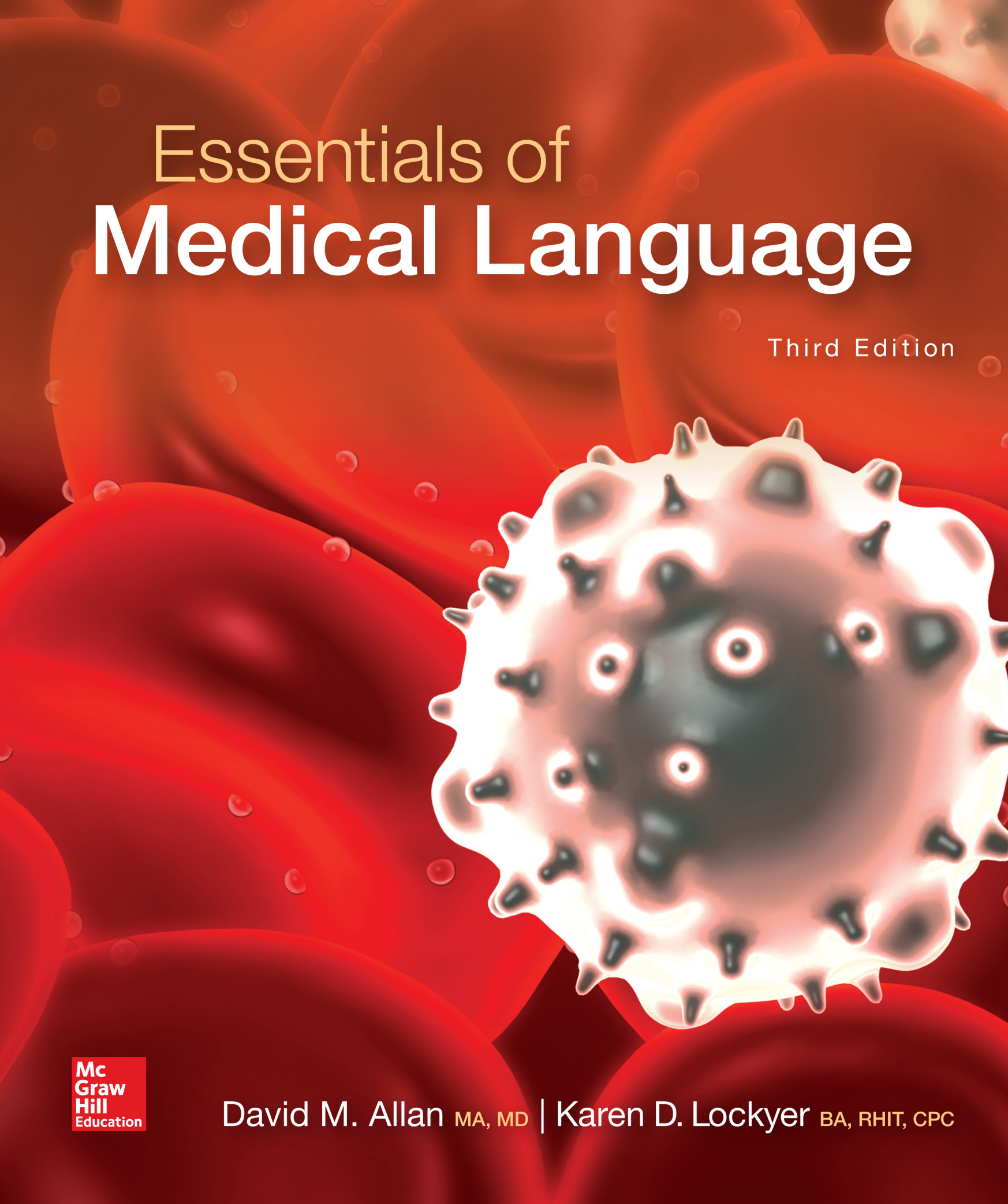
Essentials of Medical Language

Third Edition



David M. Allan MA, MD | Karen D. Lockyer BA, RHIT, CPC

Mc Graw Hill Education

Essentials of Medical Language

Third Edition

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Karen D. Lockyer, BS, RHIT, CPC

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ESSENTIALS OF MEDICAL LANGUAGE, THIRD EDITION

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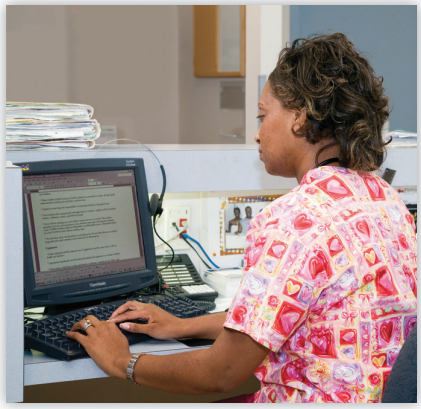

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What Helps Students Learn Medical Terminology

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 3e 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 xv and xiv).

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 third edition contains 120 fewer text pages than the previous edition. This has been achieved by focusing on essential terms, disorders, and procedures and by changing the layout of the text on each page.
2. The book's artwork has been updated with 40 new figures and labeling has been reduced to allow greater focus on the terms.
3. Each body system chapter includes new sections on diagnostic and therapeutic procedures and coverage of pharmacological terms.
4. More word construction and deconstruction exercises have been added to the Test Bank in *Connect*.
5. The learning outcomes have been revised and updated.
6. The learning outcomes have been tagged numerically and related to all questions in the Test Bank and to the exercises and activities in *Connect.*
7. The learning outcomes have been mapped to the content, with lessons and topics within the lessons in each chapter directly correlated to the outcome it satisfies.
8. The Word Analysis and Definition (WAD) tables and review exercises have been updated and expanded.
9. The contextual Case Reports have been emphasized within well-defined boxes. Each spread with a Case Report includes exercises that review the Case Report.
10. The exercises in the Test Bank move from easy to more difficult based on Bloom's taxonomy.

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 Tables (WAD)

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.

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.

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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Blackboard, the Web-based course management system, has partnered with McGraw-Hill Education to better allow students and faculty to use online materials and activities to complement face-to-face teaching. Blackboard features exciting social learning and teaching tools that foster active learning opportunities for students. You'll transform your closed-door classroom into communities where students remain connected to their educational experience 24 hours a day. This partnership allows you and your students access to McGraw-Hill's Connect and Create right from within your Blackboard course—all with a single sign-on. Not only do you get single sign-on with Connect and Create, but you also get deep integration of McGraw-Hill Education content and content engines right in Blackboard. Whether you're choosing a book for your course or building *Connect* assignments, all the tools you need are right where you want them—inside Blackboard. Gradebooks are now seamless. When a student completes an integrated Connect assignment, the grade for that assignment automatically (and instantly) feeds into your Blackboard grade center. McGraw-Hill Education and Blackboard can now offer you easy access to industry-leading technology and content, whether your campus hosts it or we do. Be sure to ask your local McGraw-Hill Education representative for details. *Still want a single sign-on solution using another learning management system?* See how **McGraw-Hill Compus®** (**http://mhcampus.mhhe.com/**) makes the grade by offering universal sign-on, automatic registration, gradebook synchronization, and open access to a multitude of learning resources—all in one place. MH Campus supports Active Directory, Angel, Blackboard, Canvas, Desire2Learn, eCollege, IMS, LDAP, Moodle, Moodlerooms, Sakai, Shibboleth, WebCT, BrainHoney, Campus Cruiser, and Jenzibar eRacer. Additionally, MH Campus can be easily connected with other authentication authorities and LMSs.

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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,* 3e. 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.
- **McGraw-Hill's EZ-Test Generator,** which makes creating tests easy!
  - This flexible electronic testing program allows instructors to create tests correlated to every chapter and learning outcome. Accommodating a variety of question types tied to Bloom's taxonomy, EZ-Test allows instructors to create multiple versions of the tests and then export to a course management system, such as Blackboard. EZ-Test Online gives you a place online to quickly and easily administer the exams you create.

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.

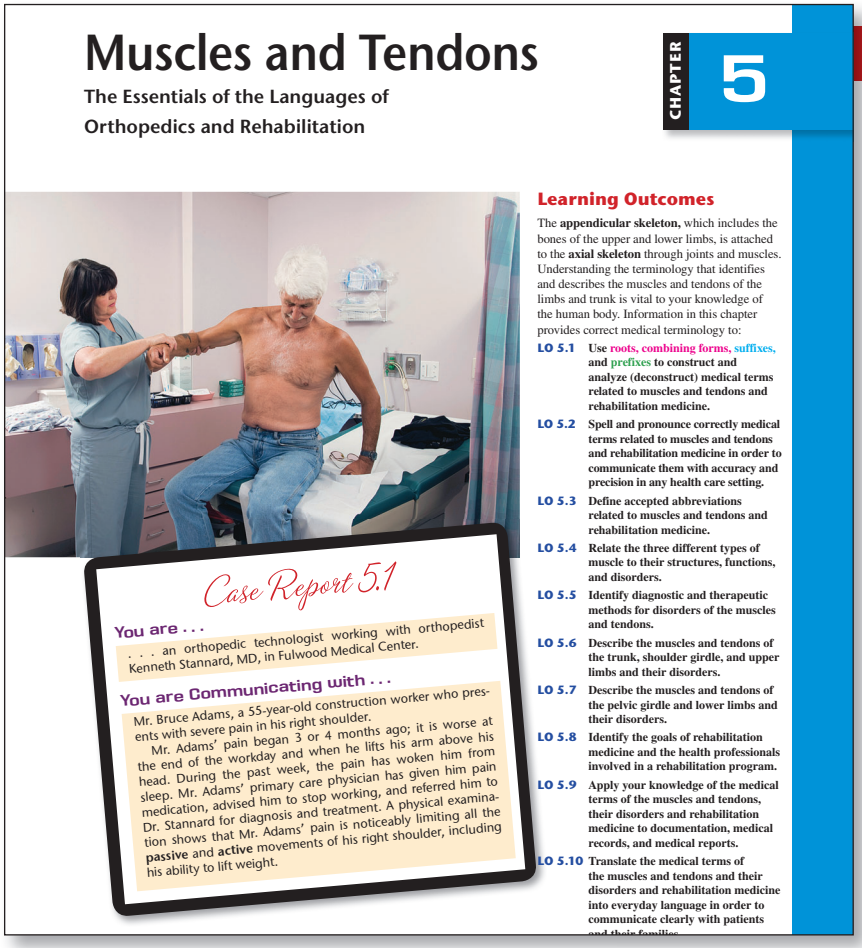
The A & P organizational approach, used in conjunction with an authentic medical setting and patient cases, encourages student motivation and facilitates active, engaged learning.

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

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 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

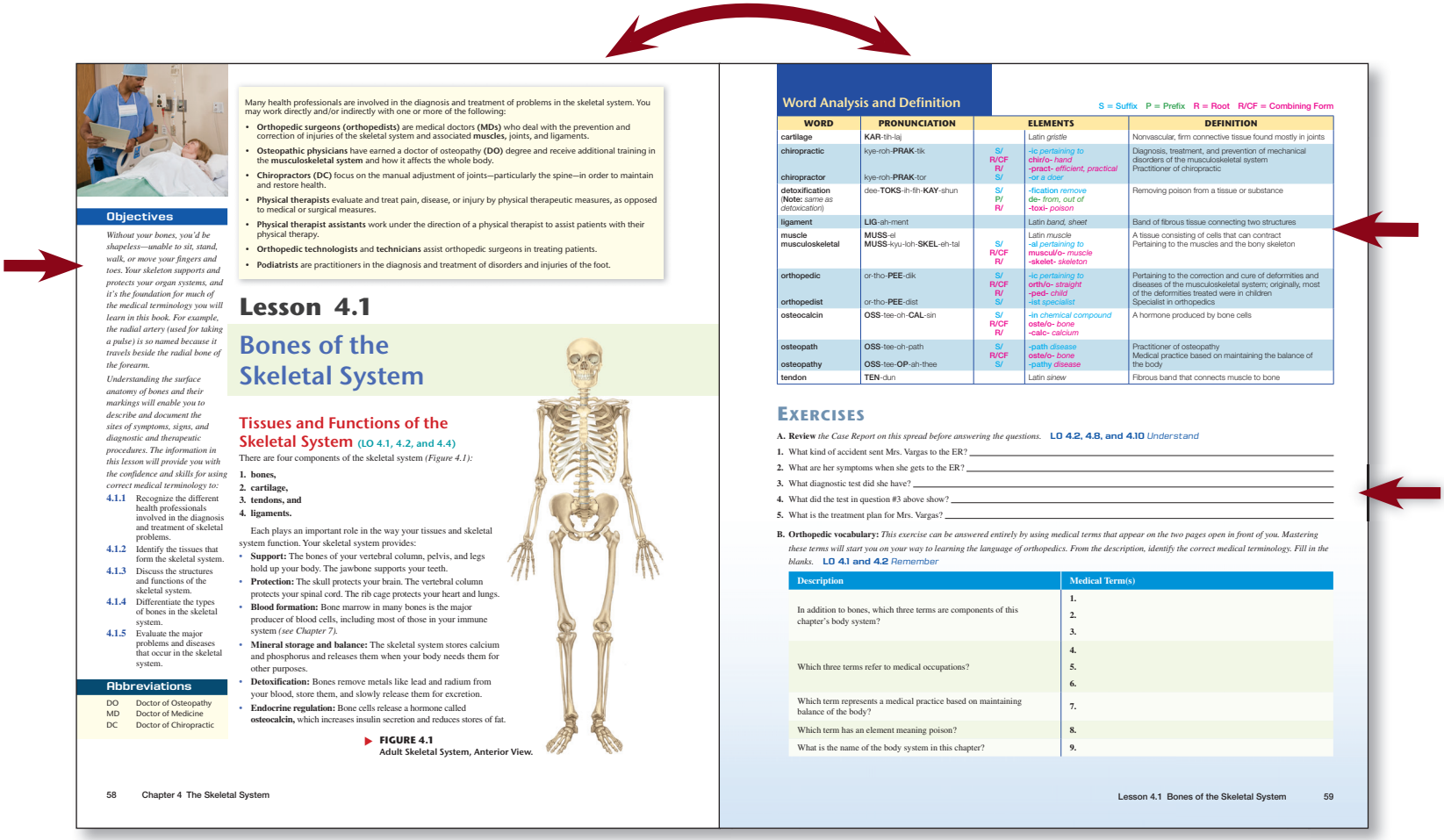
At the same time, **Learning Outcomes** are presented to let students know what they will learn in the chapter. This technique immediately engages students, motivating them to read on to learn how this patient's case (and their role in the patient's care) relates to the medical terminology being introduced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



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.

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

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.

58 Chapter 4 The Skeletal System

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/	*-ic pertaining to* **chir/o-** *hand* **-pract-** *efficient, practical*	Diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system Practitioner of chiropractic
chiropractor	kye-roh-**PRAK**-tor	S/	*-or a doer*	
detoxification (**Note:** *same as detoxication*)	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 *the Case Report on this spread before answering the questions.* **LO 4.2, 4.8, and 4.10** *Understand*

1. What kind of accident sent Mrs. Vargas to the ER? _____
2. What are her symptoms when she gets to the ER? _____
3. What diagnostic test did she have? _____
4. What did the test in question #3 above show? _____
5. What is the treatment plan for Mrs. Vargas? _____

B. Orthopedic vocabulary: *This exercise can be answered entirely by using medical terms that appear on the two pages open in front of you. Mastering these terms will start you on your way to learning the language of orthopedics. From the description, identify the correct medical terminology. Fill in the blanks.* **LO 4.1 and 4.2** *Remember*

Description	Medical Term(s)
In addition to bones, which three terms are components of this chapter's body system?	1. 2. 3.
Which three terms refer to medical occupations?	4. 5. 6.
Which term represents a medical practice based on maintaining balance of the body?	7.
Which term has an element meaning poison?	8.
What is the name of the body system in this chapter?	9.

Lesson 4.1 Bones of the Skeletal System 59

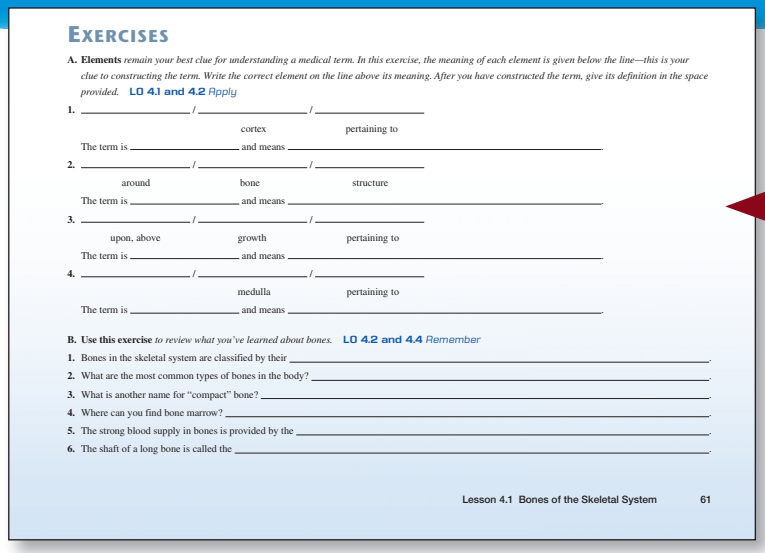
Word Analysis and Definition Tables

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. Write 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** *Apply*

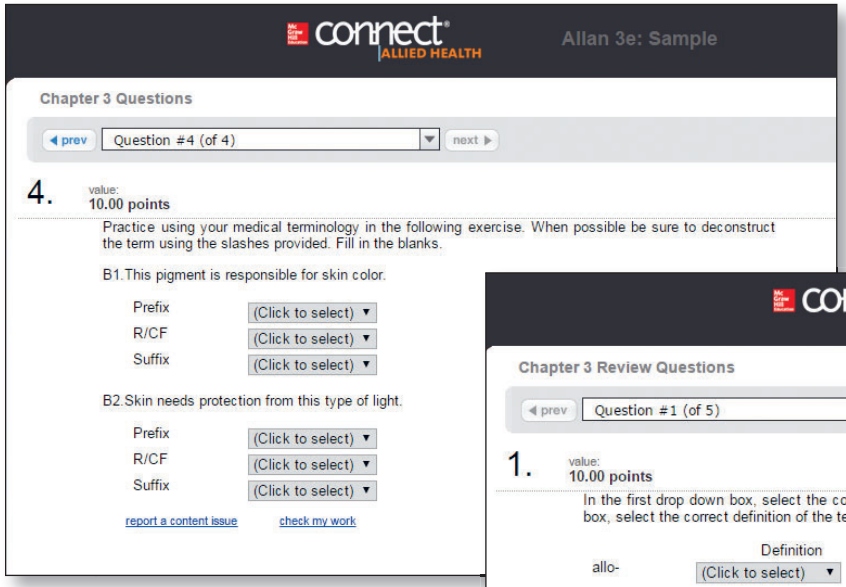
1. _____ / _____ / _____
   cortex pertaining to
   The term is _____ and means _____.
2. _____ / _____ / _____
   around bone structure
   The term is _____ and means _____.
3. _____ / _____ / _____
   upon, above growth pertaining to
   The term is _____ and means _____.
4. _____ / _____ / _____
 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

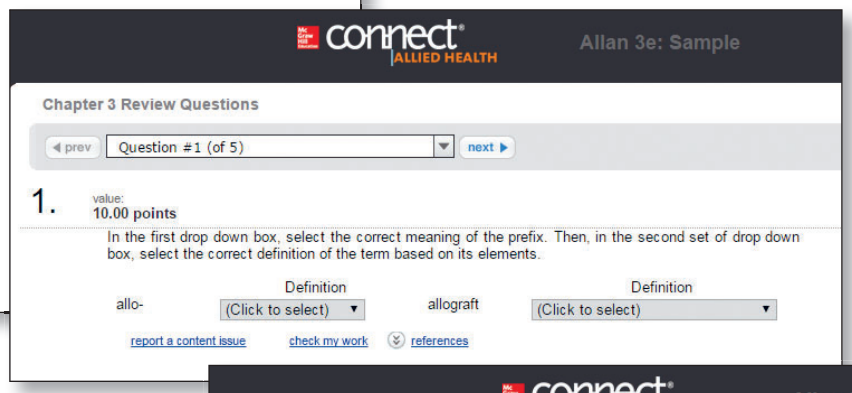
B. Use this exercise *to review what you've learned about bones.* **LO 4.2 and 4.4** *Remember*

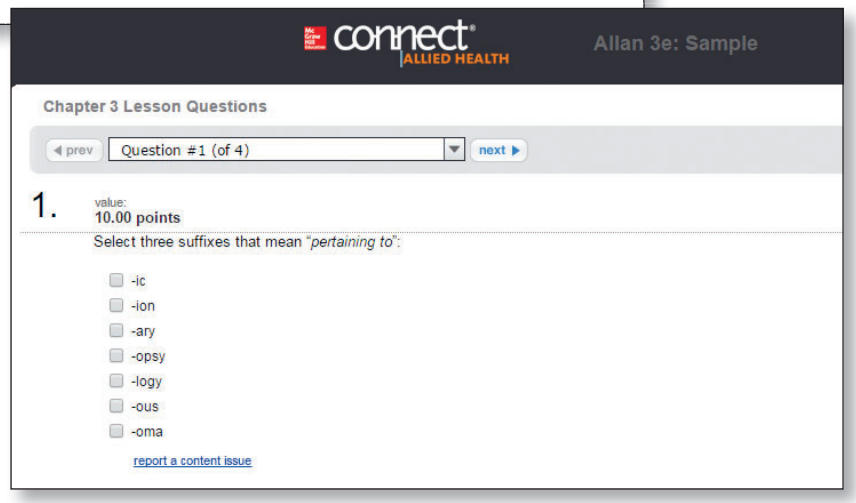
1. Bones in the skeletal system are classified by their _____.
2. What are the most common types of bones in the body? _____.
3. What is another name for "compact" bone? _____.
4. Where can you find bone marrow? _____.
5. The strong blood supply in bones is provided by the _____.
6. The shaft of a long bone is called the _____.

Lesson 4.1 Bones of the Skeletal System 61

Chapter Review in Connect

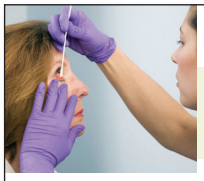






Vivid Illustrations and Photos

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



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: Pupils Equal, Round, Reactive to Light and Accommodation.**

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.

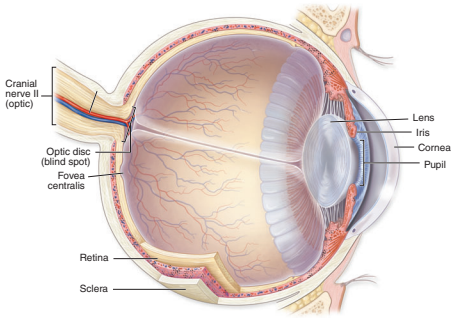
At the center of the front of the eye is the **cornea,** a transparent, dome-shaped membrane. The cornea has no blood supply and obtains its nutrients from tears and from fluid in the anterior chamber behind it.

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.

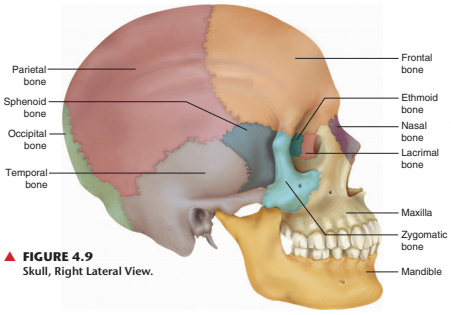
▲ **FIGURE 5.3**
RICE Treatment.

Lesson 4.2 (cont'd)

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.



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

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.

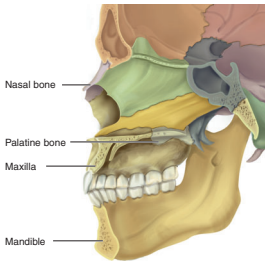
These bones of the skull provide protection for the brain and the organs of vision, taste, hearing, equilibrium, and smell.

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 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."



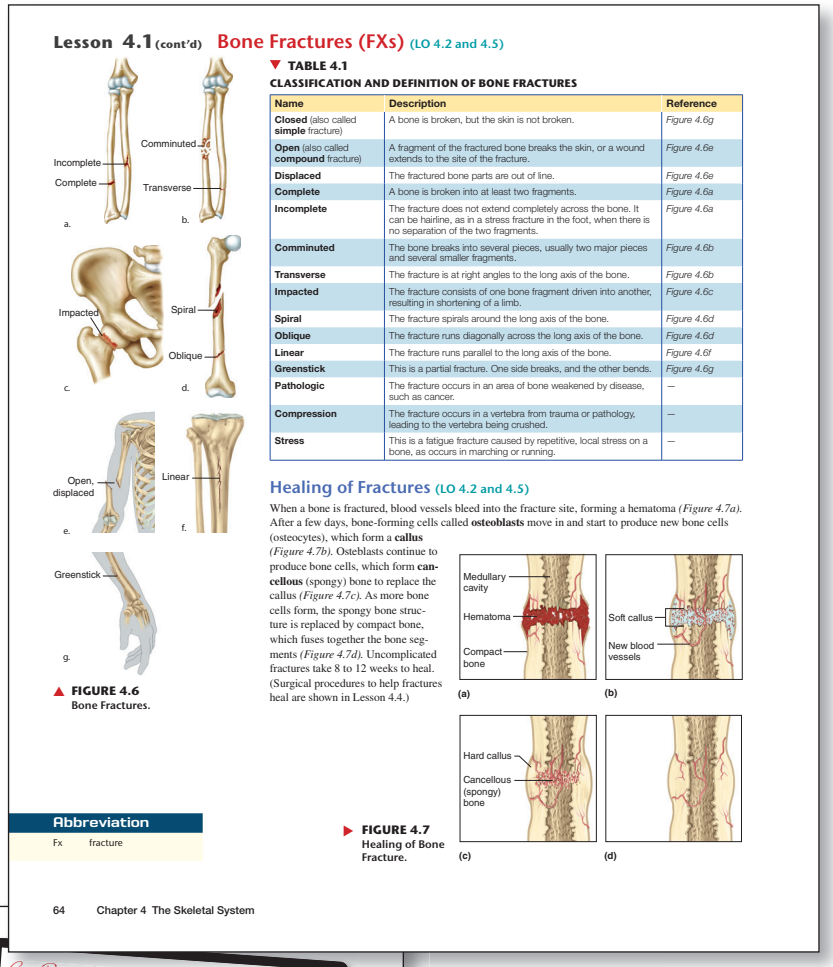
▲ **FIGURE 4.10**
Facial Bones.

Abbreviation

TMJ temporomandibular joint

Tables

Meaningful tables aid in summarizing concepts and lesson topics.



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.

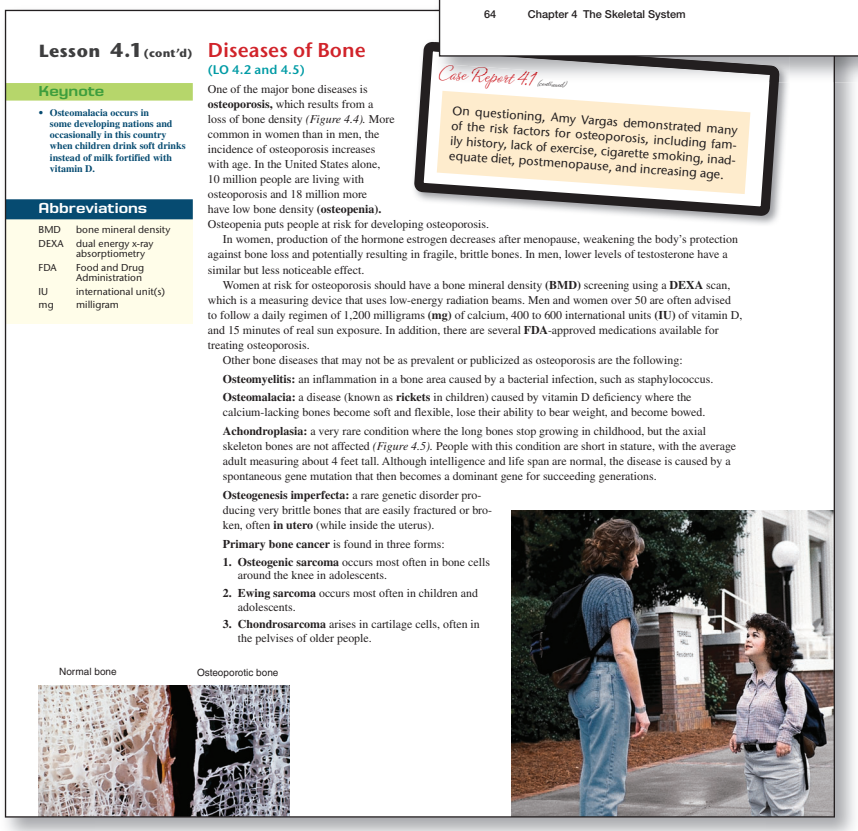
Abbreviation

Fx	fracture

64 Chapter 4 The Skeletal System

Keynotes and Abbreviations

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



Lesson 4.1 (cont'd) Diseases of Bone (LO 4.2 and 4.5)

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

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.

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 in a bone area 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: 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.

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Learning the Essentials of Medical Language

Welcome

Case Report W.1

You are . . .

. . . a student preparing for a career as a health professional and allied health care worker.

You are communicating with . . .

. . . many different health professionals in health care teams as you go through an externship at Fulwood Medical Center. The center comprises a medical office building with physicians in a wide range of primary care, medical specialties, and complementary medicine therapies; a 300-bed hospital with a busy Emergency Room and operating rooms; a laboratory, pharmacy, X-Ray Department, Physiotherapy Department, and Patient Education Unit that serve both the hospital and the medical offices.

Between attending classes, doing your externship, working part-time, and bringing up two children, you have a full schedule. The knowledge and skills you are learning in the classroom and at Fulwood Medical Center will prepare you for a successful future.

Learning Outcomes

In order to get the most out of your learning experiences and this textbook, you need to:

LO W.1 **Establish a commitment to learn medical terminology.**

LO W.2 **Recognize the knowledge and skills you will need to be an active learner.**

LO W.3 **Understand how the contextual approach of this book promotes active learning.**

LO W.4 **Utilize the pedagogical devices used in each chapter and lesson.**

LO W.5 **Use the vivid illustrations, photos, and tables in the book to enhance understanding of the concepts being taught.**

LO W.6 **Solve the exercises in each lesson and at the end of each chapter to demonstrate understanding of the material.**

LO W.7 **Implement the effective organizational strategies and study habits described in this chapter of the book.**

LO W.8 **Understand how a commitment to lifelong learning will enhance your professionalism.**

LO W.9 **Differentiate the roles of the various members of a health care team in different medical specialties and settings.**

FIGURE W.1
Direct Communication with Doctor and Patient.

Case Report W.2

You are . . .

. . . Luis Guitterez, a certified medical assistant (CMA) working with Susan Lee, MD, a primary care physician at Fulwood Medical Center.

You are communicating with . . .

. . . Dr. Lee and Mrs. Martha Jones, a patient.

Luiz Guitterez, CMA: Dr. Lee, this is Mrs. Martha Jones, who is a type **2 diabetic** with **retinopathy** and **neuropathy.** She had a routine appointment with us today. Her temperature is 97.8, pulse 120, respirations 24, blood pressure 100/50.

Mrs. Martha Jones: Dr. Lee, I've had a cough and cold for the past few days, and today I'm feeling drowsy and nauseous and my chest hurts.

Dr. Lee: Did you give yourself your morning insulin?

Mrs. Jones: I can't remember.

Dr. Lee: Luis, she's confused, has **tachycardia** and **tachypnea,** and is **hypotensive.** I'm concerned she is going into diabetic **ketoacidosis.** Get the glucometer and test her blood glucose while I examine her. She may have **pneumonia.**

(Note: The pronunciations and meanings of the medical terms used in this Case Report are on page W-9.)

Keynote

As a health professional, you are part of a team of medical and other professionals who provide health care services designed to improve the health and well-being of their patients.

The Health Care Team (LO W.9)

Fulwood Medical Center is a realistic health care setting that allows you to experience the use of medical language. Each chapter in this book focuses on the medical terminology used in a specific medical specialty and the body systems related to that specialty. A variety of health professionals make up the teams caring for patients in each medical specialty.

The team leader is a medical doctor, or physician, who can be an **MD** (doctor of medicine) or a **DO** (doctor of osteopathy). Most **managed care systems** require the patient to have a **primary care physician.** This physician can be a **family practitioner, internist,** or **pediatrician** (for children) and is responsible for the continuing overall care of the patient. In managed care, the primary care physician acts as the "gatekeeper" for the patient to enter the system, supervising all care the patient receives.

FIGURE W.2
Administrative medical assistants are among the health professionals who provide indirect care to patients.

If needed medical care is beyond the expertise of the primary care physician, the patient is referred to a medical specialist whose expertise is based on a specific body system or even a part of a body system. For example, a **cardiologist** has expertise in diseases of the heart and vascular system, whereas a **dermatologist** specializes in diseases of the skin and an **orthopedist** in problems with the musculoskeletal system. A **gastroenterologist** is an expert in diseases of the whole digestive system, whereas a **colorectal surgeon** specializes only in diseases of the lower gastrointestinal tract.

Other health professionals work under the supervision of the physician and provide direct care ***(Figure W.1)*** to the patient. These can include a **physician assistant, nurse practitioner, medical assistant,** and, in specialty areas, different therapists, technologists, and technicians with expertise in the use of specific therapeutic and diagnostic tools.

Still other health professionals on the team provide indirect patient care *(Figure W.2).* These include **administrative medical assistants,**

transcriptionists, health information technicians, medical insurance billers, and **coders,** all of whom are essential to providing high-quality patient care.

As you study the language of each medical specialty at Fulwood Medical Center, you will also meet the members of each specialty's health care team and learn more about their roles in caring for the patient.

"Why Do I Need to Learn Medical Terminology?"

Communication Needs

Throughout your career as a health professional, you will need to communicate with other health professionals. This need is present whether you are providing direct patient care—for example, as a CMA like Luis Guitterez—or whether you are providing indirect patient care—for example, as a medical transcriptionist, biller, or coder. In this book, you will find all the medical terms necessary to equip yourself with the essential medical vocabulary needed for work and further study in any of the allied health professional careers.

As you can see in Case Report W.2, health professionals use specific terms and a different language to describe to each other situations they encounter each day. You need to be able to understand, spell, and pronounce the terms they use.

Modern medical terminology is an artificial language constructed over centuries using words and elements from Greek and Latin origins (where healing professions began). Some 15,000 or more words are formed from 1,200 Greek and Latin roots. New words are being added continually as new medical discoveries are made. Medical terminology enables health professionals from different fields, different specialties, and different countries to communicate clearly and precisely with each other. Every profession has its own language *(Figure W.3).*

▲ **FIGURE W.3**
Every Profession Has Its Own Language
You may have difficulty understanding your auto mechanic when she tells you that the expansion valve, evaporator core, and orifice tubes in your air-conditioning system need to be replaced.

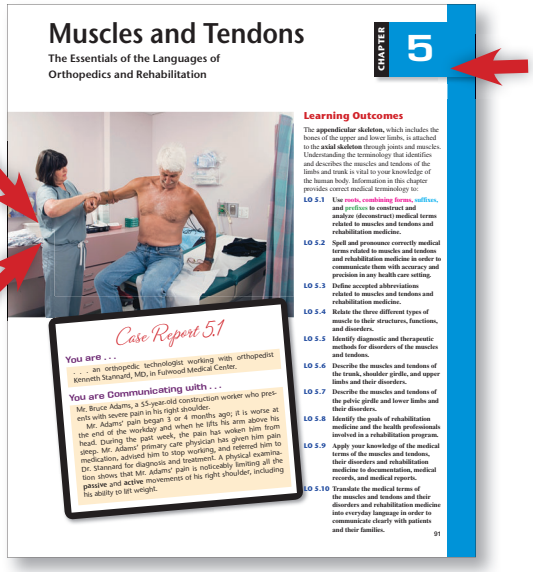
Listening, Speaking, Reading, Writing, and Critical Thinking

Daily in your practice as a health professional you will:

- ***Listen*** to information from physicians about patient care, and carry out their instructions.
- ***Listen*** to patients describing their symptoms, and translate their descriptions into medical terms.
- ***Speak*** to physicians and other health professionals to report information and ask questions.
- ***Speak*** to patients to translate and clarify information given to them by physicians and other health professionals.
- ***Read*** physicians' comments and treatment plans in patient medical records and insurance reports.
- ***Read*** the results of physical examinations, procedures, and laboratory and diagnostic tests.
- ***Write*** to document actions taken by yourself and other members of the health care team *(Figure W.4).*
- ***Write*** to precisely record verbal orders, test results given over the phone, and other phone messages.
- ***Think*** critically to evaluate medical documentation for accuracy.
- ***Think*** critically to analyze and discover the meaning of unfamiliar medical terms using the strategies outlined in *Chapter 1* of this book.

▲ **FIGURE W.4**
Accurate Documentation of Care Is Critical.

IF YOU CANNOT SPEAK AND UNDERSTAND THE LANGUAGE, YOU CANNOT JOIN THE CLUB.


Muscles and Tendons
The Essentials of the Languages of Orthopedics and Rehabilitation
CHAPTER 5
Learning Outcomes
Case Report 5.1
You are . . .
You are Communicating with . . .

"What's Unique About This Book?"

Although the chapters in this book are organized by body system, as in many other textbooks on medical terminology, this book has many unique features that enhance learning, create interest, and provide a consistent learning strategy for you.

Each chapter is broken down into lessons; each lesson is broken down into self-contained topic areas so that there are smaller "chunks" of information to master.

You Are . . . You Are Communicating With . . .

At the beginning of each chapter and lesson, you are placed in the role of a health professional in a field related to the body system and medical specialty covered in the material. At the same time, learning objectives (**LOs**) are presented for each chapter and lesson. These techniques immediately engage your attention, motivate you to read on to discover how this patient's diagnosis and care progress, and illustrate the medical terminology being introduced in the lessons.

Word Analysis And Definition

All the information needed for a topic area is presented in self-contained two-page spreads. On the left-hand page, the new medical terms are introduced. On the right-hand page, for each new medical term the pronunciation, color-coded word elements, and definition are provided in a **Word Analysis and Definition (WAD)** box. For example, in Case Report W.2 earlier in this chapter, the medical terms diabetic, retinopathy, neuropathy, tachycardia, tachypnea, hypotensive, ketoacidosis, glucometer, and pneumonia were used. On the right-hand page here, you can see an example of how these terms are analyzed. All these terms will appear again in the appropriate body-system chapter.

Also, below each WAD are exercises that test your understanding of key components of the terminology analyzed in the WAD.

Keynotes

- **Study Hints provide ways to help retain knowledge.**
- **Abbreviation Boxes show commonly accepted abbreviations.**
- **Illustrations and photos are vivid and clear and correlate precisely to the appropriate terms in the text.**

Exercises

In addition to the exercises at the end of each topic area, there are chapter review questions exercises included in Connect (see below).

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

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Word Analysis and Definition

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

WORD	PRONUNCIATION	ELEMENTS		DEFINITION
diabetes mellitus	dye-ah-**BEE**-teez **MEL**-ih-tus		diabetes, Greek *a siphon* mellitus, Latin *sweetened with honey*	Metabolic syndrome caused by absolute or relative insulin deficiency and/or insulin ineffectiveness
diabetic (adj)	dye-ah-**BET**-ik	S/ R/	-ic *pertaining to* diabet- *diabetes*	Pertaining to or suffering from diabetes
hypotension	**HIGH**-poh-**TEN**-shun	S/ P/ R/	-ion *action, condition* hypo- *below* -tens- *pressure*	Persistent low arterial blood pressure
hypotensive (adj)	**HIGH**-poh-**TEN**-siv	S/	-ive *pertaining to, quality of*	Pertaining to or suffering from hypotension
ketoacidosis	**KEY**-toe-ass-ih-**DOE**-sis	S/ R/CF R/CF	-sis *abnormal condition* ket/o- *ketone* -acid/o- *acid*	Excessive production of ketones, making the blood acidic
neuropathy	nyu-**ROP**-ah-thee	S/ R/CF	-pathy *disease* neur/o- *nerve*	Any disorder affecting the nervous system
pneumonia (**Note:** *The initial "p" is silent.*)	new-**MOH**-nee-ah	S/ R/	-ia *condition* pneumon- *air, lung*	Inflammation of the lung parenchyma
retinopathy	ret-ih-**NOP**-ah-thee	S/ R/CF	-pathy *disease* retin/o- *retina*	Any disease of the retina
tachycardia	tack-ih-**KAR**-dee-ah	S/ P/ R/	-ia *condition* tachy- *rapid* -card- *heart*	Rapid heart rate, above 100 beats per minute
tachypnea	tack-ip-**NEE**-ah	P/ R/	tachy- *rapid* -pnea *breathe*	Rapid breathing

The elements of a term are discussed in Chapter 1.

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SMARTBOOK™

Exercises

Elements *are your best tool for understanding medical terms. In the chart below, the elements are listed in column 1. Identify the meaning of each element in column 2, and give an example of a term containing that element in column 3. Some terms will apply to more than one element. The first one is done for you.*

Element	Meaning of Element	Medical Term Containing This Element
hypo	**below**	**hypotension**
tens		
ion		
neuro		
retino		
pathy		
ia		
pneumon		
pnea		
tachy		

1. Choose any term from column 3, and use it in a sentence of your choice:

_____

_____

_____

"What Is Lifelong, Active Learning?"

Lifelong Learning

▲ **FIGURE W.5**
Every Patient Interaction Is an Opportunity for Learning.

Your current training in medical terminology is necessary for you to be able to continue your education in your health care profession. But it is important to recognize that school is only one of the many places where you acquire knowledge.

You also acquire knowledge:

- Each time you ask a question about a patient or a report and receive an answer.
- Each time you analyze an unfamiliar medical term and discover its meaning.
- Each time you interact with a patient and see how that patient is coping with his or her problems *(Figure W.5).*

All these are opportunities for learning to discover ***your own*** answers to ***your own*** problems or lack of knowledge.

This type of knowledge—discovered through your own experience and driven by your own needs and goals—is genuine, real, and trustworthy for you. It is not like what you learn in school, which is determined by some distant authority.

The authentic knowledge you gain from solving your own problems, whether by yourself or with the help of other people or resources, motivates you to acquire still more knowledge and helps you grow as a person and as a professional.

Throughout your working life, additional classroom training will be needed to keep your skills and professional knowledge up to date with new developments in medicine. You will also continue to learn through your own experience. Everything you do in life can result in learning.

Your own experience and judgment become your most valuable resources for making your life vibrant, strong, creative, and what ***you*** want ***it*** to be.

Your own experience and judgment maximize your professional and personal success.

Your own learning never ends.

Keynote

Novelist Lillian Smith said, "When you stop learning, stop listening, stop looking, and stop asking new questions, then it is time to die."

▲ **FIGURE W.6**
Medical assistant interacts with a physician.

Actively Experiencing Medical Language

Medical terms were created to provide health care professionals a way to communicate with each other and document the care they provide. To provide effective patient care, all health care professionals must be fluent in medical language. One misused or misspelled medical term on a patient record can cause errors that can result in injury or death to patients, incorrect coding or billing of medical claims, and possible fraud charges.

When medical terms are separated from their intended context, as they are in other medical terminology textbooks, it is easy to lose sight of how important it is to use them accurately and precisely. Learning medical terminology in the context of the medical setting reinforces the importance of correct usage and precision in communication.

During your externship at Fulwood Medical Center, you will *experience* medical language. Just as in a real medical center, you will encounter and apply medical terminology in a variety of ways. Actively experiencing medical language will help ensure that you are truly learning, and not simply memorizing, the medical terms in each chapter. Memorizing a term allows you to use it in the same situation (e.g., repeating a definition) but doesn't help you apply it in new situations. Whether you are reading chart notes in a patient's medical record ***(Figure W.6)*** or a description of the treatment prescribed by a physician, you will see medical terms being used for the purpose they were intended.

Active Learning

It's no good sitting back and expecting someone else to pour knowledge into your head. You have to **actively work at learning** *(Figure W.7)*.

Get the Most Out of Lectures

- ***Prepare*** for your classroom experiences. Preview the book chapter before class ***(Figure W.7)***, and the material will be much easier to understand.
- ***Listen actively.*** You cannot do this if you are looking at your cell phone, daydreaming, or worrying about what you have to get for dinner.
- ***Ask*** a question if you do not comprehend something the instructor is saying.
- ***Write*** good notes. Focus on the main points, and capture key ideas; review and edit your notes within 24 hours of the class.

Get the Most Out of Reading

- ***Concentrate*** on what you are reading. Review the titles, objectives, headings, and visuals for each lesson to identify what the lesson is all about.
- ***Read*** actively using the SQ3R method (see the Study Hint) to help you.
- ***Write*** down any questions you have.

Study with a Partner or Group

- ***Find*** a study partner. Schedule study dates, compare notes, talk through concepts and questions, and quiz each other.
- ***Establish*** a small study group, including your study partner. Again, compare notes and quiz each other.

Perform Well on Tests

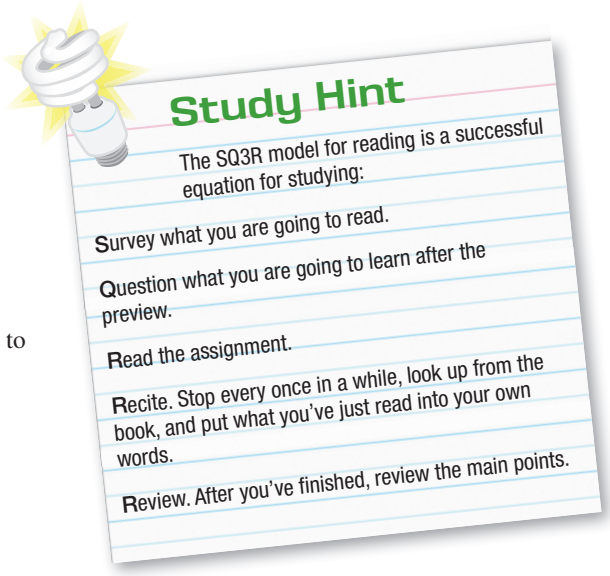
- ***Read*** the directions carefully, and scan the entire test so that you know how long it is and what types of activities it contains.
- ***Answer*** the easy questions or sections first so that you finish as much as possible before doing the difficult questions, which might slow you down.
- ***Use*** any extra time, after you have finished the test, to check that you have answered all the questions and then to confirm your answers.

Know and Motivate Yourself

- What type of learner are you? **Visual**—who responds best by **seeing** information. **Auditory**—who works best by listening. **Tactile**—who prefers hands-on applications. Recognize your type and motivate yourself by emphasizing your best method of learning to help achieve your goals.

A few months of committed study now is a small price to pay for a lifetime of professionalism.

▲ **FIGURE W.7**
Identify your own personal preferences for learning, and seek out the resources that will best help you with your studies. Recognize your weaknesses, and try to compensate for or work to improve them.



▲ **FIGURE W.8**
An Evening at Home.

Case Report W.3

Your first day of externship at Fulwood Medical Center went well. You enjoyed being in the Primary Care Clinic with Dr. Lee and Luis Guitterez, CMA. You wonder if this could be a career choice for you. Now it's 6:15 p.m. at home, and you have yet to feed the kids, get them to bed, pay some bills, pick up around the house, and review a whole chapter in your medical terminology text to prepare for a test in class tomorrow. How are you going to do all this?

"How Can I Help Myself Learn Better?"

You have a lot of time and money invested in your education. To succeed, you need to be able to focus and manage your time and your studies. To manage the difficulties described in Case Report W.3 *(Figure W.8),* you need to:

- ***Recognize*** the stresses in your life at different times.
- ***Prioritize*** mentally, and handle each task in the order of importance. In this case, eat a healthy meal with your kids, enjoy putting them to bed, pay the bills, and then relax (or meditate) for 10 minutes. When you are relaxed, settle down to review the text, and go to bed at a reasonable hour. Picking up around the house will have to wait because study and sleep are a higher priority. Sounds too easy? What other choices do you have to be able to study in an effective way?
- ***Actively develop a support group.*** Enlist the support of your spouse, parents, siblings, friends—any people you can trust and rely on. If you have a test every Thursday, get one of them to come over Wednesday night and put the kids to bed while you go over to his or her house or the library to study.
- ***Find your own space.*** Create a place where you keep everything for your courses at your fingertips, clutter-free.
- ***Study when you are most productive.*** Are you a night owl or an early bird? Set a daily study time for yourself.
- ***Balance your life.*** While studying should be a main focus, plan time for family, friends, leisure, exercise, and sleep.
- ***Resist distractions.*** Avoid the temptation to surf the Web, send instant messages, and make phone calls. Stick to your schedule.
- ***Be realistic*** when planning—know your limits and priorities.
- ***Be prepared*** for the unexpected (child's illness, your illness, inclement weather) that can turn your schedule into shambles.
- ***Reprioritize*** daily on the basis of schedule disruptions and other conflicts.
- ***Identify*** clear goals for what you need to get done today, this week, this month, before the end of the semester, and so on.

Keynote

Life, living, and learning are constant choices of priority.

Exercises

Write out *all of your activities for a typical week. On average, how many hours each week do you spend sleeping, grooming, eating, working, running errands, studying, attending your children's activities, and watching TV? Add all the hours up. There are 168 hours in the week. How many hours do you have left for studying? A sample time budget is shown below.*

Activity	Number of Hours per Day	Number of Days per Week	Number of Hours per Week
Sleeping	8	7	56
Grooming	1	7	7
Meals: preparation, eating, cleanup	1	7	7
Cleaning, laundry	1	3	3
Commuting to and from school	1	5	5
In class	4	5	20
Doing errands	1	3	3
Family time	3	7	21
Church, workout, hobbies			5
Job			30
Friends, going out, TV, entertainment			6
TOTAL			163
TOTAL HOURS IN A WEEK			168
Hours remaining for study			5

- Are 5 hours enough for study?
- When are they available?
- What can you do to increase them?

Study hours should be spent in a setting that allows you to concentrate on your work and not be distracted. Turn off your cell phone and TV. The biggest question to ask yourself is, "Am I investing my time wisely?" If not, how can you budget your time differently so that more time is spent on higher-priority activities?

The Anatomy of Medical Terms

CHAPTER 1

The Essential Elements of the Language of Medicine

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.