders cause a patient to experience difficulty breathing in any position other than sitting or standing.*
ox/i	oxygen (O_2)	**ox/i/**meter (ŏk-SĬM-ĕ-tĕr): instrument used for measuring O_2 *-meter:* instrument for measuring *An oximeter is usually attached to the tip of a finger but may also be placed on a toe or ear lobe. It provides a measurement of O_2 saturation level of the blood.*
ox/o		hyp/**ox/**emia (hī-pŏks-Ē-mē-ă): deficiency of O_2 in blood *hyp-:* under, below, deficient *-emia:* blood condition
pector/o	chest	**pector/**algia (pĕk-tō-RĂL-jē-ă): pain in the chest; also called *thoracalgia* or *thoracodynia*, *-algia:* pain
steth/o		**steth/o/**scope (STĔTH-ō-skōp): instrument used for examining the chest *-scope:* instrument for examining *A stethoscope enables evaluation of sounds in the chest as well as the abdomen.*
thorac/o		**thorac/o/**pathy (thō-răk-ŎP-ă-thē): disease of the chest *-pathy:* disease
phren/o	diaphragm; mind	**phren/o/**spasm (FRĔN-ō-spăzm): involuntary contraction of the diaphragm *-spasm:* involuntary contraction, twitching
spir/o	breathe	**spir/o/**meter (spī-RŎM-ĕt-ĕr): instrument for measuring breathing *-meter:* instrument for measuring *A spirometer measures how much air the lungs can hold (vital capacity) as well as how much and how quickly air can be exhaled.*

Element	Meaning	Word Analysis
Suffixes		
-capnia	carbon dioxide (CO_2)	hyper/**capnia** (hī-pĕr-KĂP-nē-ă): excessive CO_2 *hyper-:* excessive, above normal
-osmia	smell	an/**osmia** (ăn-ŎZ-mē-ă): without (the sense of) smell *an-:* without, not
-phonia	voice	dys/**phonia** (dĭs-FŌ-nē-ă): bad (impaired) voice (quality) *dys-:* bad; painful; difficult *Dysphonia includes hoarseness, voice fatigue, or decreased projection.*
-pnea	breathing	a/**pnea** (ăp-NĒ-ă): not breathing *a-:* without, not *Apnea is a temporary loss of breathing and includes sleep apnea, cardiac apnea, and apnea of the newborn.*
-ptysis	spitting	hem/o/**ptysis** (hē-MŎP-tĭ-sĭs): (coughing up or) spitting of blood *hem/o:* blood *Bloody sputum is usually a sign of a serious condition of the lungs.*
-thorax	chest	py/o/**thorax** (pī-ō-THŌ-răks): pus in the chest (cavity); also called *empyema* *py/o:* pus *Pyothorax is usually caused by a penetrating chest wound or spreading of infection from another part of the body.*
Prefixes		
brady-	slow	**brady**/pnea (brăd-ĭp-NĒ-ă): slow breathing *-pnea:* breathing
dys-	bad; painful; difficult	**dys**/pnea (dĭsp-NĒ-ă): difficult breathing *-pnea:* breathing *Dyspnea includes any discomfort or significant breathlessness.*
eu-	good, normal	**eu**/pnea (ūp-NĒ-ă): normal breathing *-pnea:* breathing *The normal range for a resting adult respiratory rate is 12 to 20 breaths/minute.*
tachy-	rapid	**tachy**/pnea (tăk-ĭp-NĒ- ă): rapid breathing *-pnea:* breathing

DavisPlus | Visit the *Medical Terminology Systems* online resource center at Davis*Plus* for an audio exercise of the terms in this table. Other activities are also available to reinforce content.

It is time to review medical word elements by completing Learning Activities 7-1 and 7-2.

Pathology

Common signs and symptoms of many respiratory disorders include cough (dry or productive), chest pain, altered breathing patterns, shortness of breath (SOB), cyanosis, fever, and exercise intolerance. Many disorders of the respiratory system, including bronchitis and emphysema, begin as an acute problem but become chronic over time. Chronic respiratory diseases are usually difficult to treat. Their damaging effects are commonly irreversible.

For diagnosis, treatment, and management of respiratory disorders, the medical services of a specialist may be warranted. **Pulmonology** is the medical specialty concerned with disorders of the respiratory system. The physician who treats these disorders is called a **pulmonologist.**

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) includes respiratory disorders that produce a chronic partial obstruction of the air passages. Because of its chronic nature, the disease usually progresses to limited airflow into and out of the lungs with increased shortness of breath (SOB) and difficulty breathing (dyspnea). COPD is insidious and is commonly first diagnosed after some lung capacity has already been lost. It is possible to have early stages of COPD without knowing it. (See Table 7-1.) The three major disorders of COPD included asthma, chronic bronchitis, and emphysema. (See Figure 7-3.)

Asthma

Asthma produces spasms in the bronchial passages **(bronchospasms)** that may be sudden and violent **(paroxysmal)** and lead to dyspnea. Asthma is commonly caused by exposure to allergens or irritants. Other causes include stress, cold, and exercise. During recovery, coughing episodes produce large amounts of mucus **(productive cough).** Over time, the epithelium of the bronchial passages thickens, breathing becomes more difficult, and flare-ups **(exacerbations)** occur more frequently. Treatment includes agents that loosen and break down mucus **(mucolytics)** and medications that expand the bronchi **(bronchodilators)** by relaxing their smooth muscles. Most cases of asthma can be treated effectively. However, when treatment does not reverse bronchospasm, a life-threatening condition called **status asthmaticus** can occur, requiring hospitalization.

Table 7-1 Stages of COPD

The table below lists the levels of severity of COPD and describes their characteristics.

Severity Level	Description
At risk, mild	• Minor difficulty with airflow • Possible presence of chronic cough with sputum production • Patient possibly unaware of disease
Moderate	• Apparent limitation in airflow • Possible shortness of breath • Patient possibly seeking medical intervention at this level
Severe	• Inadequate airflow • Increase in shortness of breath with activity • Patient experiencing diminished quality of life
Very severe	• Severe airflow limitations • Significant impairment in quality of life • Possible life-threatening exacerbations • Possible development of complications, such as respiratory or heart failure

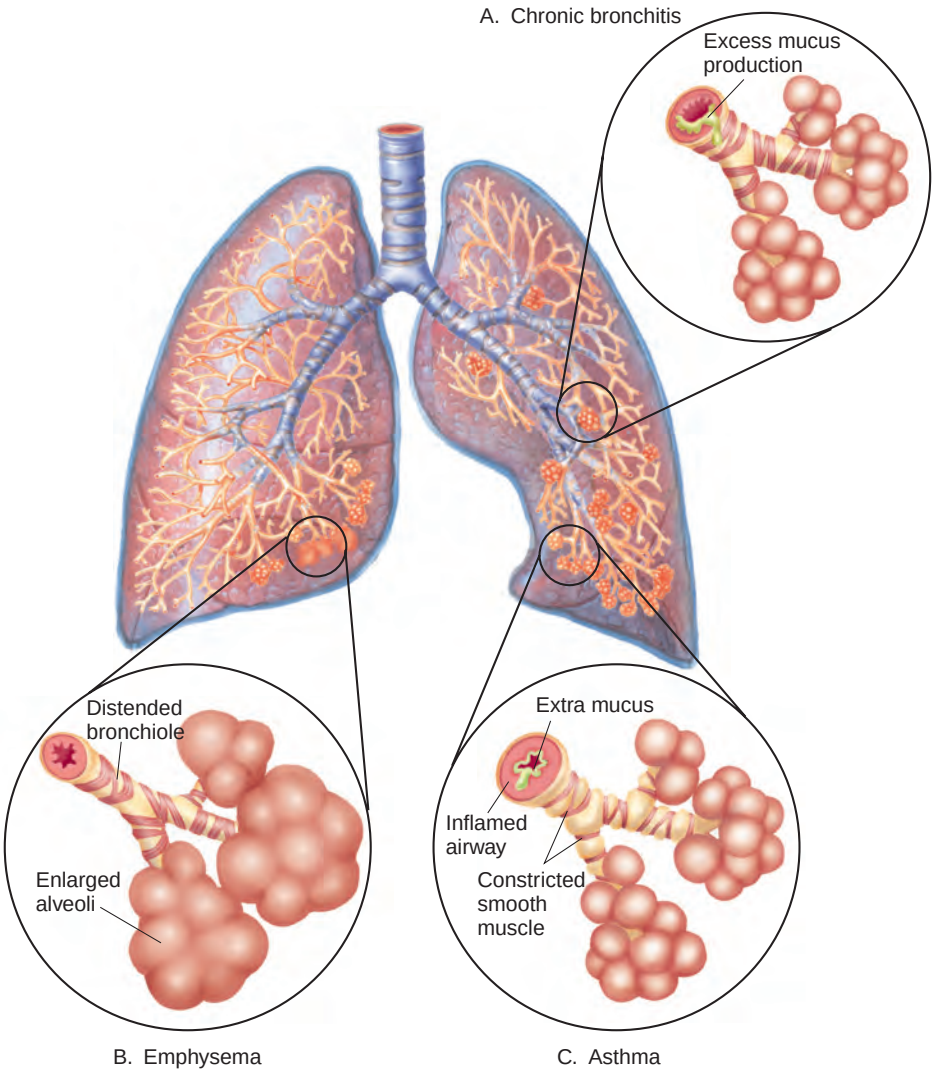


Figure 7-3 COPD. **(A)** Chronic bronchitis with inflamed airways and excessive mucus. **(B)** Emphysema with distended bronchioles and alveoli. **(C)** Asthma with narrowed bronchial tubes and swollen mucous membranes.

Chronic Bronchitis

Chronic bronchitis is an inflammation of the bronchi caused mainly by smoking and air pollution. However, other agents, such as viruses and bacteria, may also cause the disorder. Bronchitis is characterized by swelling of the mucosa and a heavy, productive cough that is commonly accompanied by chest pain. Patients usually seek medical help when they suffer exercise intolerance, wheezing, and shortness of breath (SOB). Bronchodilators and medications that aid in the removal of mucus **(expectorants)** help widen air passages. Steroids may be prescribed if the disease progresses or becomes chronic.

Emphysema

Emphysema is characterized by decreased elasticity of the alveoli. The alveoli expand (dilate) but are unable to contract to their original size. The air that remains trapped in the chest results in a characteristic "barrel-chested" appearance. This disease commonly occurs with another respiratory disorder, such as asthma, tuberculosis, or chronic bronchitis. It is also found in long-term heavy smokers. Most emphysema sufferers find it easier to breathe when sitting upright or standing erect **(orthopnea).** As the disease progresses, relief—even in the orthopneic position—is not possible. Treatment for emphysema is similar to that of chronic bronchitis.

Influenza

Influenza (flu) is an acute infectious respiratory viral disease. Three major viral types are of concern: type A, type B, and type C. Type A is of primary concern because it is associated with worldwide epidemics **(pandemics)** and its causative organism is highly infectious **(virulent).** Influenza type A epidemics occur about every 2 to 3 years. Type B is usually limited geographically and tends to be less severe than type A. Both viruses undergo antigenic changes; consequently, new vaccines must be developed in anticipation of outbreaks. Type C is a mild flu and is not associated with epidemics.

The onset of the flu is usually rapid. Symptoms include fever, chills, headache, generalized muscle pain **(myalgia),** and loss of appetite, but recovery occurs in about 7 to 10 days. The flu virus rarely causes death. If death occurs, it is usually the result of a secondary pneumonia caused by bacteria or viruses that invade the lungs. Children should not use aspirin for relief of symptoms caused by viruses because there appears to be a relationship between Reye syndrome and the use of aspirin by children ages 2 to 15.

Pleural Effusions

Any abnormal fluid in the pleural cavity, the space between the visceral and parietal pleura, is called a **pleural effusion.** Normally, the pleural cavity contains only a small amount of lubricating fluid. However, some disorders may cause excessive fluid to collect in the pleural cavity. Two initial techniques used to diagnose pleural effusion are auscultation and percussion. **Auscultation** is listening to sounds made by organs of the body using a stethoscope. **Percussion** is gentle tapping on the chest with the fingers and listening to the resultant sounds to determine the position, size, or consistency of the underlying structures. Chest x-ray (CXR) or magnetic resonance imaging (MRI) tends to confirm the diagnosis.

Effusions are classified as transudates and exudates. A **transudate** is a noninflammatory fluid that resembles serum but with slightly less protein. It results from an imbalance in venous-arterial pressure or a decrease of protein in blood. Both of these conditions allow serum to leak from the vascular system and collect in the pleural space. Common causes include heart failure and liver disorders. An **exudate** is usually high in protein and commonly contains blood and immune cells. Common causes include tumors, infections, and inflammation.

Various types of pleural effusions include serum **(hydrothorax),** pus (**empyema** or **pyothorax**), and blood **(hemothorax).** Although not considered a pleural effusion, air can enter the pleural space **(pneumothorax),** resulting in a partial or complete collapse of a lung. (See Figure 7-4.)

Treatment consists of correcting the underlying cause of the effusion. It commonly includes surgical puncture of the chest using a hollow-bore needle **(thoracocentesis, thoracentesis)** to remove excess fluid for diagnostic or therapeutic purposes. (See Figure 7-5.) Sometimes a physician will insert chest tubes to drain fluid or remove air in pneumothorax.

Tuberculosis

Tuberculosis (TB) is a communicable disease caused by the bacterium *Mycobacterium tuberculosis.* TB spreads by droplets of respiratory secretions **(droplet nuclei)** from an infected individual when he coughs, laughs, or sneezes. The waxy coat of the TB organism keeps it alive **(viable)** and infectious for 6 to 8 months outside the body. The waxy coat of this bacterium resists staining in the laboratory, but once stained it is difficult to remove even when an acid rinse is employed. Hence, TB is also known as the **acid-fast bacillus** (AFB).

Not everyone infected with TB bacteria becomes ill. As a result, two TB-related conditions exist: latent TB infection and active TB disease. With latent TB infection, the first time the TB organism enters the body **(primary tuberculosis)** the disease develops slowly. It eventually produces typical inflammatory nodules **(granulomas)** called **tubercles,** which encase the organism. These granulomas usually remain dormant for years and the patient is asymptomatic. The only evidence of the latent infection is a positive skin test for TB. In the dormant stage, the patient cannot transmit the disease to others.

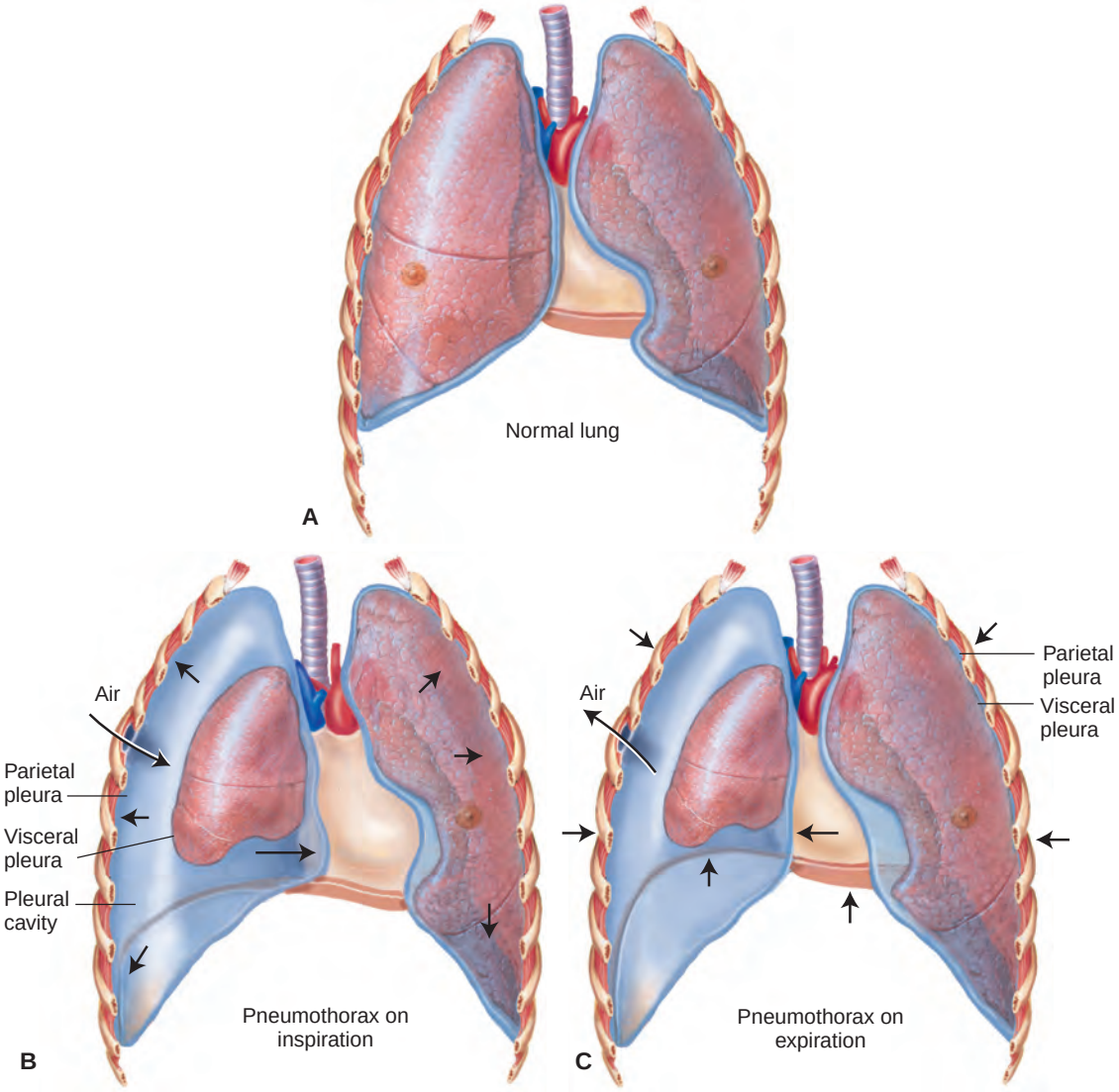


Figure 7-4 Pneumothorax. **(A)** Normal. **(B)** Open pneumothorax during inspiration. **(C)** Open pneumothorax during expiration.

When the immune system becomes impaired **(immunocompromised)** or when the patient is re-exposed to the bacterium, the active disease may develop and the patient becomes infectious to others. Sign and symptoms include hemoptysis, weakness, chills, fever, loss of appetite, and night sweats.

Although primarily a lung disease, TB can infect the bones, genital tract, meninges, and peritoneum. Some TB strains that infect AIDS patients have become resistant and do not respond to standard medications. Treatment may include using several antibiotics **(combination therapy)** at the same time.

Pneumonia

Pneumonia is any inflammatory disease of the lungs. It may be caused by bacteria, viruses, fungi, chemicals, or other agents that cause lung inflammation. In addition, some unrelated diseases cause various forms of pneumonia. For example, one type of pneumonia is associated with influenza and may be fatal. Other potentially fatal pneumonias may result from food or liquid inhalation **(aspiration pneumonias).** Some pneumonias affect only one lobe of the lung **(lobar pneumonia),** but

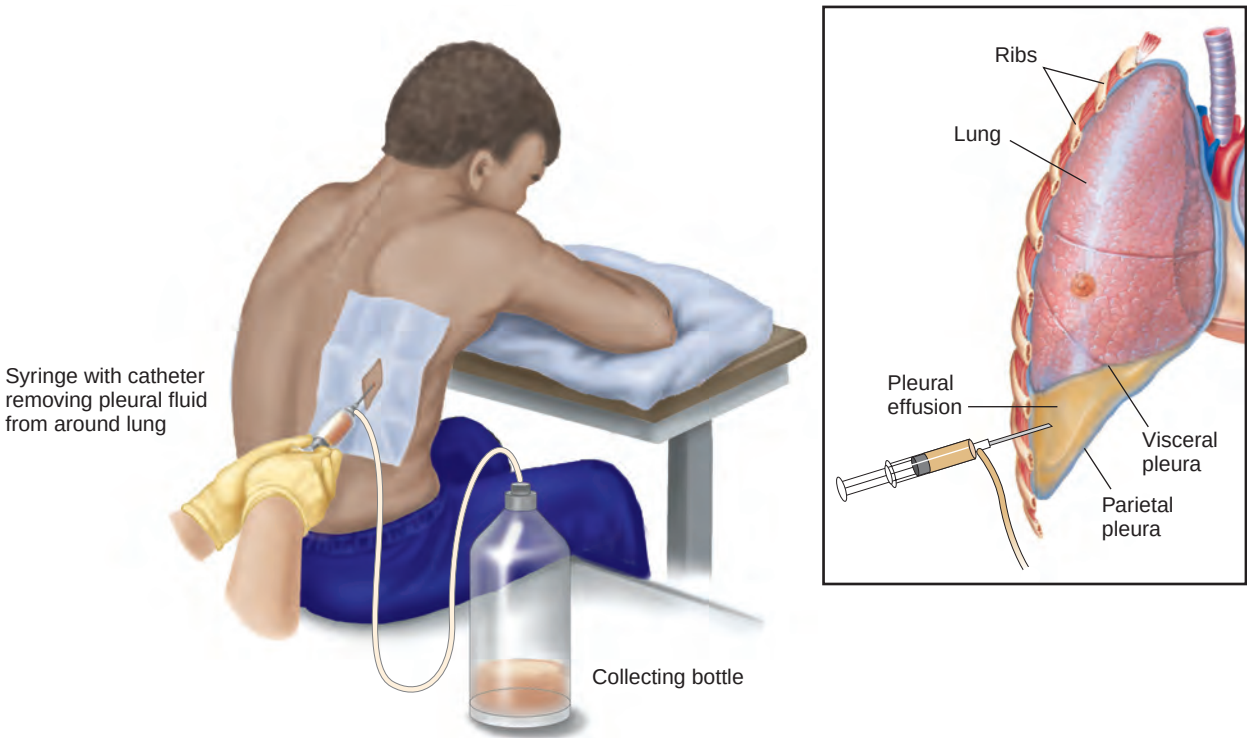


Figure 7-5 Thoracentesis.

some are more diffuse **(bronchopneumonia).** Chest pain, mucopurulent sputum, and spitting of blood **(hemoptysis)** are common signs and symptoms of the disease. If the air in the lungs is replaced by fluid and inflammatory debris, the lung tissue looses its spongy texture and becomes swollen and engorged **(consolidation).** Consolidation is primarily associated with bacterial pneumonias, not viral pneumonias.

***Pneumocystis* pneumonia** (PCP) is a type of pneumonia closely associated with AIDS. Recent evidence suggests that it is caused by organisms that reside in or on most people **(normal flora)** but causes no harm as long as the individual remains healthy. When the immune system begins to fail, this organism becomes infectious **(opportunistic).** Diagnosis relies on examination of biopsied lung tissue or bronchial washings **(lavage).**

Cystic Fibrosis

Cystic fibrosis is a hereditary disorder of the exocrine glands that causes the body to secrete extremely thick **(viscous)** mucus. This thickened mucus clogs ducts of the pancreas and digestive tract. As a result, digestion is impaired and the patient may suffer from malnutrition. It also blocks ducts of the sweat glands, causing the skin to become highly "salty." In the lungs, mucus blocks airways and impedes natural disease-fighting mechanisms, causing repeated infections. Medications in the form of mists **(aerosols)** along with postural drainage provide relief.

An important diagnostic test called the **sweat test** measures the amount of salt excreted in sweat. When elevated, it indicates cystic fibrosis. Although the disease is fatal, improved methods of treatment have extended life expectancy, and patient survival is approximately 30 years.

Acute Respiratory Distress Syndrome

Acute respiratory distress syndrome (ARDS) is a condition in which the lungs no longer function effectively, threatening the life of the patient. It usually occurs as a result of very serious lung conditions, such as trauma, severe pneumonia, and other major infections that affect the entire body **(systemic infections)** or blood **(sepsis).** In ARDS, the alveoli fill with fluid **(edema)** caused

by inflammation and then collapse, making oxygen exchange impossible. Mechanical ventilation is commonly required to save the life of the patient.

Hyaline membrane disease (HMD), also called **infant respiratory distress syndrome (IRDS),** is a form of respiratory distress syndrome. It is most commonly seen in preterm infants or infants born to diabetic mothers. It is caused by insufficient **surfactant,** a phospholipid substance that helps keep alveoli open. With insufficient surfactant, the alveoli collapse and breathing becomes labored. Clinical signs may include blueness **(cyanosis)** of the extremities. Flaring of the nostrils **(nares)** and central cyanosis are typically present. Other signs include rapid breathing **(tachypnea),** intercostal retraction, and a characteristic grunt audible during exhalation. Radiography shows a membrane that has a ground-glass appearance **(hyaline membrane),** bilateral decrease in volume, and alveolar consolidation. Although severe cases of HMD result in death, some forms of therapy are effective.

Oncology

Lung cancer, also called **bronchogenic carcinoma,** is a malignancy that arises from the epithelium of the bronchial tree. As masses form, they block air passages and alveoli. Within a short time they spread (**metastasize**) to other areas of the body usually lymph nodes, liver, bones, brain, and kidneys**.** Cigarette smoking causes most lung cancers. High levels of pollution, radiation and asbestos exposure may also increase risk.

Very few lung cancers are found in the early stages when the cure rate is high. Treatment of lung cancers include surgery, radiation, chemotherapy, or a combination of these methods depending on the type and stage of the tumor, and the general health of the patient. The prognosis for patients with cancer (CA) is generally poor.

Diseases and Conditions

This section introduces diseases and conditions of the respiratory system with their meanings and pronunciation. Word analyses for selected terms are also provided.

Term	Definition
acidosis ăs-ĭ-DŌ-sĭs *acid:* acid *-osis:* abnormal condition; increase (used primarily with blood cells)	Excessive acidity of body fluids *Respiratory acidosis is commonly associated with pulmonary insufficiency and the subsequent retention of carbon dioxide.*
anosmia ăn-ŎZ-mē-ă *an-:* without, not *-osmia:* smell	Absence of the sense of smell *Anosmia usually occurs as a temporary condition resulting from an upper respiratory infection or a condition that causes intranasal swelling.*

(continued)

Term	Definition
apnea ăp-NĒ-ă *a-:* without, not *-pnea:* breathing	Temporary loss of breathing *There are three types of apnea: obstructive (enlarged tonsils and adenoids), central (failure of the brain to transmit impulses for breathing), and mixed (combination of obstructive and central apnea).*
sleep	Sleeping disorder in which breathing stops repeatedly for more than 10 seconds, causing measurable blood deoxygenation (See Figure 7-6.)
asphyxia ăs-FĬK-sē-ă *a-:* without, not *-sphyxia:* pulse	Condition caused by insufficient intake of oxygen *Some common causes of asphyxia are drowning, electric shock, lodging of a foreign body in the respiratory tract, inhalation of toxic smoke, and poisoning.*
atelectasis ăt-ĕ-LĔK-tă-sĭs *atel:* incomplete; imperfect *-ectasis:* dilation, expansion	Collapsed or airless state of the lung, which may be acute or chronic and affects all or part of a lung *Atelectasis is a potential complication of some surgical procedures, especially those of the chest, because breathing is commonly shallow after surgery to avoid pain from the surgical incision. In fetal atelectasis, the lungs fail to expand normally at birth.*
Cheyne-Stokes respiration chān-STŌKS	Repeated breathing pattern characterized by fluctuation in the depth of respiration: first deeply, then shallow, then not at all *Cheyne-Stokes respirations are usually caused by diseases that affect the respiratory centers of the brain (such as heart failure and brain damage).*

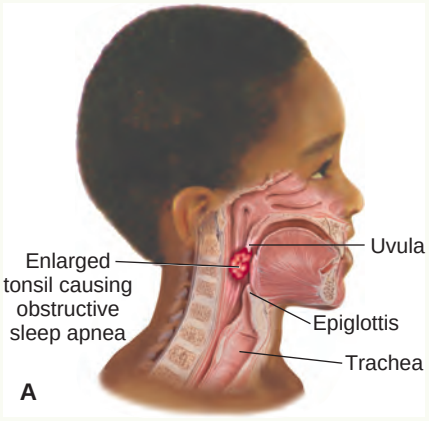


Figure 7-6 Sleep apnea. **(A)** Airway obstruction caused by enlarged tonsils, which eventually leads to obstructive sleep apnea. **(B)** Continuous positive airway pressure (CPAP) machine used to treat sleep apnea.

Term	Definition
coryza kŏ-RĪ-ză	Acute inflammation of the membranes of the nose; also called *head cold* or *upper respiratory infection* (URI)
crackle KRĂK-ĕl	Abnormal respiratory sound heard on auscultation, caused by exudates, spasms, hyperplasia, or when air enters moisture-filled alveoli; also called *rale*
croup CROOP	Common childhood condition involving inflammation of the larynx, trachea, bronchial passages and, sometimes, lungs *Signs and symptoms of croup include a resonant, barking cough with suffocative, difficult breathing; laryngeal spasms; and, sometimes, the narrowing of the top of the air passages.*
deviated nasal septum DĒ-vē-āt-ĕd NĀ-zl SĔP-tŭm *nas:* nose *-al:* pertaining to	Displacement of cartilage dividing the nostrils that causes reduced airflow and, sometimes, nosebleed
epiglottitis ĕp-ĭ-glŏt-Ī-tĭs *epiglott:* epiglottis *-itis:* inflammation	Severe, life-threatening infection of the epiglottis and supraglottic structures that occurs most commonly in children between 2 and 12 years of age *Signs and symptoms of epiglottitis include fever, dysphagia, inspiratory stridor, and severe respiratory distress. Intubation or tracheostomy may be required to open the obstructed airway.*
epistaxis ĕp-ĭ-STĂK-sĭs	Nasal hemorrhage; also called *nosebleed*
finger clubbing KLŬB-ĭng	Enlargement of the terminal phalanges of the fingers and toes commonly associated with pulmonary disease
hypoxemia hī-pŏks-Ē-mē-ă *hyp-:* under, below, deficient *ox:* oxygen *-emia:* blood condition	Oxygen deficiency in arterial blood; usually a sign of respiratory impairment
hypoxia hī-PŎKS-ē-ă *hyp-:* under, below, deficient *-oxia:* oxygen	Oxygen deficiency in body tissues; usually a sign of respiratory impairment
pertussis pĕr-TŬS-ĭs	Acute, infectious disease characterized by a cough that has a "whoop" sound; also called *whooping cough* *Immunization of infants as part of the diphtheria-pertussis-tetanus (DPT) vaccination is effective in preventing pertussis.*
pleurisy PLOO-rĭs-ē *pleur:* pleura *-isy:* state of; condition	Inflammation of the pleural membrane characterized by a stabbing pain that is intensified by coughing or deep breathing; also called *pleuritis*

(continued)

Term	Definition
pneumoconiosis nū-mō-kō-nē-Ō-sĭs *pneum/o:* air; lung *coni:* dust *-osis:* abnormal condition; increase (used primarily with blood cells)	Disease caused by inhaling dust particles, including coal dust (anthracosis), stone dust (chalicosis), iron dust (siderosis), and asbestos particles (asbestosis)
pulmonary edema PŬL-mō-nĕ-rē ĕ-DĒ-mă *pulmon:* lung *-ary:* pertaining to	Accumulation of extravascular fluid in lung tissues and alveoli, most commonly caused by heart failure *Excessive fluid in the lungs induces coughing and dyspnea.*
pulmonary embolism PŬL-mō-nĕ-rē ĔM-bō-lĭzm *pulmon:* lung *-ary:* pertaining to *embol:* plug *-ism:* condition	Blockage in an artery of the lungs caused by a mass of undissolved matter (such as a blood clot, tissue, air bubbles, and bacteria) (See Figure 7-7.)

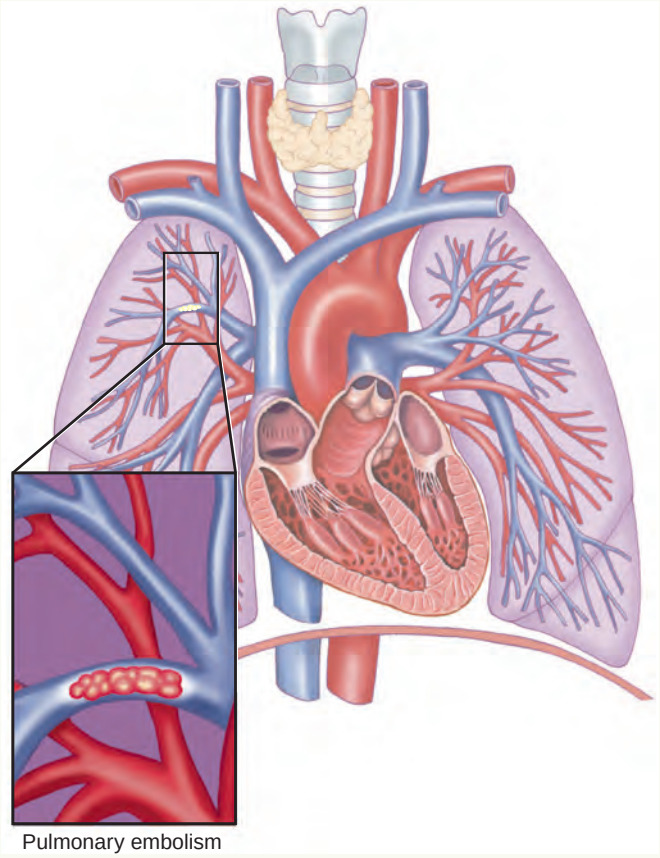


Figure 7-7 Pulmonary embolism. From Williams and Hopper: *Understanding Medical-Surgical Nursing,* 4th edition. FA Davis, Philadelphia, 2011, p 664, with permission.

Term	Definition
rhonchus RŎNG-kŭs	Abnormal breath sound heard on auscultation of an obstructed airway *A rhonchus is described as a course, rattling noise that resembles snoring, commonly suggesting secretions in the larger airways.*
stridor STRĪ-dor	High-pitched, harsh, adventitious breath sound caused by a spasm or swelling of the larynx or an obstruction in the upper airway *The presence of stridor requires immediate intervention.*
sudden infant death syndrome (SIDS)	Completely unexpected and unexplained death of an apparently normal, healthy infant, usually less than age 12 months; also called *crib death* *The rate of SIDS has decreased more than 30% since parents have been instructed to place babies on their backs for sleeping rather than on their stomachs.*
wheeze HWĒZ	Whistling or sighing sound heard on auscultation that results from narrowing of the lumen of the respiratory passageway *Wheezing is a sign of asthma, croup, hay fever, obstructive emphysema, and other obstructive respiratory conditions.*

It is time to review pathology, diseases, and conditions by completing Learning Activity 7-3.

Medical, Surgical, and Diagnostic Procedures

This section introduces medical, surgical and diagnostic procedures used to treat and diagnose respiratory disorders. Descriptions are provided as well as pronunciations and word analyses for selected terms.

Procedure	Description
Medical	
aerosol therapy ĀR-ō-sŏl THĔR-ă-pē	Lung treatment using various techniques to deliver medication in mist form directly to the lungs or air passageways *Techniques include nebulizers, metered-dose inhalers (MDIs), and dry powder inhalers (DPIs). Nebulizers change liquid medications into droplets to be inhaled through a mouthpiece. (See Figure 7-8.) MDIs deliver a specific amount when activated. Children and the elderly can use a spacer to synchronize inhalation with medication release. (See Figure 7-9.) A DPI is activated by a quick inhalation by the user.*
antral lavage ĂN-trăl lă-VĂZH	Washing or irrigating of the paranasal sinuses to remove mucopurulent material in an immunosuppressed patient or one with known sinusitis that has failed medical management

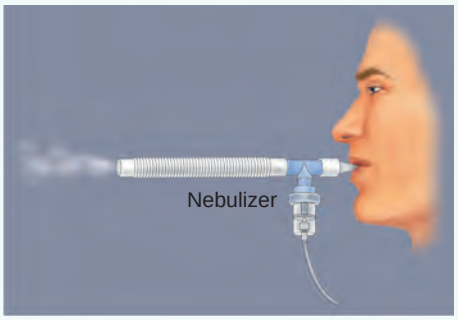


Figure 7-8 Nebulizer.

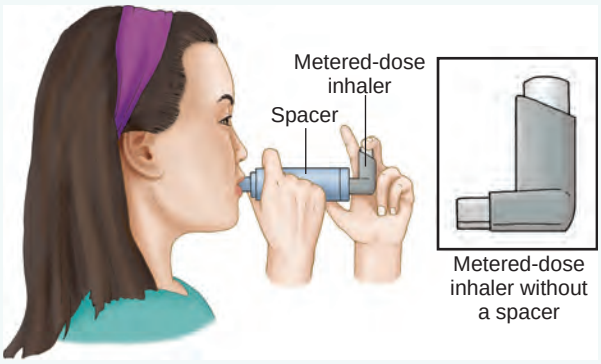


Figure 7-9 Metered-dose inhaler.

Procedure	Description
oximetry ŏk-SĬM-ĕ-trē *ox/i:* oxygen *-metry:* act of measuring	Noninvasive method of monitoring the percentage of hemoglobin (Hb) saturated with oxygen; also called *pulse oximetry* *In oximetry, a probe attached to the patient's finger or ear lobe links to a computer that displays the percentage of hemoglobin saturated with oxygen.*
polysomnography pŏl-ē-sŏm-NŎG-ră-fē *poly-:* many, much *somn/o:* sleep *-graphy:* process of recording	Test of sleep cycles and stages using continuous recordings of brain waves (EEGs), electrical activity of muscles, eye movement, respiratory rate, blood pressure, blood oxygen saturation, heart rhythm and, sometimes, direct observation of the person during sleep using a video camera (See Figure 7-10.)
postural drainage PŎS-tū-răl	Method of positioning a patient so that gravity aids in the drainage of secretions from the bronchi and lobes of the lungs
pulmonary function tests (PFTs) PŬL-mō-nĕ-rē *pulmon:* lung *-ary:* pertaining to	Variety of tests used to evaluate respiratory function, the ability of the lungs to take in and expel air as well as perform gas exchange across the alveolocapillary membrane *Measurement of different portions of lung volume provides an indication of breathing impairments, as does measurement of the volume of air expelled during a rapid, vigorous exhalation.*

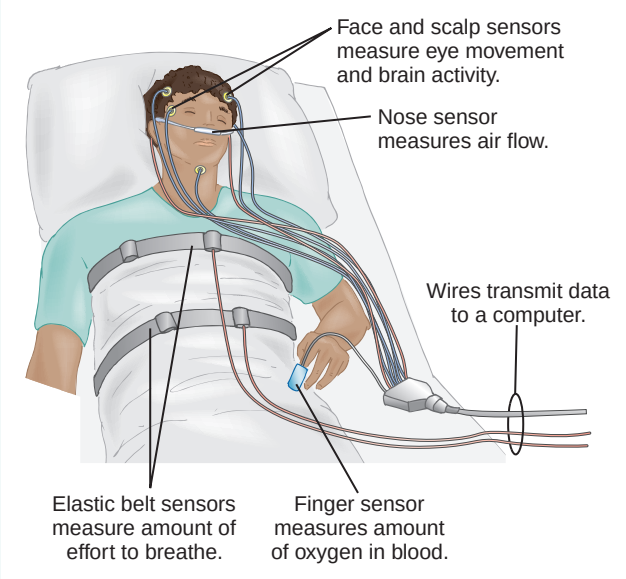


Figure 7-10 Polysomnography.

(continued)

Procedure	Description
spirometry spī-RŎM-ĕ-trē *spir/o:* breathe *-metry:* act of measuring	PFT that measures the breathing capacity of the lungs, including the time necessary for exhaling the total volume of inhaled air (See Figure 7-11.) *A spirometer produces a graphic record of spirometry results for placement in the patient's chart.*

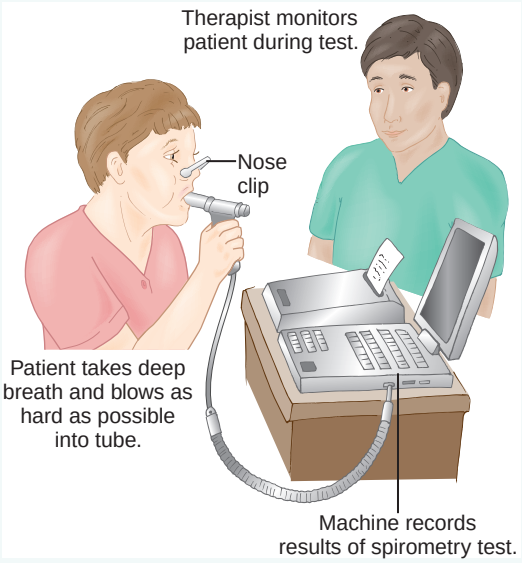


Figure 7-11 Spirometry.

Surgical

endotracheal intubation
ĕn-dŏ-TRĀ-kē-ăl ĭn-tū-BĀ-shŭn
endo-: in, within
trache: trachea
-al: pertaining to

Procedure in which a plastic tube is inserted into the trachea to maintain an open airway

Endotracheal intubation is commonly performed before surgery when the patient is first placed under sedation or in emergency situations to facilitate ventilation if necessary. (See Figure 7-12.)

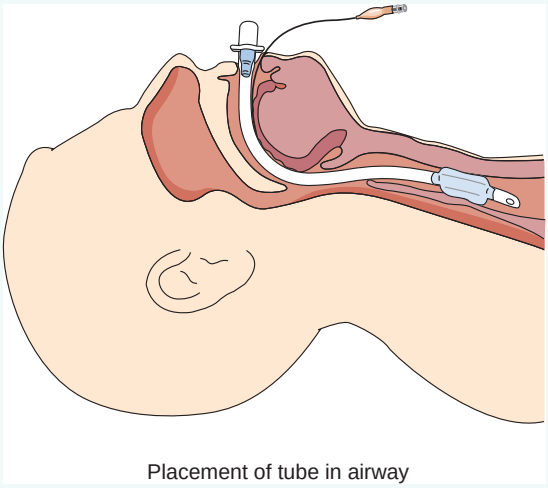


Figure 7-12 Endotracheal intubation. Williams and Hopper: *Understanding Medical-Surgical Nursing,* 4th edition. FA Davis, Philadelphia, 2011, p 617, with permission.

Procedure	Description
pleurectomy ploor-ĚK-tō-mē *pleur:* pleura *-ectomy:* excision, removal	Excision of part of the pleura, usually the parietal pleura *Pleurectomy is performed to reduce pain caused by a tumor mass or to prevent the recurrence of pleural effusion but is generally ineffective in the treatment of malignancy of the pleura.*
pneumectomy nūm-ĚK-tō-mē *pneum:* air; lung *-ectomy:* excision, removal	Excision of a lung or a portion of the lung, commonly for treatment of cancer (See Figure 7-13.)

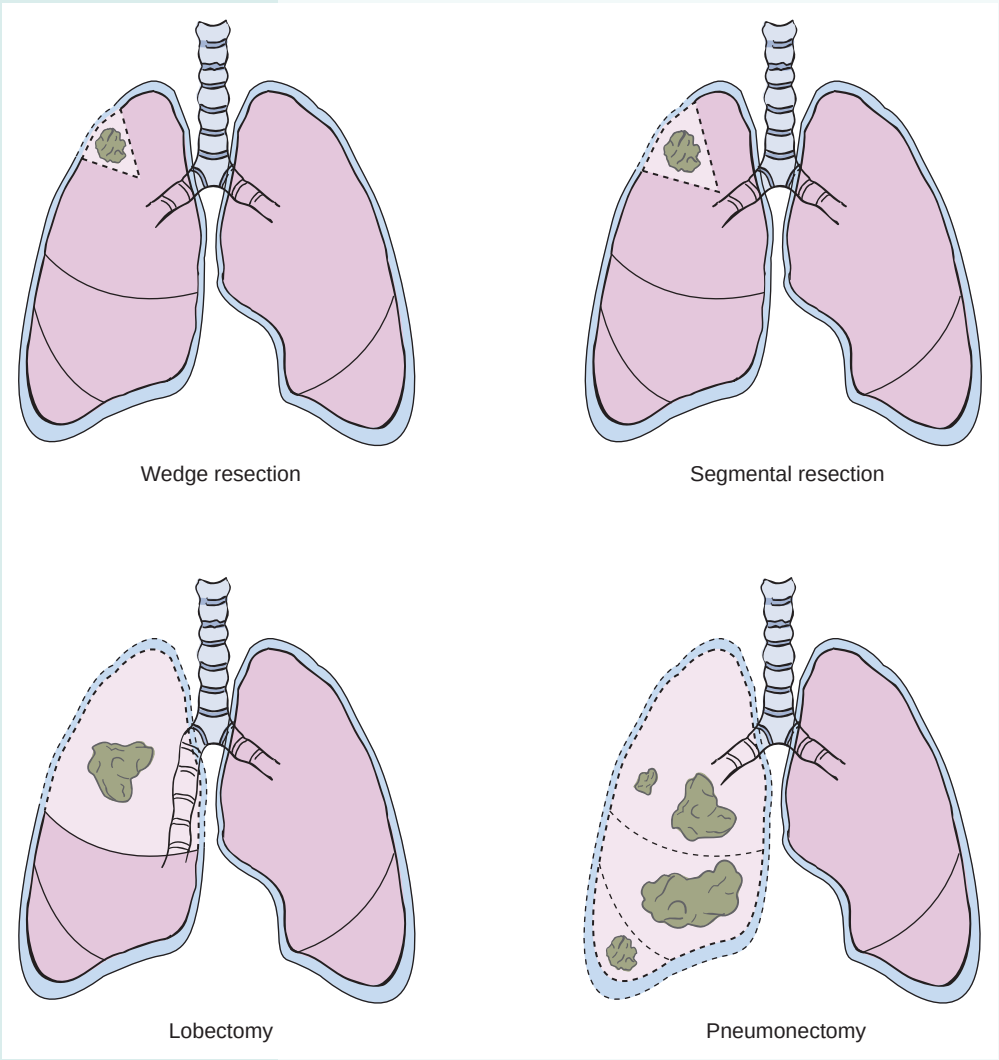


Figure 7-13 Types of pneumonectomies. Williams and Hopper: *Understanding Medical-Surgical Nursing,* 4th edition. FA Davis, Philadelphia, 2011, p 673, with permission.

(continued)

Procedure	Description
septoplasty sĕp-tō-PLĂS-tē *sept/o:* septum *-plasty:* surgical repair	Surgical repair of a deviated nasal septum usually performed when the septum is encroaching on the breathing passages or nasal structures *Common complications of a deviated septum include interference with breathing and a predisposition to sinus infections.*
thoracentesis thō-ră-sĕn-TĒ-sĭs	Surgical puncture and drainage of the pleural cavity; also called *pleurocentesis* or *thoracocentesis* *Thoracentesis as a diagnostic procedure helps determine the nature and cause of an effusion and, as a therapeutic procedure, relieves the discomfort caused by the effusion.*
tracheostomy trā-kē-ŎS-tō-mē *trache/o:* trachea *-stomy:* forming an opening (mouth)	Surgical procedure in which an opening is made in the neck and into the trachea into which a breathing tube may be inserted (See Figure 7-14.)

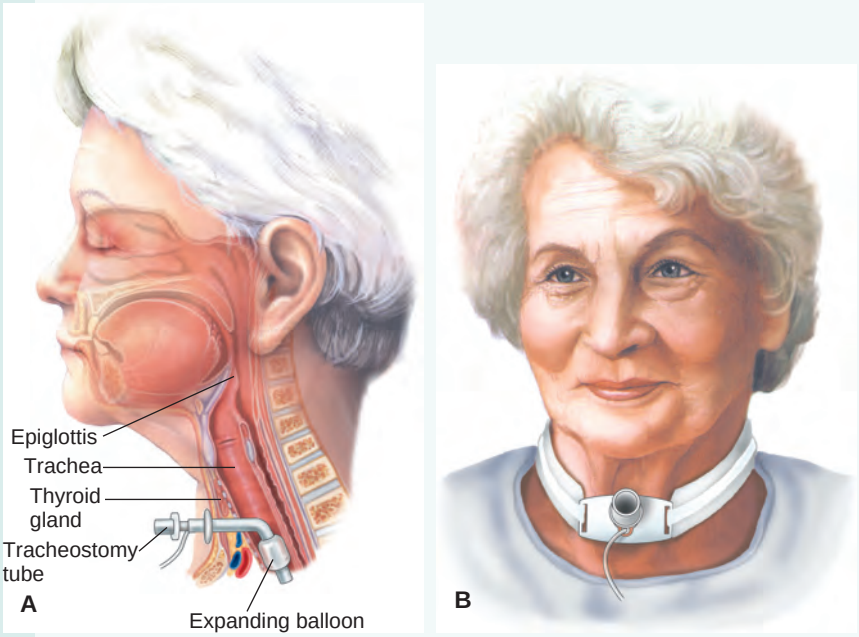


Figure 7-14 Tracheostomy. **(A)** Lateral view with tracheostomy tube in place. **(B)** Frontal view.

Diagnostic

Clinical

Mantoux test măn-TŪ	Intradermal test to determine tuberculin sensitivity based on a positive reaction where the area around the test site becomes red and swollen *A positive test suggests a past or present exposure to TB or past TB vaccination. However, the Mantoux test does not differentiate between active and inactive infection.*

Procedure	Description
Endoscopy	
bronchoscopy brŏng-KŎS-kō-pē *bronch/o:* bronchus *-scopy:* visual examination	Visual examination of the bronchi using an endoscope (flexible fiberoptic or rigid) inserted through the mouth and trachea for direct viewing of structures or for projection on a monitor (See Figure 7-15.) *Attachments on the bronchoscope can be used to suction mucus, remove foreign bodies, collect sputum, or perform biopsy.*
laryngoscopy lăr-ĭn-GŎS-kō-pē *laryng/o:* larynx (voice box) *-scopy:* visual examination	Visual examination of the larynx to detect tumors, foreign bodies, nerve or structural injury, or other abnormalities
mediastinoscopy mē-dē-ăs-tĭ-NŎS-kō-pē *mediastin/o:* mediastinum *-scopy:* visual examination	Visual examination of the mediastinal structures, including the heart, trachea, esophagus, bronchus, thymus, and lymph nodes *The mediastinoscope is inserted through a small incision made above the sternum. The attached camera projects images on a monitor. Additional incisions may be made if nodes are removed or other diagnostic or therapeutic procedures are performed.*
Laboratory	
arterial blood gas (ABG) ăr-TĒ-rē-ăl *arteri/o:* artery *-al:* pertaining to	Test that measures dissolved oxygen and carbon dioxide in arterial blood *ABG analysis evaluates acid-base state and how well oxygen is being carried to body tissues.*

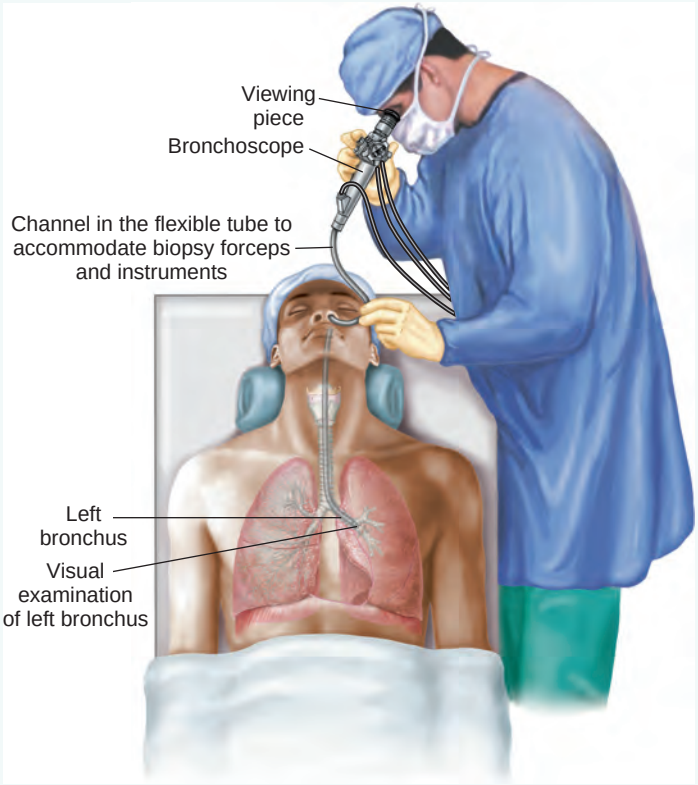


Figure 7-15 Bronchoscopy of the left bronchus.

(continued)

Procedure	Description
sputum culture SPŪ-tŭm	Microbial test used to identify disease-causing organisms of the lower respiratory tract, especially those that cause pneumonias
sweat test	Measurement of the amount of salt (sodium chloride) in sweat *A sweat test is used almost exclusively in children to confirm cystic fibrosis.*
throat culture	Test used to identify pathogens, especially group A streptococci *Untreated streptococcal infections may lead to serious secondary complications, including kidney and heart disease.*
Imaging	
computed tomography pulmonary angiography (CTPA) kŏm-PŪ-tĕd tō-MŎG-ră-fē PŬL-mō-nĕr-ē ăn-jē-ŎG-ră-fē *tom/o:* to cut *-graphy:* process of recording *pulmon:* lung *-ary:* pertaining to *angi/o:* vessel (usually blood or lymph) *-graphy:* process of recording	Minimally invasive imaging that combines computed tomography scanning and angiography to produce images of the pulmonary arteries *This test is highly sensitive and specific for the presence of pulmonary emboli.*
ventilation-perfusion (V-Q) scan	Nuclear test scan that evaluates both airflow (ventilation) and blood flow (perfusion) in the lungs for evidence of a blood clot in the lungs; also called *V-Q lung scan*

Pharmacology

Several classes of drugs are prescribed to treat pulmonary disorders. These include antibiotics, which are used to treat respiratory infections, and bronchodilators, which are especially effective in treating COPD and exercise-induced asthma. (See Table 7-2.) Bronchodilators relax smooth muscles of the bronchi, thus increasing airflow. Some bronchodilators are delivered as a fine mist directly to the airways via aerosol delivery devices, including nebulizers and metered-dose inhalers (MDIs). Another method of delivering medications directly to the lungs is dry-powder inhalers (DPIs) that dispense medications in the form of a powder. Steroidal and nonsteroidal anti-inflammatory drugs are important in the control and management of many pulmonary disorders.

Table 7-2 Drugs Used to Treat Respiratory Disorders

This table lists common drug classifications used to treat respiratory disorders, their therapeutic actions, and selected generic and trade names.

Classification	Therapeutic Action	Generic and *Trade* Names
antibiotics ăn-tĭ-bī-ĂW-tĭks	Destroy or inhibit the growth of bacteria by disrupting their membranes or one or more of their metabolic processes	**azythromycin** ā-ZĬTH-rō-mī-sĭn *Zithromax* **erythromycin** ĕr-ĭth-rō-MĪ-sĭn *Ery-tab*

Table 7-2 Drugs Used to Treat Respiratory Disorders—cont'd

Classification	Therapeutic Action	Generic and *Trade* Names
antihistamines ăn-tĭ-HĬS-tă-mēnz	Block histamines from binding with histamine receptor sites in tissues *Histamines cause sneezing, runny nose, itchiness, and rashes.*	**fexofenadine** fĕk-sō-FĔN-ă-dēn *Allegra* **loratadine** lor-ĂH-tă-dēn *Claritin*
antitussives ăn-tĭ-TŬS-ĭvz	Relieve or suppress coughing by blocking the cough reflex in the medulla of the brain *Antitussives alleviate nonproductive dry coughs and should not be used with productive coughs.*	**hydrocodone** hī-drō-KŌ-dōn *Hycodan* **dextromethorphan** dĕk-strō-mĕth-OR-făn *Vicks Formula 44*
bronchodilators brŏng-kō-DĪ-lā-torz	Stimulate bronchial muscles to relax, thereby expanding air passages, resulting in increased air flow *Bronchodilators are used to treat chronic symptoms and prevent acute attacks in respiratory diseases, such as asthma and COPD, and may be delivered by an inhaler, orally, or intravenously.*	**albuterol** ăl-BŪ-tĕr-ŏl *Proventil, Ventolin* **salmeterol** săl-MĔT-ĕr-ŏl *Serevent*
corticosteroids kor-tĭ-kō-STĔR-oyds	Act on the immune system by blocking production of substances that trigger allergic and inflammatory actions *Corticosteroids are available as nasal sprays, in metered-dose-inhalers (inhaled steroids), and in oral forms (pills or syrups) to treat chronic lung conditions, such as asthma and COPD.*	**beclomethasone dipropionate** bĕ-klō-MĔTH-ă-sōn dī-PRŌ-pĕ-ō-nāt *Vanceril, Beclovent* **triamcinolone** trī-ăm-SĬN-ō-lōn *Azmacort*
decongestants dē-kŏn-JĔST-ănts	Constrict blood vessels of nasal passages and limit blood flow, which causes swollen tissues to shrink so that air can pass more freely through the passageways *Decongestants are commonly prescribed for allergies and colds and are usually combined with antihistamines in cold remedies. They can be administered orally or topically as nasal sprays and nasal drops.*	**oxymetazoline** ŏks-ē-mĕt-ĂZ-ō-lēn *Dristan* **pseudoephedrine** soo-dō-ĕ-FĔD-rĭn *Drixoral, Sudafed*
expectorants ĕk-SPĔK-tō-rănts	Liquefy respiratory secretions so that they are more easily dislodged during coughing episodes *Expectorants are prescribed for productive coughs.*	**guaifenesin** gwī-FĔN-ĕ-sĭn *Robitussin, Mucinex*

Abbreviations

This section introduces respiratory-related abbreviations and their meanings.

Abbreviation	Meaning	Abbreviation	Meaning
ABG	arterial blood gas(es)	**MRI**	magnetic resonance imaging
AFB	acid-fast bacillus (TB organism)	**NMT**	nebulized mist treatment
ARDS	acute respiratory distress syndrome	**O_2**	oxygen
CA	cancer	**PA**	posteroanterior; pernicious anemia
CO_2	carbon dioxide	**Pco_2**	partial pressure of carbon dioxide
COPD	chronic obstructive pulmonary disease	**PCP**	Pneumocystis carinii pneumonia; primary care physician
CPAP	continuous positive airway pressure	**PFT**	pulmonary function test
CPR	cardiopulmonary resuscitation	**pH**	degree of acidity or alkalinity
CT	computed tomography	**PND**	paroxysmal nocturnal dyspnea
CTPA	computed tomography pulmonary angiography	**Po_2**	partial pressure of oxygen
CXR	chest x-ray, chest radiograph	**RD**	respiratory distress
DPI	dry powder inhaler	**RDS**	respiratory distress syndrome
DPT	diphtheria, pertussis, tetanus	**SIDS**	sudden infant death syndrome
Hb, Hgb	hemoglobin	**SOB**	shortness of breath
HMD	hyaline membrane disease	**T&A**	tonsillectomy and adenoidectomy
IRDS	infant respiratory distress syndrome	**TB**	tuberculosis
MDI	metered-dose inhaler	**URI**	upper respiratory infection

It is time to review procedures, pharmacology, and abbreviations by completing Learning Activity 7-4.

LEARNING ACTIVITIES

The following activities provide review of the respiratory system terms introduced in this chapter. Complete each activity and review your answers to evaluate your understanding of the chapter.

Medical Language Lab
Turning terminology into language

Visit the Medical Language Lab at the web site: medicallanguagelab.com. Use it to enhance your study and reinforcement of this chapter with the flash-card activity. We recommend you complete the flash-card activity before starting Learning Activities 7-1 and 7-2 below.

Learning Activity 7-1

Combining Forms, Suffixes, and Prefixes

Use the elements listed in the table to build medical words. You may use these elements more than once.

Combining Forms		Suffixes		Prefixes
bronch/o	*rhin/o*	*-capnia*	*-osis*	*brady-*
bronchi/o	*sept/o*	*-centesis*	*-phonia*	*dys-*
cyan/o	*sinus/o*	*-ectasis*	*-plasty*	*eu-*
laryng/o	*tonsill/o*	*-ectomy*	*-plegia*	*hyper-*
ox/i		*-emia*	*-pnea*	
pleur/o		*-ia*	*-scope*	
pneumon/o		*-meter*	*-tomy*	

1. surgical puncture of the pleura _____
2. instrument for examining the bronchus _____
3. excision of the tonsils _____
4. slow breathing _____
5. difficult voice _____
6. abnormal condition of blue(ness) _____
7. instrument to measure oxygen (saturation) _____
8. paralysis of the voice box _____
9. surgical repair of the septum _____
10. incision of the sinus _____
11. excessive carbon dioxide _____
12. good, normal breathing _____
13. expansion of a bronchi _____
14. surgical repair of the nose _____
15. condition of the lungs _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 6.67 = _____ % Score

Learning Activity 7-2

Building Medical Words

Use *rhin/o* (nose) to build words that mean:

1. discharge from the nose _____
2. inflammation of (mucous membranes of the) nose _____

Use *laryng/o* (larynx [voice box]) to build words that mean:

3. visual examination of the larynx _____
4. inflammation of the larynx _____
5. stricture or narrowing of the larynx _____

Use *bronch/o* or *bronchi/o* (bronchus) to build words that mean:

6. dilation or expansion of the bronchus _____
7. disease of the bronchus _____
8. spasm of the bronchus _____

Use *pneumon/o* or *pneum/o* (air; lung) to build words that mean:

9. air in the chest (pleural space) _____
10. inflammation of the lungs _____

Use *pulmon/o* (lung) to build words that mean:

11. specialist in lung (diseases) _____
12. pertaining to the lung _____

Use *-pnea* (breathing) to build words that mean:

13. difficult breathing _____
14. slow breathing _____
15. rapid breathing _____
16. absence of breathing _____

Build surgical words that mean:

17. surgical repair of the nose _____
18. surgical puncture of the chest _____
19. removal of a lung _____
20. forming an opening (mouth) in the trachea _____

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

Learning Activity 7-3

Pathology, Diseases, and Conditions

Match the following terms with the definitions in the numbered list.

anosmia	*deviated septum*	*hemoptysis*	*pneumoconiosis*
apnea	*emphysema*	*hypoxemia*	*pulmonary edema*
atelectasis	*empyema*	*hypoxia*	*surfactant*
consolidation	*epistaxis*	*pertussis*	*transudate*
coryza	*exudate*	*pleurisy*	*tubercles*

1. collapsed or airless lung _____
2. pus in the pleural cavity _____
3. phospholipid that allows the lungs to expand with ease _____
4. deficiency of oxygen in the tissues _____
5. inflammatory fluid high in protein with blood and immune cells _____
6. absence or decrease in the sense of smell _____
7. deficiency of oxygen in the blood _____
8. granulomas associated with tuberculosis _____
9. temporary loss of breathing _____
10. disease characterized by a decrease in alveolar elasticity _____
11. spitting of blood _____
12. nosebleed; nasal hemorrhage _____
13. excessive fluid in the lungs that induces cough and dyspnea _____
14. noninflammatory fluid that resembles serum but with less protein _____
15. displacement of the cartilage dividing the nostrils _____
16. acute inflammation of the membranes of the nose; also called *head cold* _____
17. condition in which dust particles are found in the lungs _____
18. inflammation of the pleural membrane _____
19. loss of sponginess of lungs due to engorgement _____
20. whooping cough _____

Check your answers in Appendix A. Review material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

Learning Activity 7-4

Matching Procedures, Pharmacology, and Abbreviations

Match the following terms with the definitions in the numbered list.

ABGs	*antral lavage*	*Mantoux test*	*rhinoplasty*
aerosol therapy	*CXR*	*oximetry*	*septoplasty*
AFB	*decongestant*	*pneumectomy*	*sputum culture*
antihistamine	*expectorant*	*polysomnography*	*sweat test*
antitussive	*laryngoscopy*	*pulmonary function tests*	*throat culture*

1. microbial test used to identify disease-causing organisms of the lower respiratory tract _____
2. test of sleep cycles and stages _____
3. imaging procedure to evaluate the lungs _____
4. washing or irrigating sinuses _____
5. relieves sneezing, runny nose, itchiness, and rashes _____
6. relieves or suppresses coughing _____
7. used primarily in children to confirm cystic fibrosis _____
8. noninvasive test used to monitor the percentage of hemoglobin saturated with oxygen _____
9. TB organism _____
10. inhalation of medication directly into the respiratory system via a nebulizer _____
11. decreases mucous membrane swelling by constricting blood vessels _____
12. intradermal test to determine tuberculin sensitivity _____
13. laboratory tests to assess gases and pH of arterial blood _____
14. reduces the viscosity of sputum to facilitate productive coughing _____
15. used to identify pathogens, especially group A streptococci _____
16. multiple tests used to determine the ability of lungs and capillary membranes to exchange oxygen _____
17. visual examination of the voice box to detect tumors and other abnormalities _____
18. procedure to correct a deviated nasal septum _____
19. excision of the entire lung _____
20. reconstructive surgery of the nose, commonly for cosmetic purposes _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 5 = _____ % Score

Learning Activity 7-5

Medical Scenarios

To construct chart notes, replace the italicized terms in each of the two scenarios with one of the medical terms listed below.

antitussive	*dyspnea*	*septoplasty*
cephalodynia	*myalgia*	*sinusitis*
coryza	*pharyngitis*	*T&A*
deviated nasal septum		

Billy P., a 2-year-old boy, was referred to the ENT Clinic by his pediatrician. His mother states that, while sleeping, Billy experiences (1) ***difficult breathing***, starts gasping for air, and then wakes up crying. This is especially true when he has a (2) ***head cold***. The examination of his nasal passages show a (3) ***septum displaced to one side***, causing impaired air flow through the nostrils. His tonsils and adenoids are also enlarged, making breathing even more difficult. The physician schedules a (4) ***surgical repair of the septum*** and (5) ***removal of the tonsils and adenoids.***

1. _____
2. _____
3. _____
4. _____
5. _____

Betty L. presents to the Student Health Services on campus. She complains of (6) ***muscle pain*** and (7) ***headache***. Betty L. states that she was up the entire night with a dry hacking cough. Upon examination, the physician confirms that Betty has flu and stated that her headache was probably due to (8) ***inflamed sinuses***. He further notes an (9) ***inflammation of the throat*** without evidence of strep infection. Betty L. is advised to drink clear fluids and take Tylenol, as needed, to reduce fever and general discomfort. The physician also prescribes Hycodan, a (10) ***medication to control coughing***.

6. _____
7. _____
8. _____
9. _____
10. _____

Check your answers in Appendix A. Review any material that you did not answer correctly.

Correct Answers _____ X 10 = _____ % Score

MEDICAL RECORD ACTIVITIES

The two medical records included in the following activities use common clinical scenarios to show how medical terminology is used to document patient care. Complete the terminology and analysis sections for each activity to help you recognize and understand terms related to the respiratory system.

Medical Record Activity 7-1

SOAP Note: Respiratory Evaluation

Terminology

Terms listed in the following table are taken from *SOAP Note: Respiratory Evaluation* that follows. Use a medical dictionary such as *Taber's Cyclopedic Medical Dictionary;* the appendices of *Systems,* 7th ed.; or other resources to define each term. Then review the pronunciations for each term and practice by reading the medical record aloud.

Term	Definition
anteriorly ăn-TĒR-ē-or-lē	
bilateral bī-LĂT-ĕr-ăl	
COPD	
exacerbation ĕks-ăs-ĕr-BĀ-shŭn	
heart failure	
Hx	
hypertension hī-pĕr-TĔN-shŭn	
interstitial ĭn-tĕr-STĬSH-ăl	
PE	
peripheral vascular disease pĕr-ĬF-ĕr-ăl VĂS-kū-lăr	

(continued)

Term	Definition
pleural PLOO-răl	
posteriorly pŏs-TĒR-ē-or-lē	
rhonchi RŎNG-kī	
SOB	
wheezes HWĒZ-ĕz	

Visit the *Medical Terminology Systems* online resource center at Davis*Plus* to practice pronunciation and reinforce the meanings of the terms in this medical report.

SOAP NOTE: RESPIRATORY EVALUATION

Emergency Department Record

Date: February 1, 20xx
Patient: Flowers, Richard
Chief Complaint: SOB

Time Registered: 1345 hours
Physician: Samara Batichara, MD

Medications: Vytorin 10/20 mg daily; Toprol-XL 50 mg daily; Azmacort 2 puffs three times a day; Proventil 2 puffs every six hours.

S: This 49-year-old man with Hx of COPD is admitted because of exacerbation of SOB over the past few days. Patient was a heavy smoker and states that he quit smoking for a short while but now smokes 3-4 cigarettes a day. He has a Hx of difficult breathing, hypertension, COPD, and peripheral vascular disease. The patient underwent triple bypass surgery in 19xx.

O: T: 98.9 F. BP: 180/90. Pulse: 80 and regular. R: 20 and shallow. PE indicates scattered bilateral wheezes and rhonchi heard anteriorly and posteriorly. When compared with a portable chest film taken 22 months earlier, the current study most likely indicates interstitial vascular congestion. Some superimposed inflammatory change cannot be excluded. There may also be some pleural reactive change.

A: 1. Acute exacerbation of chronic obstructive pulmonary disease.
2. Heart failure.
3. Hypertension.
4. Peripheral vascular disease.

P: Admit to hospital.

Samara Batichara, MD
Samara Batichara, MD

SB:icc

D: 2/1/20xx; T: 2/1/20xx

Analysis

Review the medical record *SOAP Note: Respiratory Evaluation* to answer the following questions.

1. What symptom caused the patient to seek medical help?

2. What was the patient's previous history?

3. What were the abnormal findings of the physical examination?

4. What changes were noted from the previous film?

5. What are the present assessments?

6. What new diagnosis was made that did not appear in the previous medical history?

Medical Record Activity 7-2

SOAP Note: Chronic Interstitial Lung Disease

Terminology

Terms listed in the following table are taken from *SOAP Note: Chronic Interstitial Lung Disease* that follows. Use a medical dictionary such as *Taber's Cyclopedic Medical Dictionary;* the appendices of *Systems,* 7th ed.; or other resources to define each term. Then review the pronunciations for each term and practice by reading the medical record aloud.

Term	Definition
ABG	
adenopathy ăd-ĕ-NŎP-ă-thē	
basilar crackles BĂS-ĭ-lăr KRĂK-ĕlz	
cardiomyopathy kăr-dē-ō-mī- ŎP-ă-thē	
chronic KRŎN-ĭk	
diuresis dī-ū-RĒ-sĭs	
dyspnea dĭsp-NĒ-ă	
fibrosis fī-BRŌ-sĭs	
interstitial ĭn-tĕr-STĬSH-ăl	
kyphosis kī-FŌ-sĭs	
Lasix LĀ-sĭks	
neuropathy nū-RŎP-ă-thē	
P_{CO_2}	
pedal edema PĒD-ăl ē-DĒ-mă	

(continued)

Term	Definition
pH	
Po_2	
pulmonary fibrosis PŬL-mō-nĕ-rē fī-BRŌ-sĭs	
renal insufficiency RĒ-năl ĭn-sŭ-FĬSH-ĕn-sē	
rhonchi RŎNG-kī	
silicosis sĭl-ĭ-KŌ-sĭs	
thyromegaly thī-rō-MĔG-ă-lē	

Visit the *Medical Terminology Systems* online resource center at Davis*Plus* to practice pronunciation and reinforce the meanings of the terms in this medical report.

SOAP NOTE: CHRONIC INTERSTITIAL LUNG DISEASE

O'Malley, Robert 09/01/20xx

SUBJECTIVE: Patient is an 84-year-old male with chief complaint of dyspnea with activity and pedal edema. He carries the dx cardiomyopathy, renal insufficiency, COPD, and pulmonary fibrosis. He also has peripheral neuropathy, which has improved with Elavil therapy.

OBJECTIVE: BP: 140/70. Pulse: 76. Neck is supple without thyromegaly or adenopathy. Mild kyphosis without scoliosis is present. Chest reveals basilar crackles without wheezing or rhonchi. Cardiac examination shows trace edema without clubbing or murmur. Abdomen is soft and nontender. ABGs on room air demonstrate a P_{O_2} of 55, P_{CO_2} of 45, and pH of 7.42.

ASSESSMENT: Chronic interstitial lung disease, likely a combination of pulmonary fibrosis and heart failure. We do believe he would benefit from further diuresis, which was implemented by Dr. Lu. Should there continue to be concerns about his volume status or lack of response to Lasix therapy, then he might benefit from right heart catheterization.

PLAN: Supplemental oxygen will be continued. We plan no change in his pulmonary medication at this time and will see him in return visit in 4 months. He has been told to contact us should he worsen in the interim.

Samara Batichara, MD
Samara Batichara, MD

SB:icc

Analysis

Review the medical record *SOAP Note: Chronic Interstitial Lung Disease* to answer the following questions.

1. When did the patient notice dyspnea?

2. Other than the respiratory system, what other body systems are identified in the history of present illness?

3. What were the findings regarding the neck?

4. What was the finding regarding the chest?

5. What appears to be the likely cause of the chronic interstitial lung disease?

6. What did the cardiac examination reveal?