

# MEDICAL LANGUAGE

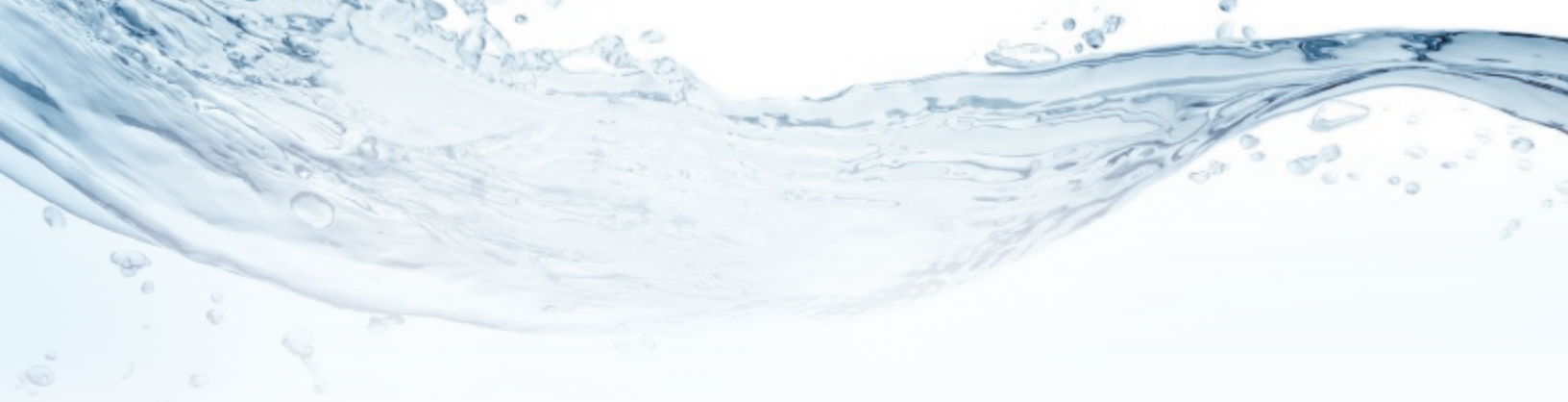
SIXTH EDITION



*immerse yourself*



SUSAN M. TURLEY



# Medical Language

IMMERSE YOURSELF

SIXTH EDITION

Susan M. Turley



Content Production: Melissa Bashe,  
William Johnson and Tanya Ott  
Development Editor: Laura S. Horowitz/  
York Content Development  
Medical Illustrator: Anita Impagliazzo

Product Management: Katrin Beacom and  
Stephen Heasley  
Product Marketing: Brooke Imbornone  
Project Management: Patty Donovan/Straive  
Cover Printer: Phoenix Color/Hagerstown

**Copyright © 2024, 2020, 2017, 2014, 2011, 2007 by Pearson Education, Inc. or its affiliates, 221 River Street, Hoboken, NJ 07030.** All Rights Reserved. Printed in the United States of America. This publication is protected by copyright, and permission should be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise. For information regarding permissions, request forms and the appropriate contacts within the Pearson Education Global Rights & Permissions department, please visit [www.pearsoned.com/permissions/](http://www.pearsoned.com/permissions/).

Notice: The author and the publisher of this book have taken care to make certain that the information given is correct and compatible with the standards generally accepted at the time of publication. Nevertheless, as new information becomes available, changes in treatment and in the use of equipment and procedures become necessary. The reader is advised to carefully consult the instruction and information material included in each piece of equipment or device before administration. Students are warned that the use of any techniques must be authorized by their medical advisor, where appropriate, in accordance with local laws and regulations. The publisher disclaims any liability, loss, injury, or damage incurred as a consequence, directly or indirectly, of the use and application of any of the contents of this book.

Many of the designations by manufacturers and seller to distinguish their products are claimed as trademarks. Where those designations appear in this book, and the publisher was aware of a trademark claim, the designations have been printed in initial caps or all caps.

**CIP available at Library of Congress**

ScoutAutomatedPrintCode



ISBN-13: 978-0-13-805302-4  
ISBN-10: 0-13-805302-2

# Contents in Brief

## Part I Introduction to Medical Language

**Chapter 1** Medical Language: Its Structure and Meaning 2

**Chapter 2** Health Care Today 26

## Part II Medical Specialties and Body Systems

**Chapter 3** Dermatology • *Integumentary System* 72

**Chapter 4** Gastroenterology • *Gastrointestinal System* 128

**Chapter 5** Pulmonology • *Respiratory System* 194

**Chapter 6** Cardiology • *Cardiovascular System* 252

**Chapter 7** Hematology and Immunology • *Blood and Lymphatic System* 318

**Chapter 8** Orthopedics • *Skeletal System* 378

**Chapter 9** Orthopedics • *Muscular System* 438

**Chapter 10** Neurology • *Nervous System* 488

**Chapter 11** Urology • *Urinary System* 560

**Chapter 12** Male Reproductive Medicine • *Male Genitourinary System* 612

**Chapter 13** Gynecology and Obstetrics • *Female Genital and Reproductive System* 656

**Chapter 14** Endocrinology • *Endocrine System* 736

**Chapter 15** Ophthalmology • *Eye* 792

**Chapter 16** Otolaryngology • *Ears, Nose, and Throat* 844

## Part III Other Medical Specialties

**Chapter 17** Psychiatry 898

**Chapter 18** Oncology 946

**Chapter 19** Radiology and Nuclear Medicine 996

## Appendices

**Appendix A** Glossary of Medical Word Parts: Prefixes, Combining Forms, and Suffixes A-1

**Appendix B** Glossary of Medical Abbreviations, Acronyms, and Short Forms B-1

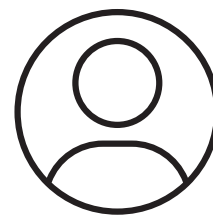
**Appendix C** Student's Answer Key\* C-1

\*Appendix C can be found online at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources)

## Index IN-1



# Pearson's Commitment to Diversity, Equity, and Inclusion



**Pearson is dedicated to creating bias-free content that reflects the diversity, depth, and breadth of all learners' lived experiences.**

We embrace the many dimensions of diversity, including but not limited to race, ethnicity, gender, sex, sexual orientation, socioeconomic status, ability, age, and religious or political beliefs.

Education is a powerful force for equity and change in our world. It has the potential to deliver opportunities that improve lives and enable economic mobility. As we work with authors to create content for every product and service, we acknowledge our responsibility to demonstrate inclusivity and incorporate diverse scholarship so that everyone can achieve their potential through learning. As the world's leading learning company, we have a duty to help drive change and live up to our purpose to help more people create a better life for themselves and to create a better world.

## **Our ambition is to purposefully contribute to a world where:**

- Everyone has an equitable and lifelong opportunity to succeed through learning.
- Our educational content accurately reflects the histories and lived experiences of the learners we serve.
- Our educational products and services are inclusive and represent the rich diversity of learners.
- Our educational content prompts deeper discussions with students and motivates them to expand their own learning (and worldview).

## **Accessibility**

We are also committed to providing products that are fully accessible to all learners. As per Pearson's guidelines for accessible educational Web media, we test and retest the capabilities of our products against the highest standards for every release, following the WCAG guidelines in developing new products for copyright year 2022 and beyond.

 You can learn more about Pearson's commitment to accessibility at <https://www.pearson.com/us/accessibility.html>

## **Contact Us**

While we work hard to present unbiased, fully accessible content, we want to hear from you about any concerns or needs with this Pearson product so that we can investigate and address them.



Please contact us with concerns about any potential bias at <https://www.pearson.com/report-bias.html>



For accessibility-related issues, such as using assistive technology with Pearson products, alternative text requests, or accessibility documentation, email the Pearson Disability Support team at [disability.support@pearson.com](mailto:disability.support@pearson.com)



# Two Journeys

In August 2000, I began two journeys—the adoption of children into our family and the writing of this textbook. Although very different, those two journeys shared a common thread of language and communication.

The first journey was the adoption of two beautiful children, Lien and Minh (then ages 9 and 8), who joined our family from an orphanage in Vietnam in 2001. This journey of adoption involved completing paperwork, doing research, learning a new language and culture, and traveling to an exotic land.

The second journey was the process of writing this textbook. That journey also involved paperwork and research, but I did not need to learn a new language or culture. Because of my many years of experience in the healthcare field, I already understood medical language and culture.

I did, however, need to determine the best way to present that knowledge to each student who would study this textbook. And so, as I wrote, I drew on my own efforts and struggles to learn a new language and culture during the adoption process. Those insights helped me identify with students who are learning medical language for the first time and encouraged me to include real-world medical and healthcare features that would support students and strengthen their learning process.

I am thrilled to say that each of my daughters chose to follow in my footsteps and embrace the healthcare field as their career choice: Lien is a physician's assistant and Minh is a nursing assistant.



## Did You Know?

As I write this in 2023, I am ever mindful of the many children in this country and around the world who are in need of help, food, love, and homes.

All of the royalties from every edition of this textbook have and continue to provide financial support to orphanages and feed-and-read school programs for destitute children in other countries, as well as to help hungry children and their families in the United States who are experiencing food insecurity.

# Preface

## Something Different

You may have already noticed that there is something different about this textbook! Perhaps you have discovered its abundance of real-world healthcare images. Maybe you have noticed some of the exercises (Practice Laps) that place you in your soon-to-be-realized role as a healthcare professional—using medical language and analyzing medical reports. Or perhaps you have already begun exploring the Internet-based student media materials (MyLab Medical Terminology™) with their highly engaging and interactive activities that add a unique dimension to learning. As you begin this exciting and important journey into the world of medical language, we offer you this promise—that you will be immersed in a new, exciting learning experience.

As a soon-to-be healthcare professional, your knowledge, hard work, and interpersonal skills will have a direct impact on the health care of others—throughout your career. Therefore, we do everything we can to empower you and help you learn medical language—the language you will use to communicate and positively impact the lives of others. And so, we encourage you to immerse yourself in this textbook and the rich variety of resources it offers to help you learn medical language, the language of your chosen career!

Let's start at the beginning and take a closer look at the title of this book: *Medical Language: Immerse Yourself*.

## Medical Language

*Medicine* is the drama of life and death, and few subjects are as compelling, profound, or worthy of study. *Language* is a method of communicating and an expression of people, events, and cultures. This textbook is about *medical language*. Instead of simply memorizing medical vocabulary words, this textbook offers a complete, one-of-a-kind, immersive experience—and the opportunity to embrace the real world of medicine and health care. Just as if you traveled to Tokyo to learn the Japanese language and culture, our goal is for you to immerse yourself in real-world examples and images of medical language and the culture of health care.

Real medicine affects real patients—their lives, their families, and their futures. As a healthcare professional, no matter which aspect of health care you choose for a career, you will have important responsibilities. It is our responsibility to provide you with as realistic a view as possible of health care today. Here are some examples of how we have done this:

- The chapter titles in this textbook are the names of medical specialties, not body systems (as in other medical terminology books). Our point of view reflects medicine as it is practiced in the real world. For example, someone with a skin condition visits a dermatologist, not an “integumentary system specialist.” That’s why Chapter 3 is titled “Dermatology.” A patient with a fractured leg is treated in the hospital’s orthopedic department, not in the “skeletal system department.” The decision to present chapter titles in this way is an example of our commitment to make this textbook a realistic reflection of what health care is today. This real-world approach has been tested extensively, and instructors and students alike have overwhelmingly supported and validated this way to learn.
- The images presented include photographs and realistic medical illustrations that portray the diversity of the world. The medical photographs are of real persons or patients and real healthcare professionals in real healthcare settings.



- The chapter review exercises provide “Practice Laps” for each section of the chapter, while “Dive In” provides a comprehensive chapter review, and “Immerse Yourself” asks critical-thinking questions about medical reports or presents scenarios in which the student is the healthcare professional, identifying a patient’s condition and rephrasing it in a medical language format.
- The Internet-based student media will immerse you in the virtual world of MyLab Medical Terminology™, where you will explore a variety of fun study opportunities.

## Immerse Yourself

You are about to begin an interactive learning experience that involves you, *Medical Language*, and your instructor—a journey that will inspire you and equip you to become an expert in using and understanding medical language. The goal is to engage your senses, stimulate you, and immerse you in medical language.

You will not be a passive reader! Instead, you will be challenged to select, listen, speak, spell, respond, examine, think, compare and contrast, build and define, and make connections and conclusions. Determine to actively immerse yourself by answering chapter questions in the “Practice Laps,” “Dive In,” and “Immerse Yourself” exercises and in MyLab Medical Terminology™ online.

## New Features

*Medical Language*, Sixth Edition, continues to enhance the learning experience for students, as described here.

- Medical information has been updated to include new vocabulary, advances in health care, and drugs.
- Medical images and illustrations are up-to-date, exceptionally clear, and medically realistic.
- Healthcare images reflect the concepts of diversity, equality, and inclusion.
- *Medical Language* now includes 19 chapters. The sixth edition divides the first chapter into two chapters to reduce the amount of new material presented at the very beginning of the course.

Chapter 1, Introduction to Medical Language

Chapter 2, Health Care Today

- Subsequent chapters were retained but renumbered.
- In response to many requests from both instructors and reviewers, the fifth-edition chapters on psychiatry, oncology, and radiology and nuclear medicine were updated and included in the sixth edition.

Chapter 17, Psychiatry

Chapter 18, Oncology

Chapter 19, Radiology and Nuclear Medicine

- A new, in-depth feature, “Beneath the Surface,” explores in greater detail the latest newsworthy medical advances and events.

## Retained Features

*Medical Language*, Sixth Edition, continues to include the best features from the previous editions.

- Chapters 1–19 include numbered sections of text that correlate with the numbered learning outcomes at the beginning of those chapters. This format

has been well received by both instructors and students and provides a consistent chapter template that is easy for students to follow:

1. Anatomy
  2. Physiology
  3. Diseases
  4. Laboratory, Diagnostic, and Radiologic Procedures
  5. Medical Procedures, Drugs, and Surgical Procedures.
- Clinical Connections feature boxes show the relationships between different body systems and how they work together to maintain homeostasis in the body.
  - A student-focused learning format evaluates competency believe this is outdated word from DEI perspective- remove, or change to proficiency or similar following each chapter section using Practice Laps exercises.
  - Medical illustrations use colors that are accessible to persons with color-deficient vision.
  - The format continues to be compatible with any device a student might use to view the e-text.
  - The Student Answer Key (Appendix C) continues to include every other answer. This encourages students to remember what they have learned, while providing intermittent guidance about the correct answers. Appendix C can be found at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources). A full Answer Key is provided to the instructor within the Instructor Resources.

## Comprehensive Teaching Package

Perhaps the most gratifying part of an instructor's work is the "a-ha" learning moment when the light bulb goes on and a student truly understands a concept—when that connection is made. Along these lines, Pearson is pleased to help instructors foster more of these educational connections by providing a complete suite of resources to support teaching and learning. Qualified adopters are eligible to receive a wealth of tools designed to help them prepare, present, and assess. For more information, please contact your Pearson sales representative or visit [www.pearsonhighered.com/educator](http://www.pearsonhighered.com/educator).

## Online Instructor's Resources

*Medical Language*, Sixth Edition, continues to enhance the teaching experience for instructors, as described here.

- A complete chapter-by-chapter Test Bank with a full variety of different types of test questions. The Test Bank also allows instructors to generate customized quizzes and exams.
- An accompanying PowerPoint presentation containing discussion points and images.
- A sample course syllabus.
- A complete image library that includes every photograph and illustration from the new sixth edition textbook.
- Articles with useful ideas, such as classroom management tips, how to construct test questions, and how to put students at ease on the first day of class.
- Ready-made worksheets that can be used for quizzes or homework assignments.
- An array of teaching pearls and tips.
- Extra content, such as word origins and the stories behind anatomical structures and diseases named for someone (eponyms)—things not covered in the textbook.

- Appendix C, the Student Answer Key, includes the answers to every other chapter question; this format encourages students to remember the answers and discourages copying. The full Answer Key is available in the Instructor Resources.

## What Makes This Textbook Different?

### We Listened

In developing the previous five editions of this textbook, our development team immersed ourselves to look at things from your perspective—as a student or an instructor. For this sixth edition, we continued to strive to make *Medical Language* a customer-driven textbook by aggressively and comprehensively researching the needs and desires of current medical terminology students and instructors. Our goal was to guarantee that we were “speaking the same language” as those who would ultimately be using this textbook. To do this, we gathered a highly qualified development team of over 170 reviewers, with a combined 2,250 years of teaching experience, the expertise of four physicians in various areas of medical practice four physicians and a certified physician assistant in psychiatry, as well as feedback from students from across the United States to help steer us toward success.

Over the past 22 years we sat in classrooms, hosted focus groups, and conducted thorough manuscript reviews. We asked for blunt and uncompromising opinions and insights. We also commissioned dozens of detailed reviews from instructors, asking them to analyze and evaluate each chapter of the textbook. They not only told us what they did and didn’t like, but they identified, page by page, ways in which we could refine and enhance our key features. Their invaluable feedback was compiled, analyzed, and incorporated throughout the new sixth edition of *Medical Language*.

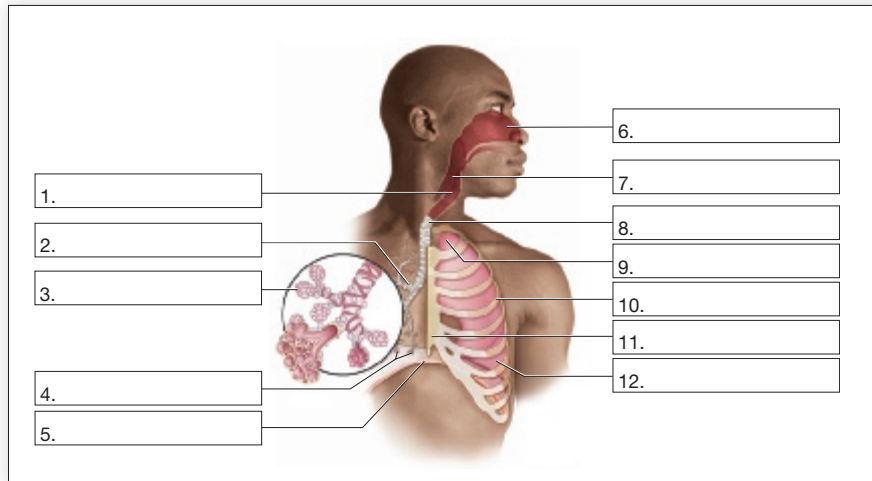
We asked our reviewers to imagine their ideal medical terminology book—what it should include, how it should look. We had the author meet personally with several instructors to discuss the specifics of the book’s organization, layout, format, and features. We asked question after question. This book is truly the product of a successful partnership between the author, the publisher, our development team, our consultants and contributors, and our student and instructor reviewers. We listened.

### We Learned

Here are some of the recommendations that we heard, responded to, and included in all previous editions, now updating and enhancing them even further in this new sixth edition:

- **Design.** Students and instructors alike told us they wanted an appealing, uncluttered design with a rich abundance of medical images and enough white space to allow for notetaking.
- **Exercises.** Both students and instructors suggested that we provide a greater quantity and variety of exercises than other medical terminology books, thus providing maximum opportunities to reinforce learning. There are Practice Laps exercises after each numbered section to allow students to immediately assess their knowledge of that section. The Student Answer Key with answers to only some of the questions is in Appendix C (online). Instructors asked that we only provide the answers to some of the exercises so that the exercises could also be used as graded homework assignments.

- **Illustrations.** Students and instructors alike suggested that we display colorful and interesting illustrations as large as possible on the page, with opportunities to label those images in practice exercises.



- **Special Feature Boxes.** Students asked for highlighted boxes that would help break up the reading and also provide them with opportunities to learn something new or interesting, thereby providing additional context. These appear through each chapter.
- **Medical Specialties Approach.** A substantial majority (75%) of instructors told us that they wanted a medical specialties approach, rather than an approach based only on body systems.
- **Focus on Word Building.** Another substantial majority of instructors (over 70%) told us that they wanted a focus on word building with analysis of combining forms, suffixes, and prefixes right within the text and not just at the end of each chapter or in isolated boxes. This feature appears in the far right column on relevant pages.
- **Medical Report Activities.** Instructors wanted an activity in each chapter that challenged students to analyze actual medical reports. These are in the Immerse Yourself section of the Chapter Review Exercises.
- **Lecture Support Materials.** Instructors told us about the increased challenge of creating interesting lectures and suggested that we create a fully loaded PowerPoint presentation system complete with a multitude of illustrations and photographs. In addition, we created Guided Lectures, a comprehensive learning experience. It includes the PowerPoint presentation coordinated with a full lecture. This is an especially helpful feature for students enrolled in an online course or for students who miss a lecture.
- **Tools for Testing.** Instructors asked for a complete testing package that was customizable to fit their needs. Additionally, they asked for this to be available in online course formats.



## We Made a Commitment to Accuracy

As part of our respect for real medicine and the importance of getting it right the first time, we made a commitment to accuracy. It was important to us to attain the highest level of medical accuracy possible throughout the textbook and the accompanying educational package in order to match the precision required of today's healthcare professionals. The author drew on her 30 years of experience in clinical nursing, health information management, medical transcription, researching and writing for medical publications, and teaching courses in a community college setting to provide accurate and complete medical information. Our development team read every page, every test question, and every vocabulary word. Our content experts read each chapter for accuracy and analyzed every bit of content in the ancillary resources. We also engaged the technical editing services of five physician and consultant specialists who carefully reviewed the chapters that correspond to their respective practices.

We welcome any and all feedback you may have to help us enhance the accuracy of this textbook. If you identify any errors that need to be corrected in a subsequent printing, please send them to:

Pearson Health Science Editorial  
Medical Terminology Corrections  
221 River Street  
Hoboken, NJ 07030

# Our Development Team

## About the Author

**Susan M. Turley, MA (Educ), BSN, RN, RHIT**, is a full-time author and editor who has extensive experience in both the medical and educational fields.

As a healthcare professional, Susan has worked in a variety of settings: acute care/ICU, long-term care, physicians' offices, and managed care. She has held positions as an intensive care nurse, plasmapheresis nurse, and medical transcriptionist; physician office auditor and director of quality management and corporate compliance for an HMO; and director of quality management, infection control, physician credentialing, and medical records for a large skilled nursing facility.

As an adjunct professor in the School of Health, Wellness, and Physical Education at Anne Arundel Community College in Arnold, Maryland, Susan taught courses in medical terminology, pathophysiology, pharmacology, and medical transcription. She assisted in obtaining initial accreditation for the college's medical assisting program. Susan was a codeveloper of the nationally acclaimed *The SUM Program for Medical Transcription Training* and reference books for Health Professions Institute. She developed the curricula for the bachelor, master's, and doctoral programs for the International Institute of Original Medicine. Susan has been a guest speaker at national seminars for accreditation of utilization management programs, medical transcription teacher training, and health information management certification examination review seminars.

Susan is also the author of *Understanding Pharmacology for Health Professionals*, Sixth Edition (Pearson, 2022) and more than 40 articles published in medical transcription and health information management journals. With physician authors, she has co-written three nationally funded grants and two chapters in physicians' anesthesiology and ENT textbooks. Susan has also coauthored numerous abstracts and articles published in nationally known journals, and she was the editor of an Opinion column that appeared in the *Journal of the American Medical Association* in 2016. Most recently, she contributed as a subject-matter expert in nursing and pharmacology for the fourth edition of Pearson's *Nursing: A Concept-Based Approach to Learning*.

In between updating editions of her own textbooks, Susan does medical editing on projects such as *Nursing: A Concept-Based Approach to Learning*, Fourth Edition (2023). She also creates indexes for medical, pharmacology, legal, historical, and educational textbooks for various publishers.

Susan holds a Master of Arts degree in adult education from Norwich University in Vermont, a Bachelor of Science degree in nursing from the Pennsylvania State University, and state licensure as a registered nurse. She is a member of and has national certification from the American Health Information Management Association. She is also a member of the American Society for Indexing.



## About the Illustrator

The illustrations throughout this textbook are the result of a close collaborative effort between the author and medical illustrator. Every illustrated figure was custom developed to be medically accurate, precise, unique, and fresh. From an educational standpoint, it was important for all of the medical art to be consistent throughout, rather than an assortment of illustrative styles with varying levels of detail. The illustrations for this sixth edition have been updated to reflect the highest degree of medical accuracy while retaining the realism and ease of understanding for students that have always been the hallmark of this textbook.

**Anita Impagliazzo, BA, MA, CMI**, is a medical and scientific illustrator in Charlottesville, Virginia. A graduate of the University of Virginia, she went on to complete the Biomedical Illustration Graduate Program at the University of Texas Southwestern Medical Center at Dallas. She was employed for several years by companies specializing in exhibits for medical malpractice litigation before starting her own business in 2001.

Anita's regular clients now include physicians and researchers at the University of Virginia, Tulane University, University of Pittsburgh, University of Florida, the Max Planck Institute, and the Royal College of London. She also provides pro bono work to St. Jude Children's Research Hospital. She has worked on multiple textbooks, including the popular Martini series of anatomy and physiology atlases and the revered Netter Collection of Medical Illustrations. Anita is a member of the Association of Medical Illustrators and the Society for Neuroscience. Her work has won several awards. She never tires of using medical language to learn and teach about the human body: how it works, how it fails, how it is fixed, and how the fixing fails.



## Consultants and Contributors

Our development team helped infuse this textbook with ideas, vision, and a passion for medical language, crafting the framework and contributing to what has become a landmark educational tool. Their influence will continue to have an impact for years to come as many students study *Medical Language: Immerse Yourself*. We are pleased to introduce the members of our team.

### Physicians and Physician Assistants

**Stephen Caldwell, MD**  
Director of Hepatology  
Digestive Health Center of Excellence  
Charlottesville, Virginia

**John H. Dirckx, MD**  
Former Medical Director, University of Dayton  
Dayton  
Student Health Center  
Dayton, Ohio

**Joseph Gibbons, MD**  
Internal Medicine Physician  
Centennial Medical Group  
Elkridge, Maryland

**James Michelson, MD**  
Professor of Orthopedic Surgery  
George Washington University School of Medicine  
Washington, D.C.

**Lien Turley, PA-C**  
Health and Psychiatry Consultants  
Oldsmar, Florida

### Ancillary Content Providers

**James F. Allen, Jr., RN, BSN, MBA/HCM, JD, MSN-Ed**  
Lansing Community College  
Lansing, Michigan

**Michael Battaglia, MS, EdD**  
Greenville Technical College  
Greenville, South Carolina

**Dale Brewer, BS, MEd, CMA, (AAMA)**  
Pensacola Junior College  
Pensacola, Florida

**Dean Chiarelli, MA, RD, HFS, CHES**  
Arizona State University  
Phoenix, Arizona

**Dianne Davis, BS, MS, ABD EdD**  
West Virginia University at Parkersburg  
Parkersburg, West Virginia

**Sarah E.W. Finch, PhD**  
Florida State College at Jacksonville  
Jacksonville, Florida

**Jean M. Krueger-Watson, PhD**  
Clark College  
Vancouver, Washington

**Angela Moderow, PT, MPT**  
Carolinas Rehabilitation  
Charlotte, North Carolina

**Janet Pandzik, MS, CMT, RMA**  
Good Careers Academy  
San Antonio, Texas

**Garnet Tomich, BA**  
San Diego, California

**Katherine Twomey, MLS**  
Greenville Technical College  
Greenville, South Carolina



# Manuscript Reviewers

(\*Reviewer conference attendee)

**Denise M. Abrams, PT, MASS**  
SUNY Broome Community College  
Appalachian, New York

**Betsy Adams, AAS, BS, MSBE**  
Alamance Community College  
Graham, North Carolina

**Mercedes Alafriz-Gordon, BS**  
High Tech Institute  
Phoenix, Arizona

**Diana Alagna, RN, AHI, CPT**  
Branford Hall Career Institute  
Southington, Connecticut

**Jana Allen, BS, MT\***  
Volunteer State Community  
College  
Gallatin, Tennessee

**Pam Anania, RN, APRN, MSN**  
Brookdale Community College  
Lincroft, New Jersey

**Ellen Anderson, RHIA**  
College of Lake County  
Northfield, Illinois

**Judy Anderson, MEd**  
Coastal Carolina Community  
College  
Jacksonville, North Carolina

**Peggy Anderson, DNP, MS, RN**  
Brigham Young University  
Provo, Utah

**Wendy Anderson**  
MTI College  
Sacramento, California

**Lori Andreucci, MEd, CMT, CMA**  
Gateway Technical College  
Racine, Wisconsin

**Leah Beall, CST, BS**  
Fortis College  
Westerville, Ohio

**Debbie Bedford, CMA, AAS**  
North Seattle Community College  
Seattle, Washington

**Tricia Berry, OTR/L**  
Hamilton College  
Urbandale, Iowa

**Sue Biederman, MSHP, RHIA**  
Texas State University  
San Marcos, Texas

**Richard Boan, BS, MS, PhD**  
Midlands Technical College  
Columbia, South Carolina

**Jennifer Boles, MSN, RN, NCSN**  
Cincinnati State Technical and  
Community College  
Cincinnati, Ohio

**Julie E. Boles, MS, RHIA**  
Ithaca College  
Ithaca, New York

**Annie M. Boster, PT**  
Bishop State Community College  
Mobile, Alabama

**Susan A. Boulden, RN**  
Mt. Hood Community College  
Aloha, Oregon

**Beth Braun, MA, PhD**  
Truman College  
Chicago, Illinois

**Shannon Bruley, BAS, AEMT-IC**  
Henry Ford Community College  
Dearborn, Michigan

**Juanita R. Bryant, CMA-A/C**  
Sierra College  
Penn Valley, California

**Thomas Bubar, BA, MS**  
Erie Community College  
Williamsville, New York

**Susan Buboltz, RN, MS, CMA**  
Madison Area Technical College  
Madison, Wisconsin

**Patricia Bufalino, MA, MN, RN,  
FNP**  
Riverside Community College  
Moreno Valley, California

**Ginger Bushway**  
Mendocino College  
Ukiah, California

**Mary Butler, BS**  
Collin County Community College  
McKinney, Texas

**Toni Cade, MBA, RHIA, CCS,  
FAHIMA**  
University of Louisiana at  
Lafayette  
Lafayette, Louisiana

**Cara L. Carreon, BS, RRT, CMA,  
CPC**  
Ivy Tech Community College  
Lafayette, Indiana

**Rafael Castilla, MD**  
Ho Ho Kus School  
Ramsey, New Jersey

**Julia I. Chapman, BS**  
Stark State College of Technology  
North Canton, Ohio

**Dean Chiarelli, MA, RD, HFS,  
CHES**  
Arizona State University  
Phoenix, Arizona

**Kim Christmon, BS, RRT**  
Volunteer State Community  
College  
Gallatin, Tennessee

**Paula-Beth Ciolek**  
National College of Business and  
Technology  
Richmond, Kentucky

**Deresa Claybrook, MS, RHIT**  
Oklahoma City Community  
College  
Oklahoma City, Oklahoma

**Mike Cochran, BA, RT(R)(CT),  
ARRT, VSRT, SWDSRT**  
Southwest Virginia Community  
College  
Richlands, Virginia

**Christine Cole, CCA**  
Williston State College  
Williston, North Dakota

**Ronald Coleman, EdD**  
Volunteer State Community College  
Gallatin, Tennessee

**Michelle Cooney, MA, MT(ASCP)**  
Moraine Valley Community  
College  
Palos Hills, Illinois

**Jeffrey Crisp, MS**  
Program Director, Allied Health  
Science  
Spartanburg Community College  
Spartanburg, South Carolina

**Bonnie Crist**  
Harrison College  
Indianapolis, Indiana

**Cathleen Currie, RN, BS**  
College of Southern Idaho  
Twin Falls, Idaho

**Dianne Davis, BS, MS, ABD EdD**  
West Virginia University at  
Parkersburg  
Parkersburg, West Virginia

**Denise J. DeDeaux, AAS, BS,  
MBA\***  
Fayetteville Technical Community  
College  
Fayetteville, North Carolina

**Shelley Dennis, PhD, MD**  
Rio Salado Community College  
Tempe, Arizona

**Anita Denson, BS, CMA**  
National College of Business and  
Technology  
Danville, Kentucky

**Susan D. Dooley, CMT\***  
Seminole Community College  
Sorrento, Florida

**Robert Fanger, MEd**  
Del Mar College  
Corpus Christi, Texas

**Sarah E.W. Finch, PhD**  
Florida State College at Jacksonville  
Jacksonville, Florida

**Vickie Findley, MPA, RHIA**  
Fairmont State College  
Fairmont, West Virginia

**Karalea Fisher, RHIT**  
Central New Mexico Community  
College  
Albuquerque, New Mexico

**Kathie Folsom, MS, BSN, RN**  
Skagit Valley College—Whidbey  
Island Campus  
Oak Harbor, Washington

**Joyce Foster**  
State Fair Community College  
Sedalia, Missouri

**Elaine Garcia, RHIT**  
Spokane Community College  
Spokane, Washington

**Suzanne B. Garrett, MSA, RHIA**  
Central Florida Community  
College  
Ocala, Florida

**Cheryl Gates, RN, MSN, PHN**  
Cerro Coso Community College  
Ridgecrest, California

**Barbara E. Geary, RN, MA**  
North Seattle Community College  
Seattle, Washington

**Paige Gebhardt, RMT**  
Sussex County Community  
College  
Newton, New Jersey

**Laura Ristrom Goodman, MSSW**  
Pima Medical Institute  
Tucson, Arizona

**Patricia Goshorn, MA, RN,  
CMA-AC C**  
Cosumnes River College  
Sacramento, California

**Debra Griffin, RN, BSN**  
Tidewater Community College  
Virginia Beach, Virginia

**Dawn Guzicki, RN**  
Detroit Business  
Institute—Downriver  
Riverview, Michigan

**Paula Hagstrom, MM, RHIA**  
Ferris State University  
Big Rapids, Michigan

**Dotty Hall, RN, MSN, CST**  
Ivy Tech Community College  
Lafayette, Indiana

**Karen Hardney, MEd, RT**  
Chicago State University  
Chicago, Illinois

**Marie Hattabaugh, RT(R)(M)**  
Pensacola Junior College  
Pensacola, Florida

**Tiffany Heath, CMA, CMAS,  
AHI, CS**  
Porter and Chester Institute  
Chicopee, Massachusetts

**Barbara L. Henry, RN, BSN**  
Gateway Technical College  
Racine, Wisconsin

**Forrest Heredia**  
Pima Medical Institute  
Tucson, Arizona

**Cathy Hess, RHIA**  
Texas State University  
San Marcos, Texas

**Dori L. Hess, MS, LMT, BS**  
Stark State College of  
Technology  
Canton, Ohio

**Jan C. Hess, MA**  
Metropolitan Community College  
Omaha, Nebraska

**Denise M. Hightower, RHIA**  
Cape Fear Community College  
Wilmington, North Carolina

**Beulah A. Hofmann, RN, MSN,  
CMA**  
Ivy Tech Community College  
Greencastle, Indiana



**Valentina Holder, MA.Ed, RHIA**  
Pitt Community College  
Winterville, North Carolina

**Joe Horan**  
Seacoast Career School  
Manchester, New Hampshire

**Pamela S. Huber, MS, MT(ASCP)**  
Erie Community College  
Williamsville, New York

**James E. Hudacek, MSEd\***  
Loraine County Community College  
Amherst, Ohio

**Bud W. Hunton, MA, RT (R) (QM)**  
Sinclair Community College  
Dayton, Ohio

**Karen Jackson, NR-CMA**  
Remington College  
Garland, Texas

**Donna Jimison RN, MSN**  
Cuyahoga Community College  
Parma, Ohio

**Timothy J. Jones, MA**  
Oklahoma City Community College  
Oklahoma City, Oklahoma

**Rita Kealy, MM, MT(ASCP)**  
Moraine Valley Community College  
Palos Hills, Illinois

**Kathleen Kearney, BS, MEd, EMT-P**  
Kent State University  
Kent, Ohio

**Cathy Kelley-Arney, CMA, MLTC, BSHS, AS**  
National College of Business and Technology  
Bluefield, Virginia

**Winifred Khalil, RN, MS**  
San Diego Mesa College  
San Diego, California

**Heather Kies, MHA**  
Goodwin College  
East Hartford, Connecticut

**Jan Klawitter, CMA (AAMA), CPC**  
San Joaquin Valley College  
Bakersfield, California

**Marsha Lalley, BSM, MSM**  
Minneapolis Community and Technical College  
Minneapolis, Minnesota

**Joyce Lammers, PT, MHS, PCS**  
University of Findlay  
Findlay, Ohio

**LaShawn Lawrence, MS, RHIT, CCHP**  
Miami-Dade College  
Miami, Florida

**Carol A. Lehman, ART**  
Hocking College  
Nelsonville, Ohio

**Sandra Lehrke, MS, RN**  
Anoka Technical Community College  
Anoka, Minnesota

**Randall M. Levin, FACEP**  
Sanford Brown College  
Milwaukee, Wisconsin

**Maria Teresa Lopez-Hill, MS**  
Laredo Community College  
Laredo, Texas  
Bow Valley College  
Calgary, Alberta  
Collin County Community College  
McKinney, Texas

**Michelle Lovings, BA**  
Missouri College  
Brentwood, Missouri

**Carol Loyd, MSN, RN**  
University of Arkansas Community College  
Morriston, Arkansas

**Patricia McLane, RHIA, MA**  
Henry Ford Community College  
Dearborn, Michigan

**Michael C. McMinn, MA, RRT**  
Mott Community College  
Flint, Michigan

**Jennifer Michael, MSRS, RT(R)**  
Northwestern State University  
Natchitoches, Louisiana

**Aimee Michaelis**  
Pima Medical Institute  
Denver, Colorado

**Michele Miller, PhD, CMA(AAMA)**  
Lakeland Community College  
Kirtland, Ohio

**Ann Minks, FAAMT**  
Lake Washington Technical College  
Kirkland, Washington

**Suzanne Moe, RN**  
Northwest Technical College  
Bemidji, Minnesota

**Barbara S. Moffet, PhD, RN**  
Southeastern Louisiana University  
Hammond, Louisiana

**Debby Montone, BS, RN, CCS-P, RCVT**  
Eastwick College/Ho Ho Kus Schools  
Ramsey, New Jersey

**Karen Myers, CPC**  
Pierce College Puyallup  
Puyallup, Washington

**Gloria Newton, MA-ED**  
Shasta College  
Redding, California

**B. Jeanine Newton-Riner, MHSA, RRT, EMT-P**  
Chattahoochee Technical College  
Marietta, Georgia

**Amanda Niebur, BA**  
Minneapolis Business College  
Roseville, Minnesota

**Erin Nixon, RN**  
Bakersfield College  
Bakersfield, California

**Alice M. Noblin, MBA, RHIA, CCS, LHRM**  
University of Central Florida  
Orlando, Florida

**Wendy Oguz, AS, BA**  
National College  
Indianapolis, Indiana

**Evie O'Nan, RMA**  
National College  
Florence, Kentucky

**Kerry Openshaw, PhD**  
Bemidji State University  
Bemidji, Minnesota

**Bob Osborn**  
Lansing Community College  
Lansing, Michigan

**Janet Pandzik, MS, CMT, RMA**  
Good Careers Academy  
San Antonio, Texas

**Mirella G. Pardee, MSN, RN**  
University of Toledo  
Toledo, Ohio

**Sherry Pearsall, MSN**  
Bryant & Stratton College  
Liverpool, New York

**Tina Peer, MS, RN**  
The College of Southern Idaho  
Twin Falls, Idaho

**Tammie C. Petersen, RNC-OB, BSN**  
Austin Community College  
Austin, Texas

**Susan Prion, EdD, RN**  
University of San Francisco  
San Francisco, California

**Mary Rahr, MS, RN, CMA**  
Northeast Wisconsin Technical College  
Madison, Wisconsin

**Edilberto A. Raynes, MD**  
Tennessee State University  
Nashville, Tennessee

**Deward Reece, DC**  
Sanford Brown College  
Milwaukee, Wisconsin

**Joy Renfro, EdD, RHIA, CMA, CCS-P, CPC**  
Eastern Kentucky University  
Richmond, Kentucky

**Sheila G. Rockoff, EdD, MSN, BSN, AS, RN**  
Santa Ana College  
Santa Ana, California

**Mary Sayles, RN, MSN**  
Sierra College—Nevada County Campus  
Rocklin, California

**Jody E. Scheller, MS, RHIA**  
Schoolcraft College  
Garden City, Michigan

**Patricia Schrull, MSN, MBA, MEd, RN**  
Lorain County Community College  
Elyria, Ohio

**Theresa R. Schuldt, MEd, HT/HTL (ASCP)**  
Rose State College  
Midwest City, Oklahoma

**Jan Sesser, BS, RMA (AMT), CMA**  
High Tech Institute  
Phoenix, Arizona

**Julie A. Shellenbarger, MBA, RHIA**  
University of Northwestern Ohio  
Lima, Ohio

**Donna Sue Shellman, MA, CPC**  
Gaston College  
Dallas, North Carolina

**Karin Sherrill, BSN**  
Mesa Community College  
Gilbert, Arizona

**Paula Silver, PharmD**  
ECPI University  
Newport News, Virginia

**Vicki Simpson, PhD, RN, CHES**  
Purdue University West Lafayette  
West Lafayette, Indiana

**Erin Sitterley**  
North Seattle Community College  
Seattle, Washington

**Tim J. Skaife, RT(R), MA**  
National Park Community College  
Hot Springs, Arizona

**Lynn G. Slack, CMA**  
ICM School of Business and Medical Careers  
Pittsburgh, Pennsylvania

**Ellie Smith, RN, MSN**  
Cuesta College  
San Luis Obispo, California

**Sherman K. Sowby, PhD, CHES**  
California State University—Fresno  
Fresno, California

**Darla K. Sparacino, MEd, RHIA**  
Arkansas Tech University  
Russellville, Arkansas

**Carolyn Stariha, BS, RHIA**  
Houston Community College—Coleman Campus  
Houston, Texas

**Kathy Stau, CPhT**  
Medix School  
Smyrna, Georgia

**Twila Sterling-Guillory, RN, MSN**  
McNeese State University  
Lake Charles, Louisiana

**Deb Stockberger, MSN, RN**  
North Iowa Community College  
Mason City, Iowa

**Susan Stockmaster, OTR, CMAA (AAMA)**  
Trident Technical College  
North Charleston, South Carolina

**Paula L. Stoltz, CMT-F**  
Medical Transcription Education Center  
Fairlawn, Ohio

**Diane Swift**  
State Fair Community College  
Sedalia, Missouri

**J. David Taylor, PhD, PT, CSCS**  
University of Central Arkansas  
Conway, Arkansas

**Sylvia Taylor, CMA, CPCA**  
Cleveland State Community College  
Cleveland, Tennessee

**Jean Ternus, RN, MS**  
Kansas City Community College  
Kansas City, Kansas

**Cindy B. Thompson, BSRT, MA\***  
Alamance Community College  
Graham, North Carolina

**Lenette Thompson, CST**  
Piedmont Technical College  
Greenwood, South Carolina

**Margaret A. Tiemann, RN, BS**  
St. Charles Community College  
Cottleville, Missouri

**Cheryl Travelstead, BS, AS, ASS, RT(R)(BD)**  
Tidewater Community College  
Norfolk, Virginia

**Mary Jane Tremethick, PhD, RN, CHES**  
Northern Michigan University  
Marquette, Michigan

**Valeria D. Truitt, BS, MAEd**  
Craven Community College  
New Bern, North Carolina

**Christine Tufts-Maher, MS, RHIA**  
Seminole Community College  
Altamonte Springs, Florida

**Deborah Uhlian, BS, AHL, RMA**  
Charles Stewart Mott Community College  
Flint, Michigan

**Pam Ventgen, CMA (AAMA), CCS-P, CPC, CPC-I**  
University of Alaska—Anchorage  
Anchorage, Alaska

**Patricia Von Knorring**  
Tacoma Community College  
Gig Harbor, Washington

**Jane C. Walker, BBA, PhD, RN, ASLNC-C, CPN, CNE**  
Walters State Community College  
Morristown, Tennessee

**Mary Warren-Oliver, BA**  
Gibbs College  
Vienna, Virginia

**Kristen Waterstram-Rich, MS, CNMT**  
Rochester Institute of Technology  
Rochester, New York

**Kim Webb, RN, MN**  
Northern Oklahoma College  
Tonkawa, Oklahoma

**Richard Weidman, RHIA, CCS-P**  
Tacoma Community College  
Tacoma, Washington

**Bonnie Welniak, RN, MSN**  
Monroe County Community College  
Monroe, Michigan

**Connie Werner, MS, RHIA**  
York College of Pennsylvania  
York, Pennsylvania

**Victoria Lee Wetle, RN, EdD**  
Chemeketa Community College  
Salem, Oregon

**David J. White, MA, MLIS**  
Baylor University  
Waco, Texas

**Jay W. Wilborn, MEd, MT(ASCP)**  
National Park Community College  
Hot Springs, Arkansas

**Tammy L. Wilder, RN, MSN, CMSRN**  
Ivy Tech Community College  
Evansville, Indiana

**Brad Winterton, DVM, MPH, DACVPM**  
Weber State University  
Ogden, Utah

**Antionette Woodall**  
Remington College—Cleveland  
North Olmsted, Ohio

**Scott Zimmer, MS**  
Metropolitan Community College  
Omaha, Nebraska

## Focus Group Participants

**Kim Anthony Aaronson, BS, DC**  
Harry S. Truman College  
Harold Washington College  
Chicago, Illinois

**Kendra J. Allen, LPN**  
Ohio Institute of Health Careers  
Columbus, Ohio

**Delena Kay Austin, BTIS, CMA**  
Macomb Community College  
Clinton Township, Michigan

**Molly Baxter**  
Baker College—Port Huron  
Port Huron, Michigan

**Joan Berry, RN, MSN, CNS**  
Lansing Community College  
Lansing, Michigan

**Kenneth Bretl, MA, RRT**  
College of DuPage  
Glen Ellyn, Illinois

**Carole Bretscher**  
Southwestern College  
Bellbrook, Ohio

**Adrienne L. Carter, MEd, NRMA**  
Riverside Community College  
Moreno Valley, California

**Mary Dudash-White, MA, RHIA, CCS**  
Sinclair Community College  
Dayton, Ohio

**Cathy Flite, MEd, RHIA**  
Temple University  
Philadelphia, Pennsylvania

**Sherry Gamble, RN, CNS, MSN, CNOR**  
University of Akron  
Akron, Ohio

**Mary Garcia, BA, AD, RN**  
Northwestern Business College  
Northeastern Illinois University  
Truman College  
Chicago, Illinois

**Joyce Garozzo, MS, RHIA, CCS**  
Community College of Philadelphia  
Philadelphia, Pennsylvania

**Patsy Gehring, PhD, RN, CS**  
Lakeland Community College  
Kirkland, Ohio

**Michelle Heller, CMA, RMA**  
Ohio Institute of Health Careers  
Columbus, Ohio

**Janet Hossli**  
Northwestern Business College  
Chicago, Illinois

**Trudi James-Parks, RT, BS**  
Lorain County Community College  
Elyria, Ohio

**Sherry L. Jones, RN, ASN**  
Western School of Health and Business  
Community College of Allegheny County  
Pittsburgh, Pennsylvania

**Esther H. Kim**  
Chicago State University  
Chicago, Illinois

**Richelle S. Laipply, PhD, CMA**  
University of Akron  
Akron, Ohio

**Andrea M. Lane, CMA-C, BAS RN, MS**  
Brookdale Community College  
Lincroft, New Jersey

**Mary Lou Liebal, BS, RTR, MA**  
Cuyahoga Community College  
Cleveland, Ohio

**Stacey Long, BS**  
Miami Jacobs Career College  
Dayton, Ohio

**Anne Loochtan, MEd**  
Columbus State Community College  
Cincinnati, Ohio

**Anne M. Lunde, BS, CMT**  
Waubensee Community College  
Sugar Grove, Illinois

**Janice Manning, MA, PCP**  
Baker College  
Jackson, Michigan

**Sandy Marks, RN, MS(HCA)**  
Cerritos College  
Norwalk, California

**Kathleen Masters, MS, RN**  
Monroe County Community College  
Monroe, Michigan

**Mary Morgan, MS, CNMT**  
Columbus State Community College  
Columbus, Ohio

**Andrew Muniz, OT, BBA, MBA**  
Baker College  
Auburn Hills, Michigan

**Michael Murphy, AAS, CMA, CLP**  
Berdan Institute  
Union, New Jersey

**Stephen Nardozi, BA**  
SUNY-Westchester Community College  
Valhalla, New York

**Ruth Ann O'Brien, MHA, RRT**  
Miami Jacobs Career College  
Dayton, Ohio

**Tammie Petersen, BSN, RNC-OB**  
Austin Community College  
Austin, Texas

**Donna Schnepf, MHA, RHIA**  
Moraine Valley Community College  
Palos Hills, Illinois

**Ann M. Smith, MS**  
Joliet Junior College  
Joliet, Illinois

**Mark Velderrain**  
Cerritos College  
Norwalk, California

**Jane C. Walker, BBA, RN, ASLNC-C, CPN, CNE**  
Walters State Community College  
Morristown, Tennessee

**Barbara Wiggins, MT(ASCP)**  
Delaware Technical & Community College  
Georgetown, Delaware

**Gail S. Williams, Ph.D., MT(ASCP)SBB, CLS(NCA)**  
Northern Illinois University  
DeKalb, Illinois

**Karen Wright, RHIA, MHA**  
Hocking College  
Nelsonville, Ohio

## Student Advisors

**Tobi Burch**  
Community College of Philadelphia  
Philadelphia, Pennsylvania

**Calvin Byrd**  
Temple University  
Philadelphia, Pennsylvania

**Kimberly Clark**  
Community College of Philadelphia  
Philadelphia, Pennsylvania

**Susan DiMaria**  
Brookdale Community College  
Lincroft, New Jersey

**Avelina Elam**  
Thomas Jefferson University  
Philadelphia, Pennsylvania

**Michael Flores**  
Berdan Institute  
Union, New Jersey

**Frederick Herbert**  
Temple University  
Philadelphia, Pennsylvania

**Brenda Merlino**  
Thomas Jefferson University  
Philadelphia, Pennsylvania

**Megan Milos**  
Ocean County College  
Toms River, New Jersey

**Payam Mohadjeri**  
Temple University  
Philadelphia, Pennsylvania

**Monica Narang**  
Westchester Community College  
Valhalla, New York

# Thank You

## To the Pearson Development Team

My sincere thanks to ALL of the members of the Pearson Development Team!

My utmost thanks go to Kevin Wilson, Product Manager–Health Sciences, for his early advocacy and support for the new sixth edition of *Medical Language*. He also provided a smooth project transition to Stephen Heasley, Product Manager for the sixth edition. Stephen was a Portfolio Manager in Australia but also had been a Prentice Hall sales representative who enthusiastically had sold previous editions of *Medical Language*! I also wish to thank my previous editor John Goucher, as well as Mark Cohen, the originator and editor of the first edition of *Medical Language* that received a Pearson Professional and Careers Product Team of the Year award in 2007. I also want to express my gratitude to Melissa Bashe, Managing Producer–Health Sciences, who has been and continues to be an invaluable resource, coordinating production activities since the first edition of *Medical Language*; she has now expertly managed the many facets of the sixth edition.

My gratitude and thanks go to Anita Impagliazzo, my medical illustrator. She embraced much more than her original role and quickly became a creative collaborator and advisor for every edition. She is a wonderfully talented medical illustrator whose efforts made this textbook medically accurate, artistically unique, and without equal. By combining medical illustrations superimposed on real-life photographs of people, she created a never-before-seen level of medical realism, to the delight of the author and the awe of students and instructors alike.

My sincere appreciation goes to Laura S. Horowitz, York Content Development, my development editor. She expertly and seamlessly coordinated all aspects of the very complicated process of creating a new sixth edition, as she had done for previous editions. Her professional expertise was a constant throughout this process, and all of the many steps and details involved would have been overwhelmingly difficult to accomplish without her expertise and support.

My thanks also go to Studio Montage for creating a beautiful and inviting design and format for the sixth edition. My thanks also go to Jerilyn DeCarlo at Straive, who designed a fresh and innovative cover based on the continuing “Immerse Yourself” theme.

Thank you to the talented team at Straive, led by Patty Donovan, Project Manager, who oversaw the extensive editing, layout, and typesetting of the sixth edition. In light of the complexity of this textbook, I especially appreciated their professionalism, flexibility, creative insights, and can-do approach.

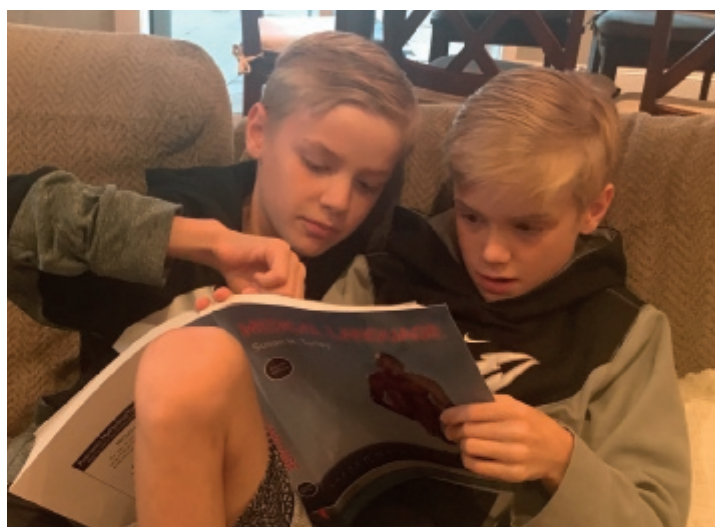
And thanks to the Pearson media team that designed and produced a spectacular array of ancillary learning applications to support this textbook.



## To Students and Instructors

My thanks to the many classes of students who motivated me to continually research and present medical language clearly and thoroughly. It was their warm response to my teaching methods and materials that encouraged me to keep improving in the classroom and throughout the many editions of this textbook.

Also thanks to the many reviewers, instructors, and practitioners—my colleagues—who have overwhelmingly validated my efforts to write about medical language with a uniquely interesting, lively, and fresh approach. They each played an important role in the development of this textbook, and I hope that they share my sense of pride and accomplishment in this new sixth edition.



**An enthusiastic user of *Medical Language: Immerse Yourself* and community-college instructor graciously provided this photograph of her twin sons intently studying the fourth edition of this textbook! Future healthcare professionals!**



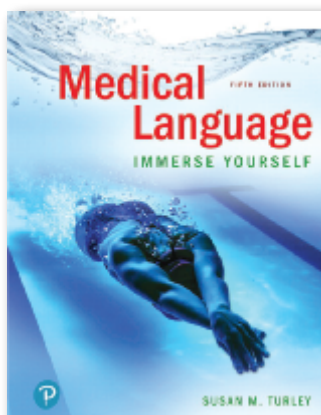
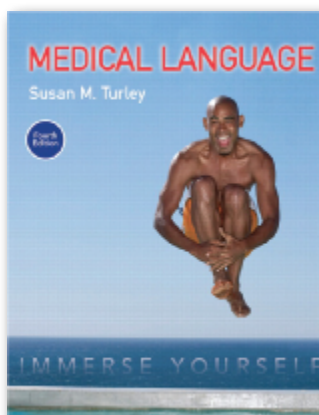
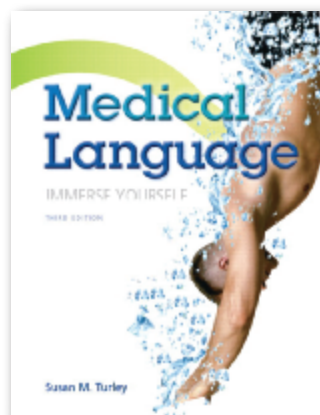
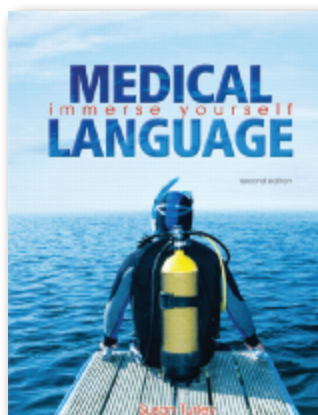
# The Purpose of *Medical Language*

No new medical terminology book has touched the lives of so many people as profoundly as *Medical Language: Immerse Yourself*. We credit the astounding success of the award-winning first edition and all subsequent editions to their special ability to meet the needs of students and instructors!

Students need to be immersed in the real world of medicine from the moment they begin to study. That means more than simply learning medical words (medical terminology); it means learning medicine as a language! This is why the chapters in *Medical Language* are named not by body systems (as is the case with other medical terminology textbooks)—but by medical specialties—an approach that reflects medicine as it is practiced in the real world. In addition, all of the text, illustrations, and photo images have been carefully selected to reflect the most up-to-date medical information and the most realistic portrayal of medicine as it is practiced today.

The emphasis on learning medical language as a language is reinforced by including an easy-to-use pronunciation guide for each bolded word in the text and providing a breakdown of each bolded word into its component word parts and their meanings.

The new sixth edition builds on Pearson's development teams and the author's commitment to excellence. And so, we have once again challenged our reviewers to critique every feature, every page, every word—to help enhance the learning and teaching process. The information is presented in a way that reflects the level of detail that the majority of instructors told us they need. The result of their expertise and feedback has been an intelligent reorganization as well as the integration of features that you, our customer, have asked for and will not find in any other medical terminology textbook.



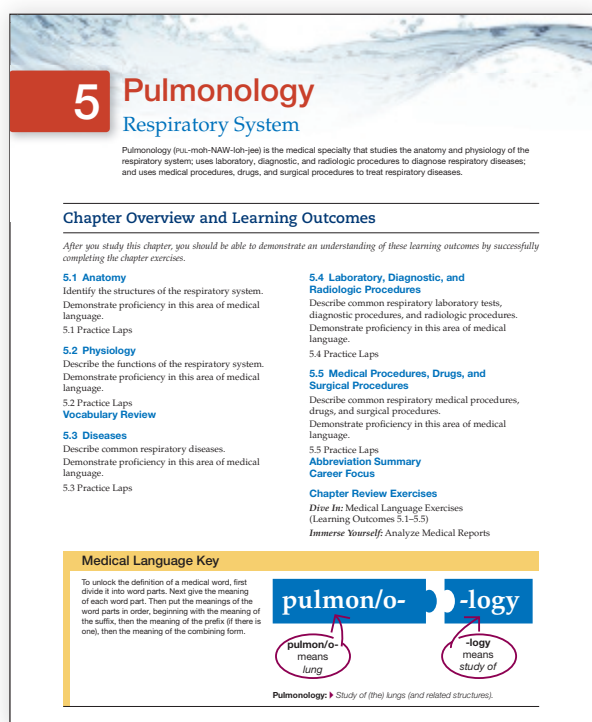
# An Overview of *Medical Language*

## Chapter Format

Each chapter follows a consistent organization and educational approach that is designed for student success.

## Chapter Overview and Learning Outcomes

The opening page of each chapter includes a brief outline to help students review the scope of the chapter and its special features. Each chapter section is numbered, and that numbering is used consistently throughout the chapter and in related chapter exercises. The chapter learning outcomes can be fulfilled by students in a very practical way—by successfully completing the chapter exercises. The opening page of most chapters ends with a Medical Language Key feature box that analyzes the name of the medical specialty presented in that chapter.



Five main sections are included in most chapters. The examples here are taken from Chapter 5, Pulmonology: Respiratory System.

## 1. Anatomy

The first section of the chapter describes the anatomy of the body system related to that chapter's medical specialty.

### 5.1 Anatomy

#### Upper Respiratory System

The upper respiratory system is in the head and neck. It includes the nose, nasal cavity, and pharynx (throat). *Note:* Some of these same structures were discussed in Chapter 4, Gastroenterology. Other structures (the sinuses, adenoids, tonsils) are part of the ears, nose, and throat and are discussed in Chapter 16, Otolaryngology.

## Practice Laps

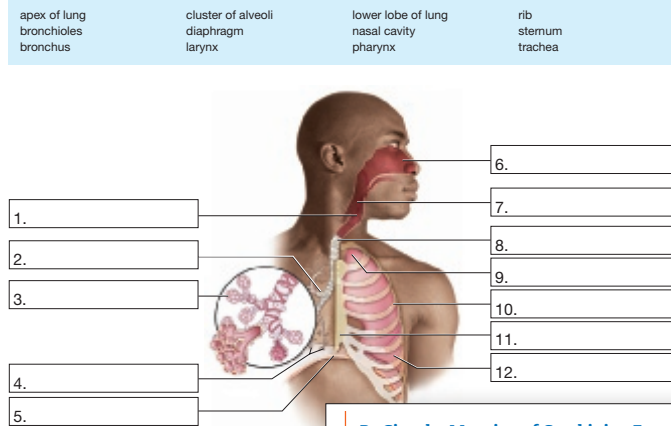
The Anatomy section (and each subsequent numbered section) ends with Practice Laps exercises to reinforce the learning process.

### 5.1 PRACTICE LAPS

Use the Answer Key in Appendix C at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources) to check your answers.

#### A. Label Structures

Insert each anatomy word or phrase in the correct numbered box. Be sure to check your spelling.



#### B. Give the Meaning of Combining Forms

Next to each combining form, provide its meaning. The first one has been done for you.

| Combining Form | Meaning          | Combining Form | Meaning |
|----------------|------------------|----------------|---------|
| 1. lob/o-      | lobe of an organ | 8. hil/o-      | _____   |
| 2. alveol/o-   | _____            | 9. laryng/o-   | _____   |
| 3. bronchi/o-  | _____            | 10. muc/o-     | _____   |

#### C. Build Medical Words

Review the definition of the medical word. Think about the combining form that is given. Select the correct suffix from the Suffix List and insert it on the blank line. Then build the medical word and insert it on the line. (Remember: You may need to remove the combining vowel. Always remove the hyphens and slash.) Be sure to check your spelling.

##### Suffix List

|                      |                                   |                      |                      |
|----------------------|-----------------------------------|----------------------|----------------------|
| -al (pertaining to)  | -ate (composed of; pertaining to) | -eal (pertaining to) | -ole (small thing)   |
| -ar (pertaining to)  |                                   | -ic (pertaining to)  | -ous (pertaining to) |
| -ary (pertaining to) |                                   |                      |                      |

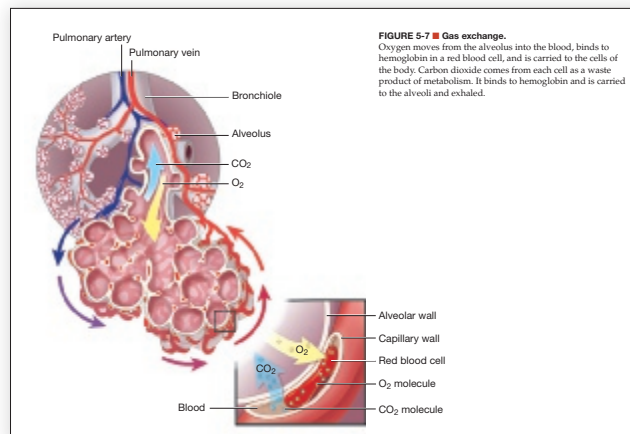
| Definition of the Medical Word                 | Combining Form | Suffix | Build the Medical Word |
|------------------------------------------------|----------------|--------|------------------------|
| <b>Example:</b> Pertaining to (the) bronchiole | bronchiol/o-   | -ar    | bronchiolar            |

## 2. Physiology

The next chapter section describes the physiology of the body system related to that chapter's medical specialty. This section also ends with Practice Laps exercises.

### 5.2 Physiology

Breathing is an involuntary process that occurs without any conscious effort. Receptors in large arteries in the chest and neck send information to the brain about the level of oxygen in the blood, and receptors in the brain collect information about the blood level of carbon dioxide. Based on this information, the **respiratory control centers** in the brain regulate the rate and depth of respirations by sending nerve impulses to the **phrenic nerve**, causing the diaphragm to contract and move downward, expanding the thoracic cavity. You can voluntarily control your respirations (when you hold your breath), but eventually involuntary control takes over, forcing you to breathe.



# Vocabulary Review

The Anatomy and Physiology sections end with a Vocabulary Review. It includes each bolded anatomy and physiology word or phrase in the chapter, a brief description, and related combining forms.

| Vocabulary Review                       |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                         |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Word or Phrase                          | Description                                                                                                                                                                                                                                                                                                                                                                                        | Combining Forms                                                                         |
| Overview                                |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                         |
| cardiopulmonary                         | Pertaining to the heart and lungs                                                                                                                                                                                                                                                                                                                                                                  | cardi/o- heart<br>pulmon/o- lung                                                        |
| respiratory system                      | The structures of the upper respiratory system include the nose, nasal cavity, and pharynx (throat). The lower respiratory system includes the larynx (voice box), trachea (windpipe), bronchi, bronchioles, lungs, alveoli, and thoracic cavity. Also known as the <b>respiratory tract</b> . The functions of the respiratory system are to bring oxygen into the body and expel carbon dioxide. | spir/o- breathe; coil                                                                   |
| Anatomy of the Upper Respiratory System |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                         |
| mucosa                                  | <b>Mucous membrane</b> that lines the respiratory system. It warms and humidifies incoming air. It produces <b>mucus</b> to trap foreign particles and bacteria.                                                                                                                                                                                                                                   | muc/o- mucus                                                                            |
| nose                                    | The <b>nares</b> are the external openings of the nose. The <b>nasal cavity</b> is the hollow area inside the nose. The <b>nasal septum</b> divides the nasal cavity into right and left sides.                                                                                                                                                                                                    | nas/o- nose<br>cav/o- hollow space<br>sept/o- dividing wall; septum                     |
| pharynx                                 | The throat. A shared passageway for both air and food. The <b>nasopharynx</b> is inferior to the nasal cavity, the <b>oropharynx</b> is posterior to the oral cavity, and the <b>laryngopharynx</b> is superior to the larynx.                                                                                                                                                                     | pharyng/o- pharynx; throat<br>nas/o- nose<br>or/o- mouth<br>laryng/o- larynx; voice box |

## 3. Diseases

The next chapter section describes the causes, symptoms, and treatments for diseases of the body system related to that chapter’s medical specialty. This section also ends with Practice Laps exercises.

### 5.3 Diseases

Note: Diseases of the nose, sinuses, pharynx, tonsils, adenoids, and larynx are discussed in Chapter 16, Otolaryngology.

| Word or Phrase                    | Description                                                                                                                                                                                                                                               | Pronunciation/Word Parts                                                             |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Nose and Pharynx</b>           |                                                                                                                                                                                                                                                           |                                                                                      |
| upper respiratory infection (URI) | Bacterial or viral infection of the nose and/or throat. Also known as a <b>common cold</b> or a <b>head cold</b> (Figure 5-8 ■).<br><br><b>Treatment:</b> Antibiotic drug for a bacterial infection; antiviral drug to treat influenza A and B infections | <b>infection</b> (in-FEK-shun)<br>infect/o- disease within<br>-ion action; condition |



**FIGURE 5-8 ■ Upper respiratory infection.**  
An upper respiratory infection is caused by a bacterium or virus. It spreads easily to others on unwashed hands or by droplets of mucus and saliva that are expelled into the air during sneezing and coughing.

| Word or Phrase                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Pronunciation/Word Parts                                                                                                                                                                                                                                                            |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Trachea, Bronchi, and Bronchioles</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                     |
| asthma                                   | Hyperactivity of the bronchi and bronchioles. Inflammation and swelling of the mucosa with excessive mucus production. <b>Bronchospasm</b> (contraction of the smooth muscle) narrows the lumens of the bronchi and bronchioles, causing shortness of breath, coughing, wheezing, and difficulty exhaling. Asthma attacks are triggered by exposure to allergens (dust, mold, perfume, smoke, chemicals), exercise, cold air, or emotional stress. Patients with asthma are said to be <b>asthmatic</b> . Asthma is a type of reactive airway disease. <b>Status asthmaticus</b> is a prolonged, extremely severe, life-threatening asthma attack.<br><br><b>Prevention:</b> Avoid things that trigger asthma attacks. Prevent attacks by daily use of a corticosteroid drug, bronchodilator drug, or leukotriene receptor blocker drug.<br><br><b>Treatment:</b> Inhaled bronchodilator drug during attacks; oxygen for severe attacks | <b>asthma</b> (AZ-mah)<br><br><b>bronchospasm</b> (BRONG-koh-spazm)<br>bronch/o- bronchus<br>-spasm sudden, involuntary muscle contraction<br><br><b>asthmatic</b> (az-MAT-ik)<br>asthm/o- asthma<br>-atic pertaining to<br><br><b>status asthmaticus</b> (STAT-uhs az-MAT-ih-kuhs) |



## 4. Laboratory, Diagnostic, and Radiologic Procedures

The next chapter section describes tests that are ordered to diagnose diseases related to that chapter's medical specialty. This section also ends with Practice Laps exercises.

### 5.4 Laboratory, Diagnostic, and Radiologic Procedures

| Word or Phrase                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pronunciation/Word Parts                                                                                                                                                                                  |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Laboratory Tests and Diagnostic Procedures</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                           |
| <b>arterial blood gases (ABG)</b>                 | Blood test to measure the partial pressure (p) of the gases oxygen ( $\text{pO}_2$ ) and carbon dioxide ( $\text{pCO}_2$ ) in the arterial blood. The pH (how acidic or alkaline the blood is) is also measured. The higher the level of carbon dioxide, the more acidic the blood and the lower the pH.                                                                                                                                                                                                                                                  | <b>arterial</b> (ar-TEER-ee-al)<br><b>arteri/o-</b> artery<br><b>-al</b> pertaining to                                                                                                                    |
| <b>carboxyhemoglobin</b>                          | Blood test to measure the level of carbon monoxide (CO) in the blood. An increased level is caused by exposure to fire, smoke, or fumes in a closed, unventilated space. Carbon monoxide is carried by hemoglobin as carboxyhemoglobin. A blood level above 50% is fatal.                                                                                                                                                                                                                                                                                 | <b>carboxyhemoglobin</b> (kar-BAWK-see-HEE-moh-GLUH-bin)<br><b>carbox/y-</b> carbon monoxide<br><b>hem/o-</b> blood<br><b>glob/o-</b> comprehensive; shaped like a globe<br><b>-in</b> substance          |
| <b>oximetry</b>                                   | Procedure to measure the percentage of hemoglobin saturation in the blood. An <b>oximeter</b> , a small, noninvasive clip device, is placed on the patient's index finger. It emits light waves that penetrate the skin and are absorbed or reflected by saturated hemoglobin in red blood cells (hemoglobin bound to oxygen) versus unsaturated hemoglobin (not bound to oxygen). The oximeter displays the oxygen saturation level of the blood but not the carbon dioxide level. A <b>pulse oximeter</b> also measures the pulse rate (Figure 5-17 ■). | <b>oximetry</b> (awk-SIM-eh-tree)<br><b>ox/i-</b> oxygen<br><b>-metry</b> process of measuring<br><br><b>oximeter</b> (awk-SIM-eh-ter)<br><b>ox/i-</b> oxygen<br><b>-meter</b> instrument used to measure |



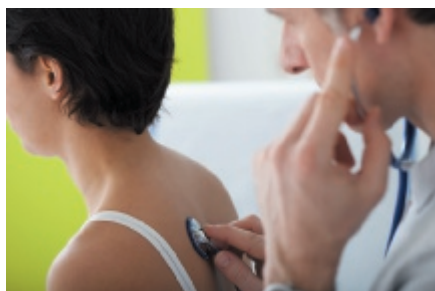
**FIGURE 5-17 ■ Pulse oximeter.** This device is used in ambulances and other healthcare settings to provide a quick measurement of the percentage of the patient's hemoglobin that is saturated with oxygen ( $\%\text{SpO}_2$ ) and the pulse rate (PR) in beats per minute (bpm). Both of this patient's measurements are within normal limits. Note: A pulse oximeter may not provide an entirely accurate measurement of the  $\%\text{SpO}_2$  in patients with darker skin.

## 5. Medical Procedures, Drugs, and Surgical Procedures

The last chapter section describes the medical procedures, drugs, and surgical procedures related to that chapter's medical specialty. Again, this section ends with Practice Laps exercises.

### 5.5 Medical Procedures, Drugs, and Surgical Procedures

| Word or Phrase                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Pronunciation/Word Parts                                                                                                                                                                                                      |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Medical Procedures</b>                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                               |
| <b>auscultation and percussion (A&amp;P)</b> | Auscultation uses a <b>stethoscope</b> to listen to breath sounds in all lobes of the lungs. Percussion uses the finger of one hand to tap on the fingers of the other hand that are spread out on the patient's back and positioned over a lobe of the lung. After a few taps, the hand is moved over another lobe. The sounds heard on auscultation and percussion tell the healthcare provider if the breath sounds are normal or abnormal and if the lungs are clear or if there is dullness because of the presence of fluid or a tumor (Figure 5-21 ■). | <b>auscultation</b> (aws-kul-TAY-shun)<br><b>auscult/o-</b> listening<br><b>-ation</b> being; having; process<br><br><b>stethoscope</b> (STETH-oh-skohp)<br><b>steth/o-</b> chest<br><b>-scope</b> instrument used to examine |



## Abbreviation Summary

Each chapter ends with a summary of abbreviations and their meaning from the chapter.

### Abbreviation Summary

|                        |                                                            |                                         |                                                                      |
|------------------------|------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------|
| <b>ABG</b>             | arterial blood gases                                       | <b>LUL</b>                              | left upper lobe (of the lung)                                        |
| <b>AFB</b>             | acid-fast bacillus                                         | <b>MDI</b>                              | metered-dose inhaler                                                 |
| <b>AP</b>              | anteroposterior                                            | <b>MDR-TB</b>                           | multidrug-resistant tuberculosis                                     |
| <b>A&amp;P</b>         | auscultation and percussion                                | <b>MRI</b>                              | magnetic resonance imaging                                           |
| <b>AQI</b>             | Air Quality Index                                          | <b>O<sub>2</sub></b>                    | oxygen                                                               |
| <b>ARDS</b>            | acute respiratory distress syndrome                        | <b>PA</b>                               | posteroanterior                                                      |
| <b>BS</b>              | breath sounds                                              | <b>PCO<sub>2</sub>, pCO<sub>2</sub></b> | partial pressure of carbon dioxide                                   |
| <b>C&amp;S</b>         | culture and sensitivity                                    | <b>PFT</b>                              | pulmonary function test                                              |
| <b>CAT, CT</b>         | computerized axial tomography                              | <b>PND</b>                              | paroxysmal nocturnal dyspnea                                         |
| <b>CF</b>              | cystic fibrosis                                            | <b>PO<sub>2</sub>, pO<sub>2</sub></b>   | partial pressure of oxygen                                           |
| <b>CO</b>              | carbon monoxide                                            | <b>PPD</b>                              | packs per day (of cigarettes); purified protein derivative (TB test) |
| <b>CO<sub>2</sub></b>  | carbon dioxide                                             | <b>RA</b>                               | room air (no supplemental oxygen)                                    |
| <b>COPD</b>            | chronic obstructive pulmonary disease                      | <b>RLL</b>                              | right lower lobe (of the lung)                                       |
| <b>CPAP</b>            | continuous positive airway pressure (pronounced "SEE-pap") | <b>RML</b>                              | right middle lobe (of the lung)                                      |
| <b>CPR</b>             | cardiopulmonary resuscitation                              | <b>RRT</b>                              | registered respiratory therapist                                     |
| <b>CXR</b>             | chest x-ray                                                | <b>RUL</b>                              | right upper lobe (of the lung)                                       |
| <b>DOE</b>             | dyspnea on exertion                                        | <b>SARS</b>                             | severe acute respiratory syndrome                                    |
| <b>ETT</b>             | endotracheal tube                                          | <b>SIDS</b>                             | sudden infant death syndrome                                         |
| <b>FEV<sub>1</sub></b> | forced expiratory volume (in 1 second)                     | <b>SOB</b>                              | shortness of breath                                                  |
| <b>FiO<sub>2</sub></b> | fraction (percentage) of inspired oxygen                   | <b>SpO<sub>2</sub></b>                  | saturated partial oxygen                                             |
| <b>FVC</b>             | forced vital capacity                                      | <b>TB</b>                               | tuberculosis                                                         |
| <b>IRDS</b>            | infant respiratory distress syndrome                       | <b>URI</b>                              | upper respiratory infection                                          |
| <b>LLL</b>             | left lower lobe (of the lung)                              | <b>V/Q</b>                              | ventilation-perfusion (scan)                                         |

\*\*This abbreviation is still in use, but many hospitals have removed it from their official list of abbreviations because it also has an undesirable meaning that is unrelated to the respiratory system.

## Career Focus

This feature introduces students to a healthcare career related to that chapter's medical specialty.

### Career Focus

#### Meet Susan, a respiratory therapist in a hospital

"I love my job. I've been doing it for 36 years. I probably could retire, but I choose not to. We treat neonates to geriatric patients. We treat patients with asthma, COPD, and pulmonary fibrosis and give information to the patients' families. We also manage oxygen therapy, nebulizer therapy, and medication therapy. We do pulmonary function technology and blood gases. I feel that being a respiratory therapist allows me to feel respected and appreciated, not only by the medical staff but also by the patients because you are giving patient care. You are dealing with the patient as well as the rest of the healthcare team. You feel good at the end of the day when you leave."



- **Respiratory therapists** are allied health professionals who perform pulmonary function tests and administer respiratory therapy with various types of equipment that provide oxygen or respiratory assistance to a patient.
- **Pulmonologists** are physicians who practice in the medical specialty of pulmonology. They diagnose and treat patients with respiratory problems. Physicians can take additional training and become board certified in the subspecialty of pediatric pulmonology.
- **Thoracic (or cardiothoracic) surgeons** perform pulmonary surgery, including surgery for cancer.
- **Oncologists** treat cancer of the lungs with chemotherapy drugs.

**therapist** (THAIR-ah-pist)  
*therap* = treatment  
*-ist* person who specializes in

**pulmonologist** (pu-moh-NAW-loh-jist)  
*pulmon/o* = lung  
*log/o* = study of; word  
*-ist* person who specializes in

**oncologist** (ong-KAW-loh-jist)  
*onc/o* = mass; tumor  
*log/o* = study of; word  
*-ist* person who specializes in

## Chapter Review Exercises

This section reaffirms students' knowledge with a fun and extensive variety of exercises. **Dive In** exercises are linked to numbered learning outcomes for the chapter and are designed to appeal to a range of learning styles. These exercises emphasize proficiency in medical information as well as medical language—word parts and their meanings, building words, dividing words, nouns, adjectives, spelling, and pronunciation. **Immerse Yourself** exercises emphasize the application of this knowledge as students review real patient records and answer critical-thinking questions.

### Chapter Review Exercises

#### Dive In: Medical Language Exercises

Test your knowledge of the chapter by completing these review exercises. Use the Answer Key in Appendix C at [www.pearsonhighered.com/healthprofessionresources](http://www.pearsonhighered.com/healthprofessionresources) to check your answers. Note: Each of the numbered exercise headers corresponds to a numbered learning outcome at the beginning of the chapter.

#### 5.1 Anatomy

##### MATCHING EXERCISE

Match each word or phrase to its description.

- |                  |                                                                          |
|------------------|--------------------------------------------------------------------------|
| 1. alveoli       | _____ small passageway that ends in several alveoli                      |
| 2. apex          | _____ impulse from this structure causes the diaphragm to contract       |
| 3. bronchiole    | _____ projections of bone in the nasal cavity that slow down inhaled air |
| 4. bronchus      | _____ small hairs in the mucosa that move in waves                       |
| 5. cilia         | _____ connecting passageway between the trachea and the bronchioles      |
| 6. diaphragm     | _____ air sacs that are the functional units of the lung                 |
| 7. phrenic nerve | _____ membranes around the lung and lining the thoracic cavity           |
| 8. pleurae       | _____ muscular structure that moves on inhalation                        |
| 9. thorax        | _____ topmost part of a lung                                             |
| 10. trachea      | _____ bony cage surrounding the lungs                                    |
| 11. turbinates   | _____ connecting passageway between the larynx and                       |

#### Immerse Yourself: Analyze Medical Reports

##### Electronic Health Record #1

This is an Office Visit in the SOAP note format. Review the note and answer the questions.

| PEARSON PRIMARY CARE ASSOCIATES                                                                                                                                                                                                                                                                                      |                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Task Edit View Time Scale Options Help                                                                                                                                                                                                                                                                               |                               |
|                                                                                                                                                                                                                                                                                                                      |                               |
|                                                                                                                                                                                                                                                                                                                      | <b>OFFICE VISIT SOAP NOTE</b> |
| PATIENT NAME: GUPTA, Priya                                                                                                                                                                                                                                                                                           |                               |
| MEDICAL RECORD NUMBER: 964-43651                                                                                                                                                                                                                                                                                     |                               |
| DATE OF VISIT: 11/19/xx                                                                                                                                                                                                                                                                                              |                               |
| <b>SUBJECTIVE:</b> This 45-year-old woman has been followed in our office for reactive airway disease. She comes in today with shortness of breath and audible wheezing. This morning it was cold outside; she was in the city and was around someone who was smoking. She did not have her rescue inhaler with her. |                               |
| <b>OBJECTIVE:</b> Temperature 98.2, heart rate 100, respiratory rate 30, blood pressure 130/80. Oximeter displays a measurement of 85%. She seems to be anxious. Auscultation is positive for wheezing.                                                                                                              |                               |
| <b>ASSESSMENT:</b> Asthma attack.                                                                                                                                                                                                                                                                                    |                               |
| <b>PLAN:</b> A bronchodilator drug was administered via an MDI and the symptoms subsided.                                                                                                                                                                                                                            |                               |

## MyLab Medical Terminology™

This end-of-chapter reminder encourages students to make use of the variety of online interactive activities and games to further enhance their learning experience.

### MyLab Medical Terminology™

**MyLab Medical Terminology** is a premium online homework management system that includes a host of features to help you study. Registered users will find:

- A multitude of quizzes and activities built within the MyLab platform
- Powerful tools that track and analyze your results—allowing you to create a personalized learning experience
- Videos and audio pronunciations to help enrich your progress
- Streaming lesson presentations (guided lectures)
- A space where you and your instructor can check your progress and manage your assignments

# Special Features

“How would you describe the ideal medical terminology textbook?” That is the question we asked our development team of students and instructors. Their responses helped us craft an array of special features that make this book unique.

**Vibrant Medical Illustrations and Photographs** This feature brings medical language to life and facilitates understanding, especially for visual learners.



## Pronunciation/Word Parts

**respiratory** (RES-pih-rah-TOR-ee)  
**re-** again and again; backward; unable to  
**spir/o-** breathe; coil  
**-atory** pertaining to  
Respiratory: Pertaining to again and again (to) breathe

## tract (TRAKT)

**cardiopulmonary**  
(KAR-dee-oh-PUL-moh-NAIR-ee)  
**cardi/o-** heart  
**pulmon/o-** lung  
**-ary** pertaining to

## naris (NAY-rihs)

**nares** (NAY-reez)  
Latin plural noun: Change the singular ending -is to -es.

**nasal** (NAY-zal)  
**nas/o-** nose  
**-al** pertaining to

**cavity** (KAV-ih-tee)  
**cav/o-** hollow space  
**-ity** condition; state

## septum (SEP-tum)

**septal** (SEP-tal)  
**sept/o-** dividing wall; septum  
**-al** pertaining to

## Medical Word Pronunciation/Word Parts

This feature is in the margin of the page (and within tables), wherever there is a bolded word in the text. This feature gives students the tools to pronounce new medical words on their own using the pronunciation guide. The guide provides a phonetic pronunciation of the medical word, as the large capital letters represent the primary accented syllable in the medical word and the small capital letters represent the secondary accented syllable. The Word Part section of this feature provides each word part in bold and blue, with the meaning of the word part in italics to help students understand a new medical word based on its word parts and their meanings. In the eText, the Word Part sections can be found.



**Tables** This feature is used to present content in a visually organized way that students can more easily understand and study.

**Table 6-3 Locations and Descriptions of the Veins**

The veins are listed as they are encountered anatomically, beginning with the vena cava.

| Veins                     | Location and Description                                                                                                                                                                                                                                                                               | Pronunciation/Word Parts                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>superior vena cava</b> | The <b>superior vena cava</b> carries deoxygenated blood from the head, neck, chest, and arms to the right atrium. The superior vena cava is named for its location, which is superior to the heart.                                                                                                   | <b>vena cava</b> (VEE-nah KAY-vah)<br>Latin plural noun: Change the singular ending -a to -ae.<br><b>Example:</b> The superior and inferior venae cavae |
| <b>inferior vena cava</b> | The <b>inferior vena cava</b> carries deoxygenated blood from the abdomen, pelvis, and legs to the right atrium. The inferior vena cava is named for its location, which is inferior to the heart. In the area of the hip bones, the right and left iliac veins join to become the inferior vena cava. |                                                                                                                                                         |
| <b>jugular veins</b>      | The <b>jugular veins</b> carry deoxygenated blood from the head and neck to the superior vena cava. The jugular vein takes its name from a Latin word that means throat.                                                                                                                               | <b>jugular</b> (JUG-yoo-lar)<br><b>jugul/o-</b> throat<br><b>-ar</b> pertaining to                                                                      |
| <b>pulmonary veins</b>    | The <b>pulmonary veins</b> carry <b>oxygenated</b> blood from the lungs to the left atrium of the heart. The adjective for lung is <b>pulmonary</b> . <b>Remember:</b> The pulmonary veins are the exception because they are the only veins that carry <b>oxygenated</b> blood.                       | <b>pulmonary</b> (PUL-moh-nair-ee)<br><b>pulmon/o-</b> lung<br><b>-ary</b> pertaining to                                                                |
| <b>portal veins</b>       | The <b>portal veins</b> carry deoxygenated blood from the intestines and liver to the inferior vena cava. The portal veins are named for the porta hepatis, an opening (or portal) in the liver where blood vessels enter and exit.                                                                    | <b>portal</b> (POR-tal)<br><b>port/o-</b> point of entry<br><b>-al</b> pertaining to                                                                    |
| <b>fibular veins</b>      | The <b>fibular veins</b> carry deoxygenated blood from the lateral sides (little toe sides) of the lower legs to the femoral veins. The fibular veins are named for the fibula bones in the lower legs.                                                                                                | <b>fibular</b> (FI-byoo-lar)<br><b>fibul/o-</b> fibula<br><b>-ar</b> pertaining to                                                                      |
| <b>saphenous veins</b>    | The <b>saphenous veins</b> carry deoxygenated blood from the lower legs to the femoral veins. The saphenous veins take their name from a Latin word that means clearly visible, as these veins often can be observed under the skin along the length of the legs.                                      | <b>saphenous</b> (SAF-eh-nuhs)<br><b>saphen/o-</b> clearly visible<br><b>-ous</b> pertaining to                                                         |

## Feature Boxes

These spark students' interest with information related to the real world of medicine.

**Across the Life Span** This feature box presents medical information related to the stages of life—from pediatrics to geriatrics.

### Across the Life Span

**Pediatrics.** Babies are evaluated by a pediatrician for their ability to attain developmental milestones. A typical 1-month-old baby can lift its head only briefly. By 3 months of age, most babies have developed the muscular coordination to turn over in bed. One of the next developmental milestones is being able to lift up the head and chest (Figure 9-17 ■).



**FIGURE 9-17 ■ Growth and development milestones.**

This baby can lift his head and support his entire upper body with his arms, an activity that requires strength and coordination of the muscles of the neck, shoulders, and arms.

**Geriatrics.** Throughout life, regular exercise is an important part of wellness and physical fitness. Aging and chronic disease can limit mobility and decrease muscle strength. The size and strength of the muscles decrease over time. There is less flexibility because elastic muscle tissue is replaced by fibrous connective tissue, but active exercise helps maintain muscle strength and flexibility.

**Dive Deeper** This feature box presents additional details related to a particular chapter topic.

### Dive Deeper

Erythrocytes contain genetic material that determines a person's **blood type**. Each blood type is named for its **antigen** (protein molecule on the cell membrane of the erythrocyte). The two major blood groups based on these antigens are the ABO blood group and the Rh blood group.

The **ABO blood group** includes four different blood types: A, B, AB, and O. Type A blood contains A antigens on the erythrocytes, type B has B antigens, and type AB has both antigens. Type O blood has neither A nor B antigens on the erythrocytes. Each blood type has antibodies in the plasma against other blood types.

The **Rh blood group** has many different antigens, collectively known as the **Rh factor**. The Rh factor is either present on the erythrocytes or not. When these antigens are present, the blood type is Rh positive. When these antigens are not present, the blood type is Rh negative.

The ABO and the Rh blood groups are always considered together. For example, type AB blood is either AB positive (Rh positive) or AB negative (Rh negative).



**antigen** (AN-tih-jen)

*Antigen* is a combination of part of the word *antibody* and the suffix **-gen** (that which produces).

*Rh* is an abbreviation for *Rhesus*, a monkey that also has this same blood factor as humans do.

### Clinical Connections

This feature highlights the relationships between chapter materials and other medical specialties.

### Clinical Connections

**Public Health.** A female born today has a 1 in 8 chance of developing breast cancer sometime in her life. Breast cancer is the second-most common type of cancer in women (lung cancer is the most common). Males can also develop breast cancer. October is National Breast Cancer Awareness Month. Females are encouraged to do monthly breast self-examinations and have an annual mammography to detect early breast cancer. Early detection and treatment have decreased the death rate from breast cancer by 40% since the 1990s (Figure 13-22 ■).



**FIGURE 13-22 ■ Breast cancer awareness.**

A pink ribbon is the universal symbol for breast cancer awareness.

**Word Alert** This feature presents information about the nuances and peculiarities of medical language, based on selected bolded words in the chapter. This feature includes topics such as Abbreviations, Sound-Alike Words, and It's Greek to Me! (how Greek and Latin combining forms remain a part of medical language today).

### Word Alert

#### Sound-Alike Words

**reflex** (noun) involuntary, automatic response of the muscular–nervous pathway  
**Example:** *The patient's knee jerk reflexes were equal bilaterally.*

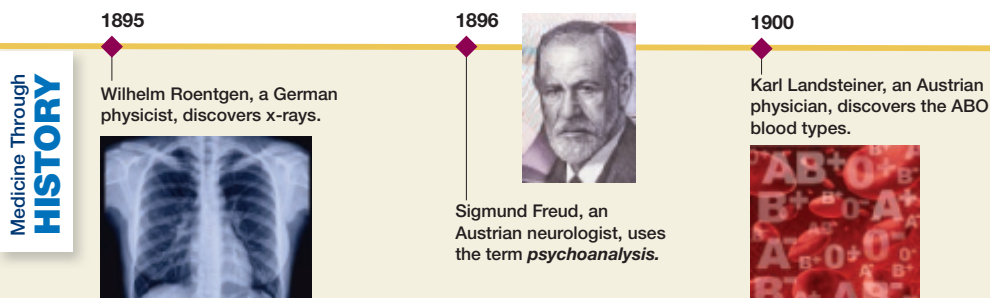
**reflux** (noun) backward flowing of fluid  
**Example:** *Acid reflux from the stomach can cause inflammation and ulcers in the esophagus.*

**Beneath the Surface** This new feature presents in-depth information on a particular topic that has recently been in the news and is related to that chapter. Examples of topics are shown here.

### Beneath the Surface

- Skin allergy testing (Chapter 3, Dermatology)
- COVID-19 pandemic and vaccines (Chapter 5, Pulmonology)
- Trauma associated with sports (Chapter 10, Neurology)
- Assisted reproductive technology (Chapter 13, Gynecology and Obstetrics)
- Opioid-related lawsuits against drug manufacturers and pharmacies (Chapter 17, Psychiatry)
- The use of artificial intelligence in nuclear medicine (Chapter 19, Radiology and Nuclear Medicine)

**Medicine through History** This new feature found in the table of contents is a visual representation of the history of medicine.



# Appendixes

Appendixes A and B can be found at the end of the textbook. Appendix C can be found online.

**Appendix A: Glossary of Medical Word Parts: Prefixes, Combining Forms, and Suffixes** Appendix A gathers all medical word parts in the textbook into one table. Prefixes, combining forms, and suffixes and their meanings are indicated by color shading.

## Appendix A

### Glossary of Medical Word Parts: Prefixes, Combining Forms, and Suffixes

#### Notes:

Rows shaded in orange contain **Prefixes**, abbreviated **P** in the Word Part Abbreviation column.

Rows shaded in blue contain **Combining Forms**, abbreviated **CF**.

Rows without shading contain **Suffixes**, abbreviated **S**.

| A          |                    |                        |
|------------|--------------------|------------------------|
| Word Part  | Meaning            | Word Part Abbreviation |
| a-         | away from; without | P                      |
| ab-        | away from          | P                      |
| abdomin/o- | abdomen            | CF                     |
| ablat/o-   | destroy; take away | CF                     |
| -able      | able to be         | S                      |
| abort/o-   | stop prematurely   | CF                     |
| abras/o-   | scrape off         | CF                     |
| absorb/o-  | absorb; take in    | CF                     |

## Appendix B: Glossary of Medical Abbreviations, Acronyms, and Short Forms

Appendix B gathers the abbreviations, etc., from each chapter.

## Appendix B

### Glossary of Medical Abbreviations, Acronyms, and Short Forms

#### Notes:

\*Abbreviations with an asterisk are those that have been flagged by The Joint Commission or the Institute of Safe Medication Practices as a source of errors. They should not be used. They are included here, however, because some practitioners and institutions still use them, and therefore you need to know what they mean.

\*\*This abbreviation is still in use, but many hospitals have removed it from their official list of abbreviations because it has an undesirable meaning that is unrelated to medicine.

| A          |                                                                                               |           |                                          |
|------------|-----------------------------------------------------------------------------------------------|-----------|------------------------------------------|
| A          | blood type A in the ABO blood group                                                           | AKA       | above-the-knee amputation                |
| A&P        | anatomy and physiology; auscultation and percussion                                           | AKI       | acute kidney injury                      |
| AB         | blood type AB in the ABO blood group                                                          | ALP       | alkaline phosphatase                     |
| AB, Ab     | abortion                                                                                      | ALS       | amyotrophic lateral sclerosis            |
| ABCDE rule | asymmetry, border, color, diameter, evolving                                                  | ALT       | alanine transaminase                     |
| ABD, abd   | abdomen                                                                                       | AMD       | age-related macular degeneration         |
| ABG        | arterial blood gases                                                                          | anti-CCP  | anti-cyclic citrullinated peptide        |
| ABR        | auditory brainstem response                                                                   | AODM      | adult-onset diabetes mellitus            |
| ACE        | angiotensin-converting enzyme                                                                 | AP        | anteroposterior                          |
| ACT        | activated clotting time                                                                       | AQI       | Air Quality Index                        |
| ACTH       | adrenocorticotrophic hormone                                                                  | ARDS      | acute respiratory distress syndrome      |
| AD, A.D.*  | right ear (Latin, <i>auris dextra</i> )                                                       | ARF       | acute renal failure                      |
| ADA        | American Diabetes Association; American Dietetic Association; Americans with Disabilities Act | ARMD      | age-related macular degeneration         |
|            |                                                                                               | ART       | assisted reproductive technology         |
|            |                                                                                               | AS, A.S.* | left ear (Latin, <i>auris sinister</i> ) |
|            |                                                                                               | ASC       | ambulatory surgery center                |

**Appendix C: Answer Key** Appendix C gives the answer for every other exercise. It can be found online at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources).

## Appendix C

### Student's Answer Key

#### Chapter 1: Medical Language: Its Structure and Meaning

##### 1.1 Practice Laps

###### A. Matching Exercise

3, 4, 6, 5, 7, 2, 1

###### B. True or False Exercise

###### B. Matching Exercise

4, 17, 6, 8, 14, 11, 7, 3, 12, 15, 2, 5, 10, 1, 16, 13, 9

###### C. True or False Exercise

1. T

3. T

5. T

###### D. English Plural Noun Exercise

1. hormones

5. ovaries

# MyLab Medical Terminology™

## What Is MyLab Medical Terminology™?

MyLab Medical Terminology™ is a flexible and engaging online program that gives you, the student, the opportunity to test your understanding of information, concepts, and medical language to see how well you know the material. From the test results, MyLab Medical Terminology builds a self-paced, personalized study plan unique to your needs. Remediation in the form of exercises, audio segments, and video clips is provided for those areas in which you may need additional instruction, review, or reinforcement. You can then work through the program until your study plan is complete and you have mastered the content. MyLab Medical Terminology is available with an embedded etextbook.

MyLab Medical Terminology™ is organized to follow the chapters and learning outcomes in *Medical Language*, Sixth Edition. With MyLab Medical Terminology, you can track your own progress through your entire course.



## How Do Students Benefit?

Here's how MyLab Medical Terminology helps you:

- Keep up with information presented in the text and lectures.
- Save time by focusing your study to review just the content you need.
- Increase your understanding of difficult concepts with study material that is appropriate for different learning styles.
- Practice building, pronouncing, and spelling medical terms.



## Key Features of MyLab Medical Terminology

**Interactive Study Games.** Fun and engaging activities give students practice building words, labeling body parts, and spelling and pronouncing medical terms with technology that assesses and scores students' skills as they can continue to improve.

**Personalized Study Plan and Materials.** Based on test results, you will receive a personalized study plan, highlighting areas where you may need improvement.

## How Do Instructors Benefit?

- Save time by providing students with a comprehensive, media-rich study program.
- Track students' understanding of course content in the program gradebook.
- Monitor students' activity with viewable student assignments.





# Contents

## Part I Introduction to Medical Language

### Chapter 1: Medical Language: Its Structure and Meaning 2

- 1.1 Medical Language** 3
  - Medical Language Skills 3
  - The Origins of Medical Language 4
- 1.2 Medical Nouns and Word Parts** 5
  - Singular and Plural Medical Nouns 5
  - Word Parts 6
- 1.3 Use Medical Words** 14
  - Divide Medical Words 14
  - Medical Word with a Prefix, Combining Form, and Suffix 14
  - Build Medical Words 15
  - Spell Medical Words 17
  - Pronounce Medical Words 17

#### Chapter Review Exercises 22



### Chapter 2: Health Care Today 26

- 2.1 The Body in Health** 27
  - Health 27
- 2.2 The Body in Disease** 36
  - Disease 36
- 2.3 Medical Specialties and Specialists** 44
  - Body Systems, Medical Specialties, and Specialists 44
- 2.4 Healthcare Professionals** 52
  - Physicians 52
  - Physician Extenders 52
  - Nurses 52
  - Allied Health Professionals 53
- 2.5 Healthcare Settings** 53
  - Hospital 53
  - Physician's Office 53
  - Clinic 54
  - Ambulatory Surgery Center 54
  - Long-Term Care Facility 54
  - Home Health Agency 54
  - Hospice 55
- 2.6 History and Physical Examination** 55
- 2.7 Electronic Health Records** 57
  - Types of Documents in the Electronic Health Record 57
  - Standard Headings in Healthcare Documents 57

#### Chapter Review Exercises 66



1550 BCE



The Egyptians create the Ebers papyrus of herbal knowledge.

475 BCE

The Chinese write a document on the treatment of disease.



377 BCE

Hippocrates, a Greek physician, is the father of modern medicine.



## Part II Medical Specialties and Body Systems

### Chapter 3: Dermatology • Integumentary System 72

#### 3.1 Anatomy 73

- Skin 73
- Nails 75
- Subcutaneous Tissue 77

#### 3.2 Physiology 80

#### 3.3 Diseases 86

- General 86
- Skin Color Conditions 88
- Skin Injuries 90
- Skin Infections 93
- Skin Infestations 95
- Allergic Skin Conditions 96
- Benign Neoplasms of the Skin 96
- Malignant Neoplasms of the Skin 98
- Autoimmune Disorders of the Skin 99
- Diseases of the Sebaceous Glands 100
- Diseases of the Sudoriferous Glands 101
- Diseases of the Hair 102
- Diseases of the Nails 102

#### 3.4 Laboratory and Diagnostic Procedures 105

#### 3.5 Medical Procedures, Drugs, and Surgical Procedures 108

- Medical Procedures 108
- Drugs 110
- Surgical Procedures 112

#### Chapter Review Exercises 117



### Chapter 4: Gastroenterology • Gastrointestinal System 128

#### 4.1 Anatomy 129

- Upper Gastrointestinal System 129
- Lower Gastrointestinal System 132
- Abdominopelvic Cavity 133
- Accessory Organs 134

#### 4.2 Physiology 138

- Digestion 138
- Absorption 140
- Elimination 140

#### 4.3 Diseases 147

- Eating 147
- Oral Cavity and Salivary Glands 147
- Esophagus and Stomach 148
- Duodenum, Jejunum, Ileum 150
- Cecum and Colon 151
- Rectum and Anus 154
- Defecation and Feces 155
- Abdominal Wall and Abdominopelvic Cavity 156
- Liver 158
- Gallbladder and Bile Ducts 162
- Pancreas 164

#### 4.4 Laboratory, Diagnostic, and Radiologic Procedures 166

- Laboratory Tests and Diagnostic Procedures 166
- Radiologic and Nuclear Medicine Procedures 168

#### 4.5 Medical Procedures, Drugs, and Surgical Procedures 172

- Medical Procedures 172
- Drugs 173
- Surgical Procedures 174

#### Chapter Review Exercises 182



1500

The toothbrush is invented in China.



1529

Ambroise Paré of France does the first amputation and invents the artificial leg.



1543

Andreas Vesalius, of Belgium, writes and illustrates the first anatomy book.



## Chapter 5: Pulmonology • Respiratory System 194

- 5.1 Anatomy** 195
  - Upper Respiratory System 195
  - Lower Respiratory System 196
- 5.2 Physiology** 201
  - Processes of Respiration 201
- 5.3 Diseases** 207
  - Nose and Pharynx 207
  - Trachea, Bronchi, and Bronchioles 208
  - Lungs 209
  - Thorax 219
  - Respiration 220
  - Oxygen and Carbon Dioxide 221
- 5.4 Laboratory, Diagnostic, and Radiologic Procedures** 224
  - Laboratory Tests and Diagnostic Procedures 224
  - Radiologic and Nuclear Medicine Procedures 226
- 5.5 Medical Procedures, Drugs, and Surgical Procedures** 228
  - Medical Procedures 228
  - Drugs 234
  - Surgical Procedures 235



### Chapter Review Exercises 241

## Chapter 6: Cardiology • Cardiovascular System 252

- 6.1 Anatomy** 253
  - Heart 253
  - Thoracic Cavity and Mediastinum 256
  - Blood Vessels 256
  - Circulation 262
- 6.2 Physiology** 268
- 6.3 Diseases** 275
  - Heart 275
  - Blood Vessels 279
  - Conduction System 284
- 6.4 Laboratory, Diagnostic, and Radiologic Procedures** 288
  - Laboratory Tests 288
  - Diagnostic Procedures 289
  - Radiologic and Nuclear Medicine Procedures 292
- 6.5 Medical Procedures, Drugs, and Surgical Procedures** 295
  - Medical Procedures 295
  - Drugs 298
  - Surgical Procedures 299



### Chapter Review Exercises 306

1608

Galileo Galilei, an Italian physicist, invents the microscope.



1616

William Harvey, a British physician, describes the circulation of the blood.



1714

Gabriel Fahrenheit, a German physicist, invents the thermometer.



## Part II Medical Specialties and Body Systems

### Chapter 7: Hematology and Immunology •

#### *Blood and Lymphatic System* 318

##### 7.1 Anatomy 319

Anatomy of the Blood 319  
Anatomy of the Lymphatic System 325

##### 7.2 Physiology 331

Blood Clotting 331  
Allergic Reaction 332  
Immune Response 333

##### 7.3 Diseases 342

Blood 342  
Erythrocytes 343  
Leukocytes 345  
Thrombocytes and Blood Clotting 347  
Lymphatic System 349  
Autoimmune Disorders 351

##### 7.4 Laboratory, Diagnostic, and Radiologic Procedures 354

Blood Cell Tests 354  
Coagulation Time Tests 355  
Other Blood Tests 356  
Urine Tests 357  
Radiologic Procedures 357

##### 7.5 Medical Procedures, Drugs, and Surgical Procedures 359

Medical Procedures 359  
Drugs 361  
Surgical Procedures 362

#### Chapter Review Exercises 367



### Chapter 8: Orthopedics •

#### *Skeletal System* 378

##### 8.1 Anatomy 379

Bones of the Axial Skeleton 379  
Bones of the Appendicular Skeleton 385  
The Structure of Bone 389  
Joints, Cartilage, and Ligaments 390

##### 8.2 Physiology 396

##### 8.3 Diseases 404

Bones 404  
Bones of the Chest 409  
Bones of the Spine 409  
Bones of the Lower Extremity 411  
Joints, Cartilage, and Ligaments 412

##### 8.4 Laboratory, Diagnostic, and Radiologic Procedures 416

Laboratory Tests and Diagnostic Procedures 416  
Radiologic and Nuclear Medicine Procedures 416

##### 8.5 Medical Procedures, Drugs, and Surgical Procedures 418

Medical Procedures 418  
Drugs 420  
Surgical Procedures 421

#### Chapter Review Exercises 428



1816

Rene Laennec, a French physician, invents the stethoscope.



1849

Elizabeth Blackwell, a British physician, becomes the first woman to receive a medical degree in the United States.



1851

Hermann von Helmholtz, a German physiologist, invents the ophthalmoscope.





## Chapter 9: Orthopedics • Muscular System 438

### 9.1 Anatomy 439

- Types of Muscles 439
- Tendons and Related Structures 439
- Muscle Origins and Insertions 440
- Muscle Names 441
- Muscles of the Head and Neck 441
- Muscles of the Shoulders, Chest, and Back 442
- Muscles of the Upper Extremity 443
- Muscles of the Abdomen 444
- Muscles of the Lower Extremity 445

### 9.2 Physiology 450

- Components and Responses of Muscles 450
- Types of Muscle Movement 451

### 9.3 Diseases 460

- Diseases of the Muscles and Related Structures 460
- Diseases of the Bursa, Fascia, or Tendon 465
- Movement Disorders 467

### 9.4 Laboratory, Diagnostic, and Radiologic Procedures 470

- Blood Tests 470
- Muscle Tests 470

### 9.5 Medical Procedures, Drugs, and Surgical Procedures 471

- Medical Procedures 471
- Drugs 473
- Surgical Procedures 475

## Chapter Review Exercises 479



## Chapter 10: Neurology • Nervous System 488

### 10.1 Anatomy 489

- Central Nervous System 489
- Peripheral Nervous System 496
- Autonomic Nervous System 498
- Somatic Nervous System 499
- Neurons and Neuroglia 499

### 10.2 Physiology 504

- Neurons and Neurotransmitters 504

### 10.3 Diseases 512

- Brain 512
- Spinal Cord 525
- Nerves 528

### 10.4 Laboratory, Diagnostic, and Radiologic Procedures 534

- Laboratory Tests 534
- Radiologic and Nuclear Medicine Procedures 535
- Other Diagnostic Tests 536

### 10.5 Medical Procedures, Drugs, and Surgical Procedures 539

- Medical Procedures 539
- Drugs 542
- Surgical Procedures 543

## Chapter Review Exercises 548



1853

Alexander Wood, a Scottish physician, invents the syringe.



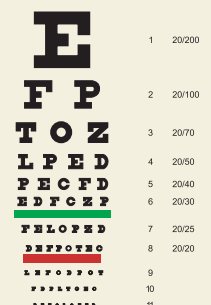
1859

Louis Pasteur, a French chemist, discovers that microorganisms cause disease.



1862

Hermann Snellen, a Dutch physician, invents the Snellen eye chart.



XXXV

## Part II Medical Specialties and Body Systems

### Chapter 11: Urology • Urinary System 560

- 11.1 Anatomy** 561
  - Kidneys 561
  - Ureters 562
  - Bladder 564
  - Urethra 564
- 11.2 Physiology** 567
- 11.3 Diseases** 575
  - Kidneys and Ureters 575
  - Bladder 579
  - Urethra 580
  - Urine and Urination 581
- 11.4 Laboratory, Diagnostic, and Radiologic Procedures** 585
  - Laboratory Tests and Diagnostic Procedures 585
  - Radiologic and Nuclear Medicine Procedures 588
- 11.5 Medical Procedures, Drugs, and Surgical Procedures** 592
  - Medical Procedures 592
  - Drugs 594
  - Surgical Procedures 595



### Chapter 12: Male Reproductive Medicine • Male Genitourinary System 612

- 12.1 Anatomy** 613
  - External Genitalia 613
  - Internal Genitalia 615
  - External Genitalia 616
- 12.2 Physiology** 620
  - Secretion of Hormones 620
  - Development of Male Secondary Sexual Characteristics 620
  - Production of Sperm 620
  - Ejaculation 621
- 12.3 Diseases** 626
  - Male Breast 626
  - Testis and Epididymis 626
  - Prostate Gland 628
  - Penis 628
- 12.4 Laboratory, Diagnostic, and Radiologic Procedures** 634
  - Laboratory Tests and Diagnostic Procedures 634
  - Radiologic and Nuclear Medicine Procedures 636
- 12.5 Medical Procedures, Drugs, and Surgical Procedures** 637
  - Medical Procedures 637
  - Drugs 638
  - Surgical Procedures 639



#### Chapter Review Exercises 602

#### Chapter Review Exercises 646

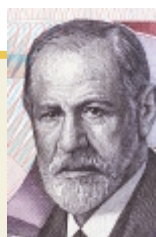
1895

Wilhelm Roentgen, a German physicist, discovers x-rays.



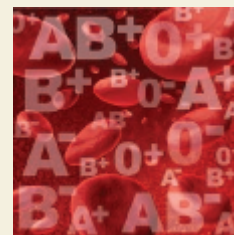
1896

Sigmund Freud, an Austrian neurologist, uses the term *psychoanalysis*.



1900

Karl Landsteiner, an Austrian physician, discovers the ABO blood types.



## Chapter 13: Gynecology and Obstetrics • Female Genital and Reproductive System 656

### 13.1 Anatomy 658

- Internal Genitalia 658
- External Genitalia 661

### 13.2 Physiology 667

- Secretion of
  - Hormones 667
- Primary and
  - Secondary Sexual
    - Characteristics 667
- Production of Ova 667
- The Menstrual Cycle 669
- Conception 670
- Labor and Delivery 672
- The Newborn 674
- Lactation 675

### 13.3 Diseases 684

- Ovaries and Uterine Tubes 684
- Uterus 686
- Menstrual Disorders 687
- Cervix 689
- Vagina 689
- Breasts 691
- Pregnancy and Labor and Delivery 692
- Fetus and Neonate 697



### 13.4 Laboratory, Diagnostic, and Radiologic Procedures 700

- Gynecologic Tests and Procedures 700
- Infertility Diagnostic Tests 702
- Pregnancy and Prenatal Diagnostic Tests 703
- Radiologic Procedures 704

### 13.5 Medical Procedures, Drugs, and Surgical Procedures 707

- Medical Procedures of the External and Internal
  - Genitalia 707
- Medical Procedures of the Breast 708
- Medical Procedures for Conception, Labor, and
  - Delivery 708
- Drugs 711
- Surgical Procedures of the Uterus, Uterine Tubes, and
  - Ovaries 712
- Surgical Procedures of the Cervix and Vagina 715
- Surgical Procedures of the Breast 715
- Surgical Procedures for Obstetrics 717

### Chapter Review Exercises 724

1905

Nikolai Korotkoff, a Russian surgeon, discovers the systolic and diastolic blood pressure.



1906

Alois Alzheimer, a German physician, first described the symptoms of Alzheimer disease.



## Part II Medical Specialties and Body Systems

### Chapter 14: Endocrinology • Endocrine System 736

#### 14.1 Anatomy 738

- Hypothalamus 738
- Pituitary Gland 738
- Pineal Gland 740
- Thyroid Gland 741
- Parathyroid Glands 741
- Thymus Gland 741
- Pancreas 742
- Adrenal Glands 743
- Ovaries 744
- Testes 744

#### 14.2 Physiology 747

- Hormone Actions 747

#### 14.3 Diseases 754

- Anterior Pituitary Gland 754
- Posterior Pituitary Gland 756
- Pineal Gland 757
- Thyroid Gland 757
- Parathyroid Glands 760
- Pancreas 761
- Adrenal Cortex 764
- Adrenal Medulla 767
- Ovaries 767
- Testes 767



#### 14.4 Laboratory, Diagnostic, and Radiologic Procedures 770

- Blood Tests 770
- Urine Tests 772
- Radiologic Procedures 773

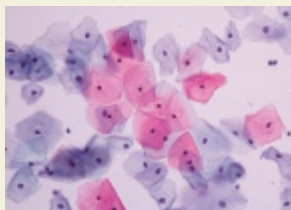
#### 14.5 Medical Procedures, Drugs, and Surgical Procedures 774

- Medical Procedures 774
- Drugs 774
- Surgical Procedures 776

#### Chapter Review Exercises 780

1943

George Papanicolaou, a Greek physician, invents the Pap test.



1948

Virginia Apgar, an American physician, develops the Apgar score for newborn assessment.





## Chapter 15: Ophthalmology • Eye 792

### 15.1 Anatomy 793

Anatomy of the Anterior Eye 793

Anatomy of the Posterior Eye 798

### 15.2 Physiology 803

### 15.3 Diseases 808

Eyelids 808

Lacrimal Glands 809

Conjunctiva, Sclera, and Cornea 810

Extraocular Muscles 811

Iris, Pupil, and Anterior Chamber 811

Lens 813

Posterior Cavity and Retina 814

Refractive Disorders of the Eyes 817

Conditions of the Visual Cortex in the Brain 818

### 15.4 Laboratory, Diagnostic, and Radiologic Procedures 821

Laboratory Tests and Diagnostic Procedures 821

Radiologic Procedures 821

### 15.5 Medical Procedures, Drugs, and Surgical Procedures 822

Medical Procedures 822

Drugs 827

Surgical Procedures 827

## Chapter Review Exercises 835



## Chapter 16: Otolaryngology • Ears, Nose, and Throat 844

### 16.1 Anatomy 845

Ear 845

Nose and Sinuses 848

Mouth 850

Pharynx 850

Larynx 851

### 16.2 Physiology 856

Hearing 856

Olfaction 857

Balance 857

### 16.3 Diseases 863

Ears 863

Sinuses, Nose, and Nasal Cavity 867

Oral Cavity and Pharynx 869

Larynx and Neck 872

### 16.4 Laboratory, Diagnostic, and Radiologic Procedures 875

Hearing Tests 875

Laboratory and Radiologic Tests 877

### 16.5 Medical Procedures, Drugs, and Surgical Procedures 879

Medical Procedures 879

Drugs 880

Surgical Procedures 881

## Chapter Review Exercises 888



1952

John Gibbon, an American surgeon, uses the heart-lung machine during heart surgery.



1957



Peter Safar, an Australian anesthesiologist invents the ABC (airway, breathing, circulation) method that leads to cardiopulmonary resuscitation (CPR).

1958



Rune Elmquist, a Swedish physician, invents the implantable cardiac pacemaker.

xxxix

## Part III Other Medical Specialties

### Chapter 17: Psychiatry 898

#### 17.1 Anatomy 899

Limbic System 899

Frontal Lobe of the Cerebrum 900

#### 17.2 Physiology 901

#### 17.3 Psychiatric Disorders 905

Anxiety, Panic, and Phobia Disorders 905

Bipolar and Depressive Disorders 907

Disruptive, Impulse-Control, and Conduct Disorders 910

Dissociative Disorders 911

Eating and Elimination Disorders 912

Gender Dysphoria 913

Neurocognitive Disorders 914

Neurodevelopmental Disorders 914

Obsessive-Compulsive Disorders 915

Paraphilic Disorders 917

Personality Disorders 918

Schizophrenia and Psychotic Disorders 919

Somatic Symptom and Factitious Disorders 920

Substance-Related Disorders 922

Trauma- and Stress-Related Disorders 924

#### 17.4 Laboratory and Diagnostic Procedures 927

Blood and Urine Tests 927

Radiologic Procedures 927

Psychiatric Procedures and Tests 927

#### 17.5 Medical Procedures, Drugs, and Psychiatric Therapies 930

Medical Procedures 930

Drugs 931

Psychiatric Therapies 932



### Chapter 18: Oncology 946

#### 18.1 Anatomy 947

#### 18.2 Physiology 949

Physiology of Normal

Cell Division 949

Physiology of Cancer

Cell Division and

Growth 950

Factors that Contribute  
to the Development  
of Cancer 950

#### 18.3 Cancer 956

General Terminology 956

Characteristics of Cancer Cells and Cancerous  
Tumors 957

Progression of Cancer Cells and Cancerous Tumors 958

Cancers Related to Body Systems 959

Cancer of Blood Cells and Lymphatic Tissue 960

Carcinoma 961

Embryonal Cell Cancer 962

Glioma 963

Sarcoma 964

#### 18.4 Laboratory, Diagnostic, and Radiologic Procedures 968

Blood Tests 968

Cytology Tests 969

Urine Test 972

Radiology and Nuclear Medicine Procedures 972

#### 18.5 Medical Procedures, Drugs, Radiation Therapy, and Surgical Procedures 975

Medical Procedures 975

Chemotherapy Drugs 976

Radiation Therapy 978

Surgical Procedures 979



### Chapter Review Exercises 938

### Chapter Review Exercises 987

1962



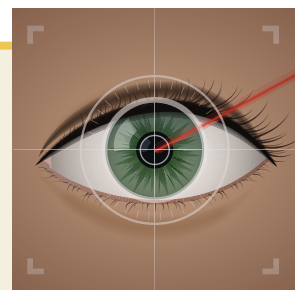
James Watson, an American biologist, and Francis Crick, a British neuroscientist, identify the double-helix structure of DNA.

1967

Christiaan Barnard, a South African surgeon, performs a heart transplant.



1988



Patricia Bath, a Black American surgeon, performs laser cataract surgery.

## Chapter 19: Radiology and Nuclear Medicine 996

### 19.1 Radiographic Procedures That Use X-rays 997

Introduction to Radiography 997  
Mammography 1000  
Bone Density Testing 1000  
Computerized Axial Tomography 1001

### 19.2 Radiographic Procedures That Use Other Technologies 1003

Radiographic Procedures That Use Contrast 1003  
Radiographic Procedures That Use Contrast and Fluoroscopy 1006  
Magnetic Resonance Imaging 1006  
Ultrasonography 1008

### 19.3 Nuclear Medicine 1012

Nuclear Medicine Procedures That Use Gamma Rays 1012  
Nuclear Medicine Procedures That Use Positrons 1014

### Chapter Review Exercises 1017



## Appendices

**Appendix A:** Glossary of Medical Word Parts: Prefixes, Combining Forms, and Suffixes A-1

**Appendix B:** Glossary of Medical Abbreviations, Acronyms, and Short Forms B-1

**Appendix C:** Student's Answer Key\* C-1

\*Appendix C can be found online at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources)

## Index IN-1

1992

William Bargar, an American surgeon, performs robotic surgery.



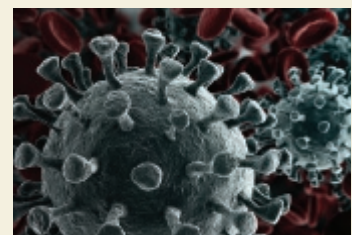
2000

Francis Crick, a British neuroscientist, and others complete the map of the human genome.



2020

World Health Organization declares the COVID-19 coronavirus to be a worldwide pandemic.



# 1

# Medical Language: Its Structure and Meaning

Medical language (MED-ih-kal LANG-gwij) is the framework on which the practice of medicine is built.

## Chapter Overview and Learning Outcomes

*After you study this chapter, you should be able to demonstrate an understanding of these learning outcomes by successfully completing the chapter exercises.*

### 1.1 Medical Language

Identify the five skills of medical language communication.

Describe the origins of medical language.

1.1 Practice Laps

### 1.2 Medical Nouns and Word Parts

Form the plural of common English, Greek, and Latin medical nouns.

Identify the characteristics of word parts (combining form, suffix, prefix).

Give the meaning of common medical word parts.

1.2 Practice Laps

### 1.3 Use Medical Words

Divide medical words into word parts.

Build medical words from word parts.

Spell and pronounce common medical words.

1.3 Practice Laps

### Vocabulary Review

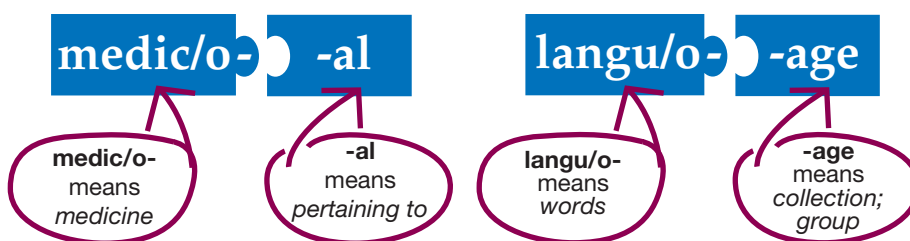
### Career Focus

### Chapter Review Exercises

**Dive In:** Medical Language Exercises  
(Learning Outcomes 1.1–1.3)

## Medical Language Key

To unlock the definition of a medical word, first divide it into word parts. Next give the meaning of each word part. Then put the meanings of the word parts in order, beginning with the meaning of the suffix, then the meaning of the prefix (if there is one), and then the meaning of the combining form.





# 1.1 Medical Language

You are about to begin the study of medical language! Right now, medical words may seem complex, but, as you study, you will learn their meanings (Figure 1-1 ■).

Studying medical language involves time and effort, but healthcare professionals know that there is no substitute for a thorough, working knowledge of medical language. **Medical language** is the language of health care and medicine, and medical words are the “tools of the trade” (Figure 1-2 ■). Learning medical language is the key to a successful healthcare career!



**FIGURE 1-1 ■ Medical language.**

Medical words are like puzzles, and their word parts are like the pieces. If you put the pieces together correctly, you can understand the meaning of the medical word.

Source: David Koscheck/Shutterstock

## Pronunciation/Word Parts

**medical** (MED-ih-kal)

**medic/o-** medicine

**-al** pertaining to

**language** (LANG-gwij)

**langu/o-** words

**-age** collection; group

**terminology** (TER-mih-NAW-loh-jee)

**termin/o-** boundary; end; word

**-logy** study of



A.



B.

**FIGURE 1-2 ■ Medical language.**

**A.** These paramedics are using medical language as they describe the condition of the patient in the ambulance to healthcare professionals in the hospital's emergency department. **B.** This nurse is analyzing a patient's electronic medical record as she communicates with the patient's physician during a teleconference. How important do you think it is for each of these healthcare professionals to have a thorough, working knowledge of medical language?

Source: **A.** LightField Studios/Shutterstock; **B.** Ariel Skelley/DigitalVision/Getty images

## Did You Know?

There is more than one way to learn medical language. Which one do you prefer?

1. Memorize a medical dictionary.
2. Take courses in Latin and Greek.
3. Study *Medical Language* and become fluent in medical language!

## Medical Language Skills

**Communication** in any language involves some combination of five language skills. These same skills apply to medical language. To access the broadest array of career opportunities, you need to become proficient in these skills in order to communicate on the job with other healthcare professionals.

**communication** (koh-MYOO-nih-KAY-shun)

**communic/o-** impart; transmit

**-ation** being; having; process

**1. Reading medical words****2. Hearing medical words**

These first two skills involve receiving medical language. This is similar to input coming into a computer.

**3. Thinking, analyzing, and understanding medical words**

This three-part skill involves processing medical language. This is similar to the processing function of a computer.

**4. Writing (or typing) and spelling medical words****5. Speaking and pronouncing medical words**

These two skills involve relaying medical language. This is similar to output coming from a computer.

Due to disabilities or a desire to communicate with people with disabilities, some people may use alternative means of becoming proficient in these language skills (such as sign language). *Medical Language* provides several ways to develop these skills and gives you many opportunities to practice and gain proficiency. For individuals who require accommodation in some of these areas due to disabilities, there are still career options that allow you to use the skills you have learned.

1. Reading
2. Hearing
3. Thinking, analyzing, and understanding
4. Writing (or typing) and spelling
5. Speaking and pronouncing

## The Origins of Medical Language

Let's start by exploring how medical language began. **Etymology** is the study of word origins. In medical language, many words came from other languages, particularly Greek and Latin. Why? Because in ancient times, both the Greeks and the Romans advanced the study and practice of medicine. They named anatomical structures, diseases, and treatments in their own languages, and many of these Greek and Latin words remain a part of medical language today. You'll be surprised by how many of these words are familiar to you.

### Pronunciation/Word Parts

**etymology** (ET-ih-MAW-loh-jee)

**etym/o-** word origin

**-logy** study of

### It's Greek to Me!

**Word Origins.** These medical words are identical to the original Greek and Latin words.

| Medical Word  | Language of Origin  |
|---------------|---------------------|
| <b>pelvis</b> | Latin <i>pelvis</i> |
| <b>sinus</b>  | Latin <i>sinus</i>  |
| <b>thorax</b> | Greek <i>thorax</i> |

These medical words are similar to the original Greek and Latin words.

| Medical Word   | Language of Origin    |
|----------------|-----------------------|
| <b>artery</b>  | Latin <i>arteria</i>  |
| <b>muscle</b>  | Latin <i>musculus</i> |
| <b>patient</b> | Latin <i>patiens</i>  |
| <b>sperm</b>   | Greek <i>sperma</i>   |
| <b>urine</b>   | Latin <i>urina</i>    |
| <b>vein</b>    | Latin <i>vena</i>     |

These medical words are similar to words from Old English, French, or Dutch.

| Medical Word     | Language of Origin          |
|------------------|-----------------------------|
| <b>bladder</b>   | Old English <i>blaedre</i>  |
| <b>drug</b>      | Old Dutch <i>droog</i>      |
| <b>heart</b>     | Old English <i>heorte</i>   |
| <b>physician</b> | Old French <i>physicien</i> |

## 1.1 PRACTICE LAPS

Use the Answer Key in Appendix C at [www.pearsonhighered.com/healthprofessionsresources](http://www.pearsonhighered.com/healthprofessionsresources) to check your answers.

### A. Matching Exercise

Match each word to its description.

- |              |                                                           |
|--------------|-----------------------------------------------------------|
| 1. bladder   | _____ medical word that is similar to a Latin word        |
| 2. drug      | _____ medical word that is similar to an Old French word  |
| 3. muscle    | _____ medical word that is similar to a Greek word        |
| 4. physician | _____ medical word that is identical to a Latin word      |
| 5. sinus     | _____ medical word that is identical to a Greek word      |
| 6. sperm     | _____ medical word that is similar to an Old Dutch word   |
| 7. thorax    | _____ medical word that is similar to an Old English word |

### B. True or False Exercise

Decide whether each statement is true or false. Insert **T** or **F** on the line.

- \_\_\_\_\_ Studying medical language involves time and effort.
- \_\_\_\_\_ Terminology is the study of word origins.
- \_\_\_\_\_ In ancient times, both the Greeks and Romans named anatomical structures, diseases, and treatments in their own languages.
- \_\_\_\_\_ All medical words originally came from the Latin language.
- \_\_\_\_\_ The medical word *pelvis* and the Latin word *pelvis* are identical.
- \_\_\_\_\_ Medical words are the “tools of the trade” for healthcare professionals.
- \_\_\_\_\_ Communication in any language consists of five language skills.

### C. Fill in the Blank Exercise

Name the five language skills.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

## 1.2 Medical Nouns and Word Parts

### Singular and Plural Medical Nouns

#### English Nouns

The rules for forming the plural of English words also apply to medical words. For most singular English nouns, form the plural by adding an -s.

**Examples:** *gland* becomes *glands*, *hormone* becomes *hormones*, *intestine* becomes *intestines*, *kidney* becomes *kidneys*, *lung* becomes *lungs*, *nerve* becomes *nerves*, *rib* becomes *ribs*, and *tonsil* becomes *tonsils*.

For some singular English nouns that end in *-y*, form the plural by changing the *-y* to *-ies*.

**Examples:** *artery* becomes *arteries*, and *ovary* becomes *ovaries*.

## Greek and Latin Nouns

The Greek and Latin languages are important sources of medical words. These languages had rules about how to form plural nouns, and those rules still apply today (Table 1-1 ■). **Note:** When a Greek or Latin noun appears in a chapter, there will be a note there to remind you of those rules.

**Table 1-1 Rules for Forming Greek and Latin Plural Nouns**

| Rule                                                                                                           | Singular Noun                    | Plural Noun                   |
|----------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|
| <b>Greek Singular and Plural Nouns</b>                                                                         |                                  |                               |
| 1. When a Greek singular noun ends in <i>-is</i> , form the plural by changing <i>-is</i> to <i>-ides</i> .    | iris                             | irides                        |
| 2. When a Greek singular noun ends in <i>-nx</i> , form the plural by changing <i>-nx</i> to <i>-nges</i> .    | phalanx                          | phalanges                     |
| 3. When a Greek singular noun ends in <i>-oma</i> , form the plural by changing <i>-oma</i> to <i>-omata</i> . | carcinoma                        | carcinomata                   |
| 4. When a Greek singular noun ends in <i>-on</i> , form the plural by changing <i>-on</i> to <i>-a</i> .       | ganglion                         | ganglia                       |
| <b>Latin Singular and Plural Nouns</b>                                                                         |                                  |                               |
| 1. When a Latin singular noun ends in <i>-a</i> , form the plural by changing <i>-a</i> to <i>-ae</i> .        | sclera<br>vertebra               | sclerae<br>vertebrae          |
| 2. When a Latin singular noun ends in <i>-us</i> , form the plural by changing <i>-us</i> to <i>-i</i> .       | alveolus<br>bronchus<br>thrombus | alveoli<br>bronchi<br>thrombi |
| 3. When a Latin singular noun ends in <i>-um</i> , form the plural by changing <i>-um</i> to <i>-a</i> .       | atrium<br>bacterium<br>ovum      | atria<br>bacteria<br>ova      |
| 4. When a Latin singular noun ends in <i>-is</i> , form the plural by changing <i>-is</i> to <i>-es</i> .      | diagnosis<br>testis              | diagnoses<br>testes           |
| 5. When a Latin singular noun ends in <i>-ex</i> , form the plural by changing <i>-ex</i> to <i>-ices</i> .    | apex<br>cortex                   | apices<br>cortices            |

## Word Parts

Medical words contain word parts. Most medical words have two word parts, but even the longest medical word has only three different types of word parts: a prefix, a combining form, and a suffix.

| Type of Word Part | Description                      |
|-------------------|----------------------------------|
| Prefix            | An optional word beginning       |
| Combining form    | The foundation of a medical word |
| Suffix            | A word ending                    |



## Combining Forms

The combining form is the foundation of a medical word, so let's begin by learning about combining forms. A combining form has the following characteristics:

- It is a word part that is the foundation of a medical word.
- It gives a medical word its main medical meaning.
- It has a root, a forward slash, a combining vowel, and a hyphen (Figure 1-3 ■). Usually, the combining vowel is an *o*, but occasionally it is an *a*, *e*, *i*, or *y*. The hyphen shows that a combining form is a word part, not a complete word.

**FIGURE 1-3 ■ Combining form.**

A combining form contains a root, forward slash, combining vowel, and hyphen. The forward slash and hyphen show that the combining form is a word part, not a complete word. When the combining form becomes part of a medical word, the forward slash and hyphen are deleted. The combining form **cardi/o-** means *heart*.



- Most medical words contain a combining form. Some medical words have two combining forms, one right after the other. *Example: cardiovascular* (the combining forms are **cardi/o-** and **vascul/o-**). Some medical words (such as *blood, drug, health, heart, or nurse*) do not contain a combining form.
- Two combining forms can have the same medical meaning because each is from a different language. Why? In ancient times, the Greeks and Romans independently advanced the study and practice of medicine, naming things in their own languages. Combining forms from Greek and Latin remain a part of medical language today. For example, the combining forms **enter/o-** (Greek) and **intestin/o-** (Latin) both mean *intestine*. When one of these is mentioned, there will be a note to remind you that there is another combining form that means the same thing or something very similar.

## Did You Know?

In *Medical Language*, each time a word part is mentioned, it is in **bold blue type** (Table 1-2 ■). This is to help you recognize that it is a word part. *Note:* Remember, word parts are not actual medical words. Now let's explore some common combining forms and their meanings.

**Table 1-2 Common Combining Forms and Their Meanings**

| Combining Form that Is Nearly Identical to Its Medical Meaning |               |               |
|----------------------------------------------------------------|---------------|---------------|
| Combining Form                                                 | Meaning       |               |
| <b>abdomin/o-</b>                                              | abdomen       |               |
| <b>arteri/o-</b>                                               | artery        |               |
| <b>intestin/o-</b>                                             | intestine     |               |
| <b>muscul/o-</b>                                               | muscle        |               |
| <b>thyroid/o-</b>                                              | thyroid gland |               |
| <b>tonsill/o-</b>                                              | tonsil        |               |
| <b>ven/o-</b>                                                  | vein          |               |
| Combining Form that Is Related to Its Medical Meaning          |               |               |
| Combining Form                                                 | Meaning       | Related Word  |
| <b>arthr/o-</b>                                                | joint         | arthritis     |
| <b>cardi/o-</b>                                                | heart         | cardiac       |
| <b>dermat/o-</b>                                               | skin          | dermatologist |
| <b>gastr/o-</b>                                                | stomach       | gastric       |
| <b>mamm/o-</b>                                                 | breast        | mammogram     |
| <b>nas/o-</b>                                                  | nose          | nasal         |
| Combining Form that Is Not Related to Its Medical Meaning      |               |               |
| Combining Form                                                 | Meaning       |               |
| <b>cost/o-</b>                                                 | rib           |               |
| <b>cutane/o-</b>                                               | skin          |               |
| <b>cyan/o-</b>                                                 | blue          |               |
| <b>enter/o-</b>                                                | intestine     |               |
| <b>hepat/o-</b>                                                | liver         |               |
| <b>integument/o-</b>                                           | skin          |               |
| <b>lapar/o-</b>                                                | abdomen       |               |
| <b>leuk/o-</b>                                                 | white         |               |

## Did You Know?

Learning medical language requires some memorization of word parts and their meanings. If you know the meanings of the word parts, you can study a medical word and already have an idea about its meaning. You don't have to use a medical dictionary to understand each new word you encounter.

## Suffixes

Now let's turn our attention to another type of word part: suffixes. A suffix has the following characteristics:

- It is a group of letters at the end of most medical words.
- It modifies or clarifies the medical meaning of the combining form.
- It is a word part that begins with a hyphen (Figure 1-4 ■).

Occasionally, a medical word has two suffixes, one right after the other. **Example:** *nutritional* (the suffixes are **-ion** and **-al**). Now let's study some common suffixes and their meanings (Table 1-3 ■).



**FIGURE 1-4 ■ Suffix.**

A suffix begins with a hyphen to show that it is a word part, not a complete word. The suffix **-ac** means *pertaining to*. When the suffix becomes part of a medical word, the hyphen is deleted.

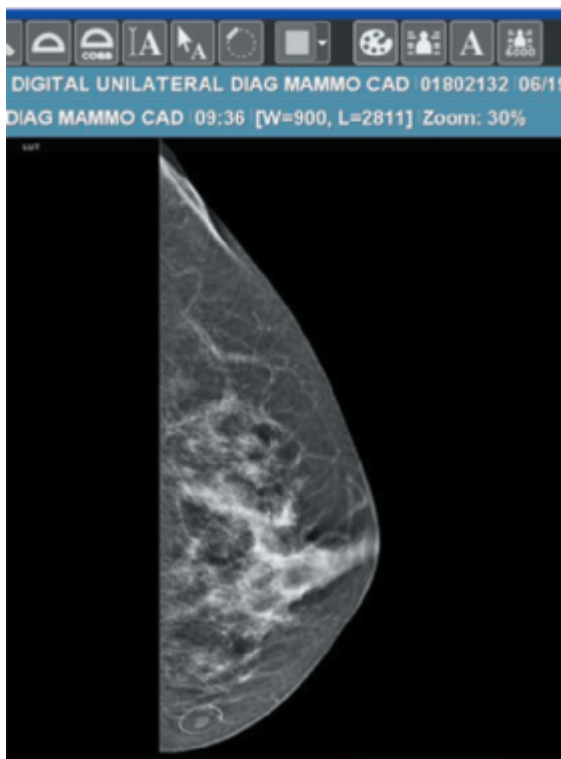
**Table 1-3 Common Suffixes and Their Meanings**

| Suffix                           | Meaning                                | Medical Word Example | Definition                                                                  | Notes                                                                       |
|----------------------------------|----------------------------------------|----------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Suffixes for an Adjective</b> |                                        |                      |                                                                             |                                                                             |
| <b>-ac</b>                       | pertaining to                          | cardiac              | <b>pertaining to</b> (the) heart                                            | Combining form <b>cardi/o-</b> means <i>heart</i> .                         |
| <b>-al</b>                       | pertaining to                          | intestinal           | <b>pertaining to</b> (the) intestine                                        | Combining form <b>intestin/o-</b> means <i>intestine</i> .                  |
| <b>-ar</b>                       | pertaining to                          | muscular             | <b>pertaining to</b> (a) muscle                                             | Combining form <b>muscul/o-</b> means <i>muscle</i> .                       |
| <b>-ary</b>                      | pertaining to                          | urinary              | <b>pertaining to</b> (the) urine                                            | Combining form <b>urin/o-</b> means <i>urinary system; urine</i> .          |
| <b>-ic</b>                       | pertaining to                          | pelvic               | <b>pertaining to</b> (the) pelvis                                           | Combining form <b>pelv/o-</b> means <i>hip bone; pelvis; renal pelvis</i> . |
| <b>-ine</b>                      | pertaining to                          | uterine              | <b>pertaining to</b> (the) uterus                                           | Combining form <b>uter/o-</b> means <i>uterus; womb</i> .                   |
| <b>-ive</b>                      | pertaining to                          | digestive            | <b>pertaining to</b> break down food                                        | Combining form <b>digest/o-</b> means <i>break down food; digest</i> .      |
| <b>-ous</b>                      | pertaining to                          | venous               | <b>pertaining to</b> (a) vein                                               | Combining form <b>ven/o-</b> means <i>vein</i> .                            |
| <b>Suffixes for a Process</b>    |                                        |                      |                                                                             |                                                                             |
| <b>-ation</b>                    | being; having; process                 | urination            | <b>process</b> (of making) urine                                            | Combining form <b>urin/o-</b> means <i>urine; urinary system</i> .          |
| <b>-ion</b>                      | action; condition                      | digestion            | <b>action</b> (to) break down food                                          | Combining form <b>digest/o-</b> means <i>break down food; digest</i> .      |
| <b>Suffixes for a Disease</b>    |                                        |                      |                                                                             |                                                                             |
| <b>-ia</b>                       | condition; state; thing                | pneumonia            | <b>condition</b> (of the) lung                                              | Combining form <b>pneumon/o-</b> means <i>air; lung</i> .                   |
| <b>-ism</b>                      | disease from a specific cause; process | hypothyroidism       | <b>disease from a specific cause</b> (of) deficient thyroid gland (hormone) | Combining form <b>thyroid/o-</b> means <i>thyroid gland</i> .               |
| <b>-itis</b>                     | infection of; inflammation of          | tonsillitis          | <b>infection of</b> (the) tonsil                                            | Combining form <b>tonsill/o-</b> means <i>tonsil</i> .                      |
| <b>-megaly</b>                   | enlargement                            | cardiomegaly         | <b>enlargement</b> (of the) heart                                           | Combining form <b>cardi/o-</b> means <i>heart</i> .                         |
| <b>-oma</b>                      | mass; tumor                            | neuroma              | <b>tumor</b> (on a) nerve                                                   | Combining form <b>neur/o-</b> means <i>nerve</i> .                          |
| <b>-osis</b>                     | abnormal condition; process            | vaginitis            | <b>abnormal condition</b> (of the) vagina                                   | Combining form <b>vagin/o-</b> means <i>vagina</i> .                        |
| <b>-pathy</b>                    | disease                                | arthropathy          | <b>disease</b> (of a) joint                                                 | Combining form <b>arthr/o-</b> means <i>joint</i> .                         |

(continued)

Table 1-3 (Continued)

| Suffix                                                | Meaning                                              | Medical Word Example                 | Definition                                                     | Notes                                                                    |
|-------------------------------------------------------|------------------------------------------------------|--------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Suffixes for a Procedure</b>                       |                                                      |                                      |                                                                |                                                                          |
| <b>-ectomy</b>                                        | surgical removal                                     | tonsil <b>ectomy</b>                 | <b>surgical removal</b> (of the) tonsils                       | Combining form <b>tonsill/o-</b> means <i>tonsil</i> .                   |
| <b>-gram</b>                                          | picture; record                                      | mamm <b>ogram</b><br>(Figure 1-5 ■)  | <b>picture</b> (of the) breast                                 | Combining form <b>mamm/o-</b> means <i>breast</i> .                      |
| <b>-graphy</b>                                        | process of recording                                 | arterio <b>graphy</b>                | <b>process of recording</b> (an) artery                        | Combining form <b>arteri/o-</b> means <i>artery</i> .                    |
| <b>-metry</b>                                         | process of measuring                                 | densit <b>ometry</b>                 | <b>process of measuring</b> (the) density (of bone)            | Combining form <b>densit/o-</b> means <i>density</i> .                   |
| <b>-scope</b>                                         | instrument used to examine                           | colon <b>oscope</b>                  | <b>instrument used to examine</b> (the) colon                  | Combining form <b>colon/o-</b> means <i>colon</i> .                      |
| <b>-scopy</b>                                         | process of using an instrument to examine            | gastro <b>scopy</b>                  | <b>process of using an instrument to examine</b> (the) stomach | Combining form <b>gastr/o-</b> means <i>stomach</i> .                    |
| <b>-tomy</b>                                          | process of making an incision                        | lapar <b>tomy</b>                    | <b>process of making an incision</b> (in the) abdomen          | Combining form <b>lapar/o-</b> means <i>abdomen</i> .                    |
| <b>Suffixes for a Medical Specialty or Specialist</b> |                                                      |                                      |                                                                |                                                                          |
| <b>-iatry</b>                                         | medical treatment                                    | psychiatry                           | <b>medical treatment</b> (for the) mind                        | Combining form <b>psych/o-</b> means <i>mind</i> .                       |
| <b>-ics</b>                                           | knowledge; practice                                  | obstetrics                           | <b>knowledge and practice</b> (of) pregnancy and childbirth    | Combining form <b>obstetr/o-</b> means <i>pregnancy and childbirth</i> . |
| <b>-ist</b>                                           | person who specializes in; thing that specializes in | therapist<br>(Figure 1-6 ■)          | <b>person who specializes in</b> treatment                     | Combining form <b>therap/o-</b> means <i>treatment</i> .                 |
| <b>-logy</b>                                          | study of                                             | cardi <b>ology</b><br>(Figure 1-7 ■) | <b>study of</b> (the) heart                                    | Combining form <b>cardi/o-</b> means <i>heart</i> .                      |

**FIGURE 1-5 ■ Mammogram.**

A mammogram is an image of the breast that is created with x-rays. The suffix **-gram** means *picture; record*.

Source: Susan Turley

**FIGURE 1-6 ■ Therapist.**

This physical therapist is assisting a patient with a fractured leg. The suffix **-ist** means *person who specializes in*.

Source: bialasiewicz/123RF