Essentials of Medical Language

Fourth Edition

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Mc Graw Hill

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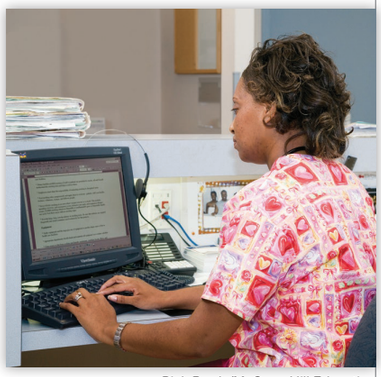

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Preface

What Helps Students Learn Medical Terminology

This Textbook Incorporates Features Designed to Address These Four Factors:

Motivation to learn	→	In order for students to be motivated to learn, what they are learning must be meaningful and relevant. To ensure the chapters in *Essentials of Medical Language* fit these criteria, the student is asked to step into the role of an allied health professional in each chapter. Authentic patient cases are used to illustrate how medical language is used on the job.
Retention of the material	→	When students encounter new medical terms within the context of a patient case, they are able to remember it more effectively. In addition, each chapter presents medical terms from one body system or medical specialty, which further serves to "tie it all together" to help students retain the knowledge and skills.
Opportunities for application and practice	→	Practice makes perfect. This is especially true for learning medical terminology. This textbook provides many opportunities for students to apply what they are learning. Exercises are included in the lessons, and are available in Connect for practice. Chapter review questions are also included in Connect to reinforce students' mastery of the terminology in each chapter.
Readily available information	→	In this book, all the information needed for a specific topic is presented in self-contained two-page spreads. On the left-hand page, new medical terms are introduced. On the right-hand page, for each new term, the pronunciation, color-coded word elements, and definition are provided in a ***Word Analysis and Definition (WAD) Table.***

Essentials of Medical Language will help you learn the terminology and language of modern health care in a way that bridges the gap between the classroom and a clinical setting.

RELEVANT MATERIALS—YOUR MOTIVATION TO LEARN!

Essentials of Medical Language 4e provides you with terminology, exercises, images and examples you can apply to other courses and within your career. You will step into the role of a health professional in every chapter and experience medical language illustrated through authentic patient cases.

BODY SYSTEMS AND MEDICAL SPECIALTIES—REMEMBER AND APPLY THE MATERIAL!

Encountering new medical terms within the context of each patient case will help you remember them more effectively. Every chapter presents medical terms from one body system or medical specialty, which helps tie it all together!

APPLICATION AND PRACTICE—YOUR KEY TO MASTERING MEDICAL TERMINOLOGY!

Practice makes perfect, especially when you are learning medical terminology. You will have plenty of opportunity to apply what you learn through exercises during the lessons and at the end of every chapter. Additional practice opportunities and exercises are available through LearnSmart and Connect (see pages xviii and xv, respectively).

To The Instructor

McGraw-Hill Education knows how much effort it takes to prepare for a new course. Through focus groups, symposia, reviews, and conversations with instructors like you, we have gathered information about what materials you need in order to facilitate successful courses. We are committed to providing you with high-quality, accurate instructor support.

Meeting Your Needs

New to This Edition!

1. The Word Analysis and Definition (WAD) tables and review exercises have been updated, and new terms have been added.
2. End of section exercises have been updated providing clear questions requiring specific answers.
3. The Case Reports have been re-designed for further emphasis.
4. Updated material on Genetics, Genetic Therapy, Immunotherapy, Precision Medicine, Personal Medicine.
5. Continued inclusion and enhancement of the Diagnostic and Therapeutic Procedures and Pharmacology section.
6. Chapter 16: Infancy to Old Age: *The Languages of Pediatrics and Geriatrics* is now available with the print text.
7. **NEW!** Application-Based Activities (ABAs): a game-based learning experience, students dive into a micro-sim environment using their medical terminology knowledge to work through a real-life medical situation. More about the ABAs in the Connect section below.

When you use *Essentials of Medical Language,* you will be supported at every point in the program. Each chapter in the book is broken down into lessons, and the Instructor's Manual provides lesson plans and additional materials for each lesson. Following are features of the textbook designed to address student needs.

Lesson-Based Approach

Each chapter of *Essentials of Medical Language* is divided into lessons covering different aspects of the overall chapter subject. Lessons within a chapter break down into topics. Each topic is designed so your students will not have to flip back and forth when completing exercises or looking at figures, tables, and boxes. All main concepts and ideas presented in topics begin and end within a two-page "spread." These spreads help learning flow smoothly by ensuring that valuable class and reading time is not wasted on flipping pages.

You Are . . . Your Patient Is . . . Case Scenarios

Each chapter and most lessons begin by immediately placing your students in the role of an allied health professional faced with a situation in which medical communication is necessary. Many different professional allied health and LPN-level nursing roles are utilized so your students can "experience" various specialties and positions. The patient cases introduced at the beginning of the chapters and lessons are referenced throughout the lessons to further unify the students' experience.

Chapter Outcomes and Lesson Objectives

The major learning outcomes for each chapter are presented in the beginning so you and your students can focus on what they need to know and be able to do by the end of the chapter. Each lesson has outcome-based learning objectives. Accomplishing each lesson's objectives helps ensure students will be able to achieve the chapter outcomes and, ultimately, the goal of the textbook: to help them learn the essential terminology and language of modern health care.

Word Analysis and Definition (WAD) Tables

Each lesson contains tables listing important medical terms and their pronunciation, elements, and definition. Prefixes, suffixes, and combining forms are color-coded. These tables provide your students with an at-a-glance view of the terms covered. The tables are excellent for reference as well as for studying and reviewing.

Exercises

In addition to the exercises at the end of topic areas in the book, the chapter review exercises are included in the Test Bank in *Connect* **(http://connect.mheducation.com)**. All these exercises are graded in their difficulty according to Bloom's Taxonomy and are tied to Chapter Learning Outcomes.

Attention is given to developing skills in spelling, forming plurals, using accepted abbreviations, writing medical language, and pronunciation. The exercises take the learner beyond memorization and teach how to think critically about the realistic application of the medical language being learned.

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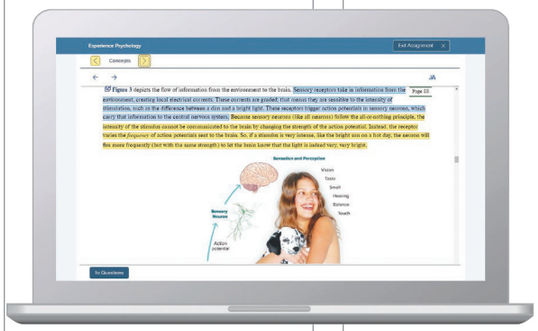

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"I really liked this app—it made it easy to study when you don't have your textbook in front of you."

- Jordan Cunningham, Eastern Washington University

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A One-Stop Spot to Present, Deliver, and Assess Digital Assets Available from McGraw-Hill: McGraw-Hill Essentials of Medical Terminology

McGraw-Hill Connect® Essentials of Medical Terminology provides online presentation, assignment, and assessment solutions. It connects your students with the tools and resources they'll need to achieve success. With Connect, you can deliver assignments, quizzes, and tests online. A robust set of questions and activities, including all of the lesson and end-of-chapter exercises, case studies, animation questions, and interactives, are presented and aligned with the textbook's learning outcomes. As an instructor, you can edit existing questions and author entirely new problems. Connect enables you to track individual student performance—by question, by assignment, or in relation to the class overall—with detailed grade reports. You can integrate grade reports easily with learning management systems (LMSs), such as Blackboard, Desire2Learn, and eCollege, plus much more.

NEW! **Application-Based Activities (ABAs) McGraw-Hill's** *new* ABAs are game-based learning activities that call upon decision making and application of medical terminology knowledge. They're not only an opportunity for students to practice skills and apply them in real-world scenarios, but also where they can see the *repercussions* of their choices or actions in a safe environment. With topics like Diagnostic Testing or Interpreting Reports, or even as the private practice psychologist in "A Shared Experience," students apply knowledge to define medical terms, disorders, treatments; choose appropriate diagnostic procedures; interpret medical documents; translate medical terms into everyday language; or even learn the meanings of medical abbreviations. Best of all, ABAs are found and assignable within Connect, and auto-gradable for the instructor.

Connect Essentials of Medical Terminology also provides students with 24/7 online access to an ebook. This media-rich version of the textbook is available through the McGraw-Hill Connect platform and allows seamless integration of text, media, and assessments. To learn more, visit **http://connect.mheducation.com. Connect Insight™** is the first and only analytics tool of its kind, which highlights a series of visual data displays—each framed by an intuitive question—to provide at-a-glance information regarding how your class is doing. As an instructor or administrator, you receive an instant, at-a-glance view of student performance matched with student activity. It puts real-time analytics in your hands so you can take action early and keep struggling students from falling behind. It also allows you to be empowered with a more valuable, transparent, and productive connection between you and your students. Available on demand wherever and whenever it's needed, Connect Insight travels from office to classroom!

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LearnSmart® is one of the most effective and successful adaptive learning resources available on the market today and is again available for *Essentials of Medical Terminology.* More than 2 million students have answered more than 1.3 billion questions in LearnSmart since 2009, making it the most widely used and intelligent adaptive study tool. It has proven to strengthen memory recall, keep students in class, and boost grades. Students using LearnSmart are 13% more likely to pass their classes and 35% less likely to drop out. This revolutionary learning resource is available only from McGraw-Hill Education, so join the learning revolution, and start using LearnSmart today!

SmartBook® is the first and only adaptive reading experience currently available. SmartBook personalizes content for each student in a continuously adapting reading experience. Reading is no longer a passive and linear experience, but an engaging and dynamic one where students are more likely to master and retain important concepts, thus coming to class better prepared. Valuable reports provide instructors with insight into how students are progressing through textbook content, and are useful for shaping in-class time and assessments. As a result of the adaptive reading experience found in SmartBook, students are more likely to retain knowledge, stay in class, and get better grades. This revolutionary technology is available only from McGraw-Hill Education for hundreds of course areas as part of the LearnSmart Advantage series.

Instructors' Resources

The Instructor Online Learning Center is available through your Connect course. Your McGraw-Hill sales representative can provide you with the access you need to easily prepare for using *Essentials of Medical Language,* 4e. Our Online Learning Centers include:

- The Instructors' Manual, which contains valuable information that makes course prep a snap!
  - This manual includes information about student learning styles and instructor strategies; innovative learning activities; assessment techniques and strategies; classroom management tips; and answer keys.
  - **Lesson Planning Guide.** Our Lesson Planning Guide comes complete with a customizable lesson plan for each of the lessons in this text. Each plan contains a step-by-step 50-minute teaching plan and master copies of handouts. Use these lessons alone or combined to accommodate different class schedules—you can even revise them to reflect your preferred topic or sequence. Each lesson plan is designed to be used with a corresponding PowerPoint® presentation that is also available on the OLC.
- **PowerPoint® Lecture Outlines.** The PowerPoint lectures with speaking notes correlate to the Lesson Plans mentioned above and include the art and photos from the text. Covering the most important parts of every lesson, the slides are customizable to fit your course needs.
- **Test Builder in Connect,** making creating tests easy!

  Available within Connect, Test Builder is a cloud-based tool that enables instructors to format tests that can be printed or administered within a LMS. Test Builder offers a modern, streamlined interface for easy content configuration that matches course needs, without requiring a download.

  Test Builder allows you to:
  - access all test bank content from a particular title.
  - easily pinpoint the most relevant content through robust filtering options.
  - manipulate the order of questions or scramble questions and/or answers.
  - pin questions to a specific location within a test.
  - determine your preferred treatment of algorithmic questions.
  - choose the layout and spacing.
  - add instructions and configure default settings.

  Test Builder provides a secure interface for better protection of content and allows for just-in-time updates to flow directly into assessments.

Contextual Approach Promotes Active Learning

Chapters in the textbook are organized by body system in accordance with an overall anatomy and physiology (A & P) approach. Lessons introduce and define terminology through the context of A & P, pathology, and clinical and diagnostic procedures/tests. The organization of the body systems into chapters is based on an "outside to inside" sequence that reflects a physician's differential diagnosis method used during an examination.

To provide students with an authentic context, the medical specialty associated with each body area or system is introduced along with relevant anatomy and physiology. Students actually step into the role of an allied health professional associated with each specialty. Patient cases and documentation are used to illustrate the real-life application of medical terminology in modern health care: to care for and communicate with patients and to interact with other members of the health care team.

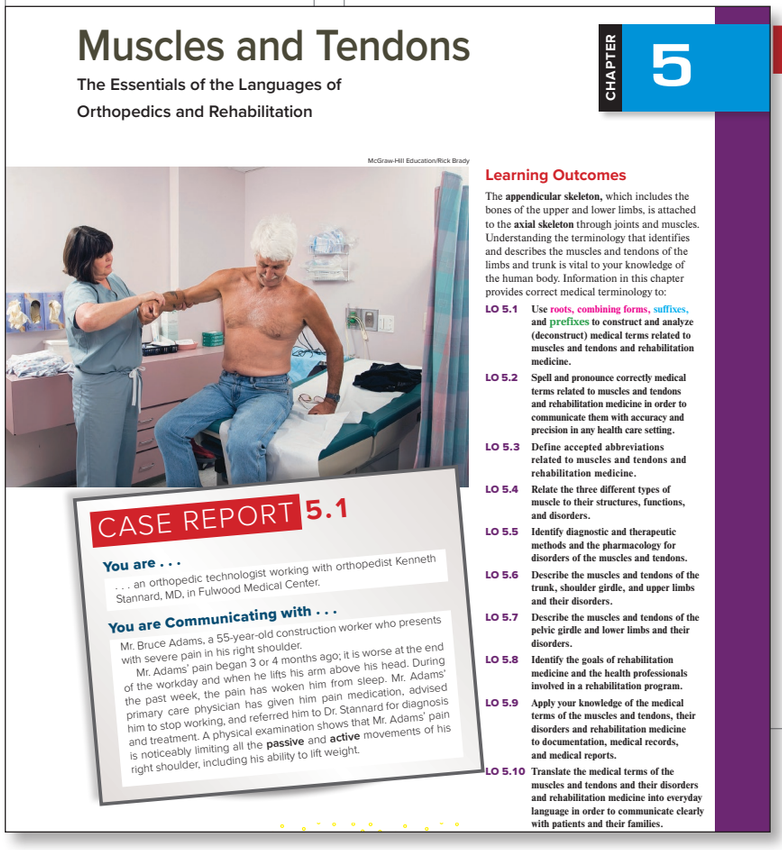
The A & P organizational approach, used in conjunction with an authentic medical setting and patient cases, encourages student motivation and facilitates active, engaged learning.

Innovative Pedagogical Aids Provide a Coherent Learning Program

Each chapter is structured around a consistent and unique framework of pedagogic devices. No matter what the subject matter of a chapter, the structure enables students to develop a consistent learning strategy, making *Essentials of Medical Language* a superior learning tool.

YOU ARE COMMUNICATING WITH . . .

Each chapter opens by placing the student in the role of an allied health professional related to the specialty and associated body systems/areas covered by the chapter. The student is also introduced to a patient and given information about the patient's case.



Muscles and Tendons

The Essentials of the Languages of Orthopedics and Rehabilitation

CHAPTER 5

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CASE REPORT 5.1

You are . . .

. . . an orthopedic technologist working with orthopedist Kenneth Stannard, MD, in Fulwood Medical Center.

You are Communicating with . . .

Mr. Bruce Adams, a 55-year-old construction worker who presents with severe pain in his right shoulder.

Mr. Adams' pain began 3 or 4 months ago; it is worse at the end of the workday and when he lifts his arm above his head. During the past week, the pain has woken him from sleep. Mr. Adams' primary care physician has given him pain medication, advised him to stop working, and referred him to Dr. Stannard for diagnosis and treatment. A physical examination shows that Mr. Adams' pain is noticeably limiting all the **passive** and **active** movements of his right shoulder, including his ability to lift weight.

Learning Outcomes

The **appendicular skeleton,** which includes the bones of the upper and lower limbs, is attached to the **axial skeleton** through joints and muscles. Understanding the terminology that identifies and describes the muscles and tendons of the limbs and trunk is vital to your knowledge of the human body. Information in this chapter provides correct medical terminology to:

LO 5.1 Use roots, combining forms, suffixes, and prefixes to construct and analyze (deconstruct) medical terms related to muscles and tendons and rehabilitation medicine.

LO 5.2 Spell and pronounce correctly medical terms related to muscles and tendons and rehabilitation medicine in order to communicate them with accuracy and precision in any health care setting.

LO 5.3 Define accepted abbreviations related to muscles and tendons and rehabilitation medicine.

LO 5.4 Relate the three different types of muscle to their structures, functions, and disorders.

LO 5.5 Identify diagnostic and therapeutic methods and the pharmacology for disorders of the muscles and tendons.

LO 5.6 Describe the muscles and tendons of the trunk, shoulder girdle, and upper limbs and their disorders.

LO 5.7 Describe the muscles and tendons of the pelvic girdle and lower limbs and their disorders.

LO 5.8 Identify the goals of rehabilitation medicine and the health professionals involved in a rehabilitation program.

LO 5.9 Apply your knowledge of the medical terms of the muscles and tendons, their disorders and rehabilitation medicine to documentation, medical records, and medical reports.

LO 5.10 Translate the medical terms of the muscles and tendons and their disorders and rehabilitation medicine into everyday language in order to communicate clearly with patients and their families.

LEARNING OUTCOMES

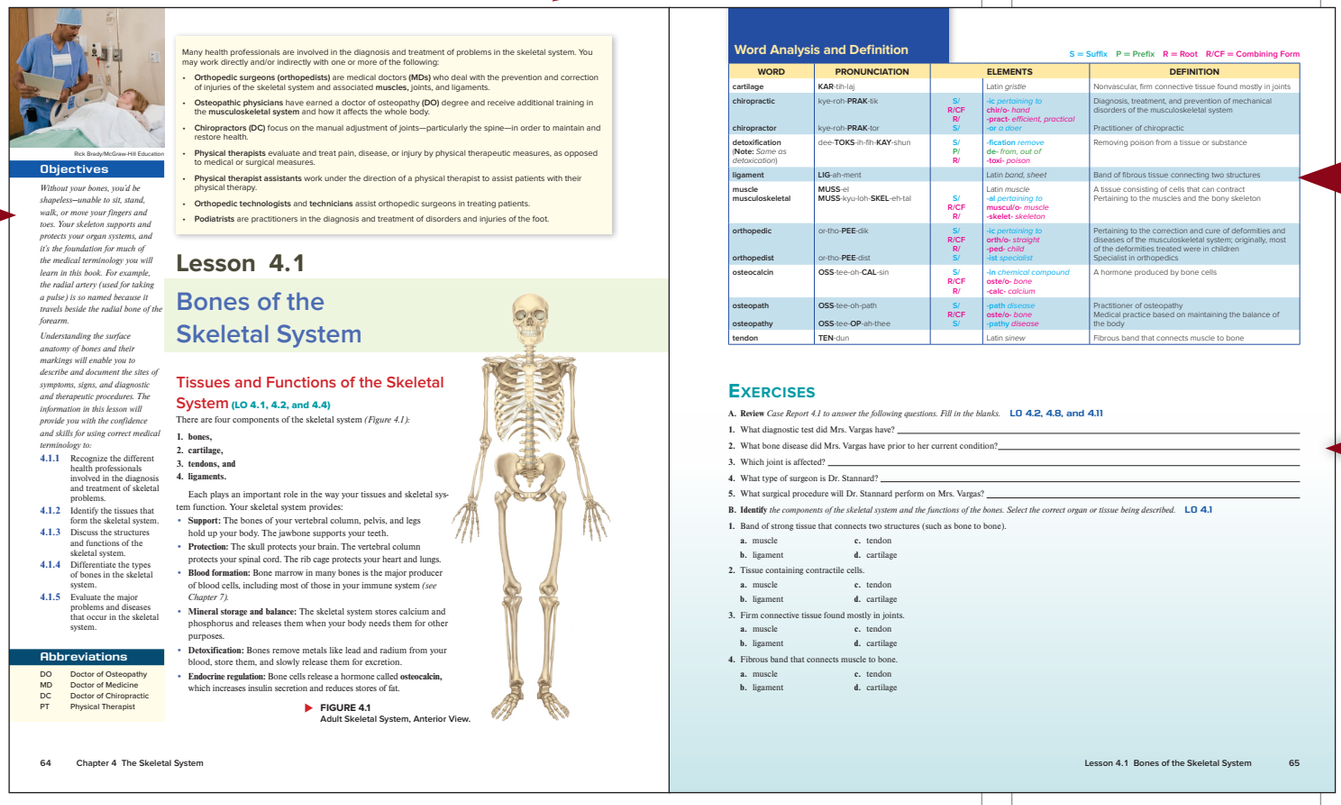
At the same time, **Learning Outcomes** are presented to let students know what they will learn in the chapter. This technique immediately engages students, motivating them to read on to learn how this patient's case (and their role in the patient's care) relates to the medical terminology being introduced in the chapter.

Lesson-Based Organization

The chapter content is broken down into chunks, or lessons, to help students digest new information and relate it to previously learned information. Rather than containing many various topics within a chapter, these lessons group the chapter material into logical, streamlined learning units designed to help students achieve the chapter outcomes. Lessons within a chapter build on one another to form a cohesive, coherent experience for the learner.

Each lesson is based on specific **Lesson Objectives** designed to support the students' achievement of the overall chapter outcomes.

Each lesson in a chapter contains an Introduction, Lesson Objectives, Lesson Topics, Word Analysis and Definition Tables, and Lesson Exercises. Within each lesson, all topics and information are presented in **self-contained two-page spreads.** This means students will no longer have to flip back and forth to see figures on one page that are described on another.



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Objectives

Without your bones, you'd be shapeless–unable to sit, stand, walk, or move your fingers and toes. Your skeleton supports and protects your organ systems, and it's the foundation for much of the medical terminology you will learn in this book. For example, the radial artery (used for taking a pulse) is so named because it travels beside the radial bone of the forearm.

Understanding the surface anatomy of bones and their markings will enable you to describe and document the sites of symptoms, signs, and diagnostic and therapeutic procedures. The information in this lesson will provide you with the confidence and skills for using correct medical terminology to:

- **4.1.1** Recognize the different health professionals involved in the diagnosis and treatment of skeletal problems.
- **4.1.2** Identify the tissues that form the skeletal system.
- **4.1.3** Discuss the structures and functions of the skeletal system.
- **4.1.4** Differentiate the types of bones in the skeletal system.
- **4.1.5** Evaluate the major problems and diseases that occur in the skeletal system.

Abbreviations

DO	Doctor of Osteopathy
MD	Doctor of Medicine
DC	Doctor of Chiropractic
PT	Physical Therapist

Many health professionals are involved in the diagnosis and treatment of problems in the skeletal system. You may work directly and/or indirectly with one or more of the following:

- **Orthopedic surgeons (orthopedists)** are medical doctors **(MDs)** who deal with the prevention and correction of injuries of the skeletal system and associated **muscles,** joints, and ligaments.
- **Osteopathic physicians** have earned a doctor of osteopathy **(DO)** degree and receive additional training in the **musculoskeletal system** and how it affects the whole body.
- **Chiropractors (DC)** focus on the manual adjustment of joints—particularly the spine—in order to maintain and restore health.
- **Physical therapists** evaluate and treat pain, disease, or injury by physical therapeutic measures, as opposed to medical or surgical measures.
- **Physical therapist assistants** work under the direction of a physical therapist to assist patients with their physical therapy.
- **Orthopedic technologists** and **technicians** assist orthopedic surgeons in treating patients.
- **Podiatrists** are practitioners in the diagnosis and treatment of disorders and injuries of the foot.

Lesson 4.1

Bones of the Skeletal System

Tissues and Functions of the Skeletal System (LO 4.1, 4.2, and 4.4)

There are four components of the skeletal system *(Figure 4.1)*:

1. **bones,**
2. **cartilage,**
3. **tendons, and**
4. **ligaments.**

Each plays an important role in the way your tissues and skeletal system function. Your skeletal system provides:

- **Support:** The bones of your vertebral column, pelvis, and legs hold up your body. The jawbone supports your teeth.
- **Protection:** The skull protects your brain. The vertebral column protects your spinal cord. The rib cage protects your heart and lungs.
- **Blood formation:** Bone marrow in many bones is the major producer of blood cells, including most of those in your immune system *(see Chapter 7)*.
- **Mineral storage and balance:** The skeletal system stores calcium and phosphorus and releases them when your body needs them for other purposes.
- **Detoxification:** Bones remove metals like lead and radium from your blood, store them, and slowly release them for excretion.
- **Endocrine regulation:** Bone cells release a hormone called **osteocalcin,** which increases insulin secretion and reduces stores of fat.

▶ **FIGURE 4.1**
Adult Skeletal System, Anterior View.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
cartilage	**KAR**-tih-laj		Latin *gristle*	Nonvascular, firm connective tissue found mostly in joints
chiropractic	kye-roh-**PRAK**-tik	S/ R/CF R/ S/	*-ic pertaining to* **chir/o-** *hand* **-pract-** *efficient, practical* *-or a doer*	Diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system
chiropractor	kye-roh-**PRAK**-tor			Practitioner of chiropractic
detoxification (**Note:** *Same as detoxification*)	dee-**TOKS**-ih-fih-**KAY**-shun	S/ P/ R/	**-fication** *remove* **de-** *from, out of* **-toxi-** *poison*	Removing poison from a tissue or substance
ligament	**LIG**-ah-ment		Latin *band, sheet*	Band of fibrous tissue connecting two structures
muscle **musculoskeletal**	**MUSS**-el **MUSS**-kyu-loh-**SKEL**-eh-tal	S/ R/CF R/	Latin *muscle* **-al** *pertaining to* **muscul/o-** *muscle* **-skelet-** *skeleton*	A tissue consisting of cells that can contract Pertaining to the muscles and the bony skeleton
orthopedic	or-tho-**PEE**-dik	S/ R/CF R/	*-ic pertaining to* **orth/o-** *straight* **-ped-** *child*	Pertaining to the correction and cure of deformities and diseases of the musculoskeletal system; originally, most of the deformities treated were in children
orthopedist	or-tho-**PEE**-dist	S/	*-ist specialist*	Specialist in orthopedics
osteocalcin	**OSS**-tee-oh-**CAL**-sin	S/ R/CF R/	*-in chemical compound* **oste/o-** *bone* **-calc-** *calcium*	A hormone produced by bone cells
osteopath	**OSS**-tee-oh-path	S/ R/CF	*-path disease* **oste/o-** *bone*	Practitioner of osteopathy Medical practice based on maintaining the balance of the body
osteopathy	**OSS**-tee-**OP**-ah-thee	S/	*-pathy disease*	
tendon	**TEN**-dun		Latin *sinew*	Fibrous band that connects muscle to bone

Exercises

A. Review *Case Report 4.1 to answer the following questions. Fill in the blanks.* LO 4.2, 4.8, and 4.11

1. What diagnostic test did Mrs. Vargas have? _____
2. What bone disease did Mrs. Vargas have prior to her current condition? _____
3. Which joint is affected? _____
4. What type of surgeon is Dr. Stannard? _____
5. What surgical procedure will Dr. Stannard perform on Mrs. Vargas? _____

B. Identify *the components of the skeletal system and the functions of the bones. Select the correct organ or tissue being described.* LO 4.1

1. Band of strong tissue that connects two structures (such as bone to bone).
   a. muscle c. tendon
   b. ligament d. cartilage
2. Tissue containing contractile cells.
   a. muscle c. tendon
   b. ligament d. cartilage
3. Firm connective tissue found mostly in joints.
   a. muscle c. tendon
   b. ligament d. cartilage
4. Fibrous band that connects muscle to bone.
   a. muscle c. tendon
   b. ligament d. cartilage

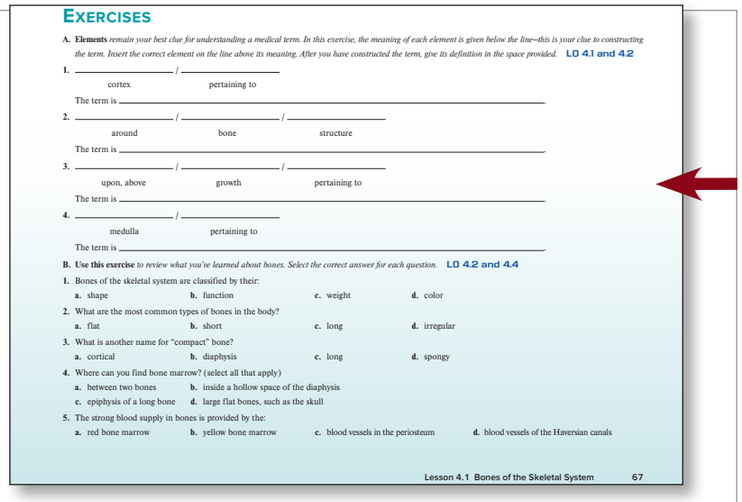
Word Analysis and Definition Tables

The medical terms covered in each lesson are introduced in context, either within a patient case or in the lesson topics. To facilitate easy reference and review, the terms are also listed in tables as a group. The **Word Analysis and Definition (WAD) Tables** list each term and its pronunciation, elements, and definition in a concise, color-coded, at-a-glance format.

Lesson and Chapter Exercises

Topics within a chapter end with exercises designed to allow students to check their basic understanding of the terms they just learned. These "checkpoints" can be used by instructors as assignments or for self-evaluation by students.

In *Connect* you will find additional review exercises that ask students to apply what they learned in all lessons of a chapter. These exercises reinforce learning and help students go beyond mere memorization to think critically about the medical language they use. In addition to reviewing and recalling the definitions of terms learned in the chapter, students are asked to use medical terms in new and different ways to ensure a thorough understanding.



EXERCISES

A. Elements *remain your best clue for understanding a medical term. In this exercise, the meaning of each element is given below the line--this is your clue to constructing the term. Insert the correct element on the line above its meaning. After you have constructed the term, give its definition in the space provided.* LO 4.1 and 4.2

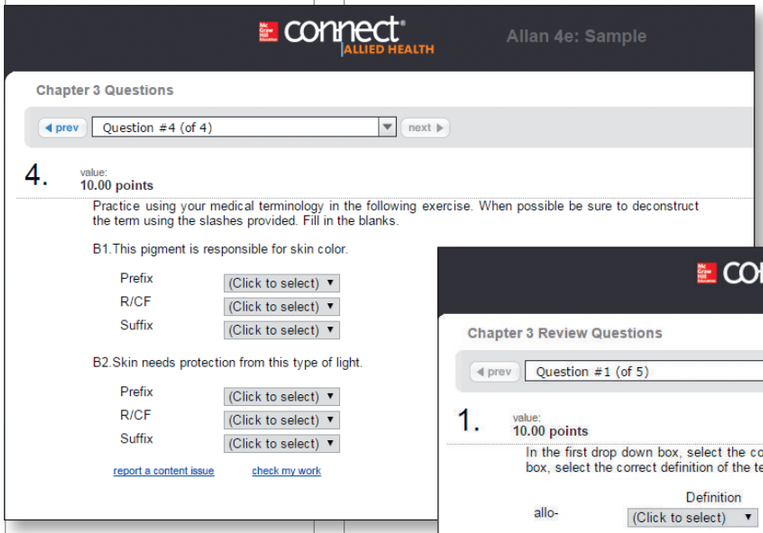
1. _____ / _____
   cortex pertaining to
   The term is _____
2. _____ / _____ / _____
   around bone structure
   The term is _____
3. _____ / _____ / _____
   upon, above growth pertaining to
   The term is _____
4. _____ / _____
   medulla pertaining to
   The term is _____

B. Use this exercise *to review what you've learned about bones. Select the correct answer for each question.* LO 4.2 and 4.4

1. Bones of the skeletal system are classified by their:
   a. shape b. function c. weight d. color
2. What are the most common types of bones in the body?
   a. flat b. short c. long d. irregular
3. What is another name for "compact" bone?
   a. cortical b. diaphysis c. long d. spongy
4. Where can you find bone marrow? (select all that apply)
   a. between two bones b. inside a hollow space of the diaphysis
   c. epiphysis of a long bone d. large flat bones, such as the skull
5. The strong blood supply in bones is provided by the:
   a. red bone marrow b. yellow bone marrow c. blood vessels in the periosteum d. blood vessels of the Haversian canals

Lesson 4.1 Bones of the Skeletal System 67

Chapter Review in Connect



connect ALLIED HEALTH Allan 4e: Sample

Chapter 3 Questions

prev Question #4 (of 4) next

4. value: 10.00 points

Practice using your medical terminology in the following exercise. When possible be sure to deconstruct the term using the slashes provided. Fill in the blanks.

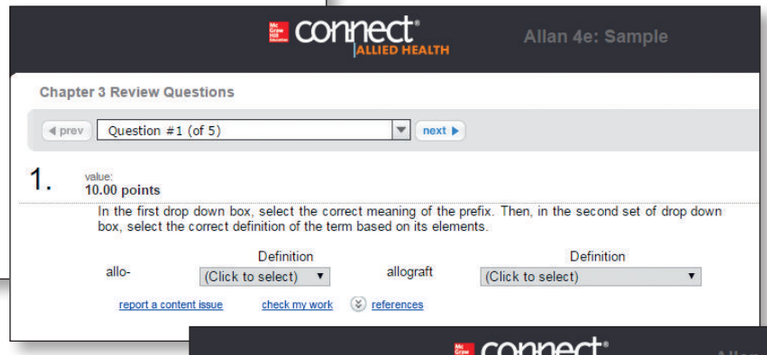
B1. This pigment is responsible for skin color.

Prefix (Click to select)
R/CF (Click to select)
Suffix (Click to select)

B2. Skin needs protection from this type of light.

Prefix (Click to select)
R/CF (Click to select)
Suffix (Click to select)

report a content issue check my work



connect ALLIED HEALTH Allan 4e: Sample

Chapter 3 Review Questions

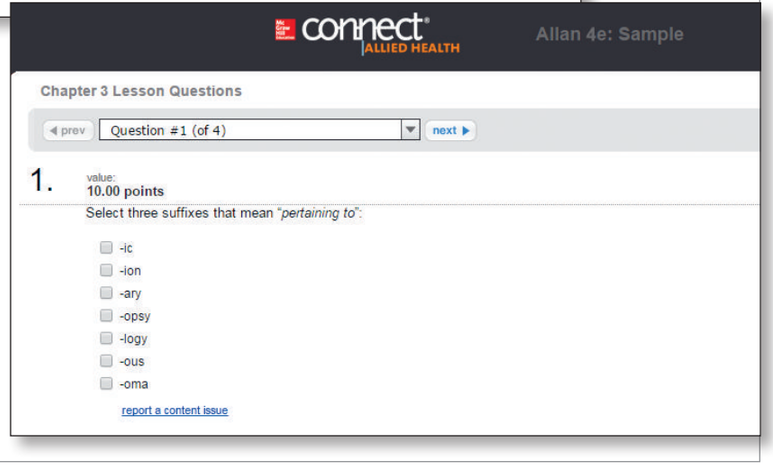
prev Question #1 (of 5) next

1. value: 10.00 points

In the first drop down box, select the correct meaning of the prefix. Then, in the second set of drop down box, select the correct definition of the term based on its elements.

allo- Definition (Click to select) allograft Definition (Click to select)

report a content issue check my work references



connect ALLIED HEALTH Allan 4e: Sample

Chapter 3 Lesson Questions

prev Question #1 (of 4) next

1. value: 10.00 points

Select three suffixes that mean "*pertaining to*":

- -ic
- -ion
- -ary
- -opsy
- -logy
- -ous
- -oma

report a content issue

VIVID ILLUSTRATIONS AND PHOTOS

Colorful, precise anatomical illustrations and photos lend a realistic view of body structures and correlate to the clinical context of the lessons.

Rick Brady/McGraw-Hill Education

Lesson 11.2

The Eyeball and Seeing

Objectives

Although your eyeball may appear to be solid, it's actually a hollow sphere that measures around 1 inch in diameter. Knowledge of its terminology, structure, and function allows you to understand how we see and what major problems and disorders can arise with the eye. In this lesson, the information will enable you to use correct medical terminology to:

- **11.2.1** Identify the principal structures of the eyeball and their functions.
- **11.2.2** Explain the role of the cornea and the problems that can occur in that structure.
- **11.2.3** Describe the structures and functions of the lens and its associated structures.
- **11.2.4** Link the different components of the retina to their functions.
- **11.2.5** Discuss disorders of the eyeball.

Keynotes

- The cornea protects the eye and, by changing shape, provides about 60% of the eye's focusing power.
- The iris controls the amount of light entering the eye.
- The lens changes its shape to focus rays of light on the retina.
- Medical shorthand for a quick, normal eye examination can be **PERRLA: P**upils **E**qual, **R**ound, **R**eactive to **L**ight and **A**ccommodation.

The Eyeball (Globe)

(LO 11.5)

The functions of the eyeball are to continuously:

1. **Adjust** the amount of light it lets in to reach the retina;
2. **Focus** on near and distant objects; and
3. **Produce** images of those objects and instantly transmit them to the brain.

As shown earlier in this chapter, the front of the eyeball is covered by the conjunctiva. This thin layer of tissue lines the inside of the eyelids and curves over the eyeball to meet the **sclera** *(Figure 11.9)*, the tough, white outer layer of the eye.

At the center of the front of the eye is the **cornea,** a transparent, dome-shaped membrane. The cornea has no blood supply and obtains its nutrients from tears and from fluid in the anterior chamber behind it.

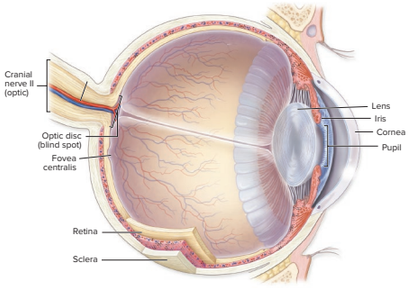
When light rays strike the eye, they pass through the cornea. Because of its dome curvature, those rays striking the edge of the cornea are bent toward its center.

The light rays then go through the **pupil,** the black opening in the center of the colored area (the **iris**) in the front of the eye.

The iris controls the amount of light entering the eye. For example, when you're in the dark outside at night the iris opens **(dilates)** to allow more light into the eye. When you're in bright sunlight or in a well-lit room, the iris closes **(constricts)** to allow less light into the eye.

After traveling through the pupil, the light rays pass through the transparent **lens.** This lens can become thicker and thinner, enabling it to bend light rays and focus them on the **retina** at the back of the eye. Accommodation is the process of changing focus, and **refraction** is the process of bending light rays.

The lens does not contain blood vessels **(avascular)** or nerves, and with increasing age, it loses its elasticity. Because of this reduced elasticity, when you reach your forties, your eyes may have difficulty focusing on near objects, a condition called **presbyopia.**



▲ **FIGURE 11.9**
Anatomy of the Eyeball.

tory tests for it. The only treatment options are pain management, physiotherapy, and stress reduction.

▲ **FIGURE 5.3**
RICE Treatment.

Rick Brady/McGraw-Hill Education

Skull and Face (LO 4.2 and 4.6)

The Skull (LO 4.2 and 4.6)

When you glance at your face in the mirror, chances are you're not thinking about what's behind your brown eyes or your slightly crooked smile. You see one image—not its layers, pieces, or parts. However, the human skull *(Figure 4.9)* is made up of 22 separate bones. Your **cranium,** the upper part of the skull that encloses the **cranial** cavity and protects the brain, contains 8 of these 22 bones; your facial skeleton contains the rest.

The bones of the cranium are joined together by sutures (joints that appear as seams), which are covered on the inside and outside by a thin layer of connective tissue. These bones have the following functions:

1. The **frontal** bone forms the forehead, roofs of the (eye) orbits, and part of the floor of the cranium and contains a pair of right and left frontal sinuses above the orbits.
2. **Parietal** bones form the bulging sides and roof of the cranium.
3. The **occipital** bone forms the back of and part of the base of the cranium.
4. **Temporal** bones form the sides of and part of the base of the cranium.
5. The **sphenoid** bone forms part of the base of the cranium and the orbits.
6. The **ethmoid** bone is hollow and forms part of the nose, the orbits, and the ethmoid sinuses.

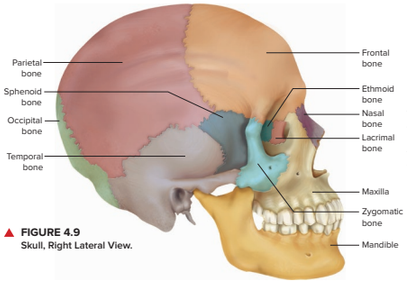
These bones of the skull provide protection for the brain and the organs of vision, taste, hearing, equilibrium, and smell.

The lower part of the skull houses the bones of the facial skeleton *(Figure 4.10)*. These bones do the following:

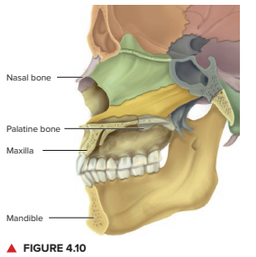
1. **Maxillary** bones form the upper jaw **(maxilla),** hold the upper teeth, and are hollow, forming the maxillary sinuses.
2. **Palatine** bones are located behind the maxilla and cannot be seen on a lateral view of the skull.
3. **Zygomatic** bones are the prominences of the cheeks (cheekbones) below the eyes.
4. **Lacrimal** bones form the medial wall of each eye orbit.
5. **Nasal** bones form the sides and bridge of the nose.
6. **The mandible** is the lower jawbone, which holds the lower teeth. The mandible articulates (joins) with the temporal bone to form the **temporomandibular joint (TMJ).**

The bones of the facial skeleton provide a frame on which the muscles and other tissues of the face facilitate eating, facial expressions, breathing, and speech.

The third component of the axial skeleton, the rib cage, is discussed in Chapter 8, "Respiratory System."



▲ **FIGURE 4.9**
Skull, Right Lateral View.



▲ **FIGURE 4.10**
Facial Bones.

Abbreviation

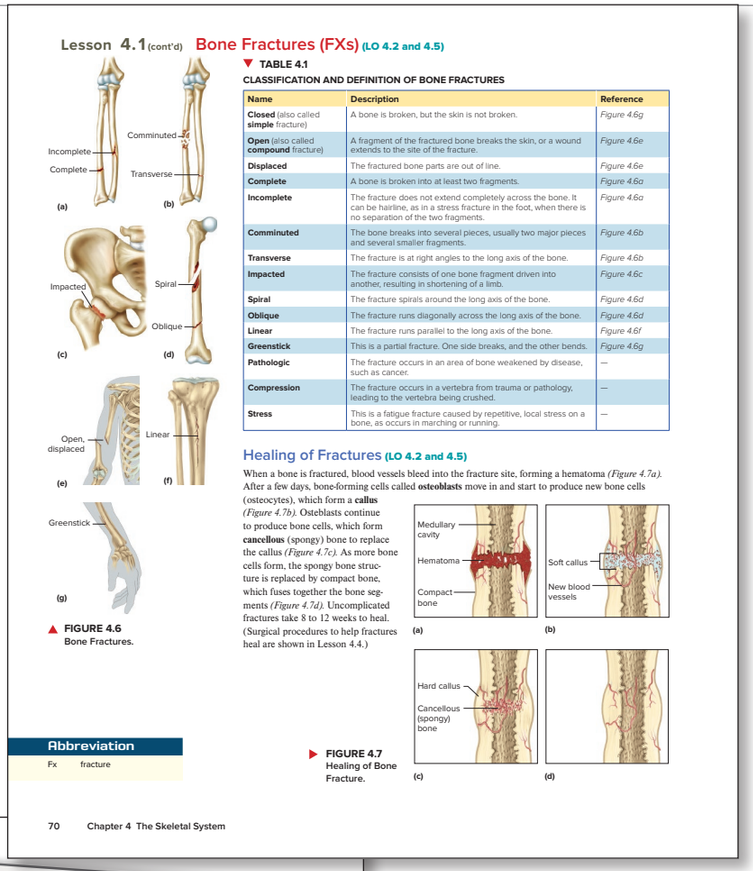
TMJ temporomandibular joint

TABLES

Meaningful tables aid in summarizing concepts and lesson topics.

KEYNOTES AND ABBREVIATIONS

Keynotes and Abbreviations offer students additional information correlating to the lesson.



Lesson 4.1 (cont'd) Bone Fractures (FXs) (LO 4.2 and 4.5)

▲ FIGURE 4.6 Bone Fractures.

▼ TABLE 4.1

CLASSIFICATION AND DEFINITION OF BONE FRACTURES

Name	Description	Reference
Closed (also called **simple** fracture)	A bone is broken, but the skin is not broken.	*Figure 4.6g*
Open (also called **compound** fracture)	A fragment of the fractured bone breaks the skin, or a wound extends to the site of the fracture.	*Figure 4.6e*
Displaced	The fractured bone parts are out of line.	*Figure 4.6e*
Complete	A bone is broken into at least two fragments.	*Figure 4.6a*
Incomplete	The fracture does not extend completely across the bone. It can be hairline, as in a stress fracture in the foot, when there is no separation of the two fragments.	*Figure 4.6a*
Comminuted	The bone breaks into several pieces, usually two major pieces and several smaller fragments.	*Figure 4.6b*
Transverse	The fracture is at right angles to the long axis of the bone.	*Figure 4.6b*
Impacted	The fracture consists of one bone fragment driven into another, resulting in shortening of a limb.	*Figure 4.6c*
Spiral	The fracture spirals around the long axis of the bone.	*Figure 4.6d*
Oblique	The fracture runs diagonally across the long axis of the bone.	*Figure 4.6d*
Linear	The fracture runs parallel to the long axis of the bone.	*Figure 4.6f*
Greenstick	This is a partial fracture. One side breaks, and the other bends.	*Figure 4.6g*
Pathologic	The fracture occurs in an area of bone weakened by disease, such as cancer.	—
Compression	The fracture occurs in a vertebra from trauma or pathology, leading to the vertebra being crushed.	—
Stress	This is a fatigue fracture caused by repetitive, local stress on a bone, as occurs in marching or running.	—

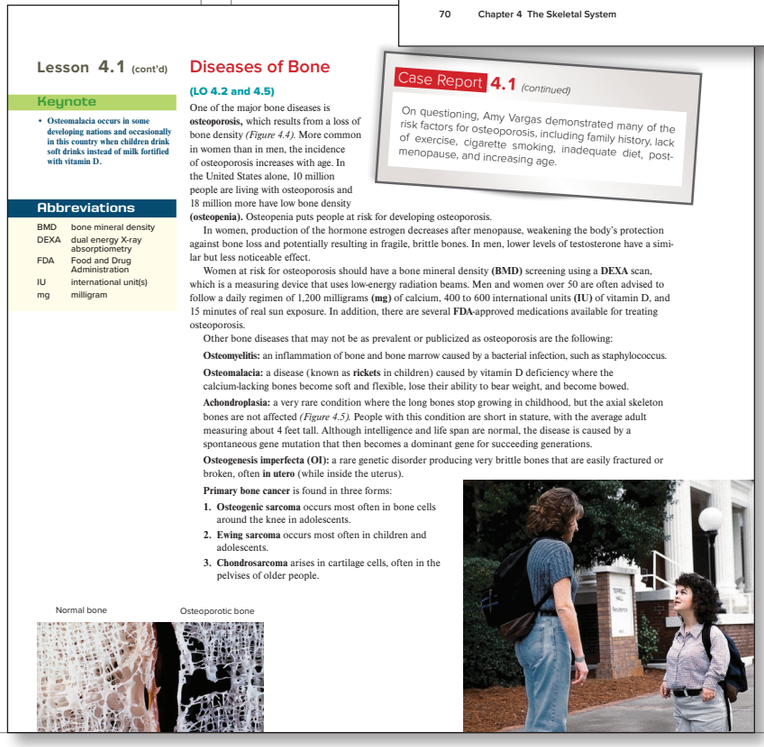
Healing of Fractures (LO 4.2 and 4.5)

When a bone is fractured, blood vessels bleed into the fracture site, forming a hematoma *(Figure 4.7a)*. After a few days, bone-forming cells called **osteoblasts** move in and start to produce new bone cells (osteocytes), which form a **callus** *(Figure 4.7b)*. Osteblasts continue to produce bone cells, which form **cancellous** (spongy) bone to replace the callus *(Figure 4.7c)*. As more bone cells form, the spongy bone structure is replaced by compact bone, which fuses together the bone segments *(Figure 4.7d)*. Uncomplicated fractures take 8 to 12 weeks to heal. (Surgical procedures to help fractures heal are shown in Lesson 4.4.)

▶ FIGURE 4.7 Healing of Bone Fracture.

Abbreviation

Fx	fracture



Lesson 4.1 (cont'd)

Keynote

- **Osteomalacia occurs in some developing nations and occasionally in this country when children drink soft drinks instead of milk fortified with vitamin D.**

Abbreviations

BMD	bone mineral density
DEXA	dual energy X-ray absorptiometry
FDA	Food and Drug Administration
IU	international unit(s)
mg	milligram

Diseases of Bone

(LO 4.2 and 4.5)

One of the major bone diseases is **osteoporosis,** which results from a loss of bone density *(Figure 4.4)*. More common in women than in men, the incidence of osteoporosis increases with age. In the United States alone, 10 million people are living with osteoporosis and 18 million more have low bone density **(osteopenia).** Osteopenia puts people at risk for developing osteoporosis.

In women, production of the hormone estrogen decreases after menopause, weakening the body's protection against bone loss and potentially resulting in fragile, brittle bones. In men, lower levels of testosterone have a similar but less noticeable effect.

Women at risk for osteoporosis should have a bone mineral density **(BMD)** screening using a **DEXA** scan, which is a measuring device that uses low-energy radiation beams. Men and women over 50 are often advised to follow a daily regimen of 1,200 milligrams **(mg)** of calcium, 400 to 600 international units **(IU)** of vitamin D, and 15 minutes of real sun exposure. In addition, there are several **FDA**-approved medications available for treating osteoporosis.

Other bone diseases that may not be as prevalent or publicized as osteoporosis are the following:

Osteomyelitis: an inflammation of bone and bone marrow caused by a bacterial infection, such as staphylococcus.

Osteomalacia: a disease (known as **rickets** in children) caused by vitamin D deficiency where the calcium-lacking bones become soft and flexible, lose their ability to bear weight, and become bowed.

Achondroplasia: a very rare condition where the long bones stop growing in childhood, but the axial skeleton bones are not affected *(Figure 4.5)*. People with this condition are short in stature, with the average adult measuring about 4 feet tall. Although intelligence and life span are normal, the disease is caused by a spontaneous gene mutation that then becomes a dominant gene for succeeding generations.

Osteogenesis imperfecta (OI): a rare genetic disorder producing very brittle bones that are easily fractured or broken, often **in utero** (while inside the uterus).

Primary bone cancer is found in three forms:

1. **Osteogenic sarcoma** occurs most often in bone cells around the knee in adolescents.
2. **Ewing sarcoma** occurs most often in children and adolescents.
3. **Chondrosarcoma** arises in cartilage cells, often in the pelvises of older people.

Case Report 4.1 *(continued)*

On questioning, Amy Vargas demonstrated many of the risk factors for osteoporosis, including family history, lack of exercise, cigarette smoking, inadequate diet, postmenopause, and increasing age.

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Ms. Basco resides in Shreveport with her husband. While very busy with her family, work, and studies, Rachel always finds time to visit her relatives in her home state of Wisconsin.

Essentials of Medical Language

CHAPTER 1

The Anatomy of Medical Terms

The Essential Elements of the Language of Medicine

McGraw-Hill Education/Rick Brady

Learning Outcomes

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

LO 1.1 **Select the roots, combining vowels, and combining forms of medical terms.**

LO 1.2 **Demonstrate the importance of suffixes and prefixes in forming medical terms.**

LO 1.3 **Construct (build) medical terms from separate elements.**

LO 1.4 **Deconstruct (break down) medical terms into their elements.**

LO 1.5 **Use correctly the plurals of medical terms.**

LO 1.6 **Articulate the correct pronunciations of medical terms.**

LO 1.7 **Demonstrate precision and accuracy in documentation and other written and verbal communication of medical terms.**

CASE REPORT 1.1

You are . . .

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

You are communicating with . . .

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

This summary of a Case Report illustrates for you the use of some simple medical terms. Modern health care and medicine have their own language. The medical terms all have precise meanings, which enable you, as a health professional, to communicate clearly and accurately with other health professionals involved in the care of a patient. This communication is critical for patient safety and the delivery of high-quality patient care.

McGraw-Hill Education/Rick Brady

Lesson 1.1

The Construction of Medical Words

Objectives

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

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

Roots

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

Abbreviations

CXR	chest X-ray
RUL	right upper lobe

Roots (LO 1.1)

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

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

Case Report 1.1 *(continued)*

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

Combining Forms (LO 1.1)

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

pneum- **root** lung or air	+	**-o-** **combining vowel**	=	**pneum/o-** **combining form**

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

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

pulmon- **root** lung	+	**-o-** **combining vowel**	=	**pulmon/o-** **combining form**

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

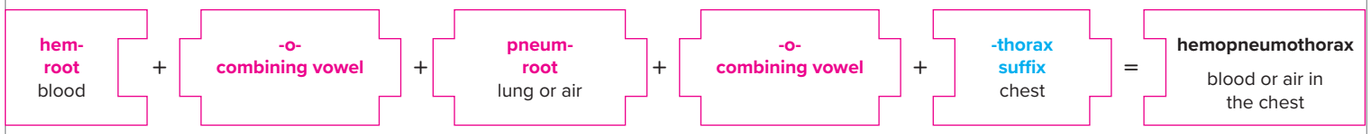
- The **root *respir-*** means *to breathe.* Adding the **combining vowel "a"** makes the **combining form *respir/a-*.**

respir- **root** to breathe	+	**-a-** **combining vowel**	=	**respir/a-** **combining form**

- The **root *bronch-*** is derived from the Greek word for *windpipe* and is one of the two subdivisions of the trachea that carry air to and from the lungs. Adding the **combining vowel "o"** to the **root *bronch-*** makes the **combining form *bronch/o-*.**

Many medical terms contain more than one **root;** when two roots occur together, they are always joined by a **combining vowel,** as in the following example:

- The word **hemopneumothorax** has the **root** *hem-,* from the Greek word meaning *blood,* and the **root *pneum-,*** from the Greek word meaning *air* or *lung,* and the **suffix *-thorax,*** from the Greek word meaning *chest.* The **combining vowel "o"** joins these two roots together to make the **combining form, *pneum/o-*.** A **hemopneumothorax** is the presence of air and blood in the space that surrounds the lungs in the chest. As blood and air fill the pleural cavity, the lungs cannot expand and respiration is not possible, thus forcing the affected lung to collapse.



Combining Forms

- Combine a **root** and a **combining vowel.**
- Can be attached to another **root** or **combining form.**
- Can precede another word element called a **suffix.**
- Can follow a **prefix.**

Keynotes

- Throughout this book, look for the following patterns:

  Roots, combining forms, and **combining vowels** will be colored **red.**

  Prefixes will be colored **green.**

  Suffixes will be colored **blue.**
- Different **roots** can have the same meaning. *Pulmon-* and *pneumon-* both mean *lung, air.*

EXERCISES

A. Review *what you have just learned about roots and combining forms. Select the correct answer to the statement.* LO 1.1

root **combining form** **combining vowel** **suffix** **prefix**

1. Roots and combining forms can go before a _____
2. This element does not have a meaning; it serves to make the word easier to pronounce: _____
3. A _____ can go before a root, but never after.
4. The _____ is the root plus a combining vowel.

B. Identify *the word parts of a medical term. Use the provided medical term to correctly answer the questions.* LO 1.1

1. In the word **pneumonia,** the root is:
   - **a.** pneum-
   - **b.** pneumon-
   - **c.** -ia
   - **d.** -nia
2. In the medical term **pulmonologist,** the root is:
   - **a.** pulm-
   - **b.** pulmon-
   - **c.** -logist
   - **d.** -gist
3. The combining vowel in the medical term **respiratory** is:
   - **a.** -a-
   - **b.** -o-
   - **c.** -i-
   - **d.** -e-

Lesson 1.1 (cont'd)

Suffixes

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

Keynote

Adjectival **suffixes** meaning *pertaining to:*

-ac, -al, -ale, -alis, -ar, -aris, -ary, atic, -ative, -eal, -ent, -etic, -ial, -ic, -ica, -ical, -ine, -ior, -iosum, -ious, -istic, -ius, -nic, -ous, -tic, -tiz, -tous, -us.

Suffixes (LO 1.2)

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

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

pulmon- **root** lung + **-ary** **suffix** pertaining to = **pulmonary** pertaining to the lung

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

pulmon/o- **combining form** lung + **-logy** **suffix** study of = **pulmonology** study of the lung

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

pneumon- **root** lung, air + **-ia** **suffix** condition of = **pneumonia** infection of lung tissue

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

respir- **root** to breathe + **-ation** **suffix** a process = **respiration** the process of breathing

- Add the **suffix** ***-itis*** to the **root** ***bronch-*** to make the term **bronchitis.** The **suffix** ***-itis*** means *inflammation.* **Bronchitis** is an inflammation of the bronchial tubes.

bronch- **root** bronchus + **-itis** **suffix** inflammation = **bronchitis** inflammation of the bronchial tubes

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

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

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

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

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

Exercises

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

A. Build the appropriate medical term *to match the definitions given. The placement of the elements is noted for you under the line; each different element is separated on the line. Insert the correct elements on the line. The first one is done for you.* **LO 1.1 and 1.2**

1. Study of the lungs: pulmon/o / logy
R/CF S

2. Pertaining to the lung: _____ / _____
R/CF S

3. The process of breathing: _____ / _____
R/CF S

4. Condition of the lung: _____ / _____
R/CF S

B. Suffixes *can provide clues to the meanings of terms. Answer the following questions using terms related to the respiratory system. Fill in the blanks.* **LO 1.1 and 1.2**

1. What is another term with the same meaning as pneumonia? _____

2. Which term is a body process? _____

3. Which suffix can be applied to a specialist? _____

Prefixes

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

Practical Points

- A **root** can start a term and does not become a **prefix.**
- A **root** can end a term and does not become a **suffix.**

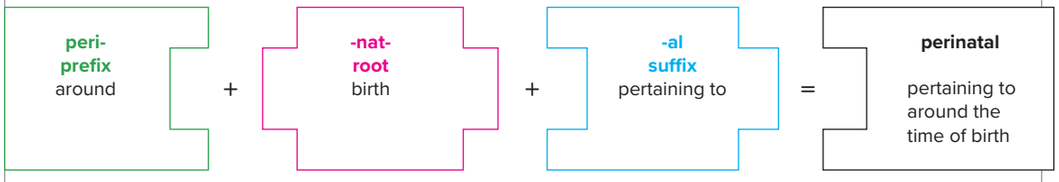
Prefixes (LO 1.2)

A **prefix** is an element added to the beginning of a **root** or **combining form** to further expand the meaning of a medical term. **Prefixes** usually indicate time, number, size, or location.

Examples of **prefixes** defining time are as follows:

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

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



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

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

Examples of prefixes indicating location are as follows:

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

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

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

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
gastric	**GAS**-trik	S/ R/	**-ic** *pertaining to* **gastr-** *stomach*	Pertaining to the stomach
epigastric **hypogastric**	ep-ih-**GAS**-trik high-poh-**GAS**-trik	P/ P/	**epi-** *above* **hypo-** *below*	Abdominal region above the stomach Abdominal region below the stomach
lateral	**LAT**-er-al	S/ R/	**-al** *pertaining to* **later-** *side*	Pertaining to one side of the body
bilateral **unilateral**	by-**LAT**-er-al you-nih-**LAT**-er-al	P/ P/	**bi-** *two* **uni-** *one*	Pertaining to both sides of the body Pertaining to one side of the body only
macrocyte	**MACK**-roh-site	P/ R/	**macro-** *large* **-cyte** *cell*	Large cell
macrocytic (adj) (**Note:** *The "e" in* cyte *is deleted to allow the word to flow.*)	mack-roh-**SIT**-ik	S/	**-ic** *pertaining to*	Pertaining to a macrocyte
mature	mah-**TYUR**		Latin *ready*	Fully developed
postmature	post-mah-**TYUR**	P/ R/	**post-** *after* **-mature** *fully developed*	Infant born after 42 weeks of gestation
premature	pree-mah-**TYUR**	P/	**pre-** *before*	Occurring before the expected time; e.g., an infant born before 37 weeks of gestation.
microcyte	**MY**-kroh-site	P/ R/	**micro-** *small* **-cyte** *cell*	Small cell
microcytic (adj) (**Note:** *The "e" in* cyte *is deleted to allow the word to flow.*)	my-kroh-**SIT**-ik	S/	**-ic** *pertaining to*	Pertaining to a small cell
natal	**NAY**-tal	S/ R/	**-al** *pertaining to* **nat-** *birth, born*	Pertaining to birth
perinatal	per-ih-**NAY**-tal	P/	**peri-** *around*	Around the time of birth
postnatal	post-**NAY**-tal	P/	**post-** *after*	After the birth
prenatal	pree-**NAY**-tal	P/	**pre-** *before*	Before the birth
pneumothorax	new-moh-**THOR**-ax	R/CF S/	**pneum/o-** *air, lung* **-thorax** *chest*	Air in the pleural cavity

EXERCISES

Prefixes: *Solid knowledge of prefixes will quickly help increase your medical vocabulary.*

A. Answer the first question, *and then build the correct term on the line next to the definitions in 2 through 4.* **LO 1.1, 1.2, and 1.4**

natal **prenatal** **postnatal** **perinatal**

1. The term *natal* means _____
2. Pertaining to around the time of birth: _____ / _____ / _____
   P R/CF S
3. Pertaining to after the birth: _____ / _____ / _____
   P R/CF S
4. Pertaining to before the birth: _____ / _____ / _____
   P R/CF S

B. Prefixes usually indicate time, number, size, or location. *Given the prefix, select the correct category of meaning.* **LO 1.2**

1. hypo
   a. time **b.** number **c.** size **d.** location
2. uni
   a. time **b.** number **c.** size **d.** location

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Lesson 1.2

Word Deconstruction, Plurals, Pronunciation, and Precision

Objectives

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

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

Keynotes

- Always begin deconstructing a medical term by identifying its suffix.
- Abbreviations are listed in Abbreviations Boxes throughout the book.

Abbreviations

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

CASE REPORT 1.2

You are . . .

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

You are communicating with . . .

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

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

The bold terms in the Case Report are used as examples in the text and/or are deconstructed in the Word Analysis and Definition box (opposite page).

Word Deconstruction (LO 1.1, 1.2, and 1.4)

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

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

my/o- combining form muscle	+	-cardi- root heart	+	-al suffix pertaining to	=	myocardial pertaining to heart muscle

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

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

cardi/o- combining form heart	+	-my/o- combining form muscle	+	-pathy suffix disease	=	cardiomyopathy disease of the heart muscle

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

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

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

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

EXERCISES

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

A. There are several forms for the term diagnosis. *Note that there are singular and plural forms of the term, as well as the noun, adjective, and verb forms. Insert the correct form of the term in the documentation below.* **LO 1.1, 1.2, and 1.7**

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

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

B. Identify the form of the term diagnosis. *Fill in the blanks.* **LO 1.4 and 1.7**

1. The verb form: _____
2. Plural form: _____
3. Singular noun: _____
4. Adjective form: _____

Lesson 1.2 (cont'd)

Communication

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

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

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

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

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

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

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

Plurals (LO 1.5)

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

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

TABLE 1.1

SINGULAR AND PLURAL FORMS

Singular Ending	Plural Ending	Examples
-a		axilla
	-ae	axillae
-ax		thorax
	-aces	thoraces
-en		lumen
	-ina	lumina
-ex		cortex
	-ices	cortices
-is		diagnosis
	-es	diagnoses
-is		epididymis
	-ides	epididymides
-ix		appendix
	-ices	appendices
-ma		carcinoma
	-mata	carcinomata
-on		ganglion
	-a	ganglia
-um		septum
	-a	septa
-us		viscus
	-era	viscera
-us		villus
	-i	villi
-us		corpus
	-ora	corpora
-x		phalanx
	-ges	phalanges
-y		ovary
	-ies	ovaries
-yx		calyx
	-ices	calices

Pronunciation (LO 1.6)

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

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

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

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

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

EXERCISES

A. Medical language: *Many terms in medicine sound and/or look very similar. The difference of only one letter can make a new term. Train your eye and ear to know the difference. Select the correct choice of terms in the following documentation.* **LO 1.6 and 1.7**

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

B. Plurals: *Select the correct form of the plural in the following sentences.* **LO 1.5**

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

C. Terminology challenge: *Use your knowledge of the new medical terms you have learned in this chapter and choose the correct answer.* **LO 1.7**

1. The term *cervical* can apply to two different places in the body. Where are they?
   - **a.** neck of the body and neck of the femur
   - **b.** neck of the uterus and neck of the humerus
   - **c.** neck of the femur and neck of the humerus
   - **d.** neck of the body and neck of the uterus
2. The terms *ileum* and *ilium* are pronounced the same but are in two different body systems. Where are they?
   - **a.** muscular and nervous systems
   - **b.** digestive and skeletal systems
   - **c.** circulatory and integumentary systems
   - **d.** endocrine and respiratory systems

Lesson 1.2 (cont'd)

Keynotes

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

Abbreviation

IV	intravenous

Keynotes

- Communicate verbally and in writing with attention to detail, accuracy, and precision.
- When you understand the individual word elements that make up a medical term, you are better able to understand clearly the medical terms you are using.

Precision in Communication (LO 1.7)

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

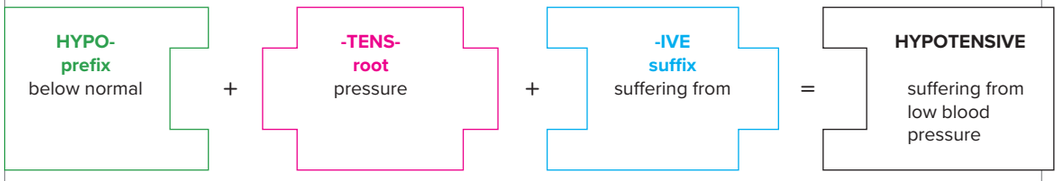
Case Report 1.2 *(continued)*

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

In the above Case Report involving Mr. Donovan, if **hypotensive** (suffering from **low** blood pressure) were confused with **hypertensive** (suffering from **high** blood pressure), incorrect and dangerous treatments could be prescribed.

- In the word **hypotensive,** the **suffix-*ive*** means *pertaining to.* The **prefix *hypo-*** means *below or less than normal.* The **root-*tens-*** means *pressure.* The term **hypotensive** means *pertaining to or suffering from a below normal or low blood pressure.*
- In the word **hypertensive,** the **prefix *hyper-*** means *above or higher than normal.* The term **hypertensive** means *pertaining to or suffering from an above normal or high blood pressure.*

To deconstruct the term **hypotensive,** start with the **suffix-*ive,*** which means *pertaining to* or *suffering from.* Next, the **prefix *hypo-*** means *below or less than normal.* Then the **root-*tens-*** means *pressure.* Now, place the pieces together to form a word meaning *suffering from a below-normal pressure* or *low blood pressure.*



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

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

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

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

EXERCISES

A. Patient documentation: *Read the following excerpts from patient charts and insert the medical term that correctly completes each sentence.* **LO 1.7**

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

B. Brain teaser: *Challenge yourself to analyze the question and insert the correct answers.* **LO 1.1, 1.2, and 1.7**

1. If a medical specialist in the study of disorders of the nervous system is a neurologist, what is a medical specialist in the study of disorders of the urinary system called?

   (Hint: Use your knowledge of suffixes and roots to help you.)
2. What element is the difference between high blood pressure and low blood pressure? _____
3. What is the tube that connects a kidney to the bladder? _____
4. What substance goes through a transfusion but not through an infusion? _____

Chapter Review exercises, along with additional practice items, are available in Connect!

CHAPTER 2

The Body as a Whole, Cells, and Genes

The Essentials of the Languages of Anatomy and Genetics

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CASE REPORT 2.1

You are . . .

. . . a certified medical assistant (**CMA**) employed as an in vitro fertilization coordinator in the Assisted Reproduction Clinic at Fulwood Medical Center.

You are communicating with . . .

. . . Mrs. Mary Arnold, a 35-year-old woman who has been unable to **conceive. In vitro fertilization (IVF)** was recommended. After **hormone** therapy, several healthy and mature eggs were recovered from her **ovary.** The eggs were combined with her husband's **sperm** in a laboratory dish where **fertilization** occurred to form a single cell, called a **zygote.** The cells were allowed to divide for five days to become **blastocysts,** and then four blastocysts were implanted in her uterus.

Your role is to guide, counsel, and support Mrs. Arnold and her husband through the implementation and follow-up for the IVF process.

Learning Outcomes

Effective medical treatment recognizes that each organ, tissue, and cell in your body, no matter where it's located, is connected to and functions in harmony with every other organ, tissue, and cell. To understand these concepts, you need to be able to:

LO 2.1 Use **roots, combining forms, suffixes, and prefixes** to construct and analyze (deconstruct) medical terms related to the anatomy and physiology of the body as a whole.

LO 2.2 Spell and pronounce correctly medical terms related to the body as a whole in order to communicate with accuracy and precision in any health care setting.

LO 2.3 Discuss the medical terms associated with cells and tissues.

LO 2.4 Explain the terms genes, genetics, and gene therapy.

LO 2.5 Describe the primary tissue groups and their functions.

LO 2.6 Relate individual organs and organ systems to the organization and function of the body as a whole.

LO 2.7 Integrate the medical terms of the different anatomic positions, planes, and directions of the body into everyday medical language.

LO 2.8 Describe the nine regions of the abdomen.

LO 2.9 Map the body cavities.

LO 2.10 Apply your knowledge of the medical terms of the body as a whole to documentation, medical records, and medical reports.

LO 2.11 Translate the medical terms of the body as a whole into everyday language in order to communicate clearly with patients and their families.

Abbreviations

CMA	certified medical assistant
IVF	in vitro fertilization

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Lesson 2.1

Composition of Body and Cells

Objectives

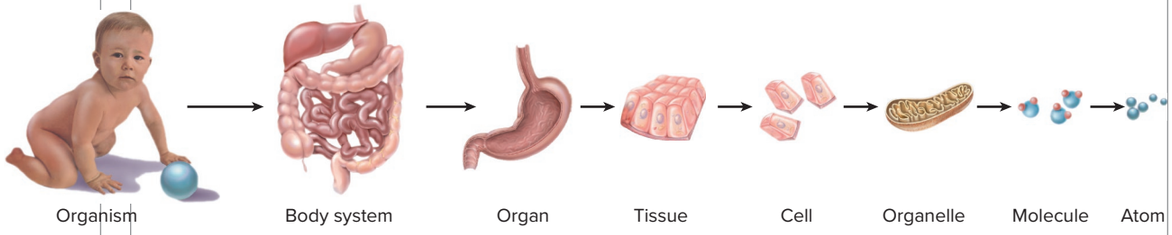
All the different elements of your body interact with each other to support constant change as your body reacts to your environment and to the nourishment you give it. To understand the structure and function of the elements of your body, you need to be able to:

2.1.1 Name the medical terms associated with cells, tissues, and organs.

2.1.2 Discuss the medical terminology for the major structures and functions of a cell.

Composition of the Body (LO 2.1 and 2.2)

- The whole body or organism is composed of **organ systems** *(Figure 2.1)*.
  - Organ systems are composed of **organs.**
    - Organs are composed of **tissues.**
      - Tissues are composed of **cells.**
        - Cells are composed in part of **organelles.**
          - Organelles are composed of **molecules.**
            - Molecules are composed of **atoms.**

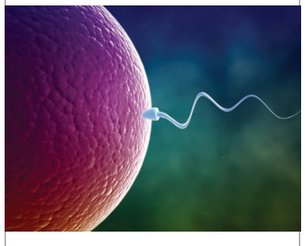


▲ **FIGURE 2.1**
Composition of the Body.

The Cell (LO 2.3)

The result of the **fertilization** of an egg by a sperm is a single fertilized cell called a **zygote** *(Figure 2.2)*. This process is also called **conception.** This zygote is the origin of every cell in your body. It divides and multiplies into trillions of cells, which become the basic unit of every tissue and organ. These cells are responsible for the structure and all the functions of your tissues and organs.

Cytology is the study of cell structure and function, and this forms the basis of the knowledge of the anatomy and physiology of every tissue and organ.



▲ **FIGURE 2.2**
Fertilization of Egg by Single Sperm.

Jezper/Shutterstock

Case Report 2.1 *(continued)*

Mrs. Arnold achieved pregnancy and delivered a healthy girl at term.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
cell	**SELL**		Latin *storeroom*	The smallest unit of the body capable of independent existence
conception	kon-**SEP**-shun		Latin *something received*	Fertilization of the egg by sperm to form a zygote
cytology	**SIGH**-tol-oh-jee	S/ R/CF	**-logy** *study of* **cyt/o-** *cell*	Study of the cell
cytologist	**SIGH**-tol-oh-jist	S/	**-logist** *one who studies, a specialist*	Specialist in the structure, chemistry, and pathology of the cell
fertilization (noun)	**FER**-til-eye-**ZAY**-shun	S/ R/	**-ation** *process* **fertiliz-** *to make fruitful*	Union of a male sperm and a female egg
fertilize (verb)	**FER**-til-ize		Greek *to bear*	Penetration of the egg by sperm
in vitro	en-**VEE**-troh		Latin *glass*	In vitro fertilization is the process of combining sperm and eggs in a laboratory dish and placing resulting embryos inside a uterus
organ	**OR**-gan		Latin *instrument, tool*	Structure with specific functions in a body system
organelle	**OR**-gah-nell	S/ R/	**-elle** *small* **organ-** *organ*	Part of a cell having specialized function(s)
organism	**OR**-gan-izm	S/	**-ism** *condition, process*	Any whole living, individual plant or animal
tissue	**TISH**-you		Latin *to weave*	Collection of similar cells
zygote	**ZYE**-goat		Greek *yolk*	Cell resulting from the union of sperm and egg

EXERCISES

A. Review *the terms related to the composition of the body and the cell. Pay careful attention to word elements and meanings. Fill in the blanks.* **LO 2.1 and 2.3**

1. Put the following terms in ascending order of their size:

organism	**cells**	**molecules**	**organs**
organ systems	**organelles**	**atoms**	**tissues**

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

B. Use the terms *and their elements related to the cell to answer the questions.* **LO 2.1 and 2.2**

1. The suffix _____ means *study of.* The suffix that means *specialist (in the study of)* is _____.

2. What part of *cyt/o* makes it a combining form rather than a root? _____

3. What is the medical term for *union of a male sperm and a female egg?* _____

4. What suffix related to the composition of the body and the cell describes the size of something? _____

5. What does a cytologist study? _____

Lesson 2.1 (cont'd)

Keynote

- The cytoplasm is a clear, gelatinous substance crowded with different organelles.

Abbreviations

DNA	deoxyribonucleic acid
RNA	ribonucleic acid

Structure and Function of Cells (LO 2.3)

As the zygote divides, every cell it creates becomes a complex little factory that carries out these basic life functions:

- **Manufacture** of **proteins** and **lipids;**
- **Production** and use of energy;
- **Communication** with other cells;
- **Replication** of **deoxyribonucleic acid (DNA);** and
- **Reproduction** of itself.

All cells contain a fluid called **cytoplasm** (intracellular fluid) surrounded by a cell **membrane** *(Figure 2.3).* Your cell membrane—made of **proteins** and **lipids**—allows water, oxygen, glucose, **electrolytes, steroids,** and alcohol to pass through it. On the outside of the cell membrane, you have receptors that bind to chemical messengers like **hormones** sent by other cells. These are the chemical signals by which your cells communicate with each other.

Organelles (LO 2.2)

Organelles are small structures in the cytoplasm of the cell that carry out special **metabolic** tasks (the chemical processes that occur in the cell).

The **nucleus** is the largest organelle *(Figure 2.3).* It is surrounded by its own membrane and directs all the cell's activities. The 46 molecules of DNA in the nucleus form 46 **chromosomes.**

A **nucleolus** is a small, dense body composed of **ribonucleic acid** (**RNA**) and protein found in the nucleus. It is involved in the manufacture of proteins from simple materials—a process called **anabolism.**

Mitochondria are the cell's powerhouses. They produce energy by breaking down compounds like glucose and fat in a process called **catabolism.**

- **Metabolism** is the sum of the constructive processes of anabolism and the destructive processes of catabolism within a cell **(intracellular).**

The **endoplasmic reticulum** manufactures steroids, cholesterol and other lipids, and proteins. It also detoxifies alcohol and other drugs.

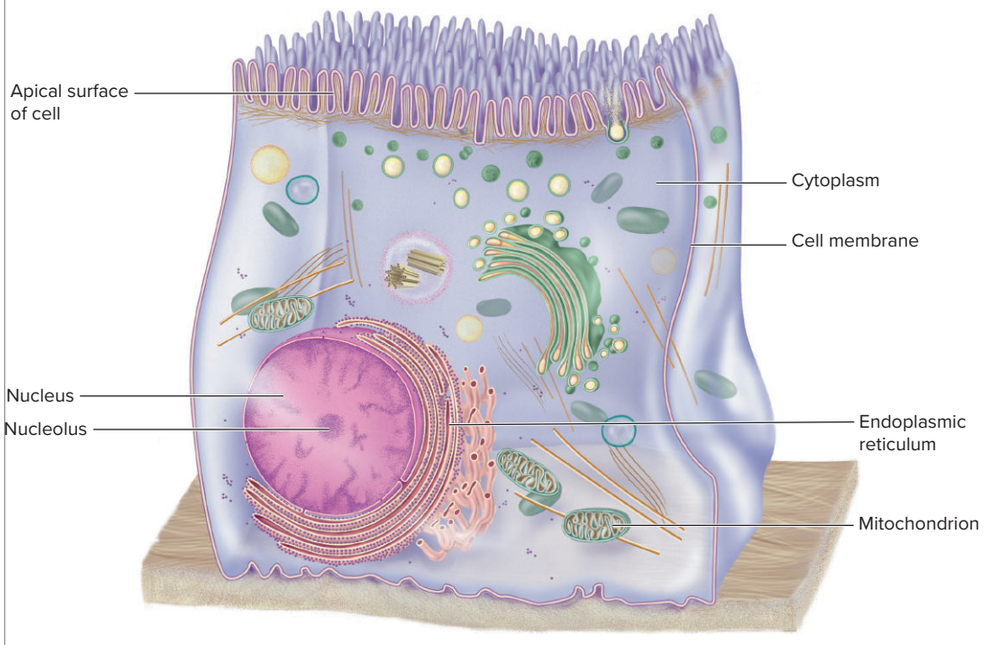


FIGURE 2.3
Structure of a Representative Cell.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
anabolism	an-**AB**-oh-lizm	S/ R/	**-ism** *process, condition* **anabol-** *build up*	The buildup of complex substances in the cell from simpler ones as a part of metabolism
catabolism	kah-**TAB**-oh-lizm	S/ R/	**-ism** *process, condition* **catabol-** *break down*	The breakdown of complex substances into simpler ones as a part of metabolism
chromosome	**KROH**-moh-sohm	S/ R/CF	**-some** *body* **chrom/o-** *color*	Body in the nucleus that contains DNA and genes
cytoplasm	**SIGH**-toh-plazm	S/ R/CF	**-plasm** *something formed* **cyt/o-** *cell*	Clear, gelatinous substance that forms the substance of a cell, except for the nucleus
deoxyribonucleic acid (DNA)	dee-**OCK**-see-rye-boh-nyu-**KLEE**-ik **ASS**-id		deoxyribose *a sugar* nucleic acid *a protein*	Source of hereditary characteristics found in chromosomes
electrolyte	ee-**LEK**-troh-lite	S/ R/CF	**-lyte** *soluble* **electr/o-** *electricity*	Substance that, when dissolved in a suitable medium, forms electrically charged particles
hormone **hormonal (adj)**	**HOR**-mohn hor-**MOHN**-al	 S/ R/	Greek *set in motion* **-al** *pertaining to* **hormon-** *hormone*	Chemical formed in one tissue or organ and carried by the blood to stimulate or inhibit a function of another tissue or organ Pertaining to a hormone
intracellular	in-trah-**SELL**-you-lar	S/ P/ R/	**-ar** *pertaining to* **intra-** *within* **-cellul-** *small cell*	Within the cell
lipid	**LIP**-id		Greek *fat*	General term for all types of fatty compounds; for example, cholesterol, triglycerides, and fatty acids
membrane **membranous (adj)**	**MEM**-brain **MEM**-brah-nus	 S/ R/	Latin *parchment* **-ous** *pertaining to* **membran-** *cover, skin*	Thin layer of tissue covering a structure or cavity Pertaining to a membrane
metabolism **metabolic (adj)**	meh-**TAB**-oh-lizm met-ah-**BOL**-ik	S/ R/ S/	**-ism** *condition, process* **metabol-** *change* **-ic** *pertaining to*	The constantly changing physical and chemical processes occurring in the cell that are the sum of anabolism and catabolism Pertaining to metabolism
mitochondria (pl) **mitochondrion (singular)**	my-toe-**KON**-dree-ah my-toe-**KON**-dree-on	S/ R/CF R/ S/	**-ia** *condition* **mit/o-** *thread* **-chondr-** *granule* **-ion** *condition*	Organelles that generate, store, and release energy for cell activities
nucleolus	nyu-**KLEE**-oh-lus	S/ R/CF	**-lus** *small* **nucle/o-** *nucleus*	Small mass within the nucleus
nucleus **nuclear (adj)**	**NYU**-klee-us **NYU**-klee-ar	 S/ R/	Latin *command center* **-ar** *pertaining to* **nucle-** *nucleus*	Functional center of a cell or structure Pertaining to a nucleus
protein	**PRO**-teen		Greek *protein*	Class of food substances based on amino acids
ribonucleic acid (RNA)	RYE-boh-nyu-**KLEE**-ik **ASS**-id	S/ P/ R/	**-ic** *pertaining to* **ribo-** *from ribose, a sugar* **-nucle-** *nucleus*	The information carrier from DNA in the nucleus to an organelle to produce protein molecules
steroid	**STAIR**-oyd	S/ R/	**-oid** *resembling* **ster-** *solid*	Large family of chemical substances found in many drugs, hormones, and body components

EXERCISE

A. Knowledge *of elements is your best clue to determining the meaning of medical terminology. Deconstruct the elements in these questions to find your answers. Select the BEST ANSWER to the question.* **LO 2.3**

1. Which term relates to electrically charged particles?

a. protein **b.** hormonal **c.** electrolyte

2. Which term relates to change?

a. steroid **b.** metabolic **c.** lipid

3. Which term has an element meaning "condition"?

a. metabolism **b.** cytoplasm **c.** hormone

4. What is a thin layer of tissue that covers a structure or cavity?

a. lipid **b.** membrane **c.** hormone

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Lesson 2.2

Genes and Genetics

Objectives

- **2.2.1** Describe the structure and functions of deoxyribonucleic acid (DNA).
- **2.2.2** Discuss the roles of genes in heredity.
- **2.2.3** Define mitosis.
- **2.2.4** Discuss mutations and epigenetic changes.

Abbreviations

A	adenosine
C	cytosine
DNA	deoxyribonucleic acid
G	guanine
T	thymine

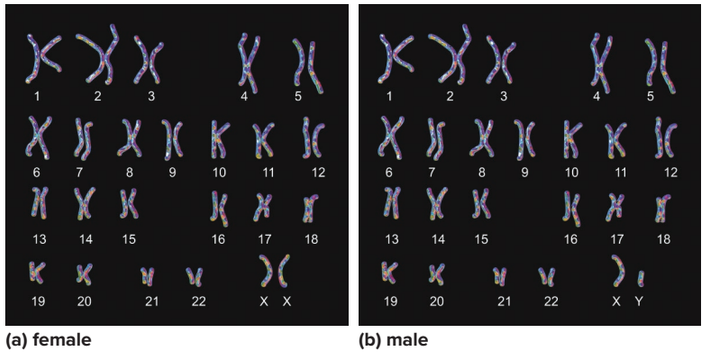
Keynotes

- Deoxyribonucleic acid (DNA) is the hereditary material in humans.
- DNA molecules are packaged into chromosomes.
- Genes are the basic functional and physical unit of **heredity** and are made up of DNA.
- Genes regulate the division and replication of cells.
- Cancer can result when cell division and replication are abnormal.
- Chemical compounds can be added to a gene and can lead to abnormal **genetic** (epigenetic) activity producing cancers and degenerative and metabolic diseases.

DNA and Genes (LO 2.4)

Inside the cell nucleus are packed 46 molecules of **deoxyribonucleic acid (DNA)** as thin strands called **chromatin**. When cells divide, the chromatin condenses with **histone** proteins to form 23 pairs (46 total) of densely coiled bodies called **chromosomes**. Twenty-two of these pairs look the same in both males and females. In the 23rd pair, females have two copies of the X chromosome; males have one X and one Y. The picture of the human chromosomes lined up in pairs is called a **karyotype** *(Figure 2.4)*.

The information in DNA is stored as a code of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). The total human DNA contains about 3 billion bases, and more than 99% of those bases are the same in all people. The sequence of these bases determines the building and maintaining of the organism's cells, similar to the way in which letters of the alphabet appear in order to form words and sentences.



(a) female (b) male

FIGURE 2.4 Human Karyotype.

(a, b) Kateryna Kon/Shutterstock

The **chromosomal** DNA bases pair with each other–A with T and C with G–and are attached to a sugar molecule and a phosphate molecule. A base, sugar, and phosphate form a **nucleotide**. Nucleotides are arranged in two long strands to form a spiral called a double **helix**.

The nuclear DNA in the chromosomes is the **hereditary** material, each unit of which is called a **gene**. The genes act as instructions to make molecules of different proteins. Each person has two copies of each gene, one inherited from each parent. Most genes are the same in all people; only less than one percent is slightly different between people. These small differences contribute to each person's unique physical features. Humans are thought to have between 20,000 and 25,000 genes. This total is called the **genome**.

Mitosis

The critical property of DNA is that it can **replicate**, make copies of itself, so that when cells divide, each new cell has an exact copy of the DNA present in the old cell. This cell division is called **mitosis**, in which a cell duplicates all of its contents, including its chromosomes, to form two identical daughter cells. When mitosis is not performed correctly, abnormal cells, such as cancer cells, can result.

Mutations and Epigenetic Changes

A permanent alteration of the nucleotide sequence of the genome of an organism is called a **mutation**. Mutations may or may not produce visible changes in the observable characteristics (**phenotype**) of an organism. Mutations play a part in both normal and abnormal biological processes including evolution, cancer, and the development of the immune system.

Chemical compounds that become added to single genes can regulate their activity to produce modifications known as **epigenetic** changes. These changes can remain as cells divide and can be inherited through generations. Environmental influences from pollution, drugs, pharmaceuticals, aging, and diets can also produce epigenetic modifications, such as cancers, mental disorders, and degenerative and metabolic disorders.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
chromatin	**KROH**-ma-tin	S/ R/CF	**-tin** *pertaining to* **chrom/a-** *color*	DNA that forms chromosomes during cell division
chromosome **chromosomal (adj)**	**KROH**-moh-sohm **KROH**-moh-**SO**-mal	R/CF R/ S/	**chrom/o-** *color* **-some** *body* **-al** *pertaining to*	The body in the cell nucleus that carries the genes Pertaining to a chromosome
deoxyribonucleic acid (DNA)	dee-**OCK**-see-**RYE**-boh-noo-**KLEE**-ik **ASS**-id	S/ P/ P/ R/ R/ R/	**-ic** *pertaining to* **de-** *without* **-oxy-** *oxygen* **-ribo-** *ribose* **-nucle-** *nucleus* **acid** *acid, low pH*	The chemical repository of hereditary characteristics
epigenetics	**EP**-ih-jeh-**NET**-iks	S/ P/ R/	**-etics** *pertaining to* **epi-** *above, over* **-gen-** *to create*	The study of disorders produced by the effects of chemical compounds (e.g., pollutants) or environmental influences (such as diet) on genes
gene **genetic (adj)** **genome**	JEEN jeh-**NET**-ik **JEE**-nome	S/ R/ R/ 	Greek *birth* **-etic** *pertaining to* **gen-** *to create* **-ome** *body*	The functional unit of heredity on a chromosome Pertaining to genetics A complete set of chromosomes
helix	**HEE**-liks		Greek *a coil*	A spiral of nucleotides in the structure of DNA
heredity **hereditary**	heh-**RED**-ih-tee heh-**RED**-ih-ter-ee	S/ R/	Latin *an heir* **-ary** *pertaining to* **heredit-** *inherited through genes*	The transmission of characteristics from parent to offspring Transmissible from parent to offspring
histone	**HIS**-tone	S/ R/	**-one** *chemical* **hist-** *tissue*	A simple protein found in the cell nucleus
karyotype	**KAIR**-ee-oh-type	S/ R/CF	**-type** *model* **kary/o-** *nucleus*	The chromosome characteristics of an individual cell
mitosis	my-**TOE**-sis		Greek *thread*	Cell division to create two identical cells, each with 46 chromosomes
mutation	myu-**TAY**-shun		Latin *to change*	A permanent alteration in the nucleotide sequence of the genome
nucleotide	**NYU**-klee-oh-tide	R/CF R/	**nucle/o-** *nucleus* **-tide** *time*	Combination of a DNA base, a sugar molecule, and a phosphate molecule
phenotype	**FEE**-noh-type	S/ R/CF	**-type** *model* **phen/o-** *appearance*	Manifestation of a genome
replicate	**REP**-lih-kate		Latin *a reply*	To produce an exact copy

EXERCISE

A. Use your knowledge of medical terminology related to genetics. Insert the correct term in the appropriate statement. **LO 2.4**

gene genome mitosis chromosomes chromatin

1. When the cell is maintaining normal function, DNA and proteins are contained within thin strands of _____ _____.
2. When the cell is dividing, DNA wraps around the proteins and is contained within densely coiled bodies called _____ _____.
3. The unit of nuclear DNA in the chromosomes is called a _____.
4. A _____ is a complete set of chromosomes.
5. The process of _____ occurs when a cell creates an exact copy of itself and divides into two identical cells.

Classic Collection/Shotshop GmbH/Alamy Images

Objectives

- **2.3.1** Discuss the applications of medical genetics.
- **2.3.2** Define the concept of personalized medicine and its advantages.
- **2.3.3** Describe gene therapy.
- **2.3.4** Explain the values of predictive medicine.

Abbreviations

ADHD	attention deficit hyperactivity disorder
BRCA	breast cancer
PA	physician's assistant

Lesson 2.3

Genetic Medicine

CASE REPORT 2.2

You are

. . . a physician's assistant (**PA**) in the Genetic Counseling Clinic at Fulwood Medical Center.

Your patient is

. . . Mrs. Patricia Bennet, a 52-year-old office manager with two daughters, aged 30 and 25. Mrs. Bennett's sister, aged 55, recently had a mastectomy for breast cancer and is now receiving chemotherapy. Their mother died of ovarian cancer in her late fifties. Mrs. Bennet wants to know her risk for breast or ovarian cancer, what she can do to prevent it, and what her daughters' risks are.

Genetic Medicine (LO 2.4)

Medical genetics is the application of genetics to medical care. Genetic medicine is the newer term for medical genetics and incorporates areas such as gene therapy, personalized (precise) medicine, and predictive medicine.

Every person has a unique variation of the human genome and an individual's health stems from this genetic variation interacting with behaviors (drinking, smoking, etc.) and influences from the environment (chemical pollution in some form). Knowing the genetic makeup will enable more accurate diagnoses to be made, the source of the disease to be understood, and earlier, more accurate treatments or the prevention of progression of the disease provided. This concept is called *personalized medicine.*

One way that the biological variant is seen is responsiveness to drugs. Attention deficit hyperactivity disorder (ADHD) medications only work for one out of ten preschoolers, cancer drugs are effective for only one out of four patients, and depression drugs work for six out of ten patients. The drug Tamoxifen used to be prescribed to women with a form of breast cancer (BRCA), but 65% developed resistance to it. These women were found to have a mutation in their CYP2D6 gene that made Tamoxifen an ineffective treatment.

Personalized medicine can assist with preventive care. Women, such as Patricia Bennet in Case Report 2.2, are already being genotyped for mutations in the BRCA1 and BRCA2 genes if they have a family history of breast or ovarian cancer. In Mrs. Bennet's case, she is positive for both mutations and is now considering surgical measures that can then be taken to prevent the disease from developing. Her daughters have appointments to receive genetic testing in their own health plans.

Cytogenetics is the study of chromosome abnormalities to determine a cause for developmental delay, mental retardation, birth defects, and **dysmorphic** features, and chromosomal abnormalities are often detected in cancer cells.

Gene therapy is an experimental technique to replace a mutated gene that causes disease with a healthy copy, inactivate a mutated gene that is functioning improperly, or introduce a new gene into the body to prevent or help cure a disease. The **therapeutic** genes are introduced into body cells, and some 600 clinical trials utilizing this form of therapy are underway in the United States.

Predictive medicine looks at the probability of a disease and allows preventive measures to be taken. Examples are newborn screening to identify genetic disorders that can be treated early in life, and **prenatal** testing to look for diseases and conditions in an **embryo** or **fetus** whose parents have an increased risk of having a baby with a genetic or chromosomal disorder.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
cytogenetics	**SIGH**-toh-jeh-**NET**-iks	S/ R/CF R/	-etics *pertaining to* cyto- *cell* -gen- *create*	Study of chromosomal abnormalities in a cell
dysmorphology	dis-mor-**FOLL**-oh-jee	S/ P/ R/CF	-logy *study of* dys- *difficult, bad* -morph/o- *form*	The study of developmental structural defects
dysmorphic	dis-**MOR**-fik	S/	-ic *pertaining to*	Possessing a developmental structural defect
embryo	**EM**-bree-oh		Greek *a young one*	Developing organism from conception until the end of the eighth week
fetus	**FEE**-tus		Latin *offspring*	Human organism from the end of the eighth week to birth
predictive	pree-**DIK**-tiv	S/ P/ R/	-ive *quality of* pre- *before* -dict- *consent*	The likelihood of a disease or disorder being present or occurring in the future
prenatal	pree-**NAY**-tal	S/ P/ R/	-al *pertaining to* pre- *before* -nat- *born*	Before birth
therapy **therapeutic**	**THAIR**-ah-pee **THAIR**-ah-**PYU**-tik		Greek *medical treatment* Greek *curing of a disorder or disease*	Systematic treatment of a disease, dysfunction, or disorder Curing or capable of curing a disorder or disease

EXERCISES

A. Discuss *the applications of medical genetics. Choose the correct answer to complete the following statements.* **LO 2.4**

1. The replacement of a mutated gene with a healthy copy is termed:

- **a.** predictive medicine
- **b.** cytogenetics
- **c.** gene therapy
- **d.** personalized medicine

2. The study of chromosome abnormalities in a cell is:

- **a.** cytogenetics
- **b.** dysmorphology
- **c.** prenatal therapy
- **d.** precise medicine

3. _____ medicine uses genetics to determine accurate treatments for an existing condition.

- **a.** Personalized
- **b.** Preventative
- **c.** Cytogenetic
- **d.** Predictive

B. Not all terms can be deconstructed. *It is sometimes necessary to memorize the medical terms of Greek and Latin origin. Given the definition, provide the term that is being described. Fill in the blanks.* **LO 2.4**

1. Systematic treatment of a disease, dysfunction, or disorder. _____

2. Human organism from conception to the end of the eighth week. _____

3. Human organism from the end of the eighth week to birth. _____

4. Curing or capable of curing a disorder or disease. _____

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Lesson 2.4

Tissues, Organs, and Organ Systems

Objectives

Your tissues, organs, and organ systems must continually adapt and adjust in order to work in sync with each other. The information in this lesson will enable you to:

- **2.4.1** Define the four primary tissue groups.
- **2.4.2** Discuss the medical terminology for the structure and functions of each tissue group.
- **2.4.3** Name the organ systems.
- **2.4.4** Describe the medical terminology for the strucure and functions of each organ system.

Abbreviation

ACL	anterior cruciate ligament

Tissues (LO 2.5)

Tissues hold your body together. Each tissue is different but made of similar cells with unique materials around them manufactured by the cells. The many tissues of your body have different structures that enable them to perform specialized functions. **Histology** is the study of the structure and function of tissues. The four primary tissue groups are outlined in *Table 2.1.*

CASE REPORT 2.3

You are . . .

. . . a physical therapy assistant employed in the Rehabilitation Unit in Fulwood Medical Center.

You are communicating with . . .

. . . Mr. Richard Josen, a 22-year-old man who injured tissues in his left knee while playing football (Figure 2.5). Using **arthroscopy,** the orthopedic surgeon removed his torn **anterior cruciate ligament (ACL)** and replaced it with a **graft** from his **patellar tendon**. The torn medial collateral ligament was **sutured** together. The tear in his medial **meniscus** was repaired. Rehabilitation is focused on strengthening the **muscles** around his knee joint and regaining joint mobility and stability.

TABLE 2.1

THE FOUR PRIMARY TISSUE GROUPS (LO 2.5)

Type	Function	Location
Connective	Bind, support, protect, fill spaces, store fat	Widely distributed throughout the body, e.g., in blood, bone, cartilage, and fat
Epithelial	Protect, secrete, absorb, excrete	Cover body surface, cover and line internal organs, compose glands
Muscle	Movement	Attached to bones; found in the walls of hollow tubes, organs, and the heart
Nervous	Transmit impulses for coordination, sensory reception, motor actions	Brain, spinal cord, nerves

Adapted from David Shier, Jackie L. Butler, and Ricki Lewis, *Hole's Human Anatomy and Physiology,* 10th ed. Copyright © 2004 The McGraw-Hill Companies, Inc. Adapted with permission.

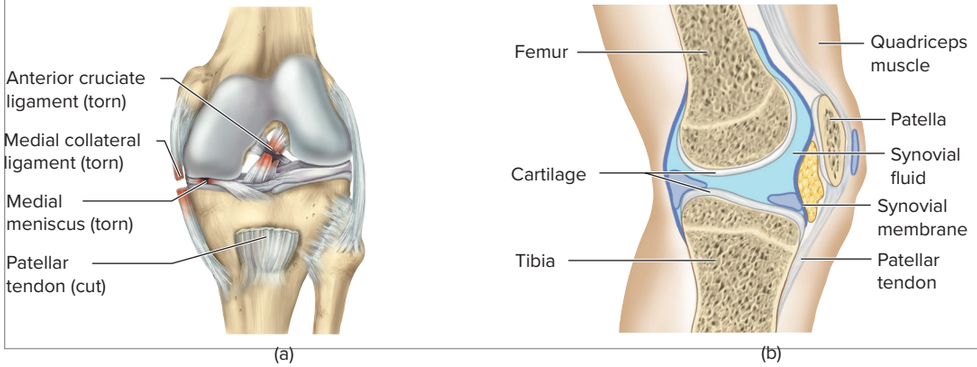

FIGURE 2.5
Knee Anatomy.
(a) Injury to left knee.
(b) Normal knee.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
arthroscopy	ar-**THROS**-koh-pee	S/ R/CF	**-scopy** *to examine, to view* **arthr/o-** *joint*	Visual examination of the interior of a joint
connective tissue	koh-**NECK**-tiv **TISH**-you	S/ R/	**-ive** *pertaining to* **connect-** *join together* tissue Latin *to weave*	The supporting tissue of the body
cruciate	**KRU**-she-ate		Latin *cross*	Shaped like a cross
graft	**GRAFT**		French *transplant*	Transplantation of living tissue
histology **histologist**	his-**TOL**-oh-jee his-**TOL**-oh-jist	S/ R/CF S/	**-logy** *study of* **hist/o-** *tissue* **-logist** *one who studies, specialist*	Study of the structure and function of cells, tissues, and organs Specialist in histology
ligament	**LIG**-ah-ment		Latin *band*	Band of fibrous tissue connecting two structures
meniscus	meh-**NISS**-kuss		Greek *crescent*	Disc of cartilage between the bones of a joint
muscle	**MUSS**-el		Latin *muscle*	A tissue consisting of contractile cells
patella (singular) **patellae (pl)** **patellar (adj)**	pah-**TELL**-ah pah-**TELL**-ee pah-**TELL**-ar	 S/ R/	Latin *small plate* **-ar** *pertaining to* **patell-** *patella*	Thin, circular bone embedded in the patellar tendon in front of the knee joint; also called the kneecap Pertaining to the patella
therapy **therapeutic** **therapist**	**THAIR**-ah-pee **THAIR**-ah-**PYU**-tik **THAIR**-ah-pist	 S/ R/ S/ R/	Greek *medical treatment* **-ic** *pertaining to* **therapeut-** *treatment* **-ist** *specialist* **therap-** *treatment*	Systematic treatment of a disease, dysfunction, or disorder Relating to the treatment of a disease or disorder Professional trained in the practice of a particular therapy

EXERCISES

A. Review *Case Report 2.3. Then answer the following questions. Fill in the blanks.* **LO 2.2, 2.5, and 2.10**

1. Which therapeutic procedure was performed on Mr. Josen? _____
2. Which tendon contributed a graft to repair the ACL? _____
3. What type of surgeon performed the procedures? _____
4. Which of the structures repaired is a type of cartilage? _____
5. Which structure was repaired by suturing? _____

B. Dictionary exercise: *When you are working in the medical field, you will be exposed to medical terms you may not recognize. Learn to use the glossary or a good medical dictionary, or practice going online to find the definitions you need. Case Report 2.3 contains some terms that are not defined within the reading. Insert the correct term in the appropriate statement.* **LO 2.2 and 2.10**

orthopedic **collateral** **sutured**

1. Placing stitches to bind the wound edges together to close an incision or laceration of a body part. _____
2. Accessory or secondary _____
3. Medical specialty that diagnosis and treats diseases and conditions of bones _____

Lesson 2.4 (cont'd)

Keynotes

- Different tissues are made of specialized cells that manufacture unique fluids. The epithelial layer of the connective tissue synovial membrane is an example, as it produces the lubricant synovial fluid.
- Each connective tissue has distinct functions that enable a structure or organ to function correctly.
- There are four major ligaments of the knee joint:
  1. anterior cruciate ligament (ACL)
  2. posterior cruciate ligament (PCL)
  3. medial collateral ligament (MCL)
  4. lateral collateral ligament (LCL)

Connective Tissues (LO 2.5)

The relation of structure to function in your body tissues is key. To help you understand this important connection, this lesson uses the knee joint to illustrate the structures and functions of the different tissues found in this joint.

Connective Tissues in the Knee Joint (LO 2.5)

The connective tissues in your knee joint make it possible for you to enjoy your daily life—from standing, sitting, walking, bending, and running. These tissues and their roles are listed below:

- The **bones** of the knee joint are the **femur, tibia,** and **patella** *(see Chapter 4).* Bone is the hardest connective tissue in your body because it contains calcium mineral salts (mainly calcium phosphate). Bones have a good blood supply so they can heal well after a fracture. Bones in general are covered with a thick fibrous tissue called the **periosteum.**
- **Cartilage** has a flexible, rubbery **matrix** (in the knee as a **meniscus)** that allows it to function as a shock absorber and a gliding surface where two bones meet to form a joint. Cartilage has very few blood vessels and heals poorly—sometimes not at all. When it is injured or torn, surgery is often needed. Cartilage also forms the shape of your ear, the tip of your nose, and your larynx.
- **Ligaments** hold the knee joint together. Two ligaments outside the joint cavity on each side of the joint are the **medial collateral ligament (MCL)** and the **lateral collateral ligament (LCL)** *(Figure 2.6).* Two other ligaments located inside the joint cavity are called the **anterior collateral ligament (ACL)** and the **posterior collateral ligament**); they cross over each other to form an "X". *(Figure 2.6).*
- **Ligaments** are strips or bands of fibrous connective tissue made of **collagen** fibers. The knee joint has four major ligaments that hold it together. The blood supply to these ligaments is poor, so they do not heal well without surgery *(Figure 2.6).*
- **Tendons** are thick, strong ligaments that attach muscles to bone.
- The **joint capsule** of the knee joint encloses the joint cavity. It's made of thin, fibrous connective tissue and strengthened by fibers that extend over it from the surrounding ligaments and muscles. These features are common to most joints.
- The **synovial membrane** lines many joint capsules and secretes **synovial fluid—**a slippery lubricant stored in the joint cavity. This fluid makes joint movement almost friction-free. It distributes **nutrients** to the cartilage on the joint surfaces of bone.
- **Muscle tissue** stabilizes the joint. Extensions of the large muscle tendons in the front and the rear of the thigh are major stabilizers of the knee joint. The muscles alone extend and flex the knee joint *(see Chapter 4).*
- **Nervous tissue** carries messages between the brain and the knee structures. All the knee structures are packed with nerves, which is why a knee injury is excruciatingly painful.

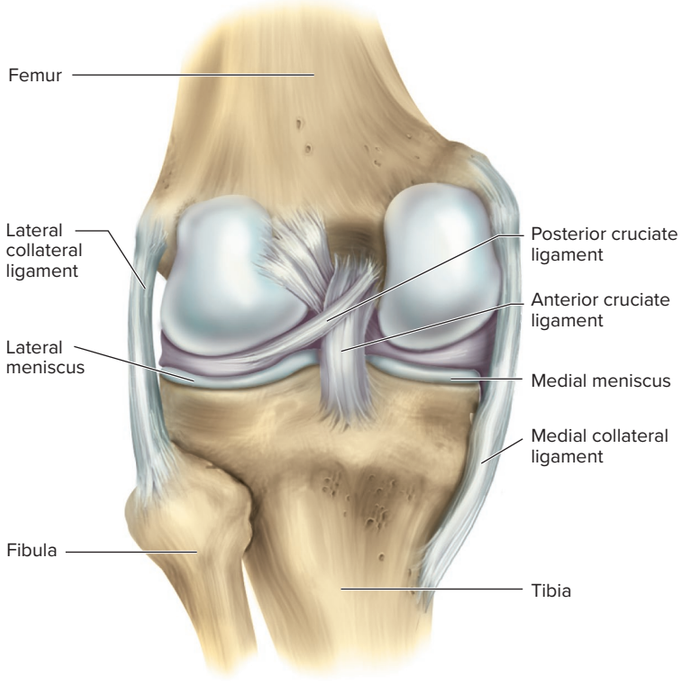

FIGURE 2.6
Ligaments of Knee Joint, with the Patellar Tendon Removed.

Word Analysis and Definition

S = Suffix P = Prefix R = Root R/CF = Combining Form

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
capsule	**KAP**-syul		Latin *little box*	Fibrous tissue layer surrounding a joint or other structure
capsular (adj)	**KAP**-syu-lar	S/ R/	**-ar** *pertaining to* **capsul-** *box*	Pertaining to a capsule
cartilage	**KAR**-tih-lage		Latin *gristle*	Nonvascular, firm connective tissue found mostly in joints
collagen	**KOLL**-ah-jen	S/ R/CF	**-gen** *produce, form* **coll/a-** *glue*	Major protein of connective tissue, cartilage, and bone
matrix	**MAY**-triks		Latin mater *mother*	Substance that surrounds and protects cells, is manufactured by the cells, and holds them together
nutrient	**NYU**-tree-ent	S/ R/	**-ent** *end result* **nutri-** *nourish*	A substance in food required for normal physiologic function
periosteum	**PER**-ee-**OSS**-tee-um	S/ P/ R/	**-um** *tissue* **peri-** *around* **-oste-** *bone*	Fibrous membrane covering a bone
synovial	si-**NOH**-vee-al	S/ P/ R/CF	**-al** *pertaining to* **syn-** *together* **-ov/i-** *egg*	Pertaining to the synovial membrane or fluid
tendon	**TEN**-dun		Latin *sinew*	Fibrous band that connects muscle to bone

EXERCISES

A. Construct the appropriate medical term *to match the definitions given. The placement of the elements is noted for you under the line; each different element is separated on the line. Write the correct elements on the line. If a term does not have a particular element, leave it blank.* LO 2.5

1. Fibrous membrane covering a bone: _____ / _____ / _____
P R/CF S

2. Major protein of connective tissue: _____ / _____ / _____
P R/CF S

3. Pertaining to the synovial membrane _____ / _____ / _____
P R/CF S

4. Substance in food that nourishes _____ / _____ / _____
P R/CF S

B. Match *each connective tissue term to its correct description.* LO 2.5

1. Term that contains a word element meaning bone
2. Term that contains a word element that means glue
3. Term that contains a word element meaning egg
4. Term that is Latin and means gristle
5. Term that is Latin and means sinew

a. cartilage
b. tendon
c. periosteum
d. synovial
e. collagen