THIRD EDITION

Medical Terminology in a Flash!

A Multiple Learning Styles Approach

Lisa Finnegan • Sharon Eagle

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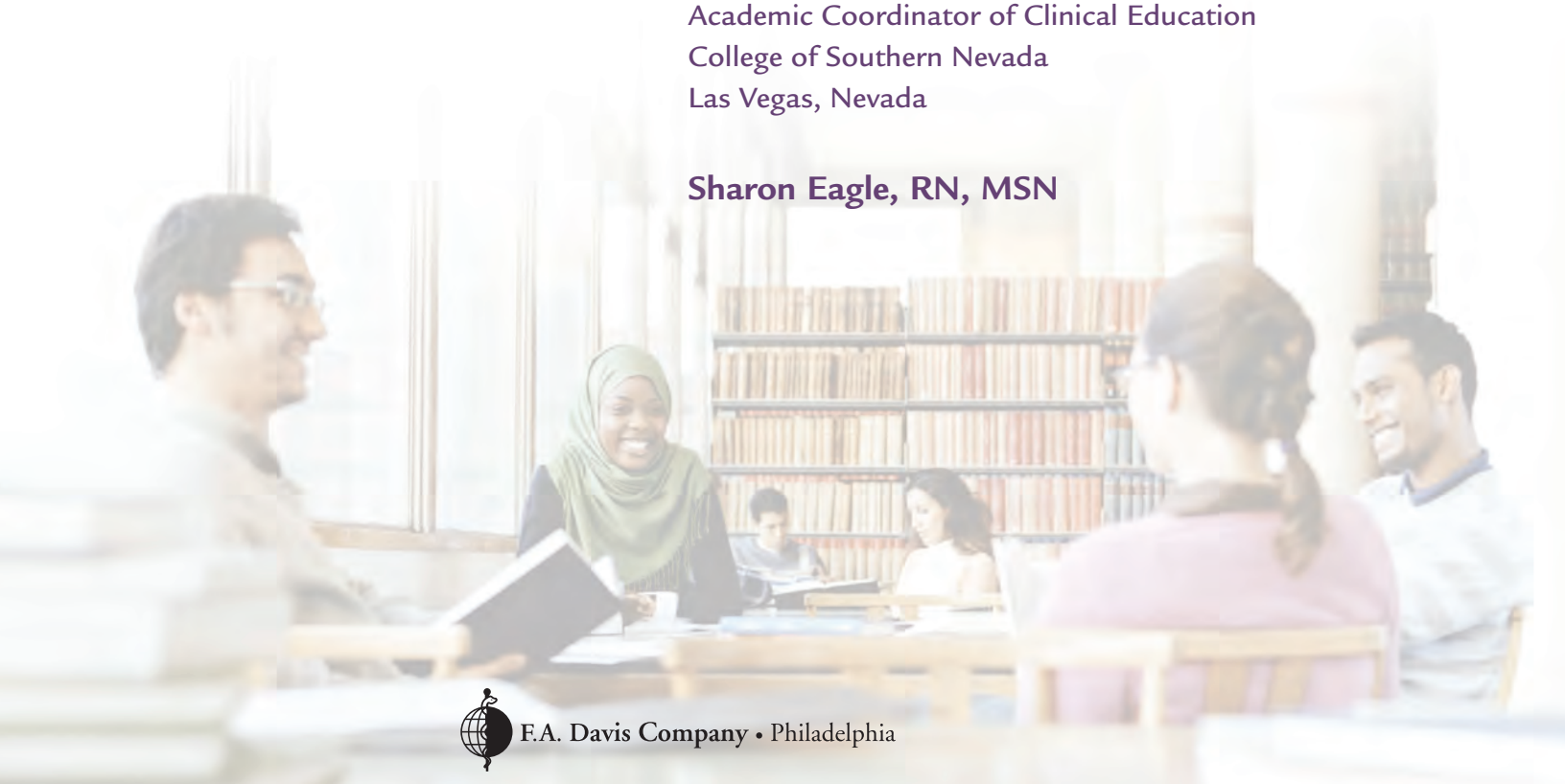

F.A. Davis Company • Philadelphia

F. A. Davis Company
1915 Arch Street
Philadelphia, PA 19103
www.fadavis.com

Printed in the United States of America

Last digit indicates print number: 10 9 8 7 6 5 4 3 2 1

Publisher: Quincy McDonald
Director of Content Development: George W. Lang
Developmental Editors: Joanna E. Cain and Pamela Speh
Art and Design Manager: Carolyn O'Brien

DEDICATION

For Tommy, Ryan, Jason, and Grandma Wolf

"Pantophobia. Not the fear of pants, though, if that's what you're thinking. It's the fear of everything. Including pants, I suppose, in that case."

The Doctor, *Doctor Who*

"There must exist certain words, in a certain specific order, that can explain all of this."

Walter White, *Breaking Bad*

PREFACE

Medical Terminology in a FLASH! 3rd edition was created for students of all ages, with all types of learning styles. Visual, auditory, verbal, and hands-on learners are supported through textbook and online resources.

For Instructors:

The third edition has been reorganized to facilitate use in all types of classrooms. The **new structure** allows instructors of traditional, online, flipped, and self-study courses to effortlessly use all or part of each chapter and utilize the book across multiple semesters if they choose. The addition of the **Medical Language Lab** will be especially appealing to instructors who would like to include an online component to their course. ***Davis Plus*** (http://davisplus.fadavis.com) continues to be the instructor's one-stop shop for important instructor resources. These resources include:

- ExamView Pro Electronic Test Bank
- PowerPoint Presentations for each chapter
- Image Resource (including all images from the book in jpeg format)
- Instructor's Manual (with additional teaching tips and activities)
- Teaching Guide (extensive teaching resource which offers lecture guidance, suggested homework assignments, and in-class activities for every lecture in a traditional one-term course)
- LMS Resource Kits (provides all of the resources on the DavisPlus site for *Medical Terminology in a Flash! 3e* in convenient-to-upload packets for the most popular learning management systems)

Updates to this edition include **Flash Cards** for every suffix, prefix, combining form, abbreviation, and pathology term in the book. New **Boxes** and improved **Flashpoint** features offer more information on certain topics as well as where to find additional information online. The **Learning Style Tips** feature has been improved by adding ideas to engage multiple learning styles in a single activity and by offering suggestions on how technology can be used to boost learning. The **Structure and Function** section of each chapter has been enhanced by supplying new exercises to strengthen the students' knowledge of key terms and definitions. Many of the exercises throughout the book are written by the author, and all of the answer keys are now located only in the Instructor's Guide to ensure that students are dedicating enough time to their assignments. There are **more abbreviations** in this edition, some of which will

appeal to those in rehabilitation professions. The new **Pharmacology** section in each chapter is a great introduction to medications that will benefit those students who will soon be taking pharmacology courses.

New! The Medical Language Lab

The Medical Language Lab is an interactive, online experience for mastering the language of medicine. The MLL uses proven language methodology to give students the practice needed to become a fluent medical language speaker. Step by step, it guides students from basic through advanced levels of proficiency to become confident medical language speakers while also providing instructors administrative capabilities to create, customize, and manage classes and gradebooks.

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

For Students:

Medical Terminology in a FLASH! includes many features to facilitate your success in this course.

In the Textbook

- **Nearly 200 flash cards** including all suffixes and prefixes. Hundreds more are online on *Davis Plus (http://davisplus.fadavis.com)*. The ***IN A FLASH*** icon will appear throughout each chapter to remind you to use your flash cards before moving on to the next section. See *Flash Card Game*s on page xxi for new ways to use your cards.
- **A workbook format** supports your learning by encouraging you to write directly in the book. The act of writing actively engages your brain in a way that reading alone cannot. Perforations allow you to remove as many pages as you'd like. You are able to tear out a few pages and carry them with you instead of carrying the whole book. This can be especially helpful when you are experiencing "wasted" moments in your day such as waiting in a line. If you have a few pages in your bag, you are able to have a quick study session!
- **Learning style tips** throughout the book help you learn and retain new information through activities that use your visual, auditory, verbal, and kinesthetic (hands-on) senses. Look for the learning style tip icons that represent the four learning styles Learning Style Tip. They will help you choose the activities that may be best for you.
- **Flashpoints and boxes** provide more information on certain topics within each chapter.
- **Clearly marked sections in each chapter** enable you to quickly and easily find specific assignments or information on which you need to focus. This is especially helpful if you are a self-study, online, or flipped classroom student. Chapters 1 and 2 help you to discover your learning style preferences and provide the suffix and prefix word parts

necessary for using medical terminology. Each chapter that follows includes a section on:

- **Structure and Function** with key medical terms and full-color anatomical illustrations of the body systems. Body parts are labeled, and combining forms are listed. This information is reinforced at the end of the section in matching and labeling exercises.
- **Combining Forms and Abbreviations** that pertain to each body system with color-coded tables. You will notice that ***prefixes*** are coded ***green***, ***suffixes*** are coded ***blue, combining forms*** (word root + a vowel) are coded ***teal***, ***abbreviations*** are coded ***orange***, and ***pathology terms*** are coded ***purple.*** This color coding directly corresponds with the color-coded flash cards in the textbook. When you go to *DavisPlus* to print out more flash cards, consider using colored paper or markings that correspond to the color of the table.
- **Pathologies, Procedures, and Pharmacology** that pertain to each body system. You will find more than 300 medications described by their generic name, brand name, therapeutic classification, and common use. In addition, you will gain some insight into how the medications act on the body.

- **Exercises that correspond to each section** for courses that do not cover the entire chapter or that divide the material into multiple semesters. You can easily find the exercises that pertain only to the sections you studied.
- **End-of-chapter exercises** provide even more practice on everything you learned in the chapter.

Online at Davis Plus

Go to ***http://davisplus.fadavis.com/*** for free access to several more student resources including:

- Hundreds more printable flash cards!
- Practice quizzes for every chapter!

Online at Medical Language Lab

Go to ***http://www.medicallanguagelab.com*** and register using the access code provided in new copies of *Medical Terminology in a FLASH! 3e.* Your free access includes:

- Interactive eBook version of the entire text.
- Lecture videos covering every chapter in the text
- Audio tutorials and pronunciation guides
- Critical listening exercises
- Response exercises
- Term generation exercises; both spoken and written
- Word building exercises
- Labeling exercises
- Crosswords, and more!

The Flash Cards

Flash cards that correspond to all of the tables are provided for you. The back of this book contains all of the flash cards for chapters 2 and 3 as well as all of the combining form cards for chapter 4. All of the combining form cards for

chapters 5 through 14 are online, ready for you to print out. You will also find cards for the abbreviation and pathology tables from every chapter online. Many of the flash cards contain visual cues, while others have an area for you to draw your own visual cue, which has meaning for you.

Be sure to practice with the flash cards after you complete each related section of the book. Take them with you when you exercise or go on road trips. Additionally, each day select a few cards to take with you in your purse or pocket, so that they are on hand during otherwise "wasted" moments such as when you're stuck waiting in a line.

- If you review five to 10 different flash cards several times each day, you can easily memorize 35 to 70 new terms each week without using your "official" study time. Over 10 weeks, that adds up to 350 to 700 new terms! Repetition is the key to memorization; flash cards make repetition easy.
- With color-coded flash cards, you will not only memorize the meanings of the word parts but will also memorize whether the word parts are suffixes, prefixes, combining forms, or pathology terms, without even making a conscious effort!
- The flash cards have terms with the same or similar meanings grouped together. Therefore, you will easily memorize two, three, or more terms in the same time it would normally take to memorize just one.

Flash Cards Games

Partner Flash/Two Players

Need one set of any number of flash cards. This is a good exercise to use when your partner is a friend or family member who is not learning medical terminology.

Give selected cards to your partner to shuffle. The partner will flash each card in front of you, one at a time. You will agree on a preset amount of time (5 seconds or less) to name the correct meaning, or correct term, depending upon which side is being flashed. Run through the cards until you can name each of them within the designated time limit. If you make a pile of cards for those you answered correctly and a pile for those you answered incorrectly, you will know which terms you need to practice a bit more.

Single Player Flash

Need one set of any number of flash cards.

Run through your cards alone, while racing against the clock. Challenge a classmate with the same set of cards to see who can complete the cards correctly, in the shortest amount of time.

Single Player Video Flash

Need one set of any number of flash cards and a video recording device.

Shuffle your cards. One at a time, show a term on your card to your video recorder. Hold it there for 3 to 5 seconds before you flip your card, showing the meaning. As you watch your completed recording, the hold time will allow you to guess the meaning of the term before you see the correct answer. Make another recording where you start by showing the meaning and then need to guess the term.

Single Player Audio Flash

Need one set of any number of flash cards and an audio recording device.

Shuffle your cards. One at a time, read a term aloud into your audio recorder. Pause quietly for 3 to 5 seconds and then flip your card and read the meaning

aloud. As you listen to your completed recording, the quiet pause will allow you to guess the meaning of the term before you hear the correct answer. Make another recording where you start by reading the meaning aloud and then need to guess the term.

Systems Game/One or More Players

Need the same set of systems flash cards for each player and a blank piece of paper with the name of each system written on top.

Start by playing with cards from two systems such as the integumentary system and the nervous system. Slowly add cards from more systems to make your game more challenging.

Players use their own cards and their own papers. The papers with the system names are laid out in front of each player in whatever order they choose. Shuffle the cards and, when ready, begin matching cards to the system they belong to by laying them down on the correct sheet of paper. The first player to correctly match all of his or her cards to the correct system is the winner. This game can also be played alone while racing against the clock.

Speed/Two Players

Need two sets of the same flash cards. Be sure to label your cards with an identifying mark or color so that your cards can be returned to you at the end of the game.

Players shuffle their cards, face each other and, when ready, begin laying down cards (each in a separate pile) at the same time. When players happen to lay down identical cards, the first one to correctly say the term and name the correct definition takes the matching cards from both piles and puts them aside. Matches will be infrequent at the beginning but will occur more and more frequently as cards are eliminated from play. The game continues until all cards are out of play. The winner is the one who collects the most pairs.

Score Four/Three or More Players

Need one set of the same cards per player. Be sure to label your cards with an identifying mark or color so that your cards can be returned to you at the end of the game.

Each player contributes a set of the same cards related to one or more body systems. All cards are shuffled together, and four are dealt to each player. Remaining cards are placed in a "draw" pile in the center of the table. The object of the game is to collect all four cards of a term. Because the cards have identifying data on both sides, the players will have to hold the cards so that no one else can see them. Players take turns asking other players for cards with a specific term. For example, the first player already has two cards with the term "gastr/o" and wants to collect the other two. On her turn, she would name another player and ask for all cards with the term "gastr/o" and would also pronounce the correct translation "stomach." The other player must hand over all cards with that term. If the other player does not have that card, then the first player must draw a card from the draw pile. Once a player has collected all four cards, that player should lay them on the table and state the term and the correct translation aloud. If the player forgets these steps when laying down the cards, another player may claim the cards by stating the magic words "Score Four!" and must then pronounce the term and identify the correct translation. If the player is unable to name the correct translation (without looking), the original player keeps control of the cards. The winner of the game is the one with the most four-card matches when all cards have been played.

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ACKNOWLEDGMENTS

I believe that everything happens for a reason. In some cases, it takes many years before you even realize you have been on a journey. I would like to express my gratitude to everyone involved in the series of events that led to this moment. I think it may have begun with my instructors in the CSN Physical Therapist Assistant Program, Joann Gutschick and Dr. Joe Cracraft. Thank you for changing my life twice. I was thrilled to return to the PTA program as an instructor and am so happy to be doing for others what you did for me. I continue to learn from you and am honored to be your colleague and friend. Thank you to Dr. Mark Guadagnoli at the University of Nevada Las Vegas. I just happened to pick your class from a list of possibilities. Because of you and your teaching style, I developed an interest in brain-based learning, and I changed my teaching methods. Many of those changes became learning activities that are represented throughout this book. Often, when a student compliments me or I have a really great day in the classroom, I smile and think to myself, "I learned that from Dr. G." Thank you to all of my students in the Physical Therapist Assistant Program who challenge me to be a better teacher every semester. Special thanks to the class of 2013 for suggesting I write a book about the learning activities I created for them. When my sales rep from F. A. Davis stopped by one day, I decided to take their advice. Thank you to Greg Middleton at F. A. Davis for listening to my sales pitch and for remembering me at exactly the right moment. Because of you, I met Quincy.

Thank you to Quincy McDonald at F. A. Davis for choosing me for this project. It has truly been a pleasure working with you and your whole team. It was very easy to do my best work for a group of people who treated me with kindness and professionalism every step of the way. Thank you to Sharon Eagle for allowing me to join in your vision for student success. I also want to express an enormous amount of gratitude to Joanna Cain and Pamela Speh of Auctorial Pursuits, Inc. for your guidance, organization, encouragement, and kindness. Thank you Gayle Crist for ensuring that I used the right words at the right time. Finally, thank you to all of the reviewers. Your input and advice facilitated some great improvements. When I entered the PTA Program 15 years ago, I had no idea that I was beginning this journey. Thank you so much to everybody who supported me and who helped me reach this destination.

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LEARNING STYLES 1

Chapter Outline

Overview

Learning style theory suggests that individuals learn information in different ways according to their unique abilities and traits. Therefore, while all humans are similar, the ways in which you best perceive, understand, and remember information may be somewhat different from the ways other people learn.

In truth, all people possess a combination of styles. You may be especially strong in one style and less so in others. You may be strong in two or three areas or may be equally strong in all areas. As you learn about the styles described in this chapter, you may begin to recognize your preferences and will then be able to modify your study activities accordingly. Try using multiple learning styles as you study rather than choosing one in particular. This will help you make the most of your valuable time, enhance your learning, and support you in doing your very best in future classes.

Sensory Learning Styles

Experts have identified numerous learning styles and have given them various names. Some are described in an abstract and complex manner, while others are relatively simple and easy to grasp. For ease of understanding, this book uses the learning styles associated with your senses. You use your senses to see and hear information. You use touch and manipulation or your sense of taste or smell. You may find it useful to think aloud as you discuss new information with someone else. Because the senses are so often involved in the acquisition of new information, many learning styles are named accordingly: visual, auditory, verbal, and kinesthetic (hands-on or tactile).

Visual Learning

Most people have a preference for visual learning. To most accurately and quickly grasp new information, these types of learners need to see the

information represented visually. The more complex the data, the more this is true. Visual learners especially like data that are colorful and visually striking. Within the classroom, they prefer instructors who use written outlines and many visual aids. During exams, they may recall information by "seeing" it in their mind's eye, whether it is an actual picture or diagram or a fragment of written text. Visual information can be presented in many ways. Examples include:

Written words	Flowcharts
Diagrams	Time lines
Shapes	Maps
Patterns	Handouts
Colors	Posters
Symbols	Flash cards
Illustrations	PowerPoint presentations
Graphs	Internet data
Photos	Videos
Tables	Live demonstrations

Study Strategies for Visual Learning

Try using any study or memory technique that aids you in visually seeing and recalling information. You may find *mnemonics* (memory aids) especially helpful for remembering lists or sequenced pieces of information. Generally speaking, the more creative, whimsical, funny, or absurd they are, the better you will remember them. There are many different types of mnemonics. Some examples follow.

- Children use the well-known alphabet song, a *musical* mnemonic, to learn their ABCs.
- Students in anatomy classes use one of several mnemonic variations to remember the 12 cranial nerves (olfactory, optic, oculomotor, trochlear, trigeminal, abducens, facial, acoustic, glossopharyngeal, vagus, spinal accessory, and hypoglossal). One example is "On old Olympus' tower tops, a Finn and German viewed some hops." Note that the first letter of each word is the same as the first letter of each cranial nerve's name.
- When spelling, most people use this *rhyming* mnemonic to remember where to place the *I* and *E* in a word: "I before E, except after C."

Another form of commonly used mnemonics is the *acronym.* An acronym is an abbreviation created by using the first letters or word parts in names or phrases. Examples of acronyms include:

LASER—**L**ight **a**mplification by **s**timulated **e**mission of **r**adiation
INTERPOL—**Inter**national Criminal **Pol**ice Organization
FAQ—**F**requently **a**sked **q**uestions
PIN—**P**ersonal **i**dentification **n**umber
OLD CART—**O**nset, **l**ocation, **d**uration, **c**haracter, **a**ggravating factors, **r**elieving factors, **t**reatments

The seven warning signs of cancer can be remembered in the acronym CAUTION:

Change in bowel or bladder habits
A sore throat that does not heal
Unusual bleeding or discharge
Thickening or a lump in the breast or other area

Indigestion or difficulty swallowing
Obvious change in a mole or wart
Nagging cough or hoarseness

And finally, the warning signs of malignant melanoma are shown by the acronym ABCD:

Asymmetry—One half of the mole does not match the other half.
Border—The edges of the mole are irregular or blurred.
Color—The color varies throughout, including tan, brown, black, blue, red, or white.
Diameter—The mole is larger than 6 millimeters.

Auditory Learning

Many people have a preference for auditory (or aural) learning. In order to most accurately and quickly grasp new information, these people need to hear it spoken. The more complex the data, the more this is true. The most common example of auditory information sharing is a classroom lecture; however, there are other ways to hear information. Examples include audiotapes, videotapes, computer tutorials (with audio content), and oral discussions.

Study Strategies for Auditory Learning

Try using any study or memory technique that allows you to hear information. It can be the spoken word, data set to music, a recording of a lecture, or any other auditory format. Recordings can be valuable study tools because you can listen to them during times when you normally cannot study, such as while driving, exercising, or performing household chores. Auditory learners are usually verbal learners as well. If this is true for you, then you may learn best when you have the chance for a verbal exchange. This allows you to speak to and listen to others. For this reason, you may sometimes prefer studying with a partner or in a study group. You can also use your verbal and auditory styles together by making a recording of your own voice. Speak into the recorder as if you were "teaching" the information to another person. Like the visual learner, you may find mnemonics helpful, especially if they include rhymes or are catchy and fun to say aloud.

Verbal Learning

It is sometimes said that some people must think (first) in order to speak. For those who prefer verbal learning, the reverse may be true: They feel compelled to speak in order to think. What this means is that speaking aloud helps them process information and think things through. This is especially true when the information is complex or the situation feels stressful.

Verbal learning can include both the spoken and written word. Note that when reading aloud, the spoken word is also heard, and the written word is also seen. This is an example of how three learning styles are used simultaneously. You may feel that you are verbal learner, but if you read aloud, you are actually using auditory and visual styles as well.

Study Strategies for Verbal Learning

Try using study or memory techniques that allow you to speak aloud in order to recite data or explain concepts. Like auditory learners, you may find mnemonics helpful, especially if they are fun to say or include rhyming. You may also find writing to be very helpful. Writing down important data, such as

outlines and summaries, in a form that is meaningful for you and then reciting those things aloud helps you remember the content. You may benefit from studying with a partner or in a study group. This provides ample opportunity for discussion. It is helpful to explain challenging concepts or "teach" your study partners about a given topic. For example, the members of your study group may decide to teach one another about the four major joint types in the body: hinge, ball-and-socket, pivot, and gliding. Each person describes the appearance and function of a type of joint and gives an example. One person may compare a hinge joint, like those found in the knee and elbow, to a door hinge. While doing so, the student describes how it moves back and forth like a door that swings open and shut. The next person may compare a pivot joint, such as the one in the neck, to a chair that turns back and forth in a 180-degree half-circle. Other students may then go on to teach about their assigned joints and give examples. This type of exercise may also involve visual and kinesthetic learning as the members of the group demonstrate what they are verbalizing. To maximize the value of this exercise for verbal learners, you can add a requirement that all members of the group must verbally repeat key information or phrases after the "teacher."

Kinesthetic Learning

Most people have some kinesthetic (tactile) aspects to perceiving, understanding and remembering information. People who are strong kinesthetic learners use their bodies as they learn. They like to touch and manipulate objects. This is especially important when learning physical skills. Kinesthetic learners are often also using their visual, verbal, and auditory learning styles at the same time. Examples of physical learning include:

- Demonstrations
- Simulations
- Practicing a skill

Study Strategies for Kinesthetic Learning

Try using study or memory techniques that allow you to move your body or touch objects. For example, if you are learning the bones of the body, touch that bone on your own body or combine it with the visual learning style and point to it on a partner or on a model of a skeleton. Add the verbal and auditory learning styles by saying the name of the bone aloud as you touch it. When learning skills or procedures, your best strategy is to actually get your hands on the needed supplies and practice the procedure. Consider again the study group in which you and your friends are each describing major types of body joints. In addition to verbally describing the joints and giving examples, add a requirement that each person must somehow act out or physically mimic the joint movement—something like a charades game with talking allowed. The person describing the hinge joint now must physically get up and find a door to open and shut while describing its function. Better yet, the person might play the part of the door by moving the body back and forth. The next person compares a pivot joint, such as the one in the neck, with a chair that turns back and forth in a 180-degree half-circle. While describing this, the individual literally turns the head back and forth and then turns the chair back and forth in a 180-degree circle. After each person performs a physical demonstration, other members of the group must perform the same movement. This gives everyone full kinesthetic value from the activity in addition to verbal, auditory, and visual benefits.

When actual physical practice of a skill is not possible, visualization is a great alternative. It gives you the chance to "practice" skills in your mind and even move your body, arms, and hands as you would when performing the actual skill. When the content is theoretical, you still benefit from physical movement. Play learning games, use flash cards, complete activities included in your textbook or online, and interact with a study partner or group.

Social Preferences

In addition to sensory preferences, you may also have a social inclination for learning. If you notice that interacting with others helps you to grasp and understand information, you may benefit from a social learning environment. On the other hand, you may feel that you do your best when working alone without the distraction of others, in a solitary learning environment. Don't limit yourself to one or the other. Learning can be enhanced by studying in both environments.

Social Learning

Many people learn effectively when they are able to interact with other people. They enjoy group *synergy* (the enhanced action of two or more agents working together cooperatively) and are able to think things through with the verbal exchange that occurs during a lively discussion. Examples of social learning include:

- Discussions about specific topics
- Question-and-answer sessions
- Group projects
- Group games
- Role-playing
- Peer assessments

Study Strategies for Social Learning

If you prefer social learning, you may find that you feel restless and have difficulty staying focused when you try to study alone. You need to seek out opportunities to study with one or more additional people. If there isn't a study group available, consider starting one. Your study group will be most effective if you set and adhere to some ground rules that provide structure. Here are some suggestions:

- Identify a group leader—preferably someone with some knowledge or experience in the subject being studied.
- Have the group complete specified readings or assignments prior to each meeting.
- Have the group members agree to stay on task so the group doesn't deteriorate into a social group or complaint session.
- Set and follow time limits.
- Encourage all members to contribute.

Solitary Learning

Many people learn effectively when they are able to study alone without distraction from others. Solitary learners can participate in group study sessions by using technology. Discussion boards, social media, and online collaboration

tools allow solitary learners to provide input or focus on the information they feel is most relevant while still studying alone.

Study Strategies for Solitary Learning

If you prefer solitary learning, you may feel frustrated when trying to study with a partner or a group. You may feel like they are wasting your time and believe you would do better by yourself. You focus and concentrate best when alone. You may be a self-starter who doesn't need anyone else to prompt you or provide structure.

There are many ways that solitary learners study. They may read the textbook, review and revise notes, make and listen to audio recordings, create and use flash cards, complete online activities, use digital "apps," watch videos, or practice a skill. For these learners, the important thing is that they do it alone.

Global Versus Analytical Preferences

In addition to the sensory and social styles described above, most people tend to initially grasp information either as a whole, looking at the "big picture," or in a more sequential fashion in which the individual parts are studied first to comprehend the whole. If you are in the first group, you have a preference for global learning. If you are in the second group, you prefer analytical learning.

Global Learning

Global learners, sometimes called *holistic* learners, generally see the big picture first and later pay more attention to details. For example, when studying the human body, global learners first see the body as a whole, complete organism. With that picture in mind, they are then able to begin studying the parts. This is true even when studying individual body systems, such as the cardiovascular system. Global learners first grasp the big picture of the entire system as it circulates blood throughout the body. With further study and thought, they appreciate how the system delivers oxygen and nutrients and eliminates waste through a complex network of vessels including veins, arteries, and capillaries.

Study Strategies for Global Learning

If you prefer global learning, you may process information best using your visual and auditory abilities. When you find studying details to be tedious and boring, try to find other, more creative and fun ways to learn the same material. For example, you may prefer drawing your own colorful diagrams or may enjoy using audiovisual tutorials or other activities that are often available online or in digital "apps."

Use your strengths. It's likely that you are flexible and a multitasker. Don't be afraid to mix it up a bit to make your study efforts more lively and enjoyable. You are good at seeing the overall picture and recognizing relationships; therefore, begin each study session by identifying the relationship between what you are currently studying and your future career ambitions.

Beware of your tendency to overlook details. You can compensate with strategies that help you identify and remember details of significance. While reading, make note of terms, concepts, or sections that you skipped over or did not understand. You can do this by highlighting these areas in a specific color or by writing notes in the margins. Once you've completed your initial read, force yourself to return to each of these areas and investigate them further. When

deciding how much time and energy to devote to each one, ask yourself the following questions:

- Is there a learning objective in the syllabus that pertains to this content?
- Might this content impact my understanding of the whole?
- How likely is the instructor to include a test question on this content?
- How relevant is this content to the remainder of this class, to future classes, or to my future career?

Analytical Learning

Analytical learners, sometimes called *logical, linear, sequential,* or *mathematical* learners, generally need to see the parts before fully comprehending the whole. Analytical learners readily identify patterns and like to group data into categories for further study. They may create and follow agendas, make lists with items ranked by priority, and approach problem-solving in a logical, methodical manner.

Some of the same qualities that are your strengths can, at times, become a source of frustration. For example, you may get stuck in "analysis paralysis" as you study details. This can stall forward movement and impair decision-making. To you, facts are only facts when they are indisputably accurate and supported by reliable data. In turn, other people may become frustrated by your need to gather more data and process information in detail (often verbally). In most cases, they really don't want to hear all of your logic and rationale and instead wish you would just get to the point.

Study Strategies for Analytical Learning

If you prefer analytical learning, you may process information verbally, which means you sometimes talk to yourself and think aloud. You may also have a visual dimension to your preferred learning style that lends itself so well to grouping information into categories and drawing connections.

Use a variety of styles to maximize learning, but take care not to get stuck in analysis paralysis or sidetracked with insignificant detail. Put your organizational talent to work to make your study efforts productive: Make an agenda or create a list of topics to be studied. Prioritize topics to ensure that you address the most important things first. This is your "Need to Know" list. Set and follow time limits, but don't overanalyze your plan. It is most important to get busy studying. Rather than getting sidetracked with interesting (but low-priority) items, make another list of topics as you go along titled "Nice to Know." Come back to this list later if—and only if—time permits. Use your gift for identifying patterns by noting patterns within the material you are studying. This can be useful when you prepare for exams, because test questions often focus on features that are similar and those that are different. For example, a myocardial infarction (MI) and angina both cause chest pain. In both cases, the pain is caused by inadequate blood supply to the heart. These are two important and similar features when comparing these disorders—chest pain and lack of oxygen. On the other hand, an MI causes actual death of heart muscle tissue, while angina does not. This is an important difference.

To make the most of some study strategies, you must give yourself permission to be illogical or even silly. If a technically "inaccurate" mnemonic or silly song will help you remember something, then why not use it? Your global-learner classmates can help you with this if you will let them.

It's likely that you are a good reflective thinker and are able to evaluate your own performance. However, this can also become a flaw, because you are probably

a perfectionist and may be too hard on yourself. You must learn to let the small stuff go, not let other people bug you, and give yourself permission to be less than perfect. If other students distract or annoy you with their behaviors or chosen study tactics, try to ignore them. You may need to physically separate yourself from them to do so. You need to do your "analytical thing" and allow them to do their "global thing." You will both achieve the same goals in different ways. The exception is when you must work with others as part of a group assignment. This can be challenging for students of different styles, but this mirrors real life. In fact, this is the main reason instructors assign group work: It gives you the opportunity to practice communication and teamwork skills. In this case, it will help if everyone on the team begins by sharing information about their individual styles, including strengths, flaws, and needs. Group roles and tasks can be divided according to each person's style and strengths.

Identifying Your Style

In reading through this chapter, you probably recognized yourself in more than one of the styles described. Try using multiple learning styles instead of selecting one in particular. Think of your brain as a busy city. Is there only one way to reach your destination or are there multiple routes to choose from? If you limit yourself to only one method of learning, you are creating only one pathway to retrieve the information you stored in your memory. Using multiple learning styles will enable you to create multiple pathways and improve your chances of reaching your destination with ease! Soon, you'll begin to understand yourself better and will recognize your preferences for learning. This will help you to identify study strategies that will be most effective for you and will allow you to make the most of limited study time.

Learning Styles and Medical Terminology

Any course in medical terminology requires students to learn and remember a huge amount of information. As you learn various terms and their meanings, you must find a way to commit this knowledge to memory. In other words, you must *memorize* large amounts of data. There is no way around it; you are learning a foreign language, and to become fluent in this language, you must develop a large, accurate vocabulary and must know how to use it.

So how does learning style theory apply to learning medical terminology? By having a clear understanding of your style preferences, you will be able to use your strengths and abilities to their fullest. Knowing what *not* to do becomes as important as knowing what to *do*. Because learning and remembering memorized data are key to this course, understanding how memory works will help you to accomplish this.

Memory

Human memory is the process by which people store, retain, and retrieve information (Fig. 1-1). Perceiving, processing, and storing information are complex processes that involve many parts of your brain. It is beyond the scope of this

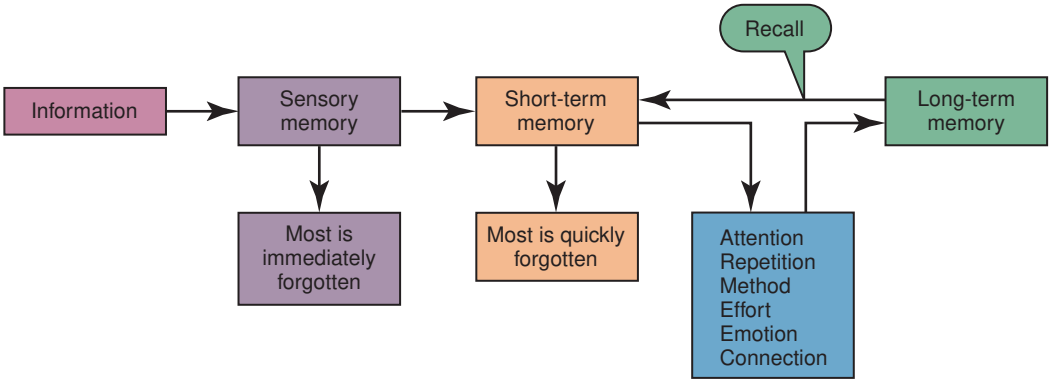

FIGURE 1-1 **Memory.**

book to describe the process in detail. However, a few key points are worth mentioning.

Sensory memory involves the first brief impression during which your brain registers patterns, sounds, smells, or other sensory data. You then almost immediately forget it, although you do store some data for later retrieval.

Perception and storage of information requires a complex combination of electrical and chemical functions within the nervous tissue of your brain, usually in your *short-term memory.* This allows you to retrieve the information for a very short span of time, usually several seconds to several minutes. In general, most people are able to retrieve four to seven items of information from short-term memory. This capability increases if the data are clustered into groups; this is known as *chunking.* For example, you may have noticed that it is easier to remember a string of numbers, such as a telephone number, if you chunk the numbers, such as in 233-467-9012 rather than 2334679012.

Memorization is a method that allows you to recall data through a process known as rote learning. It can be an effective strategy for you if you use it in the right way. It has been shown that most people's ability to retain memorized information is enhanced if they rehearse the data intermittently over an extended period of time rather than using a last-minute cram-and-forget method. In other words, cramming may or may not get you through the next exam, but it certainly will not support your long-term success in future classes or your future career. To get important memorized data into your *long-term memory,* you must do more than cram. Long-term memory is capable of storing an infinite amount of data for an indefinite period of time, perhaps for a lifetime. However, getting the information you wish to remember into your long-term memory is sometimes challenging. A number of factors are required, among them healthy functioning of several parts of the brain and a sufficient quantity and quality of sleep. Other factors important to long-term memory retention include:

- Attention (the extent to which you consciously attend to and focus on the data)
- Repetition (rehearsal of the data over and over)
- Information processing methods (strategies used to analyze and remember data; examples include chunking or other means of organizing data and using creative tricks such as mnemonics and acronyms)

- Study effort (the time and energy you devote; the greater your effort, the better your recall)
- Emotional relationship (relating the information being studied to strong emotions or significant events)
- Connection (relating new information to a prior experience or previously learned information)

Some activities hamper your ability to store and recall information in both your short-term and long-term memory banks. Examples include:

- Interference (stimuli that hamper your ability to attend to information as you learn)
- Cramming (extensive memorization of a large amount of data over a short period of time; cramming results in very poor recall and may displace other data in short-term memory)

Some general measures can help you in this process. General self-care activities that enhance memory include healthy nutrition; stress-reduction activities; regular exercise; socialization activities; and regular, good-quality sleep.

Plan for Success

To ensure your success in this course, you must take a bit of time now to do a self-assessment. It won't take long, and the information you gather will pay off big time. Completing the chapter activities below will guide you in this process. Once you've identified your preferences for learning, then you will be able to get the most from this book. You will notice specific *Learning Style Tips* scattered throughout all chapters (Fig. 1-2). The four styles you have learned about are labeled with icons that allow you to quickly find those that may be most relevant to you. However, it would be to your benefit to read them all; your style is probably a blend of the various styles, and you may want to consider trying all of the tips to find the ones that fit you best.

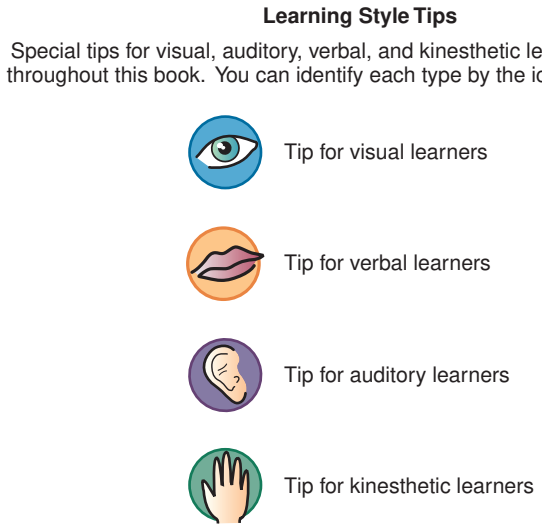

FIGURE 1-2 **Learning style tips.**

Chapter Activities

1. Investigate websites that provide free self-assessment tests such as those listed below. Take two or three different tests and compare your results. Describe what you learned about your strengths and what may be your preferred learning style(s). Be prepared to discuss your answers with your classmates.
   - http://vark-learn.com/the-vark-questionnaire
   - http://www.edutopia.org/multiple-intelligences-assessment

2. Briefly describe some study strategies that were suggested and that you are willing to try.

3. Create a plan that you believe will help you to be most effective in this course. Include approximate study times and techniques, and note which will be solitary and which will be social in nature.

4. Identify the activities you plan to employ to transfer as much medical terminology data as possible into your long-term memory.

As you continue through this book, you will find study tips included in every chapter. These tips suggest study techniques for all learning styles. Keep an open mind as you move forward and be willing to try any strategies that you believe may be helpful. Make notes as you do so about what did and did not work well and anything you might do differently next time. By the end of this course, you will have developed a good working knowledge of medical terminology. You will also have learned more about yourself and your learning preferences than you know now. Both of these things will serve you extremely well in your future classes and career.

Practice Exercises

Matching

Match the following terms with the correct description. Each answer is used once.

Exercise 1

1. _____	Visual	**a.**	Prefers to study alone
2. _____	Auditory	**b.**	Needs to see data with the eyes
3. _____	Verbal	**c.**	Needs to speak in order to think
4. _____	Kinesthetic	**d.**	Needs to hear the spoken word
5. _____	Social	**e.**	Enjoys group synergy and lively discussions
6. _____	Solitary	**f.**	Needs to touch and manipulate things

True or False

Decide whether the following statements are true or false.

Exercise 2

1.	True	False	Most people have only one predominant learning style.
2.	True	False	For visual learners, the more complex the data, the more important it is for them to see it.
3.	True	False	Written text is an example of visual data.
4.	True	False	Most auditory learners are also solitary learners.
5.	True	False	Kelly enjoys meditation and traveling alone. She is a solitary learner.

Multiple Choice

Select the one best answer to the following multiple-choice questions.

Exercise 3

1. Colors, tables, and live demonstrations all appeal to which type of learners?

- **a.** Visual
- **b.** Auditory
- **c.** Kinesthetic
- **d.** Verbal

2. Visual learners are most likely to make which of the following statements?
   - a. "That sounds like an experience I had."
   - b. "This doesn't feel right to me."
   - c. "I see what you mean."
   - d. "Let's cooperate on this project."

3. Which of the following is the **best** example of an auditory way to get information?
   - a. Reviewing flash cards
   - b. Watching a PowerPoint presentation
   - c. Listening to a lecture
   - d. Asking a question

4. Jonathon loves music and is always humming, whistling, or singing something. In a recent conversation, he told his friend, "I hear you loud and clear." Jonathon is most likely:
   - a. A visual learner
   - b. A social learner
   - c. An auditory learner
   - d. A kinesthetic learner

5. Brian fidgets in the classroom and struggles to get through lectures, yet when he is in the laboratory, he does very well and enjoys learning. His dominant learning style is most likely:
   - a. Auditory
   - b. Solitary
   - c. Kinesthetic
   - d. Verbal

6. Which of the following is an example of an acronym?
   - a. "I before E except after C"
   - b. FAQ - frequently asked questions
   - c. The alphabet (ABCs) song
   - d. "On old Olympus' tower tops, a Finn and German viewed some hops."

7. All of the following statements are true regarding analytical learners **except:**
   - a. They are sometimes called holistic learners.
   - b. They like to take a methodical approach to studying.
   - c. They readily identify patterns and like to group data into categories for further study.
   - d. They create and follow agendas and make lists with items ranked by priority.

8. Which type of learner would benefit in a study group that is taking turns describing information aloud while performing a physical demonstration?
   a. kinesthetic only
   b. verbal only
   c. visual only
   d. kinesthetic, verbal, visual and auditory

9. Which of the following statements is **not** true about using a multiple learning styles approach?
   a. It will help you to identify study strategies that will be most effective for you and will allow you to make the most of limited study time.
   b. It is too difficult and is not recommended.
   c. It creates multiple pathways in the brain for retrieving information from your memory.
   d. It will help you to recognize your preferences for learning.

10. Which of the following statements about memory is true?
    a. Sensory memory involves the first brief impression during which the brain registers sensory data such as patterns, sounds, or smells.
    b. Short-term memory allows you to retrieve data in a very short span of time, usually several seconds to several minutes.
    c. Chunking is a technique that increases the number of items one can recall.
    d. All of the statements are true.

True or False

Decide whether the following statements are true or false.

Exercise 4

1. True False Many learning styles are named according to the special senses.
2. True False Few people are strong visual learners.
3. True False Verbal learners need to listen as others speak.
4. True False *Auditory* and *aural* have similar meanings.
5. True False Kinesthetic learners like to touch and manipulate objects.

Multiple Choice

Select the one best answer to the following multiple-choice questions.

Exercise 5

1. Diagrams, shapes, and patterns are examples of which type of data?
   - a. kinesthetic
   - b. visual
   - c. solitary
   - d. verbal

2. Using flash cards with a partner benefits which type of learner?
   - a. visual learners only
   - b. auditory learners only
   - c. social learners only
   - d. verbal learners only
   - e. visual, auditory, social and verbal learners

3. Which of the following statements is **not** true regarding solitary learners?
   - a. They can use all learning styles when studying.
   - b. They can participate in group study sessions.
   - c. They can focus and concentrate best when alone.
   - d. All of the statements are true

4. Which of the following techniques may **not** appeal to visual learners?
   - a. musical mnemonics
   - b. acronyms
   - c. group discussion
   - d. rhyming mnemonics

5. Oral discussions appeal to students with which learning style?
   - a. verbal only
   - b. auditory only
   - c. social only
   - d. verbal, auditory and social

6. Which of the following statements are true regarding global learners?
   a. They are sometimes called sequential learners.
   b. They like to analyze details.
   c. They may overlook details.
   d. They approach problem-solving in a very logical manner.

7. All of the following words of advice are specifically appropriate for global learners **except:**
   a. You are flexible, so don't be afraid to mix it up a bit and make your study efforts more lively and enjoyable.
   b. Begin each study session by identifying the relationship between what you are currently studying and your future career ambitions.
   c. Beware of your tendency to get stuck in analysis paralysis.
   d. While reading, make note of terms or concepts that you skipped over and later take time to look them up.

8. All of the following words of advice are appropriate for students working on a group project **except:**
   a. Do not put global and analytical learners in the same group.
   b. Divide tasks according to learning style preferences and strengths.
   c. Practice communication and teamwork skills because this mirrors real life.
   d. Share information with each other about strengths, flaws and needs.

9. All of the following words of advice are specifically appropriate for analytical learners **except:**
   a. Prioritize items of importance for studying.
   b. Identify patterns within the material you are studying.
   c. Give yourself permission to be illogical or even silly.
   d. All of these are appropriate words of advice for analytical learners.

10. Which of the following statements about memory is true?
    a. Most data move easily from short-term to long-term memory.
    b. Emotions affect whether some information is stored in long-term memory.
    c. Cramming is an effective method of transmitting data into long-term memory.
    d. All of these statements are true.

MEDICAL WORD ELEMENTS

2

Chapter Outline

Word Parts

Most medical words derive from Greek or Latin and therefore may look and sound odd to you. However, once you have taken the time to learn the meanings of the word parts, you will be able to understand most of the medical terms you encounter, regardless of how big or complex they appear. There are three types of word parts that you need to know: (1) suffixes, (2) prefixes, and (3) combining forms (created by joining a *word root* to a *combining vowel*). You will use these word parts in a three-step process to find the meanings of medical terms. You also need to know the abbreviations and pathology terms that are used in health care; however, the three-step deciphering process often does not work with these terms.

Flashpoint

Word Root (WR) + Combining Vowel (CV) = Combined Form (CF)

Suffixes

A **suffix** is a word part that comes at the end of the medical term. If the suffix ***-meter*** (instrument used to measure) is added to the combining form therm/o, the result is the creation of the word therm/o/***meter,*** an instrument used to measure heat.

Prefixes

A **prefix** is a word part that comes at the beginning of the medical term. For example, again consider the word root therm. If it is joined with the prefix ***hypo-*** (beneath or below) and the suffix -ia (condition), then a new word is created: ***hypo***/therm/ia, a condition of low heat. As you may already know, this term is used in reference to a condition of low body temperature.

Combining Forms

The **combining form** is created by joining a **word root** with a **combining vowel**. A word root (WR) is the main stem, or primary meaning, of the word. An example using a nonmedical term is the word *walking.* The main stem or root of this word is *walk.* A combining vowel (CV) is used to make the medical term easier to pronounce. You could say that it makes medical terms more user-friendly for the tongue. A combining vowel is not always necessary. When it is needed, in nearly all cases the combining vowel is an ***o,*** although there are a few exceptions.

The combining vowel has no impact on the meaning of the term; it is placed between word parts to link them together. For example, consider the root *therm,* which means *heat.* If this word root is combined with the combining vowel *o,* the result is the combining form *therm/o.* Combining vowels are typically used to link word parts together regardless of whether the following part is a suffix or another combining form.

When to Use a Combining Vowel

Flashpoint

When a term is created by using a combining vowel to link two word parts, the emphasis nearly always shifts to the syllable containing the combining vowel. The vowel, when an *o,* also changes to a short "ah" sound.

To determine the need for a combining vowel, notice whether the following word part begins with a consonant or a vowel. If it begins with a consonant, as in the word *therm/o/meter,* then a combining vowel (often *o*) is usually needed. However, if the next word part begins with a vowel *(a, e, i, o, u),* then a combining vowel is usually not needed. This is because the vowel at the beginning of the next word part serves as the combining vowel. For example, when the root *arthr,* which means *joint,* is combined with the suffix ***-itis***, which means *inflammation,* no combining vowel is needed. The *i* in *-itis* serves as the combining vowel. The new term *arthr/itis* is created, which means *inflammation of a joint.* This term may already be familiar to you.

The terms we have been using are diagrammed below so that you can clearly see how the word parts fit together, as well as when and why combining vowels are used.

hypo* / *therm* / *ia
↑ ↑ ↑
prefix WR suffix
(suffix starts with vowel: no CV needed)

therm* / *o* / *meter
↑ ↑ ↑
WR CV suffix
(suffix starts with consonant: CV needed)

arthr* / *itis
↑ ↑
WR suffix
(suffix starts with vowel: no CV needed)

Three Simple Steps

There are just three simple steps to follow as you begin deciphering medical terms:

1. Translate the *last* word part first.
2. Translate the *first* word part next.
3. Translate *following* word parts in order.

It's that simple. Here's an example: Consider the term *esophagogastroduodenoscopy.* This term is quite a mouthful and may seem rather intimidating.

However, we will follow the three simple steps described above, and you will see how easy it can be to decipher this word's meaning. You may find it helpful to put slashes between the word parts: esophag/o/gastr/o/duoden/o/scopy. After practicing these steps a few times, you won't need to do this anymore.

Step 1
-Scopy is a **suffix** that means visual examination.
Step 2
Esophag/o is a **combining form** that means esophagus.
Step 3
Gastr/o is a **combining form** that means stomach.
Duoden/o is a **combining form** that means duodenum, which is the first part of the small intestine.

Now put it all together. The final translation of esophagogastroduodenoscopy: visual examination of the esophagus, stomach, and duodenum, also known as an upper endoscopy.

Flashpoint
It may help you to remember the order in which to complete these steps if you consider the order in which you write your name on most legal forms: last, first, middle.

Learning Style Tip

Reading the terms aloud helps verbal and auditory learners. If you are a verbal learner, you need to say them. If you are an auditory learner, you need to hear them, even if it is in your own voice.

Abbreviations

Abbreviations save time and simplify the speaking, reading, and writing of medical terms. They are used extensively in health care because there are so many terms that are lengthy and difficult to pronounce. ***EGD*** is the abbreviation for the large term you just learned, *esophagogastroduodenoscopy.* Many abbreviations are **acronyms**, abbreviations formed by using the first letter of each word. An example of this type of abbreviation is ***CAD,*** which stands for *coronary artery disease.* Some abbreviations do not even contain letters found in the medical term. For example, ***c̄*** is the abbreviation for the word *with.* **Symbols** are also used to save time and space when **documenting**, or writing in the patient's chart, and in written communication with other medical professionals. An example of a symbol is ↑, which means *upward* or *increase.* As you continue through this book, you will notice that each chapter contains a table of abbreviations that pertain to the body system you are studying. See Table 2-14 on page 40 for abbreviations and symbols that do not pertain to a particular body system but do have an important role in documentation and written communication with other medical professionals.

It is very important that you use only abbreviations that are commonly recognized and have been approved by the facility in which you work. Making up your own abbreviations or using ones not recognized by your facility can lead to communication errors and can potentially jeopardize patient well-being. For example, some people may interpret the abbreviation ***hs*** to mean *half strength* while others interpret it as *at bedtime.* The Joint Commission (formerly the Joint Commission on Accreditation of Healthcare Organizations or JCAHO) has developed a "Do Not Use" list of abbreviations to help ensure patient safety.

Flashpoint
The Joint Commission provides accreditation and certification to more than 20,000 health-care organizations in the United States. Their standards and initiatives have been developed to ensure the highest quality and safety in patient care. For more information, go to www.jointcommission.org

Pathology Terms

Pathology terms are used extensively in health care; they refer to diseases and disorders of all body systems. An example is ***multiple sclerosis,*** a chronic disease in which nerves lose the ability to transmit messages to the muscles. Students sometimes struggle with these terms because the three-step deciphering process that you just learned often does not work with these terms. Learning and remembering pathology terms requires study and memorization. However, this book includes some helpful tips to assist you with this process. Many of the pathology terms have pictures that accompany the definition and the terms are included in the learning exercises in each chapter. There are also flash cards for the pathology terms from each chapter on the Davis*Plus* website.

Closer Look

Let's take a closer look at the concepts mentioned previously.

Learning Style Tip

Study with a partner so you can take turns quizzing each other. Verbalizing terms and definitions helps verbal learners; listening to each other helps auditory learners.

Suffixes

Flashpoint
Suffixes always change the meaning of the term.

Suffixes are word parts that appear at the ends of words and modify the meaning in some way. Consider the combining form ***appendic/o,*** which means *appendix.* If the suffix ***-itis*** *(inflammation)* is added, the term *appendic/itis* is created. As you may already know, this term means *inflammation of the appendix.*

This chapter introduces you to a large number of suffixes. They have been grouped according to several general categories. Note that the suffixes are usually arranged in alphabetical order; however, where there are two or more suffixes with the same or similar meanings, they are grouped together. This will make them easier for you to learn. Don't worry about word building yet. Just focus on learning and memorizing these suffixes. To help you with this process, study the suffix tables using the following steps:

1. Read the suffix in the first column.
2. Practice pronouncing the suffix correctly by using the guide in the second column.
3. Read the meaning aloud in the third column.
4. Write the suffix in the fourth column as you again pronounce it aloud.

Table 2-1 shows suffixes that indicate medical specialty, and Table 2-2 contains suffixes that indicate surgeries, procedures, or treatments. Note that these suffixes will be reviewed again throughout the following chapters.

TABLE 2-1

SUFFIXES THAT INDICATE MEDICAL SPECIALTY

Suffix	Pronunciation Guide	Meaning	Write the Suffix
-iatrics, -iatry	ī-ă-trĭks, ī-ă-trē	field of medicine	
-iatrist, -ician, -ist	ī-ă-trĭst, ĭ-shŭn, ĭst	specialist	
-logist, -ologist	lō-jĭst, ŏl-ō-jĭst	specialist in the study of	
-logy, -ology	lō-jē, ŏl-ō-jē	study of	

TABLE 2-2

SUFFIXES THAT INDICATE SURGERIES, PROCEDURES, OR TREATMENTS

Suffix	Pronunciation Guide	Meaning	Write the Suffix
-centesis	sĕn-tē-sĭs	surgical puncture	
-cidal, -cide	sī-dăl, sīd	destroying, killing	
-desis	dē-sĭs	surgical fixation of bone or joint, binding, tying together	
-dilation	dī-lā-shŭn	widening, stretching, expanding	
-ectomy	ĕk-tō-mē	excision, surgical removal	
-graphy	gră-fē	process of recording	
-metry	mĕ-trē	measurement	
-pexy	pĕk-sē	surgical fixation	
-plasty	plăs-tē	surgical repair	
-rrhaphy	ră-fē	suture, suturing	
-scopy	skō-pē	visual examination	
-therapy	thĕr-ă-pē	treatment	
-tomy	tō-mē	cutting into, incision	
-tripsy	trĭp-sē	crushing	

Practice Exercises

Fill in the Blanks

Choose the term that matches the description. Each term may be used more than once.

Exercise 1

Suffix
Word root
Prefix
Combining vowel
Combining form
Abbreviations

Pathology terms
Documenting
Acronyms
Symbols

1. _____ Used to make the medical term easier to pronounce

2. _____ Unrecognized and unapproved use of these may jeopardize patient well-being

3. _____ A word part that comes at the end of the medical term

4. _____ Writing in the patient's chart

5. _____ Created by joining a word root with a combining vowel

6. _____ Letters used to save time and simplify the speaking, reading, and writing of medical terms

7. _____ Abbreviations formed by using the first letter of each word

8. _____ Does **not** include a prefix, suffix, or combining vowel

9. _____ Is **not** used if the next word part begins with a vowel

10. _____ A word part that comes at the beginning of the medical term

11. _____ The main stem, or primary meaning, of the word

12. _____ Nonletters used to save time and space in documentation and communication with other health-care professionals

13. _____ Refer to diseases and disorders of all body systems

14. _____ When deciphering medical terms, translate this word part first

15. _____ The three-step deciphering process often does not work with these