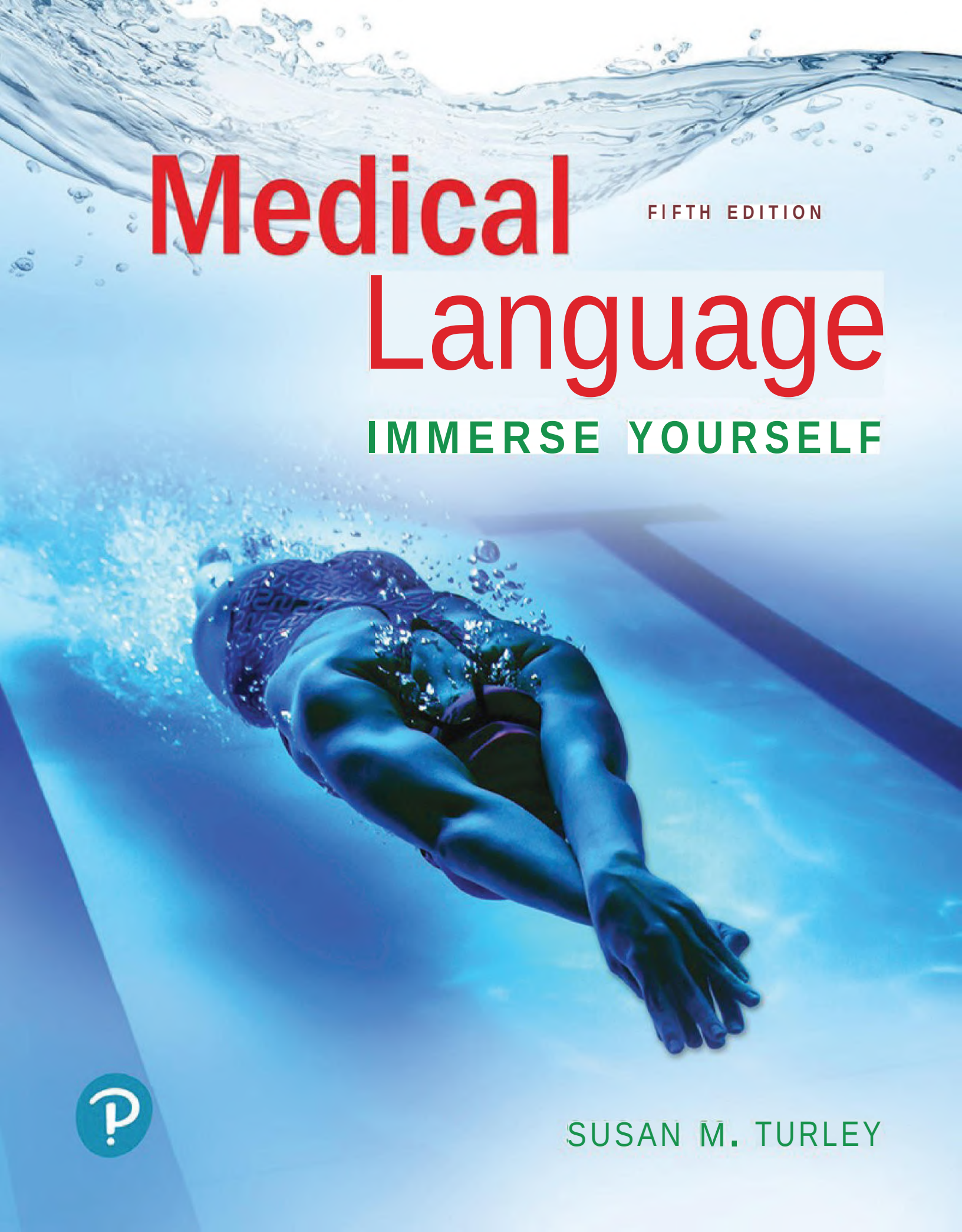


A full-page background image of a swimmer in a pool. The swimmer is seen from below, moving towards the surface, creating a large splash of water and bubbles. The water is a clear, bright blue. The swimmer is wearing a dark-colored swimsuit.

Medical Language

FIFTH EDITION

IMMERSE YOURSELF



SUSAN M. TURLEY



Medical Language

IMMERSE YOURSELF

FIFTH EDITION

SUSAN M. TURLEY

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Courseware Portfolio Manager, Health
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Development Editor: Laura S. Horowitz /
York Content Development
Medical Illustrator: Anita Impagliazzo
Portfolio Management Assistant:
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Vice President, Content Production and
Digital Studio: Paul DeLuca
Managing Producer, Health Science:
Melissa Bashe
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Amy Peltier
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Hammond
Full-Service Project Management and
Composition: Pearson CSC
Project Management Team Lead/Nursing
Sciences: Patty Donovan
Production Project Manager: Joanna Stein
Editorial Project Manager: Emily Tamburri
Inventory Manager: Vatche Demirdjian
Interior Design: Studio Montage
Cover Design: Studio Montage
Printer/Binder: LSC Communications, Inc.
Cover Printer: Phoenix Color/
Hagerstown

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Library of Congress Cataloging-in-Publication Data

Names: Turley, Susan M., author.
Title: Medical language : immerse yourself / Susan M. Turley.
Description: Fifth edition. | Hoboken, New Jersey : Pearson Education, Inc.,
[2020] | Includes index.
Identifiers: LCCN 2018054332 | ISBN 9780134988399 (student edition) | ISBN
0134988396 (student edition)
Subjects: | MESH: Terminology as Topic | Problems and Exercises
Classification: LCC R123 | NLM W 18.2 | DDC 610.1/4--dc23
LC record available at <https://lcn.loc.gov/2018054332>

10 9 8 7 6 5 4 3 2 1



ISBN-13: 978-0-13-498839-9
ISBN-10: 0-13-498839-6

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, these two journeys shared a common thread of language and communication.

The first journey was the adoption of two beautiful children, Minh and Lien (then ages 8 and 9), who joined our family from an orphanage in Vietnam in 2001. This journey of adoption involved completing much 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. This 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.

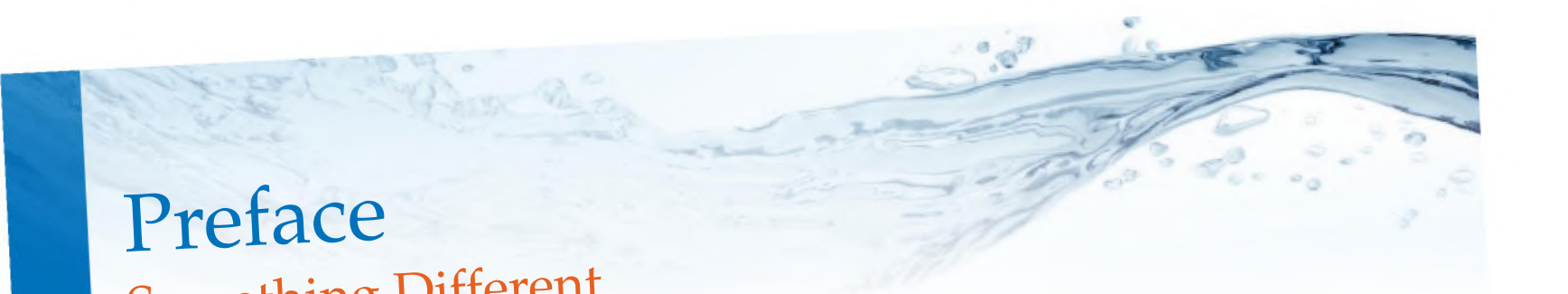
I did, however, need to determine the best way to convey that knowledge to each student who would study this textbook. And so, as I wrote, I drew on my own efforts and struggles to learn a new language and culture during the adoption process. Those insights helped me identify with students who are learning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

I am thrilled to say that each of my daughters has begun a new journey of her own in that they have chosen to follow in my footsteps and embrace the medical field as their career choice: Minh is a nursing assistant and Lien is a physician's assistant.

Did You Know?

As I write this in late 2018, I am ever mindful of the many children in this country and around the world who are in need of help, food, and homes.

All of the royalties from this textbook are given to provide ongoing financial support to orphanages and feed-and-read school programs for destitute children in several countries, as well as to help poor and hungry children in the United States.



Preface

Something Different

You may have already noticed that there is something different about this book! Perhaps by thumbing through the pages, you have taken note of the abundance of real-world healthcare images. Maybe you have discovered some of the practice exercises that abound within these pages, many of which place you in your soon-to-be-realized role of a healthcare professional. Or perhaps you have already begun exploring the revolutionary web-based student media materials that are rich with highly engaging and interactive activities that add a unique dimension to your learning. As you begin this exciting and important journey into the world of medical language and health care, we offer you this promise—that you will soon 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 health care throughout your career. Therefore, we do everything we can to help you learn and to empower you, so you can use what you learn to positively impact the lives of others. And so, we encourage you to immerse yourself in this book 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 close 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 the people, events, and culture it represents. This book is about *medical language*. As opposed to simply memorizing vocabulary words, this book offers a complete experience—the opportunity to embrace the world of health care, just as if you were learning a foreign language. Like traveling to Tokyo for a year to learn Japanese, the goal here is for you to become immersed in the sights and sounds of your new culture of health care. This book surrounds you with context that brings the medical words to life.

This book is about real medicine that affects real patients—their lives, their families, and their futures. As a healthcare professional, no matter which aspect of health care you choose, you will have important responsibilities. Therefore, we feel 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 chapters in this textbook are titled as medical specialties, not just as body systems (as are other medical terminology books). This reflects the real world. For example, people with skin conditions visit a dermatologist, not an “integrumentary system specialist.” That’s why the related chapter in this book is titled “Dermatology.” A patient with heart problems is treated in a hospital’s cardiology department and not in a “cardiovascular system department.” The decision to present the chapters in this way is an example of our commitment to make this book a realistic reflection of health care as it is in the real world. This distinction was tested extensively, and instructors and students alike overwhelmingly support and validate this way to learn.
- The majority of the images in this book incorporate medical illustrations and photographs that include a diverse array of real people, instead of cartoon-like illustrations. The photographs are of real patients and real healthcare professionals in real healthcare settings.

- The chapter review exercises present real medical reports with related critical-thinking questions. There are also exercises where you play the role of the healthcare professional in interpreting a patient's condition and rephrasing it as medical language.
- The web-based student media will immerse you in the virtual world of MyLab Medical Terminology, where you will explore a variety of fun study opportunities. In one of them, you will listen to real doctors dictating real medical sentences for you to interpret.

Immerse Yourself

You are about to begin an interactive learning experience between you, this book, and your instructor—one that will equip you and inspire you to become an expert in medical language. The goal of this book is to connect with you, to engage your visual, auditory, and kinesthetic senses, to stimulate you, and to fuel your complete understanding of medical language.

You will not be a passive reader of this book. Instead, you will be challenged to listen, speak, write, respond, examine, think, and make connections to medical language. You should consume this book by writing notes in it and filling in your answers. By being an active participant in your own learning process, the concepts presented here will come alive in vibrant color and full texture. This book is a *living* document about a *living* language. Through the features of this book and the accompanying multimedia resources, you will get a true taste of the world of health care in *living* color.

As you engage in the multisensory experience within these pages, remember to *discover*, *learn*, *know*, and *understand* the information. But—even more—experience it and *live it*! So dive in and immerse yourself!

New to This Edition

This fifth edition maintains the best aspects of previous editions while continuing to facilitate the learner's mastery of medical language in new and exciting ways. We have revised this edition so that it provides an even more valuable teaching and learning experience. Here are the enhancements that we have made:

New Book and Chapter Structure

- The book now includes 15 chapters designed to be taught within a 16-week semester course as one chapter per week, leaving the last week for review and the final examination. Much of the content from the three other chapters from the fourth edition (psychiatry, oncology, and radiology) has been incorporated into the 15 chapters and is included in the Index. The full content of the psychiatry chapter is available at www.pearsonhighered.com/healthprofessionsresources.
- The chapter structure now includes numbered sections that correlate with numbered learning outcomes. These new sections are used in Chapters 2–15, giving instructors and students a consistent template that is easy to follow. These new sections include:
 1. Anatomy
 2. Physiology
 3. Diseases
 4. Laboratory, Diagnostic, and Radiologic Procedures
 5. Medical Procedures, Drugs, and Surgical Procedures

- An innovative student-centered learning format evaluates competency after each chapter section with the use of the Practice Laps exercises.
- A new design reinforces the new chapter structure for ease of use.
- A new eText format is compatible with any device that a student might use.

Updates to Existing Content

As in every edition of *Medical Language*, we strive to improve existing content. For the fifth edition, we have:

- Improved the Anatomy and Physiology sections by revising all of the illustrations and text to improve the clarity of details concerning complex structures and functions.
- Emphasized the relationship between different body systems and how they work in conjunction to maintain homeostasis.
- Reorganized Appendix A so that it now combines all word parts and their meanings in alphabetical order to facilitate searching. The types of word parts (combining form, prefix, suffix) are indicated by color shading of the rows and by a column that indicates *CF*, *P*, or *S*. The meaning of each word part has been revised, as needed, and verified that it is consistent across all chapters.
- Provided an Answer Key, as in the fourth edition, that includes every other answer. This encourages students to think for themselves about the answers, rather than just copying them from the Answer Key. A full Answer Key is provided in the Instructor's Manual, which allows the instructor to use any chapter exercise as a homework assignment.

Comprehensive Teaching Package

Perhaps the most gratifying part of an instructor's work is the "aha" 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 instructors prepare, present, and assess. For more information, please contact your Pearson sales representative or visit www.pearsonhighered.com/educator.

Online Instructor's Resources

- A complete chapter-by-chapter Test Bank with a full variety of test questions. It also allows instructors to generate customized exams and quizzes.
- A comprehensive, turn-key lecture package with fully narrated chapter-by-chapter lectures ("Guided Lectures") in an audio format, as well as 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 book.
- 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.
- Interesting facts and anecdotes.
- Extra content, such as word origins and the stories behind anatomical structures and diseases named for someone (eponyms)—things not covered in the book.
- A complete Answer Key that includes the answers to each of the student questions in each chapter.

What Makes This Book Different?

We Listened

In developing this book over five editions, we have immersed ourselves in the perspective of you, our readers. We have strived to make *Medical Language* a customer-driven text by aggressively and comprehensively researching the needs and desires of current medical terminology students and instructors. We aimed to guarantee that we were “speaking the same language” as those who would ultimately be using this book. To do this, we gathered a highly qualified development team of over 170 reviewers, with over 2,250 years of teaching experience, 4 physician specialists, as well as 11 students from across the United States to help steer us toward success.

Over the past 14 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, numerous ways in which we could refine and enhance our key features. Their invaluable feedback was compiled, analyzed, and incorporated throughout *Medical Language*, Fifth Edition.

We asked our team 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, and our development team of students and instructors. We listened.

We Learned

Here are some of the recommendations that we heard from our team, responded to, and included in all four editions, now updating and enhancing them even further in the new fifth edition:

- **Design.** Students and instructors alike told us they wanted an appealing, uncluttered design with an abundance of rich medical images and enough white space to allow for notetaking.

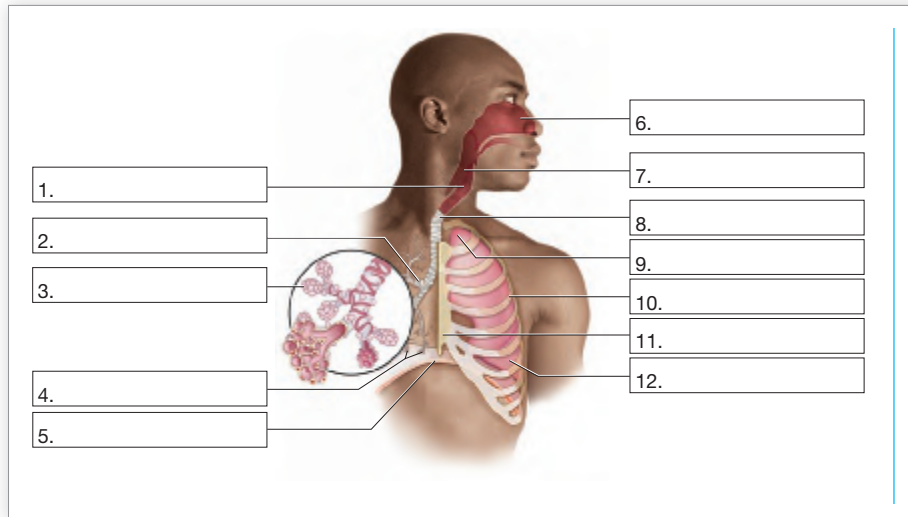
cyanosis	Bluish discoloration of the skin and nail beds because of a low level of oxygen and a high level of carbon dioxide in the blood and tissues. Circumoral cyanosis occurs around the mouth (see Figure 4-18 ■). The patient is said to be cyanotic . Treatment: Oxygen therapy. Correct the underlying cause.	cyanosis (sy-ah-NOH-sihs) cyan/o- blue -osis abnormal condition; process cyanotic (sy-ah-NAW-tik) cyan/o- blue -tic pertaining to circumoral (sir-kum-OR-al) circum- around or/o- mouth -al pertaining to
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FIGURE 4-18 ■ Cyanosis.
This newborn infant shows cyanosis of his face. He has a structural defect of his heart and, each time his heart beats, it pumps deoxygenated blood (instead of oxygenated blood) to the cells of his body.

4.2 PRACTICE LAPS

- **Exercises.** Both students and instructors suggested that we provide a greater quantity and variety of exercises than any other book, thus providing maximum opportunities to reinforce learning. 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. In the fifth edition, we have added a set of Practice Laps exercises after each numbered section to allow students to immediately assess their knowledge of that section.
- **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 as practice opportunities.



- **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.
- **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.
- **Medical Report Activities.** Instructors wanted an activity in each chapter that challenged students to analyze actual medical reports.
- **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 auditory and visual learning experience. It includes the PowerPoint presentation coordinated with a full lecture. This is an especially helpful feature for students enrolled in online courses or for students who miss a lecture.

bronchopulmonary
(BRONG-koh-PUL-moh-NAIR-ee)
bronch/o- bronchus
pulmon/o- lung
-ary pertaining to

cilia (SIL-ee-ah)

lung (LUNG)

pulmonary (PUL-moh-NAIR-ee)
pulmon/o- lung
-ary pertaining to

The related combining forms **pneum/o-** and **pneumon/o-** mean air; lung.

lobe (LOHB)

- **Tools for Testing.** Instructors asked for a complete testing package that was customizable to fit their needs. Additionally, they asked for these test items 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 accuracy possible throughout this educational package in order to match the precision required in today's healthcare environment. The author drew on her 30 years of experience in nursing, health information management, medical transcription, and medical publications and as a college instructor to provide accurate and complete information. Our development team read every page, every test question, and every vocabulary word. No less than 11 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 four physician 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 book. 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, 4th Floor
Hoboken, NJ 07030

Our Development Team

About the Author

Susan M. Turley, MA (Educ), BSN, RN, RHIT, CMT, 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 healthcare settings: acute care/ICU, long-term care, physicians' offices, and managed care. She has held positions as an intensive care nurse, plasmapheresis nurse, infection control officer, physician office auditor, medical transcriptionist, director of education, and director of quality management and corporate compliance for an HMO.

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 was instrumental in gaining initial accreditation for the college's medical assisting program. Susan was a codeveloper of *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 the soon-to-be-released *Understanding Pharmacology for Health Professionals*, Sixth Edition (Pearson, 2021) and more than 40 articles published in medical transcription and health information management journals. With physician coauthors, she has 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 medical journals, and most recently she was the editor for an Opinion column that appeared in the *Journal of the American Medical Association*.

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 has state licensure as an RN. She is a member of and has national certification in medical transcription from the Association for Healthcare Documentation Integrity (AHDI) and is a member of and has national certification from the American Health Information Management Association (AHIMA).



About the Illustrator

The illustrations throughout this book are the result of a close collaborative effort between the author and medical illustrator. Every figure was custom developed specifically for this book and refined to be medically accurate, precise, unique, and fresh. From a pedagogical point of view, it was important that all of the art be consistent throughout, rather than presenting a conglomeration of styles and varying levels of detail. The illustrations for the fifth edition have been revised, clarified, and updated to reflect the highest degree of medical accuracy while retaining realism and ease of understanding for students.

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.

About the Educational Consultant

James F. Allen, Jr., RN, MSN-Ed, MBA/HCM, JD, is an Adjunct Associate Professor at Lansing Community College in Lansing, Michigan. He earned his Master of Science in Nursing Education (MSN-Ed) at Western Governors University; his Master of Business Administration and Healthcare Management (MBA/HCM) at the University of Phoenix; and his Juris Doctorate (JD) from Thomas M. Cooley School of Law. Jim has taught courses both online and in the classroom in medical terminology, pathophysiology, pharmacology, and medical law and ethics. Since his college adopted the first edition, Jim has been an invaluable source of information and suggestions for improvement of *Medical Language*. Jim is the coauthor of *Medical Language STAT!* (Pearson, 2009) and the author of *Health Law and Medical Ethics for Healthcare Professionals* (Pearson, 2013).



Consultants and Contributors

Each member of our development team has infused this book with ideas, vision, and a passion for medical language. Our team crafted the blueprints for this book and contributed to what has become a landmark educational tool. Their influence will continue to have an impact for decades to come as many students continue to study *Medical Language*. We are pleased to introduce the members of our team.

Physician Specialist Consultants

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

John H. Dirckx, MD
Former Medical Director,
University of 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.

Quality Assurance Editor

Garnet Tomich, BA
San Diego, California

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 for the Fifth Edition

Jana Allen, MT, ASCP
Volunteer State Community College
Gallatin, Tennessee

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

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

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

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

Marie Hattabaugh, MAT, RT(R)(M), CMA (AAMA)
Pensacola State College
Pensacola, Florida

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

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

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

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

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

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

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

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

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

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

Manuscript Reviewers for Earlier Editions

(*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

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

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

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

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

Robert Fanger, MSED
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

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, MSED, 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

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

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
Morrilton, Arkansas

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

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

Aimee Michaelis
Pima Medical Institute
Denver, Colorado

Michelle G. Miller, M, CMA, COMT
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

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. Schuld, 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

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

**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

**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

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

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 utmost thanks go to John Goucher, Courseware Portfolio Manager, Health Sciences, for bringing to completion the very successful most recent editions of *Medical Language*, as well as this new fifth edition. I also want to express my thanks to Melissa Bashe, Managing Producer, Health Sciences, who coordinated activities on the first edition and has now returned to expertly manage many facets of the fifth 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 all five editions. She is a wonderfully talented medical illustrator whose efforts made this book medically accurate, artistically unique, and without equal. By combining real-life photographs of people superimposed with medical illustrations, 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 thanks go 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 edition. Her professional expertise was a constant throughout the process, and all of the many steps and details involved would have been overwhelming and difficult to complete without her all-encompassing and timely editorial assistance and personal support.

My thanks go to Studio Montage for creating a beautiful, fresh, and inviting design and format for the fifth edition. My thanks go to all of members of the Pearson team from portfolio management assistants to project managers to marketing managers and sales representatives to the executive editors and the publisher!

My thanks go to the talented team at SPi Global, led by Patty Donovan, Project Management Team Lead/Nursing Science, Emily Tamburri, Editorial Project Manager, and Joanna Stein, Project Manager, who oversaw the extensive editing, layout, typesetting, and indexing of the fifth edition. In light of the complexity of the book, I especially appreciated their professionalism, flexibility, creative insights, and can-do approach.

My thanks go to the Pearson media team that designed and produced a spectacular array of learning applications to support my textbook.

To Students and Instructors

As the author, my thanks go 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 all five editions of the textbook.

My thanks go 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. Each and every person listed played an important role in the development of this book, and I hope they share my sense of pride and accomplishment in this fifth edition.

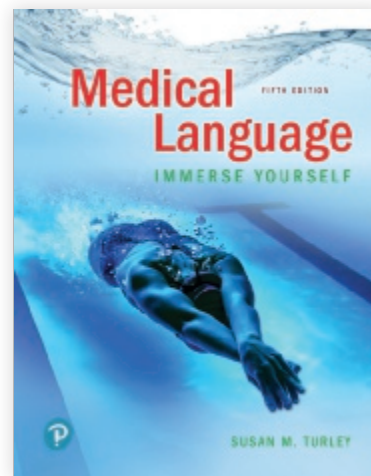
An Overview of *Medical Language*

No new medical terminology book has touched the lives of so many people as profoundly as *Medical Language*. 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 medical terminology. That is why the chapters in *Medical Language* are named—not by body system (as is the case with anatomy textbooks and other medical terminology textbooks)—but by medical specialties, which reflects the practice of medicine in the real world. In addition, all of the text, illustrations, and photo images have been carefully revised and updated to reflect the most up-to-date medical information and the most realistic medical images available.

The emphasis on learning medical language as a language is reinforced by including see-and-say pronunciations for each bolded word in the text and providing a breakdown of each bolded word into its component word parts and their meanings.

The fifth edition builds on our commitment to excellence, and so we have once again challenged the author, our reviewers, and our development team to critique every feature, every page, every word—all to help enhance the learning and teaching process. The information in each section of a chapter is presented in a way that reflects the level of detail that the majority of instructors told us they need. The result of this 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.

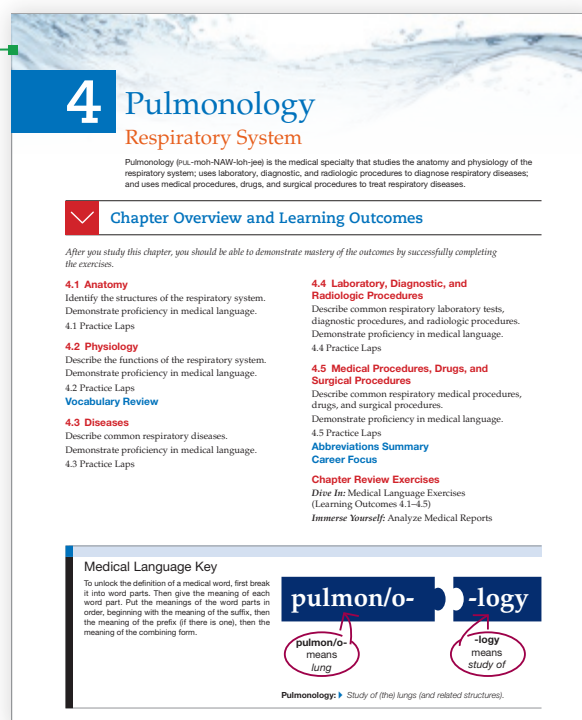


Chapter Format

Each chapter follows a consistent organization designed for student success.

Chapter Overview, Learning Outcomes, and Medical Language Key

The first page of each chapter offers a brief chapter outline to help students see the scope of the chapter as well as its special features. Each section of the chapter is numbered, and this same numbering is consistently used throughout the chapter, including in all of the exercises. The overall learning outcome for the chapter can be fulfilled by students in a very practical way by successfully completing chapter exercises. Individual learning outcomes are listed under each numbered section. The first page ends with a Medical Language Key feature box that provides a word analysis of the medical specialty described in that chapter.



The following sections are included in most chapters. The material in these sections is comprehensive in its scope but is at a level that is appropriate for a terminology textbook as opposed to an anatomy, physiology, disease, laboratory, or surgical textbook. Each section is supplemented by a rich variety of medical illustrations and photographs as well as several different Special Features, as described later.

Anatomy

The first section in each chapter is a comprehensive presentation of the anatomy of the body system related to that chapter's medical specialty.

4.1 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—as well as others (the sinuses, adenoids, tonsils)—are part of the ears, nose, and throat (described in Chapter 15, Otolaryngology).

4.1 PRACTICE LAPS

Use the Answer Key at the end of the book to check your answers.

A. Label Structures

Write each anatomy word on the line.

B. Give the Meaning of Combining Forms

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

Combining Form	Meaning	Combining Form	Meaning
1. alveol/o-	air sac	8. or/o-	

C. Build Words

Read the definition of the medical word. Look at the combining form that is given. Select the correct suffix from the Suffix List, and write it on the blank line. Then build the medical word, and write 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
Example: Pertaining to (the) bronchiole	bronchiol/o-	-al	bronchiolar

Practice Laps

The Anatomy section (and each subsequent numbered section) ends with a set of Practice Laps exercises that reinforce the material that has just been presented.

Physiology

This second section is a comprehensive presentation of the physiology of the body system related to that chapter's medical specialty.

4.2 Physiology

Breathing is normally an involuntary process that occurs without any conscious effort. **Respiratory control centers** in the brain regulate the depth and rate of respiration. 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 send information about the blood level of carbon dioxide. Based on this information, the respiratory control centers regulate the rate of respiration by sending nerve impulses to the **phrenic nerve**, causing the diaphragm to contract. You can voluntarily control your respiration (when you hold your breath), but eventually involuntary control takes over, forcing you to breathe.

Vocabulary Review

Word or Phrase	Description	Combining Forms
Overview		
cardiopulmonary	Pertaining to the heart and lungs	cardi/o- heart 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, and thorax. Also known as the respiratory tract . 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	Mucous membrane that lines most of the respiratory system. It warms and humidifies incoming air. It produces mucus to trap foreign particles and bacteria.	muc/o- mucus
nasal cavity	Hollow area inside the nose. The nasal septum divides the nasal cavity into right and left sides.	nas/o- nose sept/o- dividing wall; septum
pharynx	The throat. A shared passageway for both air and food. The nasopharynx is posterior to the nasal cavity, the oropharynx is posterior to the oral cavity, and the laryngopharynx is posterior to the larynx.	pharyng/o- pharynx; throat nas/o- nose or/o- mouth laryng/o- larynx; voice box
turbinates	Scroll-like projections of bone covered by mucous membrane on either side of the nasal cavity. They slow down and give moisture to inhaled air. Also known as nasal conchae .	turbin/o- scroll-like structure

Vocabulary Review

After the first two sections, a Vocabulary Review reinforces an understanding of anatomy and physiology with an at-a-glance review of each bolded word or phrase, its description, and related combining forms. Some chapters also contain an **Abbreviation Review** at this point.

Diseases

The third section in each chapter provides descriptions, causes, symptoms, and treatments for common diseases related to that chapter's medical specialty, again ending with a set of Practice Laps exercises.

4.3 Diseases

Note: Diseases of the nose, sinuses, pharynx, tonsils, adenoids, and larynx are described in Chapter 15, Otolaryngology.

Word or Phrase	Description	Pronunciation/Word Parts
Nose and Pharynx		
upper respiratory infection (URI)	Bacterial or viral infection of the nose and/or throat. Also known as a common cold or a head cold (see Figure 4-8 ■). Treatment: Antibiotic drug for a bacterial infection	infection (in-FEK-shun) infect/o- disease within -ion action; condition

4.4 Laboratory, Diagnostic, and Radiologic Procedures

Word or Phrase	Description	Pronunciation/Word Parts
Laboratory Tests and Diagnostic Procedures		
arterial blood gases (ABG)	Blood test to measure the partial pressure (p) of the gases oxygen (pO ₂) and carbon dioxide (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.	arterial (ar-TEER-ee-al) arteri/o- artery -al pertaining to

Laboratory, Diagnostic, and Radiologic Procedures

The fourth section describes the most common types of tests that are ordered to diagnose diseases related to that medical specialty, again ending with Practice Laps exercises.

4.5 Medical Procedures, Drugs, and Surgical Procedures

Medical Procedures, Drugs, and Surgical Procedures

The last numbered section in each chapter describes the most common medical and surgical procedures and drugs used in that medical specialty, once again ending with Practice Laps exercises.

Word or Phrase	Description	Pronunciation/Word Parts
Medical Procedures		
auscultation and percussion (A&P)	Auscultation uses a stethoscope to listen to breath sounds in all lobes of the lungs. Percussion uses the finger of one hand to tap over the finger of the other hand that is spread across the patient's back over a lobe of the lung. After a few taps, the hand is moved over another lobe. Auscultation and percussion tell the physician if the lung sounds are clear or if there is dullness because of the presence of fluid or a tumor (see Figure 4-24 ■).	auscultation (aws-kul-TAY-shun) auscult/o- listening -ation being; having; process stethoscope (STETH-oh-skohp) steth/o- chest -scope instrument used to examine percussion (per-KUH-shun) percuss/o- tapping -ion action; condition

Abbreviations Summary

A&P	auscultation and percussion	LUL	left upper lobe (of the lung)
ABG	arterial blood gases	MDI	metered-dose inhaler
AFB	acid-fast bacillus	MDR-TB	multidrug-resistant tuberculosis
AP	anteroposterior	MRI	magnetic resonance imaging
AQI	Air Quality Index	O₂	oxygen
ARDS	adult respiratory distress syndrome	PA	posteroanterior
BS	breath sounds	PCO₂, pCO₂	partial pressure of carbon dioxide
C&S	culture and sensitivity	PFT	pulmonary function test
CAT, CT	computerized axial tomography	PND	paroxysmal nocturnal dyspnea
CF	cystic fibrosis	PO₂, pO₂	partial pressure of oxygen
CO	carbon monoxide	PPD	packs per day (of cigarettes); purified protein derivative (TB test)
CO₂	carbon dioxide	RA	room air (no supplemental oxygen)
COPD	chronic obstructive pulmonary disease	RLL	right lower lobe (of the lung)
CPAP	continuous positive airway pressure (pronounced "SEE-pap")	RML	right middle lobe (of the lung)

Abbreviations Summary

Each chapter ends with a summary of all of the abbreviations and their meanings that were used in the chapter.

Meet Susan, a respiratory therapist in a hospital



- **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 drugs.

therapist (THAIR-ah-pist)
therap/o- treatment
-ist person who specializes in

pulmonologist (PUL-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

This section orients students to a different healthcare career in each chapter.

This section fortifies students with a fun and extensive variety of exercises. ***Dive In*** exercises are linked to each numbered section in the chapter and are designed for a range of learning styles. These exercises emphasize mastery of the medical information presented in each section as well as mastery of the language aspects of word parts and their meanings, building words, dividing words, singular and plural nouns, adjectives, spelling, and pronunciation. ***Immerse Yourself*** exercises emphasize the application of knowledge as students read real patient records and answer thought-provoking questions about their content.

Dive In: Medical Language Exercises

Test your knowledge of the chapter by completing these review exercises. Use the Answer Key at the end of the book to check your answers. Note: Each of the numbered exercise headers corresponds to a numbered learning outcome at the beginning of the chapter.

4.1 Anatomy

MATCHING EXERCISE

Match each word or phrase to its description

1. ap
2. tu

Immerse Yourself: Analyze Medical Reports

Electronic Patient Record #1

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

PEARSON PRIMARY CARE ASSOCIATES

Task

Edit

View

Time Scale

Options

Help

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OFFICE VISIT SOAP NOTE

PATIENT NAME: GUPTA, Priya

MEDICAL RECORD NUMBER: 964-43651

DATE OF VISIT: 11/19/xx

- 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) and self-paced learning modules
- A space where you and your instructor can check your progress and manage your assignments

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

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 bring medical language to life and facilitate understanding, especially for visual learners.

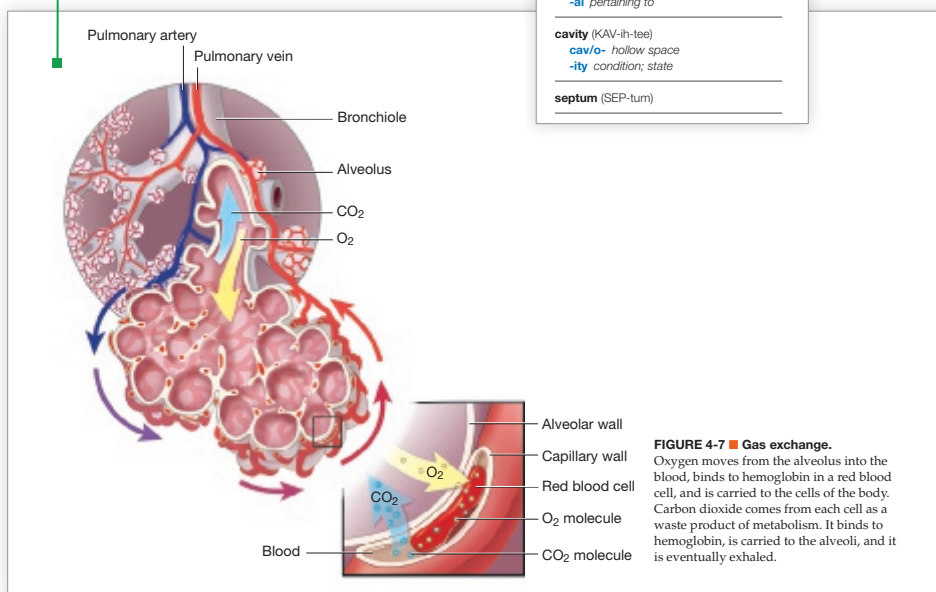


FIGURE 4-7 ■ Gas exchange. Oxygen moves from the alveolus into the blood, binds to hemoglobin in a red blood cell, and is carried to the cells of the body. Carbon dioxide comes from each cell as a waste product of metabolism. It binds to hemoglobin, is carried to the alveoli, and it is eventually exhaled.

Pronunciation/Word Parts
respiratory (RES-pih-rah-TOR-ee) re- again and again; backward; unable to spit/o- breathe; coil -atory pertaining to Respiratory: Pertaining to again and again (to) breathe
cardiopulmonary (KAR-dee-oh-PUL-moh-NAIR-ee) cardi/o- heart pulmon/o- lung -ary pertaining to
nose (NOHZ)
naris (NAY-ris)
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)

Pronunciation/Word Parts are in the page margins (and within various tables), whenever a bolded word is introduced in the text. This feature gives students the tools to understand unfamiliar words on their own—a see-and-say pronunciation guide and the word parts and meanings of each bolded word—reinforcing that word building is an ongoing process.

Tables are used whenever appropriate to present the content in a visually organized way that students can more easily understand and study.

Table 5-3 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
superior vena cava	The superior vena cava brings 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.	vena cava (VEE-nah KAY-vah) Latin plural noun: Change the singular ending -a to -ae. Example: The superior and inferior venae cavae
inferior vena cava	The inferior vena cava brings 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 pelvic cavity in the area of the hip bones, the inferior vena cava ends as it divides to become the right and left iliac veins.	
jugular veins	The jugular veins bring deoxygenated blood from the head and neck to the superior vena cava. The jugular vein takes its name from a Latin word that means neck.	jugular (JUG-yoo-lar) jugul/o- throat -ar pertaining to
pulmonary veins	The pulmonary veins bring oxygenated blood from the lungs to the left atrium of the heart. Remember: The pulmonary veins are the exception because they are the only veins that carry oxygenated blood. The adjective for the lung is <i>pulmonary</i> .	pulmonary (PUL-moh-NAIR-ee) pulmon/o- lung -ary pertaining to
portal veins	The portal veins bring deoxygenated blood from the intestines and liver to the inferior vena cava. The portal vein is named for the porta hepatis, an opening (or portal) in the liver where blood vessels enter and exit.	portal (POR-tal) port/o- point of entry -al pertaining to
fibular veins	The fibular veins bring deoxygenated blood from the little toe side of the lower leg to the femoral veins. The fibular vein is named for the fibula bone in the lower leg.	fibular (FIH-byoo-lar) fibul/o- fibula -ar pertaining to
saphenous veins	The saphenous veins bring deoxygenated blood from the lower legs to the femoral veins. The saphenous vein takes its name from a Latin word that means <i>clearly visible</i> , as this vein often can be seen through the skin on the inside lower leg.	saphenous (SAF-eh-nuhs) saphen/o- clearly visible -ous pertaining to

Feature Boxes spark student interest with key details relating the material to the real world of medicine and include:

Across the Life Span brings an infusion of relevant information related to each stage of life from neonatology to pediatrics to geriatrics.

Across the Life Span

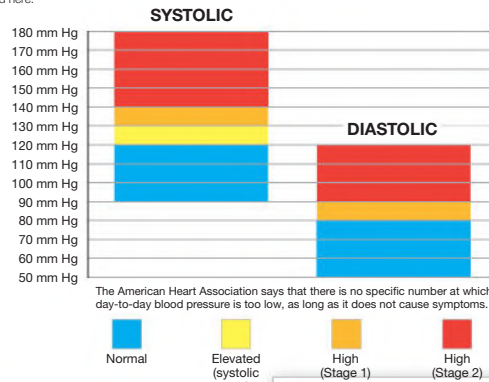
Pediatrics. In the uterus, the fetus does not breathe, and its lungs are collapsed. It receives oxygen from the mother's lungs via the placenta and umbilical cord. The lungs of the fetus do not function until the very first breath after birth. At that time, they must expand fully and stay expanded (which is helped by the presence of surfactant).

The normal respiratory rate for a newborn infant is 30–60 breaths per minute. The normal respiratory rate for an adult is 12–20 breaths per minute.

Geriatrics. As a person ages, the number of alveoli in the lungs decreases, and the remaining alveoli are less elastic. The thorax becomes stiff and is less able to expand on inhalation. In addition, a lifetime of exposure to air pollution, chemical fumes, and smoke causes damage to the lungs. These changes decrease pulmonary function in older adults.

Dive Deeper

The American College of Cardiology and the American Heart Association issued new guidelines for blood pressure and hypertension in 2017. Normal blood pressure is now anything **less than 120/80**. The new guidelines are illustrated here.



Dive Deeper presents a quick, focused glance at pertinent additional in-depth details related to the material being covered.

Clinical Connections highlights the relationships between the chapter material and other medical specialties or presents snapshots of the ways technology is changing health care.

Clinical Connections

Dietetics. The body produces its own supply of cholesterol to make bile, neurotransmitters, and male and female sex hormones. The diet contains additional cholesterol in foods from animal sources. An excessive amount of animal fat in the diet increases the cholesterol level in the blood. An excessive amount of sugar in the diet is converted by the body to triglycerides, and this causes an increased triglyceride level in the blood and increased storage as adipose tissue (fat). Fatty plaque deposits in the arteries grow more quickly in patients who eat high-fat diets or have uncontrolled diabetes mellitus.

Psychology. Some people have increased blood pressure readings just because they are nervous about being in a doctor's office. This is known as **white-coat hypertension**. This is not a true hypertension because, as soon as they leave the doctor's office, their blood pressure returns to normal.

Public Health. There are many factors that contribute to the development of coronary artery disease. These are known as **cardiac risk factors**. They include demographic factors (heredity, gender, age), medical factors (hypertension, hypercholesterolemia, diabetes mellitus, obesity), and lifestyle factors (smoking, lack of exercise, poor diet, stress, alcoholism).

Word Alert

Sound-Alike Words

breath (BRETH)	(noun)	the air that flows in and out of the lungs Example: The breath of a diabetic patient can have a fruity odor to it.
breathe (BREETH)	(verb)	the action of inhaling and exhaling Example: If you ask an asthmatic patient to breathe deeply, you might hear a wheezing sound.
mucosa (myoo-KOH-sah)	(noun)	Latin word that means mucous membrane Example: The nasal mucosa warms and moistens inhaled air.
mucous (MYOO-kuhs)	(adjective)	pertaining to a membrane (the mucosa) that secretes mucus Example: Allergies make the mucous membranes of the nose swollen and inflamed.
mucus (MYOO-kuhs)	(noun)	a secretion from a mucous membrane Example: A chronic smoker coughs and produces a significant amount of mucus.

Word Alert presents important notes about the nuances, meanings, variations, and peculiarities of language and specific, selected bolded words in the chapter. Word Alert includes topics such as Abbreviations, Sound-Alike Words, and It's Greek to Me!, which gives useful reminders about how Greek and Latin combining forms remain part of medical language today.

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

Appendix B: Glossary of Medical Abbreviations, Acronyms, and Short Forms gathers the shortened forms of medical language from the Abbreviations Summary feature within each chapter.

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

Rows shaded in blue contain **Combining Forms**, abbreviated **CF**. The chapters where a combining form can be found are listed in the Chapter column (e.g., C3 stands for Chapter 3).

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

Word Part	Meaning	Word Part Abbreviation	Chapter
a-	away from; without	P	
ab-	away from	P	
abdomin/o-	abdomen	CF	C1, C3, C5, C8, C12
ablat/o-	destroy; take away	CF	C6, C12
-able	able to be	S	

Abbreviation	Meaning	Abbreviation	Meaning
B	blood type B in the ABC blood group	BPH	benign prostatic hyperplasia
BAEP	brainstem auditory evoked potential	Bpm	beats per minute
BAER	brainstem auditory evoked response	BPP	biophysical profile
basos	basophils (short form)	BRCA	breast cancer (gene)
BE	barium enema	BS	breath sounds

MyLab Medical Terminology™

What Is MyLab Medical Terminology?

MyLab Medical Terminology is a comprehensive online testing 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 etext pages, illustrations, 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 as a standalone program or with an embedded etext.

MyLab Medical Terminology is organized to follow the chapters and learning outcomes in *Medical Language, Fifth Edition*. With MyLab Medical Terminology, you can track your own progress through your entire medical terminology 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.
- Remediate in areas in which you need additional review.

Key Features of MyLab Medical Terminology

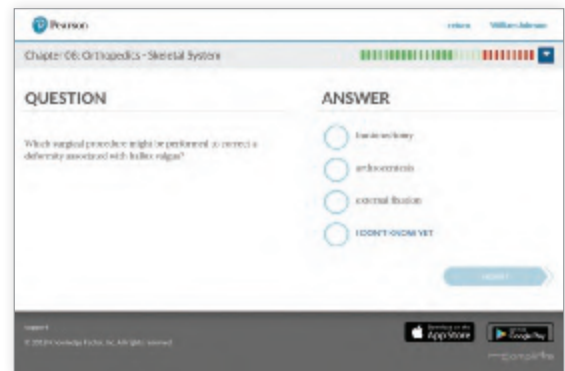
Pre-Tests and Post-Tests. Using questions aligned to the learning outcomes in *Medical Language*, multiple tests measure your understanding of topics.

Personalized Study Material. Based on the topic pre-test results, you receive a personalized study plan, highlighting areas where you may need improvement. It includes these study tools:

- Links to specific pages in the etext
- Images for review
- Interactive exercises
- Animations and video clips
- Audio glossary
- Access to full Personalized Study Material.

How Do Instructors Benefit?

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



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Appendices

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

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1

Medical Language and Health Care Today

Medical language (MED-ih-kal LANG-gwij) is the framework on which the practice of medicine is built. Healthcare professionals use medical language every day to communicate with each other.

Health care is the process by which trained and licensed professionals maintain or restore the health of the body and mind.



Chapter Overview and Learning Outcomes

After you study this chapter, you should be able to demonstrate mastery of the outcomes by successfully completing the 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 Words: Singular and Plural Nouns and Word Parts

Form the plural of common medical singular 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 Medical Words: Divide, Build, Spell, and Pronounce

Divide medical words into word parts.

Build medical words from word parts.

Spell and pronounce common medical words.

1.3 Practice Laps

Vocabulary Review

1.4 The Body in Health and Disease

Define *health* and *disease*.

Identify body planes, directions, and positions; body cavities; and body quadrants and regions.

Describe anatomy and physiology, body systems, and medical specialties.

Describe categories of diseases.

1.4 Practice Laps

Vocabulary Review

1.5 Health Care Today

Describe categories of healthcare professionals.

Describe the settings in which health care is provided.

Describe techniques used to perform a physical examination.

Describe the types and components of electronic health records.

1.5 Practice Laps

Vocabulary Review

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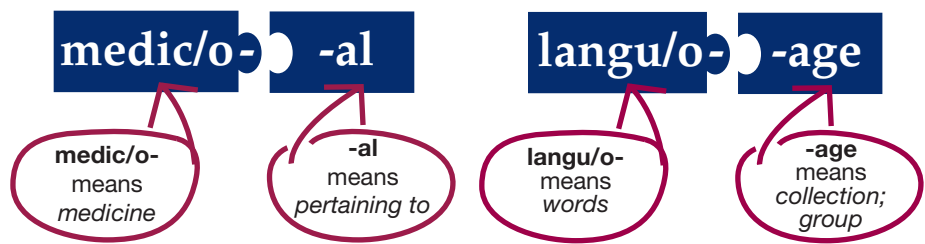
Dive In: Medical Language Exercises

(Learning Outcomes 1.1–1.5)

Immerse Yourself: Introduction to Medical Reports

Medical Language Key

To unlock the definition of a medical word, first break it into word parts. Then give the meaning of each word part. 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), then the meaning of the combining form.



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. 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 (see Figure 1-1 ■).” Learning medical language is the key to a successful career!

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

Dive Deeper

Medical Language versus Medical Terminology. There are many medical **terminology** textbooks on the market. These textbooks teach medical terms, but not medical language—the language that physicians, nurses, therapists, and other healthcare workers use. Medical terminology textbooks divide chapters by body systems, but *Medical Language* has chapters based on medical specialties, which reflects the practice of medicine in the real world. *Medical Language* reflects the way communication happens in medicine and health care today!



A.



B.

FIGURE 1-1 ■ Medical language.

A. These paramedics are speaking and writing 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 reading and analyzing a patient’s electronic medical record as she speaks to the patient’s physician who is listening to her report 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?

1.1 Medical Language

Language Skills

Communication in any language consists of five language skills. These same skills apply to medical language. You need to master all five skills in order to communicate on the job with other healthcare professionals.

1. Reading medical words

2. Hearing others speak 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.

All of these skills are critical to the communication of medical language. This textbook, *Medical Language*, helps you develop all of these skills by giving you many opportunities to practice until you have mastered them.

Pronunciation/Word Parts

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

communic/o- impart; transmit

-ation being; having; process

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

etym/o- word origin

-logy study of

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 looking at 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 to see how many of these words are familiar to you.

Word Alert

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

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

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

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

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

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

It's Greek to Me! This feature appears at the end of each chapter. It lists common combining forms mentioned in that chapter, their language of origin (Greek or Latin), and how those combining forms were used in medical words in the chapter. (Note: You will learn about combining forms in a later section.)

Word	Greek	Latin	Medical Word Examples
intestine	enter/o-	intestin/o-	gastroenterology; gastrointestinal
nerve	neur/o-	nerv/o-	neurology; nervous system
skin	dermat/o-	integument/o-	dermatology; integumentary system

1.1 PRACTICE LAPS

Use the Answer Key at the end of the book 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

Indicate whether each statement is true or false by writing **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 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 Words: Singular and Plural Nouns and Word Parts

Medical Words: Singular and Plural 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 (see 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
Greek Singular and Plural Nouns		
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
Latin Singular and Plural Nouns		
1. When a Latin singular noun ends in <i>-a</i> , form the plural by changing <i>-a</i> to <i>-ae</i> .	sclera vertebra	sclerae vertebrae
2. When a Latin singular noun ends in <i>-us</i> , form the plural by changing <i>-us</i> to <i>-i</i> .	bronchus thrombus	bronchi 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 bacterium	atria bacteria
4. When a Latin singular noun ends in <i>-is</i> , form the plural by changing <i>-is</i> to <i>-es</i> .	diagnosis testis	diagnoses 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 cortex	apices cortices

Medical 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, combining form, and suffix.

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

Dive Deeper

Learning medical language requires some memorization of word parts and their meanings.

If you know the meaning of a word part (especially a combining form), you can look at a medical word and already have an idea about its meaning because you know the meanings of its word parts.

Combining Forms

Because the combining form is the foundation of a medical word, let's begin our study of word parts 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 (see Figure 1-2 ■). 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.
- The majority of medical words contain a combining form. Some contain two combining forms, one right after the other. Example: *gastrointestinal* (the combining forms are **gastr/o-** and **intestin/o-**). Some medical words (such as *blood*, *health*, *heart*, or *nurse*), do not contain a combining form or any word parts at all.
- Two combining forms can have the same medical meaning because each is from a different language (see the feature *It's Greek to Me!* described previously.)



FIGURE 1-2 ■ Combining form.

A combining form contains a root, forward slash, combining vowel, and hyphen. The hyphen shows that the combining form is a word part, not a complete word. The combining form **cardi/o-** means *heart*.

Dive Deeper

In *Medical Language*, each time a word part is mentioned, it is shown in **bold blue type** (see the paragraph above and Table 1-2 ■).

This is to help you recognize that it is a word part. *Note:* Remember, word parts are not actual medical words because they contain forward slashes and hyphens that must be removed when a medical word is formed. Now let's look at some common combining forms and their meanings.

Table 1-2 Common Combining Forms and Their Meanings

Combining Form with a Nearly Identical Medical Meaning		
Combining Form	Meaning	
abdomin/o-	abdomen	
arteri/o-	artery	
intestin/o-	intestine	
muscul/o-	muscle	
thyroid/o-	thyroid gland	
tonsill/o-	tonsil	
ven/o-	vein	
Combining Form Similar to a Common Medical Word		
Combining Form	Meaning	Related Word
arthr/o-	joint	arthritis
cardi/o-	heart	cardiac
dermat/o-	skin	dermatologist
gastr/o-	stomach	gastric
mamm/o-	breast	mammogram
nas/o-	nose	nasal
Combining Form Not Similar to its Medical Meaning		
Combining Form	Meaning	
cost/o-	rib	
cyan/o-	blue	
enter/o-	intestine	
hepat/o-	liver	
lapar/o-	abdomen	
leuk/o-	white	

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 (see Figure 1-3 ■).

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



FIGURE 1-3 ■ 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*.

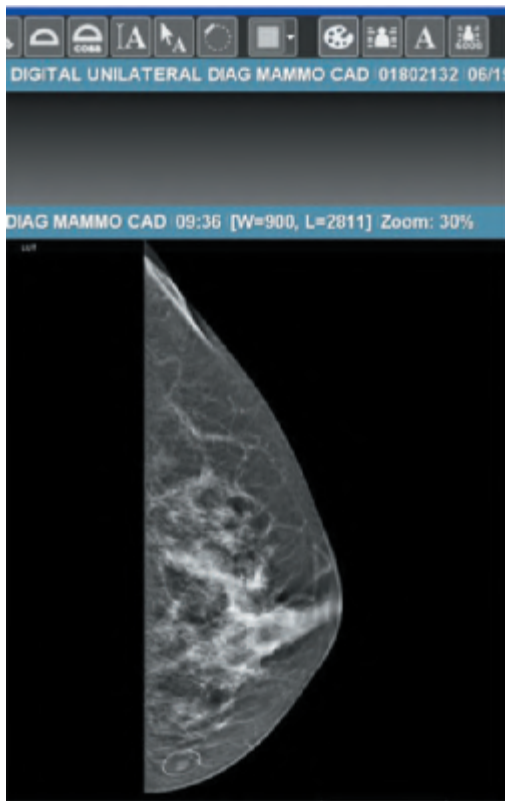
Table 1-3 Common Suffixes and Their Meanings

Suffix	Meaning	Medical Word Example	Definition	Notes
Suffixes for an Adjective				
-ac	pertaining to	cardiac	pertaining to (the) heart	Combining form cardi/o- means <i>heart</i> .
-al	pertaining to	intestinal	pertaining to (the) intestine	Combining form intestin/o- means <i>intestine</i> .
-ar	pertaining to	muscular	pertaining to (a) muscle	Combining form muscul/o- means <i>muscle</i> .
-ary	pertaining to	urinary	pertaining to (the) urine	Combining form urin/o- means <i>urinary system; urine</i> .
-ic	pertaining to	pelvic	pertaining to (the) pelvis	Combining form pelv/o- means <i>hip bone; pelvis; renal pelvis</i> .
-ine	pertaining to	uterine	pertaining to (the) uterus	Combining form uter/o- means <i>uterus; womb</i> .
-ive	pertaining to	digestive	pertaining to break down food	Combining form digest/o- means <i>break down food; digest</i> .
-ous	pertaining to	venous	pertaining to (a) vein	Combining form ven/o- means <i>vein</i> .
Suffixes for a Process				
-ation	being; having; process	urination	process (of making) urine	Combining form urin/o- means <i>urine; urinary system</i> .
-ion	action; condition	digestion	action (to) break down food	Combining form digest/o- means <i>break down food; digest</i> .
Suffixes for a Disease				
-ia	condition; state; thing	pneumonia	condition (of the) lung	Combining form pneumon/o- means <i>air; lung</i> .
-ism	disease from a specific cause; process	hypothyroidism	disease from a specific cause (of) deficient thyroid gland (hormone)	Combining form thyroid/o- means <i>thyroid gland</i> .
-itis	infection of; inflammation of	tonsillitis	infection of (the) tonsil	Combining form tonsill/o- means <i>tonsil</i> .
-megaly	enlargement	cardiomegaly	enlargement (of the) heart	Combining form cardi/o- means <i>heart</i> .
-oma	mass; tumor	neuroma	tumor (on a) nerve	Combining form neur/o- means <i>nerve</i> .
-osis	abnormal condition; process	vaginosis	abnormal condition (of the) vagina	Combining form vagin/o- means <i>vagina</i> .
-pathy	disease	arthropathy	disease (of a) joint	Combining form arthr/o- means <i>joint</i> .
Suffixes for a Procedure				
-ectomy	surgical removal	tonsillectomy	surgical removal (of the) tonsils	Combining form tonsill/o- means <i>tonsil</i> .
-gram	picture; record	mammogram (see Figure 1-4 ■)	picture (of the) breast	Combining form mamm/o- means <i>breast</i> .
-graphy	process of recording	arteriography	process of recording (an) artery	Combining form arteri/o- means <i>artery</i> .
-metry	process of measuring	densitometry	process of measuring (the) density (of bone)	Combining form densit/o- means <i>density</i> .
-scope	instrument used to examine	colonoscope	instrument used to examine (the) colon	Combining form colon/o- means <i>colon</i> .
-scopy	process of using an instrument to examine	gastroscopy	process of using an instrument to examine (the) stomach	Combining form gastr/o- means <i>stomach</i> .
-tomy	process of making an incision	laparotomy	process of making an incision (in the) abdomen	Combining form lapar/o- means <i>abdomen</i> .

continued on next page

Table 1-3 Common Suffixes and Their Meanings

Suffix	Meaning	Medical Word Example	Definition	Notes
Suffixes for a Medical Specialty or Specialist				
-iatry	medical treatment	psychiatry	medical treatment (for the) mind	Combining form psych/o- means <i>mind</i> .
-ics	knowledge; practice	obstetrics	knowledge and practice (of) pregnancy and childbirth	Combining form obstetr/o- means <i>pregnancy and childbirth</i> .
-ist	person who specializes in; thing that specializes in	therapist (see Figure 1-5 ■)	person who specializes in treatment	Combining form therap/o- means <i>treatment</i> .
-logy	study of	cardiology (see Figure 1-6 ■)	study of (the) heart	Combining form cardi/o- means <i>heart</i> .

**FIGURE 1-4 ■ Mammogram.**

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

**FIGURE 1-5 ■ Therapist.**

This physical therapist is providing therapy to a patient. The suffix **-ist** means *person who specializes in*.

**FIGURE 1-6 ■ Cardiology clinic.**

There are many types of clinics located in a hospital or in other healthcare facilities.

Prefixes

Finally, let's look at the third type of word part: prefixes. A prefix has the following characteristics:

- It is a word part that, if present, is at the beginning of a word, but not every medical word contains a prefix.
- It modifies or clarifies the medical meaning of the combining form.
- It is a single letter or group of letters that ends with a hyphen (see Figure 1-7 ■).

Some common prefixes are shown in Table 1-4 ■. Take a moment to review them and learn their meanings so that you will be ready to use them in medical words.



FIGURE 1-7 ■ Prefix.
A prefix ends with a hyphen to show that it is a word part, not a complete word. The prefix **intra-** means *within*.

Table 1-4 Common Prefixes and Their Meanings

Prefix	Meaning	Medical Word Example	Definition	Notes
Prefixed for Location or Direction				
epi-	above; upon	epidermal	pertaining to upon (the) skin	Combining form derm/o- means <i>skin</i> .
inter-	between	intercostal	pertaining to between (the) ribs	Combining form cost/o- means <i>rib</i> .
intra-	within	intravenous (see Figure 1-8 ■)	pertaining to within (a) vein	Combining form ven/o- means <i>vein</i> .
peri-	around	pericardial	pertaining to around (the) heart	Combining form cardi/o- means <i>heart</i> .
post-	after; behind	postnasal	pertaining to behind (the) nose	Combining form nas/o- means <i>nose</i> .
pre-	before; in front of	prenatal	pertaining to before (a) birth	Combining form nat/o- means <i>birth</i> .
sub-	below; underneath; less than	subcutaneous	pertaining to underneath (the) skin	Combining form cutane/o- means <i>skin</i> .
trans-	across; through	transvaginal	pertaining to through (the) vagina	Combining form vagin/o- means <i>vagina</i> .
Prefixed for Amount, Number, or Speed				
bi-	two	bilateral	pertaining to two sides	Combining form later/o- means <i>side</i> .
brady-	slow	bradycardia	condition (of a) slow heart	Combining form card/o- means <i>heart</i> .
hemi-	one half	hemiplegia	condition (of) one half (of the body with a) paralysis	Combining form pleg/o- means <i>paralysis</i> .
hyper-	above; more than normal	hypertension (see Figure 1-9 ■)	condition (of) more than normal pressure	Combining form tens/o- means <i>pressure; tension</i> .
hypo-	below; deficient	hypothyroidism	disease from a specific cause (of) deficient thyroid gland (hormone)	Combining form thyroid/o- means <i>thyroid gland</i> .
poly-	many; much	polyneuritis	inflammation of many nerves	Combining form neur/o- means <i>nerve</i> .
quadri-	four	quadriplegia	condition (of) four (limbs with) paralysis	Combining form pleg/o- means <i>paralysis</i> .
tachy-	fast	tachycardia	condition (of a) fast heart	Combining form card/o- means <i>heart</i> .
tri-	three	trigeminal	pertaining to three (nerve branches in a) group	Combining form gemin/o- means <i>group; set</i> .

continued on next page

Table 1-4 Common Prefixes and Their Meanings

Prefix	Meaning	Medical Word Example	Definition	Notes
Prefixes for Degree or Quality				
an-	not; without	anesthesia	condition (of being) without sensation	Combining form esthes/o- means <i>feeling; sensation</i> .
anti-	against	antibiotic	pertaining to (a drug that is) against living organisms	Combining form bi/o- means <i>living organism; living tissue</i> .
dys-	abnormal; difficult; painful	dysphagia	condition (of) difficult (or) painful eating (and) swallowing	Combining form phag/o- means <i>eating; swallowing</i> .
re-	again and again; back-ward; unable to	respiration	process (of) again and again (to) breathe	Combining form spir/o- means <i>breathe; coil</i> .

**FIGURE 1-8 ■ Intravenous.**

The prefix **intra-** means *within*. The needle is placed within a vein to administer intravenous fluids.

**FIGURE 1-9 ■ Hypertension.**

The numbers on this automated blood pressure machine are higher than a normal reading, which shows that the patient has hypertension. The prefix **hyper-** means *above; more than normal*.

1.2 PRACTICE LAPS

Use the Answer Key at the end of the book to check your answers.

A. Give the Meaning of Combining Forms

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

Combining Form	Meaning	Combining Form	Meaning
1. spir/o-	<u>breathe; coil</u>	4. arthr/o-	<u> </u>
2. abdomin/o-	<u> </u>	5. bi/o-	<u> </u>
3. arteri/o-	<u> </u>	6. colon/o-	<u> </u>

continued on next page

Combining Form	Meaning	Combining Form	Meaning
7. cost/o-	_____	21. nat/o-	_____
8. cutane/o-	_____	22. neur/o-	_____
9. dermat/o-	_____	23. obstetr/o-	_____
10. derm/o-	_____	24. pelv/o-	_____
11. digest/o-	_____	25. phag/o-	_____
12. enter/o-	_____	26. pleg/o-	_____
13. esthes/o-	_____	27. tens/o-	_____
14. gastr/o-	_____	28. therap/o-	_____
15. intestin/o-	_____	29. thyroid/o-	_____
16. lapar/o-	_____	30. tonsill/o-	_____
17. later/o-	_____	31. urin/o-	_____
18. leuk/o-	_____	32. uter/o-	_____
19. mamm/o-	_____	33. vagin/o-	_____
20. muscul/o-	_____	34. ven/o-	_____

B. Matching Exercise

Match each word part to its description.

- | | |
|-------------|---|
| 1. anti- | _____ prefix meaning <i>fast</i> |
| 2. brady- | _____ combining form meaning <i>liver</i> |
| 3. cardi/o- | _____ suffix meaning <i>action; condition</i> |
| 4. cyan/o- | _____ prefix meaning <i>around</i> |
| 5. hepat/o- | _____ suffix meaning <i>mass; tumor</i> |
| 6. -ion | _____ combining form meaning <i>nose</i> |
| 7. -itis | _____ combining form meaning <i>heart</i> |
| 8. nas/o- | _____ suffix meaning <i>pertaining to</i> |
| 9. peri- | _____ prefix meaning <i>slow</i> |
| 10. -oma | _____ combining form meaning <i>blue</i> |
| 11. -ous | _____ suffix meaning <i>infection of; inflammation of</i> |
| 12. tachy- | _____ prefix meaning <i>against</i> |

C. True or False Exercise

Indicate whether each statement is true or false by writing **T** or **F** on the line.

- _____ For most singular English words, form the plural by adding an -s.
- _____ Greek and Latin languages had rules about how to form a plural noun, and those rules still apply today.
- _____ By definition, a therapist is a person who specializes in treatment.
- _____ The combining form **gastr/o-** means *rib*.
- _____ The combining form **arthr/o-** means *joint*.

D. English Plural Noun Exercise

Write the plural form of each English singular noun. Be sure to check your spelling. The first one has been done for you.

- | | | | |
|-------------------|-----------------------------|----------|-----------------------------|
| 1. hormone | <u>hormones</u> | 4. nerve | <u> </u> |
| 2. kidney | <u> </u> | 5. ovary | <u> </u> |
| 3. artery | <u> </u> | | |

E. Greek Plural Noun Exercise

Write the plural form of each Greek singular noun. Be sure to check your spelling. The first one has been done for you.

- | | | | |
|----------------|-----------------------------|--------------|-----------------------------|
| 1. iris | <u>irides</u> | 3. carcinoma | <u> </u> |
| 2. phalanx | <u> </u> | 4. ganglion | <u> </u> |

F. Latin Plural Noun Exercise

Write the plural form of each Latin singular noun. Be sure to check your spelling. The first one has been done for you.

- | | | | |
|--------------------|-----------------------------|--------------|-----------------------------|
| 1. vertebra | <u>vertebrae</u> | 7. bacterium | <u> </u> |
| 2. sclera | <u> </u> | 8. ovum | <u> </u> |
| 3. bronchus | <u> </u> | 9. diagnosis | <u> </u> |
| 4. alveolus | <u> </u> | 10. testis | <u> </u> |
| 5. thrombus | <u> </u> | 11. apex | <u> </u> |
| 6. atrium | <u> </u> | | |

1.3 Divide and Build Medical Words

The third skill of medical language involves thinking, analyzing, and understanding. When you analyze something, you divide it into smaller pieces that are easier to understand. When you see or hear a medical word, you can analyze it by dividing it into its word parts. Or when you read the definition of a medical word, you can analyze it by selecting word parts to build the word itself. Here are the steps for dividing or building a medical word.

Divide Medical Words

Medical Word with a Combining Form and Suffix

Let's say you read or hear this medical word and want to know its definition.

cardiology

Step 1. Divide the medical word into its combining form and suffix.

(Note: At this point, you may not be able to look at a medical word and know that it contains a combining form and a suffix. However, as you memorize various word parts and their meanings, you will be able to do this.)



Step 2. Give the meaning of each word part.



Step 3. Combine the meanings of the word parts; put the meaning of the suffix first, then the meaning of the combining form.

Step 4. Add small connecting words to make the definition.



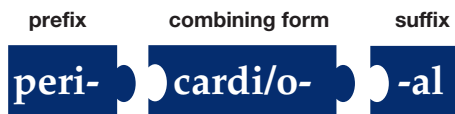
Cardiology: *Study of (the) heart (and related structures)*

Medical Word with a Prefix, Combining Form, and Suffix

Let's say you read or hear this medical word and want to know its definition.

pericardial

Step 1. Divide the medical word into its prefix, combining form, and suffix.



Step 2. Give the meaning of each word part.



Step 3. Combine the meanings of the word parts; put the meaning of the suffix first, then the meaning of the prefix, then the meaning of the combining form.

Step 4. Add small connecting words to make the definition.



Pericardial: *Pertaining to around (the) heart*

Build Medical Words

Medical words are like puzzles, and their word parts are the pieces of the puzzle. To build a medical word, begin with its definition. Select word parts that match that definition and put the word parts together (like puzzle pieces) in the correct way. Here are the steps for building a medical word.

Suffix that Begins with a Consonant

Let's say you want to build a medical word with this definition.

Study of the heart

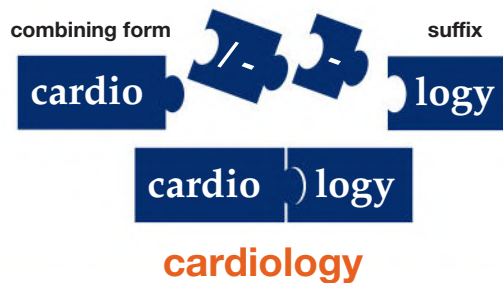
Step 1. Select the suffix whose meaning matches the definition of that medical word. Then select the combining form whose meaning matches.



Step 2. Change the order of the word parts to put the suffix last.



Step 3. Because the suffix begins with a consonant, keep the combining form's vowel, but delete the forward slash and hyphen. Delete the hyphen from the suffix. Then, join the two word parts.



Suffix that Begins with a Vowel

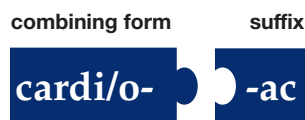
Let's say you want to build a medical word with this definition.

Pertaining to the heart

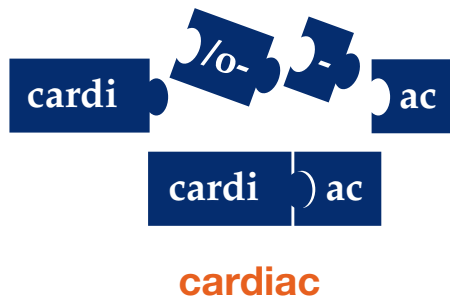
Step 1. Select the suffix whose meaning matches the definition of that medical word.
Then select the combining form whose meaning matches.



Step 2. Change the order of the word parts to put the suffix last.



Step 3. Because the suffix begins with a vowel, delete the combining form's vowel. Also delete the combining form's forward slash and hyphen. Delete the hyphen from the suffix. Then, join the two word parts.



Contains a Prefix

Let's say you want to build a medical word with this definition.

Pertaining to within the heart

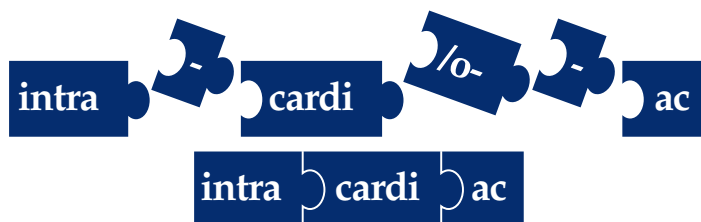
Step 1. Select the suffix, prefix, and combining form whose meanings match the definition of the medical word.



Step 2. Change the order of the word parts to put the suffix last, with the prefix first, followed by the combining form.



Step 3. Delete the hyphen from the prefix. Delete the forward slash, combining vowel, and hyphen from the combining form. Delete the hyphen from the suffix. Then, join the three word parts.



intracardiac

Write and Spell Medical Words

One of the five medical language skills is the spelling of medical words. Remembering the spelling of combining forms and other word parts and how to correctly build a medical word will also help you correctly spell the medical word. Writing and spelling medical words are emphasized in every chapter's exercises.

Speak and Pronounce Medical Words

One of the five medical language skills is the pronunciation of medical words. Knowing the definition of a medical word is important, but being able to pronounce the word correctly is equally important. In each chapter, as you read a medical word (in bold in the text), you will see an accompanying "see-and-say" pronunciation guide in the column next to the text (see Figure 1-10 ■). The syllables in the medical word are separated by hyphens. The primary (main) accented syllable is in all capital letters. The secondary accented syllable is in smaller capital letters. Use the pronunciation guide to say each syllable. In doing so, you are creating an accurate pronunciation memory for that medical word.

See-and-Say	
cardiology	(KAR-dee-AW-loh-jee)
pericardial	(PAIR-ih-KAR-dee-al)
cardiac	(KAR-dee-ak)
intracardiac	(IN-trah-KAR-dee-ak)

FIGURE 1-10 ■ Pronunciation. Pronounce each syllable in the "see-and-say" pronunciation to hear the correct pronunciation of the medical word.

1.3 PRACTICE LAPS

Use the Answer Key at the end of the book to check your answers.

A. True or False Exercise

Indicate whether each statement is true or false by writing **T** or **F** on the line.

- _____ To analyze a medical word, you must divide it into its word parts.
- _____ The final step in dividing a medical word is to add small connecting words to make a definition.
- _____ When you combine the meanings of the different word parts, you put the meaning of the combining form first because it is the most important.
- _____ When a suffix begins with a consonant, keep the combining form's vowel when you build the medical word.
- _____ To finish building a medical word, delete the hyphen from the combining form and the hyphen from the suffix.
- _____ When a suffix begins with a vowel, delete the combining form's vowel when you build the medical word.

B. Dividing Medical Words Exercise

Separate these words into their component parts (prefix, combining form, suffix). Some words do not contain all three word parts. The first one has been done for you.

Medical Word	Prefix	Combining Form	Suffix	Medical Word	Prefix	Combining Form	Suffix
1. cardiology		<u>cardi/o-</u>	<u>-logy</u>	6. intravenous	_____	_____	_____
2. cardiac		_____	_____	7. bradycardia	_____	_____	_____
3. intestinal		_____	_____	8. urination		_____	_____
4. muscular		_____	_____	9. tonsillitis		_____	_____
5. venous		_____	_____	10. bilateral	_____	_____	_____

C. Build Medical Words Exercise

Practice building medical words by joining a combining form and a suffix. Write the medical word on the line. Be sure to check your spelling. The first one has been done for you.

Combining Form	Suffix that Begins with a Vowel	Medical Word	Combining Form	Suffix that Begins with a Consonant	Medical Word
1. cardi/o-	-ac	<u>cardiac</u>	7. arthr/o-	-pathy	_____
2. digest/o-	-ive	_____	8. cardi/o-	-logy	_____
3. intestin/o-	-al	_____	9. cardi/o-	-megaly	_____
4. neur/o-	-oma	_____	10. colon/o-	-scope	_____
5. therap/o-	-ist	_____			
6. tonsill/o-	-itis	_____			

D. Spell Medical Words Exercise

Look at each medical word and detect the spelling error. Then write the correct spelling on the line. The first one has been done for you.

Misspelled Medical Word	Correct Spelling
1. sychiatry	<u>psychiatry</u>
2. cardeac	_____
3. tonsillitis	_____
4. venus	_____
5. pelvik	_____
6. cardology	_____
7. hypertensin	_____
8. antebiotic	_____

E. Pronounce and Spell Exercise

Read the “see-and-say” pronunciation out loud. Practice pronouncing it several times. Write the medical word that it represents. Be sure to check your spelling. The first one has been done for you.

“See-and-Say” Pronunciation	Spell the Medical Word
1. (ab-DAW-mih-nal)	<u>abdominal</u>
2. (KAR-dee-ak)	_____
3. (KAR-dee-AW-loh-jee)	_____
4. (dy-JES-chun)	_____
5. (dy-JES-tiv)	_____
6. (in-TES-tih-nal)	_____
7. (MAM-oh-gram)	_____
8. (MUS-kyoo-lar)	_____
9. (sy-KY-ah-tree)	_____
10. (THAIR-ah-pist)	_____
11. (TAWN-sil-EK-toh-mee)	_____
12. (YOOR-ih-NAIR-ee)	_____
13. (PEL-vik)	_____
14. (VEE-nuhs)	_____