Contents at a Glance

Introduction ................................................................ 1

Part I: Living for Linguistics .......................................................... 5
Chapter 1: Scrubbing In to Master Medical Terminology ......................... 7
Chapter 2: Medical Terminology: The How and Why ................................. 13
Chapter 3: Introducing the Big Three: Prefixes, Roots, and Suffixes .......... 19
Chapter 4: Acronyms, Eponyms, Homonyms, Multiples, and Words — Oh My! .... 31
Chapter 5: Say What? Pronunciation and Usage ............................................ 45

Part II: Mapping Words and Bodies ................................................. 55
Chapter 6: As It Was in the Beginning: Prefixes ........................................... 57
Chapter 7: So It Shall Be in the End: Suffixes .............................................. 69
Chapter 8: Hey, I Know You: Word Recognition ......................................... 75
Chapter 9: Deconstruction Junction: Breaking Down Words .................... 85
Chapter 10: An Org Chart to Live By: Organization of the Body ................ 95
Chapter 11: All Systems Go: When Systems Combine ............................ 109

Part III: In Terms of Anatomy ....................................................... 119
Chapter 12: Boning Up on the Skeletal System ....................................... 121
Chapter 13: Getting Ripped: The Muscular System .................................... 139
Chapter 14: Skin Deep: Skin, Glands, Nails, and Hair ............................. 153
Chapter 15: It Depends on Your Perception: The Sensory Systems ............. 167

Part IV: Let’s Get Some Physiology Terminology .............................. 185
Chapter 16: The Heart of the Matter: The Cardiovascular and Lymphatic Systems ........................................... 187
Chapter 17: Just Breathe: The Respiratory System .................................... 211
Chapter 18: Feeding Time: The Gastrointestinal System ......................... 227
Chapter 19: Gatekeepers of Health: The Endocrine System ..................... 245
Chapter 20: Calming Down: The Nervous System .................................... 261
Chapter 18: Feeding Time: The Gastrointestinal System ............ 227
  How the Gastrointestinal System Works ........................................ 228
  Mouth and pharynx ........................................................................ 228
  Esophagus ...................................................................................... 230
  Stomach .......................................................................................... 230
  Liver ................................................................................................. 231
  Pancreas .......................................................................................... 231
  Gallbladder ...................................................................................... 231
  Intestines .......................................................................................... 231
  Gastrointestinal Root Words ............................................................. 233
  Common Gastrointestinal Conditions .............................................. 235
  Finding the Culprit: Gastrointestinal Diseases and Pathology ......... 239
  Testing, Testing: Gastrointestinal Radiology and Diagnostic Tests ... 240
  Paging Dr. Terminology: Gastrointestinal Surgeries and Procedures ... 242
  Terminology RX: Gastrointestinal Pharmacology ......................... 244

Chapter 19: Gatekeepers of Health: The Endocrine System ........ 245
  How the Endocrine System Works .................................................. 245
  Hormones ......................................................................................... 246
  Pituitary and hypothalamus .............................................................. 247
  Thyroid .............................................................................................. 248
  Pancreas ............................................................................................ 249
  Adrenals ............................................................................................ 250
  Gonads .............................................................................................. 250
  Endocrine Root Words ...................................................................... 251
  It’s All Related: More Endocrine Anatomical Terms ...................... 253
  Common Endocrine Conditions ...................................................... 255
  Finding the Culprit: Endocrine Diseases and Pathology .................. 257
  Testing, Testing: Endocrine Radiology and Diagnostic Tests .......... 258
  Paging Dr. Terminology: Endocrine Surgeries and Procedures ........ 259
  Terminology RX: Endocrine Pharmacology .................................... 260

Chapter 20: Calming Down: The Nervous System ..................... 261
  How the Nervous System Works ...................................................... 261
  The Central Nervous System ........................................................... 263
    Brain ............................................................................................... 263
    Spinal cord .................................................................................... 264
  Peripheral Nervous System ............................................................... 265
  Nervous Root Words ........................................................................ 265
  It’s All Related: More Nerve-Wracking Terms ................................ 267
  Common Nervous Conditions .......................................................... 268
  Finding the Culprit: Nervous Diseases and Pathology .................... 270
  Testing, Testing: Nervous Radiology and Diagnostic Tests ............. 271
  Paging Dr. Terminology: Nervous Surgeries and Procedures .......... 273
  Terminology RX: Nervous Pharmacology ....................................... 273
# Part V: Name That Plumbing ..................................... 275

## Chapter 21: When You Gotta Go: The Urinary System ............ 277

- How the Urinary System Works ........................................ 277
- Kidneys ............................................................................. 278
- Ureters ............................................................................. 280
- Urinary bladder ............................................................... 280
- Urethra ............................................................................. 280
- Urinary Root Words ......................................................... 281
- Common Urinary Conditions .............................................. 283
- Finding the Culprit: Urinary Diseases and Pathology .......... 284
- Testing, Testing: Urinary Radiology and Diagnostic Tests ... 285
- Paging Dr. Terminology: Urinary Surgeries and Procedures ... 287
- Terminology RX: Urinary Pharmacology ......................... 289

## Chapter 22: Check the Plumbing: The Male Reproductive System .... 291

- How the Male Reproductive System Works .......................... 291
- Testes .............................................................................. 293
- Ducts .............................................................................. 293
- Urethra ............................................................................ 294
- Prostate ........................................................................... 294
- Penis ................................................................................ 294
- Male Reproductive Root Words .......................................... 294
- Pathological Male Reproductive Conditions ...................... 296
- Finding the Culprit: Male Reproductive Diseases and Pathology 297
- Testing, Testing: Male Reproductive Radiology and Diagnostic Tests ... 299
- Paging Dr. Terminology: Male Reproductive Surgeries and Procedures .................................................. 300
- Terminology RX: Male Reproductive Pharmacology .......... 301
- Say What? Male Terminology Tongue Twisters ................. 302

## Chapter 23: A Life Force: The Female Reproductive System ...... 305

- How the Female Reproductive System Works .................. 305
- Ovaries ............................................................................ 307
- Fallopian tubes ............................................................... 307
- Uterus ............................................................................. 308
- Vagina ............................................................................. 309
- Female Reproductive Root Words ..................................... 310
- It’s All Related: More Female Reproductive Anatomical Terms 313
- Common Female Reproductive Conditions ..................... 316
- Finding the Culprit: Female Reproductive Diseases and Pathology ... 318
- Testing, Testing: Female Reproductive Radiology and Diagnostic Tests .................................................. 319
- Paging Dr. Terminology: Female Reproductive Surgeries and Procedures .................................................. 320
- Terminology RX: Female Reproductive Pharmacology ........ 324
In this part...:
- An overview of the basic building blocks of learning terminology
- A background dossier on terminology and its history
- An introduction to root words
- A trip through the world of multiples and plurals
- Tips and tricks on pronunciation and usage
Your sensory system is all the “fun stuff” in your building. The windows, amenities, sound system, and dining facility all bring aesthetic delight to the building’s inhabitants, and your senses work in a similar fashion.

It may be hard to imagine that words can describe all the amazing things your anatomy can do, but believe us when we say that it’s all possible through terminology. And who knows? Perhaps there’s a word out there that hasn’t been created yet — until you came along.

**All Systems Go**

Once you get those basic working parts ingrained in your brain, you will move on to the physiology terminology. Physiology deals with the remaining body systems that help your fabulous body do its day-to-day work.

First up is the thing that keeps your blood pumping and your life moving forward, a heartbeat from your heart. More specifically, the cardiovascular system. Your heart does not work in a vacuum. It has supporting players, namely your blood cells and vessels. These parts all work together to supply your body with fresh, clean, oxygenated blood.

Then there is the separate but complementary lymphatic system that works to flush your body of impurities. Most directly associated with immunity, the lymphatic system works in the same context as the cardiovascular system due to the similar makeup of the system and the fact that, once cleaned by the lymph nodes, lymphatic fluid is released directly into the bloodstream. Lymph vessels are arranged in a similar pattern as the blood vessels.

Speaking of oxygenating your blood, think about how that oxygen finds its way into your body. You may not consciously think about it every day, but breathing makes it all possible. The body’s trillions of cells need oxygen and must get rid of carbon monoxide, and this exchange of gases is accomplished by the respiratory system. External respiration is the repetitive, unconscious exchange of air between the lungs and the external environment.

You have to breathe, but you also have to eat, and eating is way more fun. Your good buddy the gastrointestinal system helps turn those tasty meals and treats into usable energy for your body. Also called the alimentary or digestive tract, this system provides a tubelike passage through a maze of organs and body cavities, beginning at the mouth, the food entrance into the body, and ending at the anus, where solid waste material exits the body and your delicious Chinese takeout magically turns into . . . well, you know.

Moving on, the complicated endocrine system maintains the chemical balance of the body. It does this by sending chemical messengers called hormones throughout the body via the bloodstream. Hormones regulate and
Part I: Living for Linguistics

Sprechen Sie terminology?

Medical terminology is like a foreign language to most people. In fact, it operates exactly like a foreign language if you have never encountered it before. Just as with practicing German (or any language, for that matter), you get the meaning of medical terms by breaking down each word into different parts:

- **Prefix:** Appears at the beginning of a word and tells the how, why, where, when, how much, how many, position, direction, time, or status.
- **Root word:** Specifies the body part to which the term refers.
- **Suffix:** Appears at the end of a word and indicates a procedure, condition, or disease.

Those are the bare bones, basic parts of every medical term. Each prefix, root, and suffix has its own meaning, so it’s your job to remember them and put the three meanings together into one greater word meaning. It can be tricky, though, so proceed carefully until you are confident of individual part meanings.

As with languages, things aren’t always what they seem. For example, if you use tonsillitis and appendectomy, we see that the suffix -itis always means “inflammation” no matter what root word precedes it. Similarly, the suffix -ectomy always means “surgical removal.” So when switching suffixes, appendicitis means “inflammation of the appendix,” and tonsillectomy means “surgical removal of the tonsils.”

For example, consider two terms commonly known to most people. *Tonsillitis* is a one-word medical term to describe “inflammation of the tonsils,” and *appendectomy* is a one-word medical term to describe “surgical removal of the appendix.” It’s much easier to use one word than a long, drawn-out phrase to describe these conditions, don’t you think?

**Medical Terminology in the Real World**

The need or desire to learn medical terminology is not limited to the healthcare professionals. For example, a firefighter has to relay information to paramedics, such as the condition of a burn victim being placed in an ambulance. A police officer must complete a written report after delivering a baby in the back seat of a car. Or closer to home, think about trying to understand when a doctor tells you that your child needs surgery, or why an aging parent needs to be placed in a long-term care facility. Medical terminology allows you to convey the greatest quantity of information, with the least confusion and most precision, to anyone in the world. For example, saying someone has a badly broken wrist doesn’t convey as much as saying someone has a Salter-Harris II fracture of the right distal radius with moderate lateral displacement and 28 degrees of anterior angulation. Now who’s the coolest kid in the clinic?
In this book we outline roots, suffixes, and prefixes and include the anatomy for each body system to help you to understand how everything fits together. When in doubt, look at the table of contents and check a specific body system's chapter.

**Changes in Medical Terminology**

Medical language is an entity unto itself and followed a historical development. Common medical vocabulary used today includes terms built from Greek and Latin word parts, some of which were used by Hippocrates and Aristotle more than 2,000 years ago.

One type of medical term is the *eponym*, a term named after someone. An example would be Parkinson's disease, named after the English physician Dr. James Parkinson.

With the great advancements in medicine throughout the 20th century, medical language changed with the times and continues to do so today. Some words are discarded or considered obsolete, whereas others are changed, and new words are continually added.

Building on guidance from the Greek and Latin origins, medical terms began to be professionalized in the mid-1800s. *Dorland's Illustrated Medical Dictionary* was first published in 1890 as the *American Illustrated Medical Dictionary*, consisting of 770 pages, over 50 years after the first edition of *Webster's American Dictionary of the English Language*. Dr. William Alexander Dorland was the editor, and when he died in 1956 the dictionaries were renamed to include his name, thus they are known today as *Dorland's Illustrated Medical Dictionary*. Electronic medical publishing took off during the 1980s thanks to advancements in database publishing and electronic storage. In the mid-1990s, medical dictionaries — most notably from Dorland's, Stedman's, and Taber's — became available in electronic form with many various editions and publications available on disk, CD-ROM, and via Internet downloading. Check out Chapter 24 for a list of great resources.

**It's Greek and Latin to Me**

You can thank the two founding fathers of medical terminology for getting the ball rolling: Hippocrates and Aristotle. Hippocrates, considered the father of medicine, was a student, teacher, and great physician. Aristotle was a Greek philosopher and a physical scientist. He stressed observation and induction. His major studies were of comparative anatomy and physiology.
Part I: Living for Linguistics

- Joint replacements and other surgical procedures
- Laparoscopic surgeries
- MRIs
- Organ transplants
- Stem-cell research

Today medical terminology is used and needed in any occupation that is remotely related to medicine and the normal functioning of the body. Here are a few careers involving the need for medical terminology:

- Athletic therapy
- Audiology
- Biomedical engineer
- Cytotechnology
- Dental and dental hygiene
- Emergency medical services
- Health records and health information technicians
- Massage therapy
- Medical statistics
- Medical transcription
- Nursing Home administrator
- Nutrition
- Occupational therapy
- Personal training
- Pharmacy
- Physical therapy
- Radiology technicians
- Speech language
- Veterinary medicine

All these applications exist in addition to the obvious groups of healthcare professionals who use terminology in their day-to-day activities, including associates, the medical secretary in a doctor's office, the insurance claims adjuster, even the compensation board adjudicator.
Part I: Living for Linguistics

Table 3-1 (continued)

<table>
<thead>
<tr>
<th>Exterior Root</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papill/o</td>
<td>Nipple</td>
</tr>
<tr>
<td>Pelv/o, pelv/i</td>
<td>Pelvis</td>
</tr>
<tr>
<td>Phall/o</td>
<td>Penis</td>
</tr>
<tr>
<td>Pil/o</td>
<td>Hair</td>
</tr>
<tr>
<td>Pod/o</td>
<td>Foot</td>
</tr>
<tr>
<td>Rhin/o</td>
<td>Nose</td>
</tr>
<tr>
<td>Somat/o</td>
<td>Body</td>
</tr>
<tr>
<td>Steth/o</td>
<td>Chest</td>
</tr>
<tr>
<td>Stomat/o</td>
<td>Mouth</td>
</tr>
<tr>
<td>Tal/o</td>
<td>Ankle</td>
</tr>
<tr>
<td>Tars/o</td>
<td>Foot</td>
</tr>
<tr>
<td>Thorac/o</td>
<td>Thorax</td>
</tr>
<tr>
<td>Trachel/o</td>
<td>Neck or necklike</td>
</tr>
<tr>
<td>Trich/o</td>
<td>Hair or hairlike</td>
</tr>
<tr>
<td>Ventr/i, ventr/o</td>
<td>Front of body</td>
</tr>
</tbody>
</table>

Copycats and opposites

Some prefixes might look very different but have the same meaning. Here are some examples:

✔️ Anti- and contra- mean against.
✔️ Dys- and mal- mean bad or painful.
✔️ Hyper-, supra-, and epi- all mean above.
✔️ Hypo-, sub-, and infra- all mean below.
✔️ Intra- and endo- mean within.

However, other, more troublesome prefixes mean the opposite of each other even though they look or sound similar. These are contentious prefixes:

✔️ Ab- means away from (abduct), but ad- means toward.
✔️ Ante-, pre-, and pro- mean before, but post- means after.
✔️ Hyper-, supra-, and epi- mean above, but hypo-, infra-, and sub- mean below.
✔️ Macro- means large, while micro- means small.
✔️ Tachy- means fast, but brady- means slow.
✔️ Hyper- also means excessive, yet hypo- also means deficient.
Deriving a Plural the Medical Way

As you read earlier in this chapter, medical plurals are a bit different from the standard, everyday English variety. Read on to familiarize yourself with the nuances of medical plural building.

Medical rules for forming plurals

Some rules for pluralizing medical terms are as follows, with examples of the rule and exceptions to the rule.

Medical Rule 1: Change the a ending to ae
In other words, *vertebra* becomes *vertebrae*.

By adding the *e* to the plural, the “aah” sound ending pronunciation becomes “eh”.

✓ Axilla, axillae
✓ Bursa, bursae
✓ Conjunctiva, conjunctivae
✓ Scapula, scapulae
✓ Sclera, sclerae

Medical Rule 2: Change the um ending to a

The *a* at the end is pronounced “aah.”

✓ Acetabulum, acetabula
✓ Antrum, antra
✓ Atrium, atria
✓ Bacterium, bacteria
✓ Diverticulum, diverticula
✓ Labium, labia
✓ Medium, media

Medical Rule 3: Change the us ending to i

The *i* at the end is pronounced “eye.”

✓ Alveolus, alveoli
✓ Bronchus, bronchi
Medical Rule 6: When a term ends in yx, ax, or ix, change the x to c and add es
- Appendix, appendices
- Calyx, calyces
- Calix, calices (Strange but true, both are correct)
- Thorax, thoraces

Medical Rule 7: When a term ends in nx, change the x to g and add es
- Larynx, larynges
- Phalanx, phalanges

Medical Rule 8: For Latin medical terms that consist of a noun and adjective, pluralize both terms
- Condyloma acuminatum, condylomata acuminata
- Placenta previa, placentae previae
- Verruca vulgaris, verrucae vulgares

There are (of course!) some exceptions to all these rules:
- Cornu, cornua
- Pons, pontes
- Vas, vasa

English rules of forming plurals

Many medical terms apply basic English rules for forming plurals. Thank goodness! You will no doubt recognize many of these common English language plural rules.

English Rule 1: Add an s
- Bronchoscope, bronchoscopes
- Disease, diseases
- Endoscope, endoscopes
- Finger, fingers
- Vein, veins
<table>
<thead>
<tr>
<th>Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anuresis</td>
<td>Retention of urine in the bladder</td>
</tr>
<tr>
<td>Enuresis</td>
<td>Bed-wetting</td>
</tr>
<tr>
<td>Apparent</td>
<td>Clear, obvious</td>
</tr>
<tr>
<td>Aberrant</td>
<td>Off course, abnormal</td>
</tr>
<tr>
<td>Aural</td>
<td>Pertains to the ear</td>
</tr>
<tr>
<td>Oral</td>
<td>Pertains to the mouth</td>
</tr>
<tr>
<td>Callous</td>
<td>Hard like a callus, hardened thinking</td>
</tr>
<tr>
<td>Callus</td>
<td>Hardened area of skin</td>
</tr>
<tr>
<td>Carotid</td>
<td>Gland</td>
</tr>
<tr>
<td>Parotid</td>
<td>Gland</td>
</tr>
<tr>
<td>Cecal</td>
<td>Pertains to the cecum</td>
</tr>
<tr>
<td>Fecal</td>
<td>Pertains to feces</td>
</tr>
<tr>
<td>CNS</td>
<td>Central nervous system (abbreviation)</td>
</tr>
<tr>
<td>C&amp;S</td>
<td>Culture and sensitivity (lab test)</td>
</tr>
<tr>
<td>Discreet</td>
<td>Reserved or private</td>
</tr>
<tr>
<td>Discrete</td>
<td>Separate</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>Difficulty eating or swallowing</td>
</tr>
<tr>
<td>Dysphasia</td>
<td>Difficulty speaking</td>
</tr>
<tr>
<td>Effusion</td>
<td>Escape of fluid into tissue</td>
</tr>
<tr>
<td>Infusion</td>
<td>To introduce fluid into vein or tissue</td>
</tr>
<tr>
<td>Eczema</td>
<td>A type of dermatitis</td>
</tr>
<tr>
<td>Exemia</td>
<td>Loss of fluid from blood vessels</td>
</tr>
</tbody>
</table>
If you read Chapter 4, you now have a better idea of how medical terms are formed. But unless you work on the set of a silent medical movie, you’re going to have to learn how to pronounce these words. Even the Hollywood hotshots who rush around the sets of Grey’s Anatomy and Nurse Jackie have to learn how to say medical terms, and are paid well to do it convincingly. Though you may not net seven figures for shouting, “Get an MRI of this man’s duodenum and jejunum, stat!” you will fit right in with your medical counterparts by knowing the correct way to pronounce medical terms.

**Hooked on Phonics**

With medical terminology, sounds are not always pronounced the same as in your everyday English pronunciation, and there are not even steadfast rules that a combination of specific letters will always be pronounced in the same way. One thing that helps in both the standard English and medical worlds, though, is to learn how to pronounce phonetically — by breaking up word sounds into smaller parts.

The variety of possible letters and sound combinations can make — or at least can seem to make — medical terms difficult to pronounce, especially if you’ve never seen or heard the term before. What may seem familiar to you from everyday English might take on a whole new sound in a med term.
Terms ending in *ae* (again often plurals) are pronounced “ay” (or sometimes “eh”)

Example:

Vertebra, vertebrae: (VERT-e-bray)

In terms ending in *es* (you guessed it — often plurals), the *es* is pronounced as if it were a separate syllable.

Examples:

Naris, nares: (nar-EEZ)
Testis, testes: (test-EEZ)

**Pronouncing Common Combinations**

Now that you have established a few pronunciation rules, consider what happens to the pronunciation of a term when you combine a prefix with a root word or combining form, together with a suffix, and often a combining vowel. The combinations are endless.

Keep a few simple explanations in mind before you start combining word parts. To review:

- **Prefix**: Always at the beginning of a term. Modifies the word root that it precedes. It almost always indicates a location, number, time or period of time, or status.
- **Word root/combining form**: Usually indicates a body part, such as cardi/o for heart, gastr/o for stomach, and neur/o for nerve.
- **Suffix**: Appears at the end of a medical term. Usually, though not always, indicates a condition, procedure, disorder, or disease.

A combining vowel can be used to change the spelling of a term, making the pronunciation easier. A combining vowel is *not* used when the suffix begins with a vowel because this would make pronunciation difficult. A combining vowel is only used when the suffix begins with a consonant. For example, gastr/o pertains to the stomach. Adding the suffix -itis, meaning inflammation, results in the term gastritis (GAS-TRY-tis). If the combining vowel *o* were not removed, the result would be gastroitis creating a double vowel and a word more difficult to pronounce (GAS-TRO-it-is).
Chapter 5: Say What? Pronunciation and Usage

Even the more grounded basis of a word, the root or combining form, can change the way you say and see words. The combining vowel, in particular, can change the meaning and pronunciation:

- Arthritis (ar-THRI-tis): Inflammation of a joint (arthr/o)
- Arthropathy (ar-THROP-a-thee): A condition of a joint
- Arthroplasty (AR-thro-plas-tee): Surgical repair of a joint
- Neuritis (noo-RYE-tis): Inflammation of a nerve (neur/o)
- Neuropathy (noo-ROP-a-thee): A condition of a nerve
- Neuroplasty (NOOR-o-plas-tee): Surgical repair of a nerve

Terminology treasure hunting in the dictionary

It is important to remember that not every medical term you see or hear may appear in a medical dictionary as it is commonly spelled or pronounced. With so many root words, prefixes, and suffixes, the possible combinations would be endless, and the medical dictionary would become a set of encyclopedias. So when trying to find a term in a medical dictionary, you might have to look under the root word first and the prefix and suffix separately. Most commonly used terms are now listed alphabetically, but just because you can’t find a term in the dictionary right away doesn’t mean it doesn’t exist. It just means you might have to piece together your own definition.

What Condition Your Condition Is In

Pronouncing terms for conditions can be easy if you familiarize yourself first with the root word of the condition, and then with the suffix. Let’s use the simple, everyday stomach ailment as an example. By first pronouncing the root word, then adding different suffixes, you can up your vocabulary by a few points:

- Gastro (GAS-troh): Stomach
- Gastritis (gas-TRY-tis): Inflammation of the stomach (-itis)
- Gastrodynia (gas-troh-DYNE-ee-ah): A pain in the stomach (-dynia)
- Gastropathy (gas-TROP-a-thee): A stomach condition (-pathy)
Part II: Mapping Words and Bodies

- Myalgia: Muscle pain
- Nephrosis: Kidney condition
- Orthopnea: Inability to breathe properly except in an upright position
- Osteopenia: Deficiency in bone mass
- Photophobia: Visual intolerance of light
- Quadriplegia: Paralysis of all four quadrants of the body
- Splenomegaly: Enlargement of the spleen
- Tracheostomy: Artificial opening into the trachea; follows a tracheotomy

In the doctor’s office and hospital

- Abdominoplasty: Plastic surgery on the abdomen
- Amniocentesis: Procedure to withdraw fluid from amniotic sac during pregnancy
- Appendectomy: Surgical removal of appendix
- Bronchoscope: Instrument used to perform a bronchoscopy
- Cardiogram: Hard copy record of cardiography
- Cardiograph: Machine used to perform a cardiography
- Cardiography: Process of recording activity of the heart
- Herniorrhaphy: Surgical fixation or repair of a hernia
- Hysterectomy: Surgical removal of uterus
- Laparoscopy: Instrument used to perform a laparoscopy
- Laparotomy: Cutting into the abdomen
- Mammography: Process of examination of breast tissue
- Myorrhaphy: Suture or fixation of a muscle
- Myorrhesis: Suturing of a ruptured muscle
- Nasoplasty: Repair of deviated nasal septum
- Osteotomy: Cutting into bone
- Psychologist: Person who studies psychology
- Rhinoplasty: Nose job
- Tracheotomy: Cutting into the trachea
- Urethropexy: Surgical fixation of the urethra
Chapter 8
Hey, I Know You: Word Recognition

In This Chapter
▶ Appreciating Greek and Latin origins
▶ Surveying terms describing the body’s interior
▶ Checking out terms covering the body’s exterior
▶ Looking at pathological terms

Getting the hang of medical prefixes, roots, and suffixes is just the beginning of reaching your goal of becoming a terminology expert. Once you do that, you can move on to general word recognition.

Root words remain the basic component of word building, and you can look directly to them to recognize all sorts of words that associate with specific body parts and regions. Because you have spent so much time going over these individual building blocks, you can now begin to use what you know to piece together the larger puzzle of knowing whole words.

Blame it on Aristotle and Hippocrates. Approximately 75 percent of all medical terms are based on Latin or Greek terms.

The Inside Story: Terms for Your Interior

Inside all these cavities, of course, lies a bounty of body part-related medical terms. All the root words and combining forms from Chapter 3 (and Chapters 6 and 7) can morph into all kinds of different words that explain everything from everyday common conditions and procedures to pathology and pharmacology.

Remember that you can take any root word or combining form and create several different medical terms.
Table 8-1 lists many examples of where these root words can take you on your medical terminology journey.

<table>
<thead>
<tr>
<th>Root Word</th>
<th>What It Means</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdomin/o</td>
<td>Abdomen</td>
<td>Abdominoplasty: Surgical repair or reconstruction of the abdomen</td>
</tr>
<tr>
<td>Angi/o</td>
<td>Vessel</td>
<td>Angioplasty: Surgical repair or reconstruction of a vessel</td>
</tr>
<tr>
<td>Arteri/o</td>
<td>Artery</td>
<td>Arterioplasty: Surgical repair or reconstruction of an artery</td>
</tr>
<tr>
<td>Arthr/o</td>
<td>Joint</td>
<td>Arthritis: Inflammation of a joint</td>
</tr>
<tr>
<td>Audi/o</td>
<td>Hearing</td>
<td>Audiometry: Measurement of hearing using an audiometer</td>
</tr>
<tr>
<td>Bio</td>
<td>Life</td>
<td>Biology: The study of life and living organisms</td>
</tr>
<tr>
<td>Bronch/i,</td>
<td>Bronchus/lung</td>
<td>Bronchitis: Inflammation of the bronchi</td>
</tr>
<tr>
<td>bronch/o</td>
<td></td>
<td>Bronchoscopy: Visual examination of the bronchi</td>
</tr>
<tr>
<td>Cardi/o</td>
<td>Heart</td>
<td>Cardiomegaly: Enlargement of the heart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cardiac: Pertaining to the heart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carditis: Inflammation of the heart</td>
</tr>
<tr>
<td>Cholecyst/o</td>
<td>Gallbladder</td>
<td>Cholecystectomy: Removal of the gallbladder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cholecystitis: Inflammation of the gallbladder</td>
</tr>
<tr>
<td>Chondr/i,</td>
<td>Cartilage</td>
<td>Chondromalacia: Softening of cartilage</td>
</tr>
<tr>
<td>chondr/o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Col/o</td>
<td>Colon</td>
<td>Colonoscopy: Visual examination of the colon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colonoscope: Instrument used in colonoscopy</td>
</tr>
<tr>
<td>Cry/o</td>
<td>Cold</td>
<td>Cryobiology: Branch of biology dealing with effects of low temperatures</td>
</tr>
<tr>
<td>Root Word</td>
<td>What It Means</td>
<td>Example(s)</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>------------</td>
</tr>
<tr>
<td>Hepat/o, hepatic/o</td>
<td>Liver</td>
<td>Hepatitis: Inflammation of the liver</td>
</tr>
<tr>
<td>Heter/o</td>
<td>Other, different</td>
<td>Heterosexual: Sexually attracted to the opposite sex</td>
</tr>
<tr>
<td>Hist/o, histi/o</td>
<td>Tissue</td>
<td>Histology: Study and function of tissue</td>
</tr>
<tr>
<td>Hom/o, home/o</td>
<td>Same, alike</td>
<td>Homosexual: Sexually attracted to the same sex</td>
</tr>
<tr>
<td>Hydr/o</td>
<td>Water, wet</td>
<td>Hydromassage: Massage by means of moving water</td>
</tr>
<tr>
<td>Hyster/o</td>
<td>Uterus</td>
<td>Hysterectomy: Surgical removal of the uterus</td>
</tr>
<tr>
<td>Ile/o</td>
<td>Ileum (intestine)</td>
<td>Ileostomy: Artificial opening into the ileum</td>
</tr>
<tr>
<td>Ili/o</td>
<td>Ilium (pelvic bone)</td>
<td>Ilioinguinal: Pertaining to the ilium and inguinal regions</td>
</tr>
<tr>
<td>Jejun/o</td>
<td>Jejunum</td>
<td>Jejunitis: Inflammation of the jejunum</td>
</tr>
<tr>
<td>Lacrima</td>
<td>Tears</td>
<td>Lacrimatory: Causing a flow of tears</td>
</tr>
<tr>
<td>Laryng/o</td>
<td>Larynx</td>
<td>Laryngitis: Inflammation of the larynx</td>
</tr>
<tr>
<td>Leuk/o</td>
<td>White</td>
<td>Leukocyte: White blood cell</td>
</tr>
<tr>
<td>Lith/o</td>
<td>Stone or calculus</td>
<td>Lithotripsy: Crushing of a stone or calculus</td>
</tr>
<tr>
<td>Men/o</td>
<td>Menstruation</td>
<td>Menorrhagia: Excessive or heavy menstrual flow</td>
</tr>
<tr>
<td>Myel/o</td>
<td>Bone marrow/spinal cord</td>
<td>Myelogram: Recording of the spinal cord</td>
</tr>
<tr>
<td>My/o</td>
<td>Muscle</td>
<td>Myositis: Inflammation of a muscle</td>
</tr>
</tbody>
</table>

Table 8-1 (continued)
### Pathological Conditions

Any medical term can be used in everyday settings like the doctor’s office or hospital. Some, such as those in Table 8-3, specifically detail the different kinds of pathological conditions associated with root words.
form of heart disease. Neurology, then, is the study of nerves or the nervous system, and the neurologist is the physician who specializes in neurology. Any disease of the nervous system or the nerves is neuropathy.

Going Deeper into Suffixes

Check out some more suffix examples. Suffixes related to procedures include -centesis, referring to surgical puncture to remove fluid for diagnostic purposes or to remove excess fluid. That means abdominocentesis is surgical puncture of the abdominal cavity.

Want to talk about removing something? The suffix -ectomy means “surgical removal of.” When you see -ectomy at the end of a term, no matter how long or how difficult or confusing the first part of the word is, it means surgical removal of something. Another term we all know that ends in -ectomy is appendectomy, surgical removal of an appendix.

Unfortunately, it’s not always that easy. Take a look at a more complicated word and then break it down. How about the word salpingo-oophorectomy? The -ectomy we know indicates the surgical removal of something. But what? Salpingo is the root word referring to the fallopian tube; oophoro is the root word for ovary. Therefore, salpingo-oophorectomy is surgical removal of a fallopian tube and ovary. Surgical removal of an ovary only would be oophorectomy. Surgical removal of a fallopian tube only would be salpingectomy.

The eagle eyes among you may have noticed this: There is a hyphen in salpingo-oophorectomy. This is there mainly to aid with pronunciation and to avoid a triple “o” vowel with the combining of the two roots. The word can also be expressed as oophorosalpingectomy, which means the same thing.

Another suffix related to procedures is -graphy, meaning the process of recording a picture or a record. Radiography is the process of recording a picture by radiograph or an x-ray. Suffixes -gram and -graph are used to describe the finished product, the recording or picture. An arteriography is the process of recording the picture of arteries. The arteriogram or arteriograph is the film that is produced by the arteriography. The suffix -ostomy means to surgically create an artificial opening or stoma. A colostomy is a surgical creation of an opening between the colon and the body surface. The root word colo means colon. The suffix -otomy means “surgical cutting into,” or a surgical incision. In order, then, to perform a tracheostomy (the surgical creation of an opening in the trachea), a tracheotomy (the surgical incision into the trachea) must be performed.

It is important to know the difference between “ostomy” and “otomy” — there is only one letter difference, but a big difference in the meaning.
When referring to the front of the body, the terms *anterior* and *ventral* are used. When referring to the back of the body, it’s *posterior* and *dorsal*. With the waistline of the anatomical position as a guideline, above the waistline is referred to as *cephalad* (“head” or “upward”) or *superior* (“above”). Below the waistline is referred to as *caudal* (“tail” or “downward”) or *inferior* (“below”). Superior and inferior are also used to describe body parts in relation to one another in general.

The sides of the body are referred to as *lateral*, and the middle referred to as *medial*. The term *distal* refers to “away from the point of origin” (think of distance). *Proximal* refers to “nearest the point of origin” (close proximity). Distal and proximal are two directional terms that seem to pose problems. View the torso of the body as the point of origin. Using the arm as an example, the proximal portion of the arm is where the arm joins to the shoulder. The distal, or away-from, portion of the arm would be the hand. In the leg, the upper thigh would be the proximal portion of the leg, and the foot would be the distal portion of the leg.

Directional terms can be joined together to provide a combined form. *Ipsilateral* pertains to one side, whereas *mediolateral* is a directional term meaning pertaining to the middle and one side (such as right mediolateral pain). It is often used in medical exams and surgical procedures. Here’s one use of mediolateral: A right mediolateral abdominal incision would be an incision beginning at the middle of the abdomen and going toward the right side. A similar term is *lateromedial*. A lateromedial incision would be the same as a mediolateral one, but beginning from the side and going toward the middle.

Table 10-3 lists some root words that pertain to directional terms.

<table>
<thead>
<tr>
<th>Root Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anter/o</td>
<td>Front</td>
</tr>
<tr>
<td>Caud/o</td>
<td>Tail or downward</td>
</tr>
<tr>
<td>Cephal/o</td>
<td>Head or upward</td>
</tr>
<tr>
<td>Dist/o</td>
<td>Away from (distant) the point of origin</td>
</tr>
<tr>
<td>Dors/o</td>
<td>Back</td>
</tr>
<tr>
<td>Infer/o</td>
<td>Below</td>
</tr>
<tr>
<td>Later/o</td>
<td>Side</td>
</tr>
<tr>
<td>Medi/o</td>
<td>Middle</td>
</tr>
<tr>
<td>Poster/o</td>
<td>Back or behind</td>
</tr>
<tr>
<td>Proxim/o</td>
<td>Near to (proximity) the point of origin</td>
</tr>
<tr>
<td>Super/o</td>
<td>Above</td>
</tr>
<tr>
<td>Ventr/o</td>
<td>Front or belly</td>
</tr>
</tbody>
</table>
The anatomical divisions of the abdomen are referenced in anatomy textbooks to specify where certain organs are found.

The clinical regions of the abdomen are used to describe the abdomen when a patient is being examined. The clinical regions of the abdomen divide the abdominal area, as above, into four equal quadrants:

- **The right upper quadrant (RUQ)** contains the right lobe of the liver, gallbladder, and parts of the small and large intestines.
- **The left upper quadrant (LUQ)** contains the left lobe of the liver, stomach, pancreas, spleen, and parts of the small and large intestines.
- **The right lower quadrant (RLQ)** contains parts of the small and large intestines, appendix, right ureter, right ovary, and fallopian tube.
- **The left lower quadrant (LLQ)** contains parts of the small and large intestines, left ureter, left ovary, and fallopian tube.

Table 10-4 provides a quick look at some of the smaller body regions, beginning at the head and moving downward.

<table>
<thead>
<tr>
<th>Table 10-4 Small But Mighty Body Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
</tr>
<tr>
<td>Auricular region</td>
</tr>
<tr>
<td>Axillary</td>
</tr>
<tr>
<td>Buccal</td>
</tr>
<tr>
<td>Carpal</td>
</tr>
<tr>
<td>Cervical</td>
</tr>
<tr>
<td>Clavicular</td>
</tr>
<tr>
<td>Infraorbital</td>
</tr>
<tr>
<td>Infrascapular</td>
</tr>
<tr>
<td>Interscapular</td>
</tr>
<tr>
<td>Lumbar</td>
</tr>
<tr>
<td>Mammary</td>
</tr>
<tr>
<td>Mental</td>
</tr>
<tr>
<td>Nasal</td>
</tr>
<tr>
<td>Occipital</td>
</tr>
</tbody>
</table>

(continued)
Ventilation (breathing) is a process that again is looked after automatically by the nervous system. You don't have to consciously think about breathing. When you breathe in (inspiration), all passageways are opened to allow the air entry. The diaphragm, a large muscle separating the chest cavity from the abdominal cavity, pushes down and the ribs move up to give the lungs lots of room to expand. Air pressure within the lungs decreases and air comes in.

When you breathe out (expiration), the diaphragm moves up, the rib cage comes down, lung pressure increases, and air is pushed out.

The lungs are contained in the thoracic cavity that divides into the pleural and mediastinum cavities. The pleural cavity surrounds the lungs, and the mediastinal cavity between the lungs holds the heart, trachea, and esophagus. The right lung consists of three lobes, and the left lung two lobes. The cavities are the pleural and mediastinum, but when referring to the area in general you should say mediastinal cavity, even though the area is referred to as the mediastinum.

The gastrointestinal system

The gastrointestinal system (also called the digestive system or alimentary tract) has three functions: to digest food, absorb nutrients, and carry waste materials to be eliminated. Except for the processes of swallowing food and having a bowel movement, this system pretty much looks after itself for everything that happens in between.

We chew food, which we swallow, that goes into the esophagus and then into the stomach. The stomach partially digests the food before it moves on to the small intestine (also called small bowel) for further digestion and absorption. The residual food moves into the large intestine (large bowel) where it is doomed to be eliminated as solid waste. Except for the pharynx (throat) and esophagus, all gastrointestinal organs are in the abdominal cavity, often referred to as the gut or belly.
Chapter 11: All Systems Go: When Systems Combine

The thyroid gland secretes two hormones that are necessary for the body to maintain a normal rate of metabolism. The parathyroid glands secrete a hormone that moves the storage of calcium from bone into the blood (to maintain adequate levels of calcium in the bloodstream).

The adrenal glands are made up of the cortex and medulla. The cortex secretes steroids and mineral corticoids, which are essential to life because they regulate the levels of mineral salts, or electrolytes. In fact, all adrenal hormones secreted by the cortex are steroids. These include mineralocorticoids, which regulate potassium, sodium and chloride (electrolytes) and glucocorticoids (which includes cortisol) that aids in metabolism of carbohydrates, fat and proteins (tissues release glucose to raise blood sugar levels when needed).

The adrenal medulla secretes catecholamines, such as epinephrine (adrenaline) and norepinephrine (noradrenaline), which aid the body in stressful situations.

The pancreas has specialized cells called the islets of Langerhans. They produce insulin and glucagon, which stimulates gluconeogenesis, or sugar production, in the liver. Insulin is necessary in the blood so sugar can pass from the blood into cells. The pineal gland secretes melatonin, thought to affect the brain, help regulate sleep patterns, and influence the rate of gonad maturation.

The endocrine glands all play a part in this large orchestra to maintain the harmonious music of the body. The hypothalamus and pituitary are the orchestra leaders of this complex system, which needs to function properly to maintain good health.

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The three little systems

The central nervous system includes the brain and spinal cord. The peripheral nervous system consists of cranial and spinal nerves, or all the nerves that branch out from the brain and spinal cord. Impulses are sent to and from the brain via a vast network of nerves. The peripheral system consists of nerves that operate automatically, sending impulses from the central nervous system to glands, the heart, and blood vessels as well as the involuntary muscles in the digestive and urinary systems. This autonomic system also contains sympathetic nerves that stimulate the body when under stress or in a crisis, to increase blood pressure and heart rate.
Table 12-4 (continued)

<table>
<thead>
<tr>
<th>Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red bone marrow</td>
<td>Found in cancellous bone, the site of hematopoiesis</td>
</tr>
<tr>
<td>Scoliosis</td>
<td>Abnormal lateral curvature of the spine</td>
</tr>
<tr>
<td>Subcostal</td>
<td>Below the ribs</td>
</tr>
<tr>
<td>Tendinitis or tendonitis</td>
<td>Inflammation of a tendon</td>
</tr>
<tr>
<td>Tendon</td>
<td>Connective tissue binding muscles to bones</td>
</tr>
<tr>
<td>Tenodynia</td>
<td>Pain in a tendon</td>
</tr>
<tr>
<td>Tenosynovitis</td>
<td>Inflammation of the tendon and synovial membrane</td>
</tr>
<tr>
<td>Trabeculae</td>
<td>Supporting bundles of bony fibers in cancellous or sponge bone</td>
</tr>
<tr>
<td>Trochanter</td>
<td>Large process behind the neck of the femur</td>
</tr>
<tr>
<td>Tubercle</td>
<td>Small rounded process on a bone</td>
</tr>
<tr>
<td>Tuberosity</td>
<td>Large rounded process on a bone</td>
</tr>
<tr>
<td>Yellow bone marrow</td>
<td>The fatty tissue found in the diaphyses of long bones</td>
</tr>
</tbody>
</table>

Common Skeletal Conditions

Breaks, sprains, and bunions are no fun. Many of the most common maladies associated with the skeletal system involve the application of casts or other corrective devices. Good, old-fashioned fractures (a sudden break of the bone) top the list of skeletal conditions. Whether a result of an auto accident or just plain clumsiness (come on, like you didn’t see that curb jump out at you!), any bone in your body is a potential break waiting to happen.

You are probably familiar with many common bone conditions because you’ve likely experienced one of them.

✓ **Bunion** is an abnormal prominence with bursal swelling at the metatarsophalangeal joint near the base of the big toe.

✓ **Bursitis** is an inflammation of a bursa. Tennis elbow is an example of bursitis of the olecranon bursa.

✓ **Dislocation** is a displacement of a bone from its joint. Dislocations may be reduced or restored to their normal condition and the joint immobilized with sling or strapping for healing of torn ligaments and tendons.

✓ **Sprain**, everyone’s favorite, is trauma or injury to a joint with pain, swelling, and injury to ligaments.
Chapter 13

Getting Ripped: The Muscular System

In This Chapter
▶ Finding out how your muscular system works
▶ Determining root words, prefixes, and suffixes appropriate to this system
▶ Using terminology of the muscular system to discuss common conditions and diseases
▶ Finding the right terms to use when diagnosing problems

Think about this the next time you hit the gym: Your body is the proud owner of more than 600 muscles! Luckily, you don’t have to pump a different weight machine to work every single one. The beauty of the muscular system is that it is, in fact, a system in which different major muscle groups work together at the same time.

So relax and don’t stress too much about that rowing machine. You’re using muscles right now reading this book.

How the Muscular System Works

The *musculoskeletal* system is made up of muscles and joints. The muscles — all 600 of them and more — are responsible for movement. The skeleton provides attachment points and support for muscles, but it’s the muscle tissue’s ability to extend and contract that makes movement happen. So, for every climb of the elliptical machine, you can thank muscular tissue for making it possible.

Muscles make up the major part of fleshy portions of the body and account for one half of body weight. Muscles vary in proportion to body size, and the shape of the body is determined by muscles covering bones.
Chapter 13: Getting Ripped: The Muscular System

**Testing, Testing: Muscular Radiology and Diagnostic Tests**

Though the list of muscular conditions and diseases is quite long, there are some simple diagnostic tests doctors can perform to diagnose most muscular ailments.

- **Electromyogram (EMG)** is a record of electric activity in a muscle. This procedure is done to diagnose carpal tunnel syndrome. *Electromyography* is an electrical recording of activity in a muscle.
- **Isokinetic dynamometry**: A test to measuring the degree of muscular power using an instrument called a dynamometer.
- **MRI (magnetic resonance imaging)**: The gold standard for making pictures of soft tissues like fascia, tendons, ligaments, and muscle.
- **X-ray**: Picture of the bones.

**Paging Dr. Terminology: Muscular Surgeries and Procedures**

Now that your muscles have been poked, prodded, tested, and diagnosed, it’s time to fix what’s broken. Most of these procedures are surgical in nature.

Many surgeries are performed arthroscopically, through a scope inserted into or near a joint space, with one lone endoscope, *Palmar uniportal endoscopic carpal tunnel release*. This is also called a *Mirza technique*, an endoscopic method for release of carpal tunnel, previously accomplished by open surgery.

The surgical players are

- **Fasciectomy**: Excision of fascia (fibrous band or membrane of tissue surrounding muscle)
- **Fasciodesis**: Surgical fusion or binding of muscle fascia
- **Fasciotomy**: Surgical cutting into muscle fascia
- **Myolysis**: Surgical breaking down or separation of a muscle
- **Myoplasty**: Surgical repair of a muscle
- **Myorrhaphy**: Suturing of a muscle
- **Tenodesis**: Surgical fixation of a tendon
Glands, Both Sebaceous and Sudoriferous

The skin has two types of glands that, as accessory organs, produce important secretions. These glands under the skin’s surface are called the sebaceous (oil) glands and the sudoriferous (sweat) glands.

The sebaceous glands produce an oily secretion called sebum, whereas the sudoriferous glands produce a watery secretion called sweat. Sebum and sweat are carried to the outer edges of the skin by ducts and excreted through openings in the skin called pores. Sebum helps lubricate the skin. Sebaceous glands are closely associated with hair follicles, and their ducts open into the hair follicle through which the sebum is released.

Sebaceous glands are influenced by sex hormones. This causes them to be overactive at puberty and underactive in old age. This explains the excess oil production of the skin at puberty and gradual drying of the skin as we age.

Sudoriferous (sweat) glands are tiny coiled glands found on almost all body surfaces. You have about 2 million of them in your body. There are many more in the palms of the hands and soles of your feet. The tiny openings on the surface are called pores. Sweat helps cool the body as it evaporates from the skin surface. Nerve fibers under the skin detect pain, temperature, pressure, and touch. The adjustment of the body to its environment depends on the sensory messages relayed to the brain and spinal cord by the sensitive nerve endings in the skin.

Diaphoresis comes from the Greek dia, meaning “through,” and phoreo, meaning “I carry.” Translated, it means “the carrying through of perspiration.”

Stinking it up: Your sweat glands

Sweat gets a bad rap for being smelly when, in fact, it’s not your fault. Your body’s smell is caused by bacteria. Sweat or perspiration is almost pure water, with dissolved materials such as salt making up less than 1 percent of its total composition. Sweat is actually colorless and odorless. The odor produced when sweat accumulates is due to the action of bacteria on it.

Certain sweat glands, active only from puberty onward and larger than ordinary sweat glands, are concentrated near the reproductive organs and in the axillae (armpits). These glands secrete an odorless sweat that contains substances that are easily broken down by skin bacteria. The breakdown products are responsible for the characteristic “human body odor.” So the next time someone tells you your sweat stinks, you can say, “I beg to differ. My bacteria are the culprits.”

The ceruminous glands are classified as modified sweat glands and are found in the ear canal. These glands produce a yellow waxy substance called cerumen (ear wax).
### Root Word

<table>
<thead>
<tr>
<th>Root Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papill/o</td>
<td>Nipplelike</td>
</tr>
<tr>
<td>Pil/o</td>
<td>Hair</td>
</tr>
<tr>
<td>Py/o</td>
<td>Pus</td>
</tr>
<tr>
<td>Rhytid/o</td>
<td>Wrinkle</td>
</tr>
<tr>
<td>Sclera/o</td>
<td>Hardening</td>
</tr>
<tr>
<td>Seb/o</td>
<td>Sebum (fat)</td>
</tr>
<tr>
<td>Squam/o</td>
<td>Scale</td>
</tr>
<tr>
<td>Steat/o</td>
<td>Fat, sebum</td>
</tr>
<tr>
<td>Trich/o</td>
<td>Hair</td>
</tr>
<tr>
<td>Xer/o</td>
<td>Dry</td>
</tr>
<tr>
<td>Xanth/o</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

Herpes comes from the Greek word *herpo*, meaning “to creep along.” It is descriptive of the course and type of skin lesion as with herpes zoster (shingles).

Table 14-2 lists prefixes and suffixes pertaining to your hair, nails, skin, and glands.

### Table 14-2: Common Integumentary Prefixes and Suffixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epi-</td>
<td>On, over, upon</td>
</tr>
<tr>
<td>Para-</td>
<td>Beside, beyond, around</td>
</tr>
<tr>
<td>Per</td>
<td>Through</td>
</tr>
<tr>
<td>Sub-</td>
<td>Under, below</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suffix</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>-itis</td>
<td>Inflammation</td>
</tr>
<tr>
<td>-malacia</td>
<td>Softening</td>
</tr>
<tr>
<td>-opsy</td>
<td>View of, viewing</td>
</tr>
<tr>
<td>-orrhea</td>
<td>Flow, excessive discharge</td>
</tr>
<tr>
<td>-phagia</td>
<td>Eating or swallowing</td>
</tr>
<tr>
<td>-plasty</td>
<td>Surgical repair</td>
</tr>
</tbody>
</table>
You can thank your sensory systems for all the fun you get to have in life. While your other, also very important, systems handle the background work that keeps you running, the senses let your body have a little fun. What you see, hear, smell, touch, and taste makes life the enjoyable experience it is. So the next time you’re smelling some truly fantastic barbecue or watching a dazzling fireworks display, be grateful for your senses.

The Eye

For humans, the eye is the most important sense organ — the Big Kahuna of the senses. Sight provides the most information for us, for what we see, of course, but that includes what we can read. The eye is located in the orbit (the bony protective cavity of the skull). The eye lets light in, focuses it, transforms it into nerve impulses, and sends these impulses to the brain.

Here’s how: Light rays enter the eye via an adjustable opening, the dark center of the eye, called the pupil, which regulates the amount of light allowed in. Behind the pupil is the lens, which focuses the light. The lens is not rigid and it can adjust its shape in order to adapt to near and far objects. The light is focused by the lens into the back of the eye, where it strikes the retina. The retina transforms the focused image into nerve impulses that travel along the optic nerve to the occipital lobe of the brain for processing.

Figure 15-1 gives you a peek inside the eye.
Chapter 15: It Depends on Your Perception: The Sensory Systems

Figure 15-2 shows the different parts of the ear.

The ear is divided into three separate regions: the outer, middle, and inner ear. The outer and middle ears look after the conduction of sound waves through the ear. The inner ear contains the structures that carry the waves to the brain.

**Outer ear**

Sound waves are encouraged toward the ear canal by the **auricle**, or **pinna**, the visible outer ear, the hard, arching cartilage that forms the outer ear curve, the **tragus**, that hard little flap of cartilage that sticks out in front of the ear canal, and the earlobe.

From the pinna, the **external auditory meatus** is lined with numerous glands that secrete a yellowish waxy substance called **cerumen**. Cerumen (earwax) lubricates and protects the ear. Sound waves travel through the auditory canal and strike the **tympanic membrane** or **eardrum**, located between the outer and middle ear.
See, that wasn’t so hard! Now that you have your feet wet (or nose, as it may be), you can move on to the eye, which has about a gazillion (okay, maybe that’s an exaggeration) root words and combining forms. Check it out in Table 15-2.

<table>
<thead>
<tr>
<th>Root Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aque/o</td>
<td>Water</td>
</tr>
<tr>
<td>Blephar/o</td>
<td>Eyelid</td>
</tr>
<tr>
<td>Conjunctiv/o</td>
<td>Conjunctiva (membrane lining eyelids)</td>
</tr>
<tr>
<td>Core/o, cor/o</td>
<td>Pupil</td>
</tr>
<tr>
<td>Corne/o</td>
<td>Cornea</td>
</tr>
<tr>
<td>Dacry/o</td>
<td>Tear, tear duct</td>
</tr>
<tr>
<td>Dipl/o</td>
<td>Double</td>
</tr>
<tr>
<td>Emmetr/o</td>
<td>In due measure</td>
</tr>
<tr>
<td>Glauc/o</td>
<td>Gray</td>
</tr>
<tr>
<td>Ir/o, irid/o</td>
<td>Iris (colored portion of the eye)</td>
</tr>
<tr>
<td>Is/o</td>
<td>Equal</td>
</tr>
<tr>
<td>Kerat/o</td>
<td>Cornea</td>
</tr>
<tr>
<td>Lacrim/o</td>
<td>Tear, tear duct</td>
</tr>
<tr>
<td>Mi/o</td>
<td>Smaller, less</td>
</tr>
<tr>
<td>Mydri/o</td>
<td>Wide</td>
</tr>
<tr>
<td>Ocul/o</td>
<td>Eye</td>
</tr>
<tr>
<td>Ophthalm/o</td>
<td>Eye (ophthalmologist, specialist in eye disorders)</td>
</tr>
<tr>
<td>Opt/o</td>
<td>Eye, vision</td>
</tr>
<tr>
<td>Phac/o, phak/o</td>
<td>Crystalline lens</td>
</tr>
<tr>
<td>Phot/o</td>
<td>Light</td>
</tr>
<tr>
<td>Presby/o</td>
<td>Old age</td>
</tr>
<tr>
<td>Pupill/o</td>
<td>Pupil</td>
</tr>
<tr>
<td>Retin/o</td>
<td>Retina</td>
</tr>
<tr>
<td>Scler/o</td>
<td>Sclera (white of the eye)</td>
</tr>
<tr>
<td>Uve/o</td>
<td>Iris, ciliary body, and choroids</td>
</tr>
<tr>
<td>Vitre/o</td>
<td>Glassy</td>
</tr>
<tr>
<td>Xer/o</td>
<td>Dry</td>
</tr>
</tbody>
</table>
no-longer-useful folks out at the end of the show. None of these components can work alone. They are a merry band of players who must share the spotlight.

The main organ of the circulatory (another name for cardiovascular) system is the heart, of course, and its main job is making the blood flow freely through your veins. By pumping, the heart creates pressure that forces the blood to move throughout the body via a channel system of arteries and veins. That system reaches from the center of your chest out to the nether regions of your appendages and back again, insuring that life-giving and sustaining blood cells are carried through your entire body.

The lymphatic system works to complement the actions of the cardiovascular system by carrying lymph fluid through the body via a system similar to veins. The lymph fluid flows forward through a grouping of vessels, ducts, and nodes that filter the fluid before it reenters the bloodstream. In this chapter, you find out more about the individual components of these two powerful systems and get to know the specific terminology associated with both.

An adult human’s normal heart rate is 70–80 beats per minute. A child’s is 100–120, an elephant’s about 25, a mouse’s 700, and a canary’s heart beats about 1,000 times per minute. Your heart beats around 100,000 times a day, pumping 2½ ounces with each contraction. That’s 5 quarts a minute, 75 gallons per hour, 1,800 gallons a day, and 657,000 gallons per year.

Greek plays a role in the roots of the word for heart, cardium. This word, which you’ll get to know quite well in this chapter, is taken from the Greek word kardia. Cardium takes on other identities in the commonly known forms of cardi and cardio. But make no mistake, it’s all the same root.

Now, meet the individual players responsible for the pumping of the red stuff that keeps you going every day. Each has its own special function and terminology to go along with it. If watching ER is your only entrée into the world of medical terminology, fear not and consider this section your crash course in all things cardiovascular.

The heart

To take a tour of the heart, consider three components: layers, chambers, and valves. Together, these elements form the most powerful muscle in the body. Located to the left of the midline of your chest’s center, this muscle, about the size of your fist, pumps a continuous stream of life-giving blood through your blood vessels.
The four heart chambers are separated by membranes called septa (plural of septum).

- **Interatrial septum** separates the two atria.
- **Interventricular septum** separates the two ventricle chambers.

**Valves** are the gatekeepers of the heart, making sure the blood flows in the correct direction. They let a specific amount of blood into each chamber and don’t allow it to flow backwards. The beauty of valve terminology is that the name of each valve gives you a clue to its make-up.

- **Bicuspid valve (also called mitral):** The bi- prefix shows you that the valve has two flaps.
- **Pulmonary semilunar valve and aortic semilunar valve:** Both have a half-moon shape, thus being named from semi (part) and lunar (moon).
- **Tricuspid valve:** Tri- indicates this valve has three flaps, keeping blood moving forward.

**Blood vessels**

The vast network of blood vessels (made up of arteries and arterioles, veins and venules, and capillaries) begins at the heart and spans out through the entire body to the far reaches of the fingertips and toes. Together, these different types of vessels work to carry blood pumped by the heart through the body.

**Arteries** take care of clean, oxygenated blood. **Veins** handle the movement of deoxygenated blood. Your little friends, the capillaries, serve as mini bridges between the two types of vessels.

**Arterial system**

The arterial system is composed of arteries and arterioles (smaller arteries). The Greek aer is the basis for the word artery, meaning “air.” Combined with terein, meaning “to keep,” you get the word artery. Starting with the largest artery, the aorta, the arteries carry oxygenated blood away from the heart to the arterioles, and then on to the capillaries, where the exchange of gases (oxygen and carbon dioxide) takes place.

The pulmonary artery, with its two branches, is the exception of the arterial world. Instead of carrying oxygen-filled blood to other parts of the body, its branches carry oxygen-deprived blood to the right and left lungs.
Table 16-3  Cardiovascular and Lymphatic Vocabulary Words

<table>
<thead>
<tr>
<th>Word</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticoagulant</td>
<td>Agent or drug that slows the clotting process</td>
</tr>
<tr>
<td>Aorta</td>
<td>Largest artery in the body</td>
</tr>
<tr>
<td>Atrium, Atria</td>
<td>Upper chambers of the heart</td>
</tr>
<tr>
<td>Auscultation</td>
<td>Hearing sounds in the body through a stethoscope</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Pressure exerted by blood against the vessel walls</td>
</tr>
<tr>
<td>Capillary</td>
<td>Smallest blood vessel</td>
</tr>
<tr>
<td>Cardiac</td>
<td>Pertaining to the heart</td>
</tr>
<tr>
<td>Cardiologist</td>
<td>Physician who studies and treats diseases of the heart</td>
</tr>
<tr>
<td>Cardiology</td>
<td>Study of the heart and its diseases</td>
</tr>
<tr>
<td>Cardiopulmonary</td>
<td>Cardiopulmonary resuscitation: Emergency procedure consisting of artificial ventilation and</td>
</tr>
<tr>
<td>resuscitation:</td>
<td>external cardiac massage</td>
</tr>
<tr>
<td>Coronary arteries:</td>
<td>The blood vessels that branch from the aorta to carry oxygen-rich blood to the heart muscle</td>
</tr>
<tr>
<td>Diastole</td>
<td>The relaxation phase of the heart beat</td>
</tr>
<tr>
<td>Endocardium</td>
<td>Inner lining of the heart</td>
</tr>
<tr>
<td>Erythrocyte</td>
<td>Red blood cell</td>
</tr>
<tr>
<td>Hematologist</td>
<td>Physician who studies and treats diseases of the blood</td>
</tr>
<tr>
<td>Hematology</td>
<td>Study of the blood</td>
</tr>
<tr>
<td>Hemolysis</td>
<td>Breakdown of blood</td>
</tr>
<tr>
<td>Hemostasis</td>
<td>Stoppage of bleeding</td>
</tr>
<tr>
<td>Immunoglobulins</td>
<td>Antibodies secreted by plasma cells</td>
</tr>
<tr>
<td>Leukocyte</td>
<td>White blood cell</td>
</tr>
<tr>
<td>Manometer</td>
<td>Instrument used to measure pressure of fluid</td>
</tr>
<tr>
<td>Mitral valve</td>
<td>Valve between the left atrium and left ventricle</td>
</tr>
<tr>
<td>Myelogenous</td>
<td>Produced by the bone marrow</td>
</tr>
<tr>
<td>Occlude</td>
<td>To be closed tightly</td>
</tr>
<tr>
<td>Percussion</td>
<td>Tapping of the body surface with fingers to determine density of the part beneath</td>
</tr>
<tr>
<td>Peyer’s patches</td>
<td>Lymphatic filters located in the small intestine</td>
</tr>
<tr>
<td>Pulmonary arteries:</td>
<td>Arteries carrying oxygen-poor blood from the heart to lungs</td>
</tr>
<tr>
<td>Pulmonary circulation</td>
<td>Flow of blood from the heart to the lungs and back to the heart</td>
</tr>
</tbody>
</table>
Chronic lymphocytic leukemia (CLL): Occurs late in life and follows a slow, progressive course

Chronic myelogenous leukemia (CML): Slowly progressive

All types of leukemia are treated with chemotherapy, using drugs that prevent cell division and selectively injure rapidly dividing cells. Effective treatment can lead to remission, or disappearance of signs of the disease. Relapse occurs when leukemia cells reappear in the blood and bone marrow, necessitating further treatment. Watch out for leukemia’s nasty cousin, multiple myeloma. This is a malignant tumor of bone marrow in which malignant cells invade bone marrow and destroy bony structures.

Keep these two blood-clotting health issues in mind

Hemophilia is excessive bleeding caused by a congenital lack of coagulation factor necessary for blood clotting.

Purpura is a symptom caused by low platelets involving multiple pinpoint hemorrhages and accumulation of blood under the skin.

We couldn’t leave our good friends in the lymphatic system out of the pathology discussion. Who knew that such small things like lymph nodes could be so prone to disease?

The lymph nodes themselves are the sites of many a showdown between good health and an extended hospital stay. Hodgkin’s disease is a malignant tumor arising in lymphatic tissue such as lymph nodes and spleen. Lymphosarcoma (lymphoma) is a malignant tumor of lymph nodes that resembles Hodgkin’s disease. Often referred to as non-Hodgkin’s lymphoma, it affects lymph nodes, spleen, bone marrow, and other organs. Burkitt’s lymphoma is a malignant tumor of lymph nodes usually affecting children and most common in central Africa.

Inflammation is another common trait of lymphatic system pathology. Sometimes those pesky lymph nodes just get too big for their britches in diseases like the following:

Lymphadenitis: Inflammation of lymph nodes usually due to infection

Mononucleosis: Acute infectious disease with enlarged lymph nodes and spleen due to increased numbers of lymphocytes and monocytes

Sarcoidosis: Inflammatory disease in which small nodules form in lymph nodes and other organs
and triglyceride deposits in arteries. Having high levels of high-density lipoprotein (HDL), containing less lipids, is a positive factor in keeping the heart healthy.

Remember HDL is the “happy” cholesterol in the blood. So, just remember H for “happy.” LDL is the “bad” cholesterol. Remember L for “lousy.”

Other laboratory blood tests include the following:

- **Antiglobulin test (Coombs’ test)** determines whether erythrocytes are coated with antibody and useful in determining the presence of antibodies in infants of Rh-negative mothers. (Rh-negative is a blood type in which all Rh factors are lacking.)

- **Bleeding time** is measurement of the time it takes for a small puncture wound to stop bleeding; normal time is 3 minutes or less.

- **Coagulation time** is the time required for blood to clot in a test tube; normal time is less than 15 minutes.

- **ESR (erythrocyte sedimentation rate)** measures the speed at which erythrocytes settle out of plasma. The rate is altered in disease conditions such as infection, joint inflammation, and tumor.

- **Hemoglobin test** is the measurement of the amount of hemoglobin in a blood sample.

- **Platelet count** is the number of platelets per cubic millimeter of blood. Platelets normally average between 200,000–500,000 per cubic millimeter.

  A common diagnostic test counts the red blood cells and/or the white blood cells. To remember the normal range for each, remember RBC (really big count) for RBC (red blood cells). The normal number is about 5 million per cubic millimeter. The WBC (white blood cell count) is much smaller, averaging between 5,000–10,000 per cubic millimeter.

- **Prothrombin time (PT)** measures the ability of the blood to clot, used to follow patients taking blood thinners or anticoagulant drugs such as Coumadin.

- **White blood cell differential count** determines the number of different types of leukocytes, mature and immature, that are present in a blood sample.
Zen and the art of ticker maintenance

Sometimes surgeons have to get down and dirty to fix a heart condition. This typically involves major surgery, a Skilsaw, and lots of time. Though it may be hard to believe that these surgeries are standard issue, remember that heart surgeons perform them every day with great success.

Angioplasty is the surgical repair of a vessel. An endarterectomy is an excision within an artery of a thickened interior, usually named for the artery that is being “cleaned out.” More vein work includes phlebotomy, an incision into a vein to remove or give blood. This is also called a venipuncture. These procedures are usually done in a doctor’s office but often may be performed in an outpatient lab.

The big fun happens when surgeons get more involved with the heart. In cardiac pacemaker insertion, a battery-powered or nuclear-powered apparatus is implanted under the skin to regulate the heart rate.

Think bypasses are only for major cities with traffic issues? Not so. The coronary artery bypass graft (CABG) is a surgical technique to bring a new blood supply to heart muscles by detouring around blocked arteries, whereas a femoropopliteal bypass is surgery to establish an alternate route from the femoral artery to the popliteal artery in the leg, to bypass obstruction.

Bypass surgery can now be performed using MIDCAB (minimally invasive direct coronary artery bypass graft), and TECAB (totally endoscopic coronary artery bypass graft) with the help of the world’s most advanced surgical robot, da Vinci Si. This robot has three arms and a 3D high-definition camera, and miniaturized surgical instruments are mounted on the arms. With the surgeon’s guidance, the procedure that once required a 10- to 12-inch sternal incision can now be accomplished through small portals, allowing less trauma to the body, minimal scarring, and faster recovery time.

Terminology Rx: Cardiovascular and Lymphatic Pharmacology

Your friendly neighborhood pharmacist will know all the details of what to use for cardio and lymph-related ailments. In the meantime, you have us. This section lists the most common types of drugs used to correct cardiovascular and lymphatic conditions and diseases.

Antiarrhythmics correct cardiac arrhythmias (irregular heartbeat). Examples include digoxin (Lanoxin) and propranolol hydrochloride (Inderal).

Anticoagulants slow blood clotting. Examples include heparin calcium (Calcilean) and warfarin sodium (Coumadin).
of infected droplets, always causes a commotion when reported to health officials. So much so, in fact, that before antibiotics, hospitals built solely for the treatment of TB were quite common. TB is a bit more under control today and is treated with a specific antibiotic regime, usually over a long-term (6-month) period. There are still many cases reported, though, particularly in the Global South.

Diphtheria is another infectious disease of the upper respiratory tract, affecting the throat. Influenza, that pesky flu, is a highly infectious respiratory disease that is viral in origin. Though for most people nowadays it involves some time off work and chicken soup, the flu can be deadly if not treated, or in high-risk groups like small children and the elderly. Legionnaires’ disease is a form of lobar pneumonia caused by the bacterium Legionella pneumophilia.

Legionnaires’ disease gained notoriety after a highly publicized epidemic of it occurred at the American Legion convention in 1976.

Tired yet? Hang in there. There are a few more respiratory diseases you should know. Here’s the lowdown:

- Adult respiratory distress syndrome (ARDS) is respiratory failure in an adult as a result of disease or injury.
- Bronchogenic carcinoma is a cancerous tumor arising from the bronchus. This tumor can metastasize (spread) to brain, liver, and other organs.
- Chronic obstructive pulmonary disease (COPD) refers to any persistent lung disease that obstructs the bronchial airflow. Examples include asthma, chronic bronchitis, and emphysema.
- Cor pulmonale is a serious cardiac disease associated with chronic lung disorders such as emphysema.
- OSA, or obstructive sleep apnea, occurs when the pharynx collapses during sleep leading to absence of breathing.
- Pulmonary edema means fluid accumulation in the alveoli and bronchioles.
- Pulmonary embolism is a blood clot, fat clot, or air carried in blood circulation to pulmonary artery where it blocks the artery.
- URI is upper respiratory tract infection of pharynx, larynx, and trachea. LRI (lower respiratory infection) usually refers to an infection of everything that’s left — bronchi and lungs. It’s hard to have a LRI without the URI, but you can have the URI by itself.
Terminology RX: Respiratory Pharmacology

Several kinds of medicines are used to treat the respiratory system. Many are used for other systems as well, but they are worth repeating so you will know what is safe to use with direct relation to the lungs. **Bronchodilators** are used to treat asthma, COPD, and exercise-induced bronchospasm. They relax muscles around the bronchi, increasing air flow. They are usually given orally, intravenously, or by nebulizer or aerochamber (inhaler) administered in puffs. **Corticosteroids** are used to control inflammatory responses. **Diuretics** (water pills) are used to treat pulmonary edema.

When you are feeling the effects of a cold or bronchial infection, you probably take one of these next four drug types: **Decongestants** help reduce swelling in mucous membranes of the nose to relieve stuffiness and allow secretions to drain. **Antihistamines** help dry up secretions. They are effective in treating aller infections, but not effective on the common cold. **Antitussives** reduce coughing by suppressing the cough center in the brain. **Expectorants** reduce the thickness of sputum so it can be coughed up more easily. If over-the-counter meds just won’t cut it, a prescription may be in order. **Antibiotics** are used to treat respiratory infections, tuberculosis, and pneumonias. **Silver nitrate** can be used to cauterize superficial blood vessels that cause nosebleeds.
Some endoscopic procedures include the following:

- **Colonoscopy**: Visual examination of the colon using an instrument called a colonoscope.
- **EGD (esophagastroduodenoscopy)**: Visual examination of esophagus, stomach, and duodenum.
- **ERCP**: Also known as an *endoscopic retrograde cholangiopancreatography*, this involves an x-ray of bile and pancreatic ducts using contrast medium (like dye) and endoscopy.
- **Gastroscopy**: Visual examination of the stomach using an instrument called a gastroscope.
- **Laparoscopy**: Visual examination of any internal organ or cavity using an instrument called a laparoscope.
- **Proctoscopy**: Visual examination of the rectum using an instrument called a proctoscope.
- **Sigmoidoscopy**: Visual examination of the sigmoid colon using an instrument called a sigmoidoscope.

Here a few more procedures that are now done without the need for the endoscope:

- **Capsule endoscopy**: A capsule containing a camera is swallowed by the patient to take pictures along portions of the digestive tract not reachable by other procedures (the capsule passes normally with stool). How cool is that?!?
- **MRCP (Magnetic resonance cholangiopancreatography)**: Uses MRI technique to obtain images of the bile and pancreatic ducts.
- **Virtual colonoscopy**: Computer takes CT images of the colon and reconstructs a 3D model of the colon, to evaluate abnormalities.

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**Paging Dr. Terminology: Gastrointestinal Surgeries and Procedures**

Luckily, many parts of the gastrointestinal system can be repaired using surgical methods such as surgical excision, repair, and suturing. You will likely be familiar with many of these terms, such as *appendectomy*, but some will be brand-spanking new to you. Let’s start by taking a look at surgical excisions, or removals. Here are some of the most common:
Next, in Table 19-2, we present the nitty-gritty of endocrine terminology. As always, the root words and combining forms let you know more about the condition or location involved with each term.

### Table 19-1  Coming and Going: Endocrine Prefixes and Suffixes

<table>
<thead>
<tr>
<th>Prefix</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eu-</td>
<td>Normal</td>
</tr>
<tr>
<td>Ex-, exo-</td>
<td>Outside, outward</td>
</tr>
<tr>
<td>Hyper -</td>
<td>Excessive, above normal</td>
</tr>
<tr>
<td>Hypo-</td>
<td>Below normal</td>
</tr>
<tr>
<td>Pan-</td>
<td>All</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suffix</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>-drome</td>
<td>Run, running</td>
</tr>
<tr>
<td>-emia</td>
<td>Blood condition</td>
</tr>
<tr>
<td>-genesis</td>
<td>Production</td>
</tr>
<tr>
<td>-ism</td>
<td>Condition</td>
</tr>
<tr>
<td>-tropin</td>
<td>Stimulating the function of</td>
</tr>
</tbody>
</table>

### Table 19-2  Maintaining Balance: Endocrine Root Words

<table>
<thead>
<tr>
<th>Suffix</th>
<th>What It Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acr/o</td>
<td>Extremities, height</td>
</tr>
<tr>
<td>Aden/o</td>
<td>Gland</td>
</tr>
<tr>
<td>Adren/o</td>
<td>Adrenal glands</td>
</tr>
<tr>
<td>Andr/o</td>
<td>Male</td>
</tr>
<tr>
<td>Calc/o</td>
<td>Calcium</td>
</tr>
<tr>
<td>Cortic/o</td>
<td>Cortex</td>
</tr>
<tr>
<td>Crin/o</td>
<td>To secrete</td>
</tr>
<tr>
<td>Dips/o</td>
<td>Thirst</td>
</tr>
<tr>
<td>Estr/o</td>
<td>Female</td>
</tr>
<tr>
<td>Galact/o</td>
<td>Milk</td>
</tr>
<tr>
<td>Gluc/o, glyc/o</td>
<td>Sugar</td>
</tr>
<tr>
<td>Gonad/o</td>
<td>Sex glands</td>
</tr>
</tbody>
</table>
Part IV: Let’s Get Some Physiology Terminology

- **Glucagon**: Hormone produced by pancreas in islets of Langerhans that stimulates the release of sugar.
- **Growth hormones (GH and hGH)**: Secreted hormones stimulating the growth of long bones; also called somatotropin.
- **Hydrocortisone**: Cortisol.
- **Insulin**: Hormone secreted by islets of Langerhans; essential for the proper uptake and metabolism of sugar in cells.
- **Islets of Langerhans**: Endocrine cells of the pancreas.
- **Melatonin**: Hormone secreted by pineal gland.
- **Oxytocin**: Hormone secreted to stimulate uterus to contract during labor.
- **Renin**: Hormone secreted by kidneys to raise blood pressure.
- **Somatotropin**: Growth hormone.
- **Steroids**: Complex substance derived from cholesterol of which many hormones are made.
- **Target tissue**: Cells toward which the effects of the hormone are directed.
- **TSH**: Hormone secretion that stimulates the thyroid gland to produce thyroxine (T3) and triiodothyronine (T4).
- **Vasopressin**: Antidiuretic hormone ADH.

Next, take a look at some of the other substances associated with the endocrine system. Though not hormones, these are vital products of this system, and help keep the body functioning properly.

- **Calcium**: Mineral substance necessary for proper functioning of body tissues and bones.
- **Electrolytes**: Mineral salt found in blood and tissues; necessary for proper functioning of body cells; potassium, sodium, and calcium are examples of necessary electrolytes.
- **Glucose**: Simple sugar.
- **Glycogen**: Starch, a storage form of sugar.
- **Iodine**: Chemical element composing a large part of thyroxine, produced by the thyroid gland.

*Protein* comes from the Greek *protos*, meaning “first.”
Gynecomastia: Excessive breast development in a male

Hypergonadism: Excessive secretion of hormones by sex glands

Hypogonadism: Deficient secretion of hormones by sex glands

Now, it’s time for the potpourri of conditions. Many of these occur as a result of a more serious pathological disease, and some involve too much or too little of a specific substance in your body. It’s an endocrine grab bag!

Diabetes insipidus: Insufficient secretion of the antidiuretic hormone vasopressin; causes the kidney tubules to fail to reabsorb needed water and salt

Diabetic nephropathy: Destruction of kidneys, causing renal insufficiency requiring hemodialysis or renal transplantation

Homeostasis: Tendency in an organ to return to equilibrium or constant stable state

Hyperkalemia: Excessive amounts of potassium in blood

Hyponatremia: Deficient amount of sodium in the blood

Hyperparathyroidism: A condition of excess parathyroid hormone secretion, whether from tumor, genetic condition, or medication

Ketoacidosis: A primary complication of diabetes mellitus; fats are improperly burned leading to an accumulation of ketones in the body

Polyuria: Excessive urination

Polydipsia: Excessive thirst

Finding the Culprit: Endocrine Diseases and Pathology

While, admittedly, no condition of the endocrine system is simple or without side effects, the diseases we talk about in this section have especially serious consequences. One of the most common of these diseases is diabetes, which affects millions of people of all ages. Not only does diabetes affect the function of the body, it greatly affects a person’s everyday habits. To manage the disease, one typically has to alter the diet and often take medications or insulin injections. Basically, the patient must learn a whole new lifestyle. Read on to find out more about this and other serious endocrine diseases.

The official name of diabetes is Diabetes mellitus, which means there is a lack of insulin secretion from the pancreas.
Most surgeries of this system involve removal of tumors in the brain itself, whether malignant or benign. Tumors of the spinal cord can also be removed surgically. Surgery on the brain and the spinal cord is, as you might imagine, very involved and detailed, due to the complexity of nerves and the tissue involved. So, again, think reputable institution and not Craniotomy Mart.

But, we digress. Let’s start getting inside your head, literally:

- **Craniotomy:** Surgical cutting into and opening of the skull to gain access to the brain tissue for surgery
- **Decompression craniectomy:** A portion of the cranium (skull) is removed to relieve brain swelling following traumatic brain injury or a stroke
- **Hypophysectomy:** Removal of the pituitary gland to treat tumors, specifically craniopharyngiomas
- **Laminectomy:** Excision of the posterior arch of a vertebra
- **Neurectomy:** Excision of a nerve
- **Neuroplasty:** Surgical repair of a nerve

**Terminology RX: Nervous Pharmacology**

Now it’s time to treat yourself to some drugs. Here are some common types of medications used to treat disorders and conditions of the nervous system:

- **Anticonvulsants, hypnotics, and sedatives** are used to treat various types of seizures.
- **CNS stimulants** are used to treat attention deficit disorders.
- **Cognition adjuvant therapy** is given to treat Alzheimer’s disease.
- **Hypnotics** are used to treat sleeping disorders; examples include barbiturates and nonbarbiturates.

The Greek root of hypnotics, hypnos, means “to sleep.”
**Ureters**

You have two *ureters* (right and left). They are muscular tubes about 15–18 inches long, lined with mucous membrane, extending from the renal pelvis down to the bladder. The left ureter is longer because the left kidney sits higher in position. The urine enters the bladder in spurts via each ureter every 10–30 seconds.

At the bladder entrance is a *ureteral orifice* (opening) that opens to allow urine into the bladder from each ureter. The orifice works in sequence with the *peristaltic* (wavelike) action that propels the urine through the ureter. This action prevents urine from flowing back into the ureter when the bladder contracts.

**Urinary bladder**

The *urinary bladder* is a hollow, very elastic muscular sac in the pelvic cavity. It acts as a temporary reservoir or “holding tank” for urine. It has two openings to receive the urine flowing from each ureter. Another opening, the urethra, provides an exit route for the urine out of the body. The *trigone* is a triangular space at the base of the bladder where the ureters enter the bladder.

An average bladder holds more than 250 ml of urine before producing the desire to urinate.

Contraction of the bladder and *internal sphincter* is an involuntary action, whereas the action of the *external sphincter* is controlled by you. The act of preventing or concluding *voiding* (urination) is learned and voluntary in a healthy body.

**Urethra**

The *urethra* is a membranous tube that carries urine from the bladder to the exterior of the body. The process of expelling or voiding urine is technically called *micturition*. The external opening of the urethra is the *urethral meatus* or *urinary meatus*. The female urethra is about 1½ inches long, and its only function is urination. In the male, it is approximately 8 inches long. It extends from the bladder neck through the prostate and through the penis. The male urethra carries both urine and reproductive organ secretions (see Chapter 22). Thanks to Mother Nature, the urethra can’t mix sperm and urine, so it’s difficult to pee with an erection. That sure prevents unwanted embarrassment during those tender moments.
### Chapter 21: When You Gotta Go: The Urinary System

<table>
<thead>
<tr>
<th><strong>Root Word</strong></th>
<th><strong>What It Means</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyc/o</td>
<td>Sugar</td>
</tr>
<tr>
<td>Hydr/o</td>
<td>Water</td>
</tr>
<tr>
<td>Lith/o</td>
<td>Stone</td>
</tr>
<tr>
<td>Meat/o</td>
<td>Meatus</td>
</tr>
<tr>
<td>Medull/o</td>
<td>Medulla inner section of the kidney</td>
</tr>
<tr>
<td>Nephr/o</td>
<td>Kidney</td>
</tr>
<tr>
<td>Noct/i</td>
<td>Night</td>
</tr>
<tr>
<td>Olig/o</td>
<td>Scanty</td>
</tr>
<tr>
<td>Pyel/o</td>
<td>Renal pelvis</td>
</tr>
<tr>
<td>Py/o</td>
<td>Pus</td>
</tr>
<tr>
<td>Ren/o</td>
<td>Kidney</td>
</tr>
<tr>
<td>Trigon/o</td>
<td>Trigone</td>
</tr>
<tr>
<td>Ur/o, urin/o</td>
<td>Urine, urea, urinary tract</td>
</tr>
<tr>
<td>Ureter/o</td>
<td>Ureter (you have two)</td>
</tr>
<tr>
<td>Urethr/o</td>
<td>Urethra (you have one)</td>
</tr>
</tbody>
</table>

To keep your urethra and ureters straight, remember that ureter has two e’s, and urethra has one e. You have two ureters and one urethra.

### Common Urinary Conditions

Ah, your urinary system. So few parts, yet so many possible things that can go wrong. Who hasn’t enjoyed a few days on the cranberry juice diet thanks to an inconvenient and painful bladder infection? And who could forget the joys of passing a good, old-fashioned kidney stone? Good times — not so much.

When you are dealing with common conditions, remember that inflammation is the arch nemesis of the urinary system. When your urinary parts are inflamed, bacteria have a perfect place to grow amidst a system transporting waste material. This results in infection and a great deal of discomfort. Here are some of the usual suspects:

- **Cystitis**: Inflammation of the bladder
- **Ureteritis**: Inflammation of a ureter
- **Urethritis**: Inflammation of the urethra
- **Urinary tract infection (UTI)**: Infection of one or more organs of the urinary tract
Diuretics, often taken for hypertension, make the kidneys work overtime. A potassium (K) supplement is often given to maintain therapeutic potassium levels in the blood. A diuretic increases the excretion of urine, putting the entire urinary system into overdrive, which is not good for the kidneys or for sodium and potassium levels. This is why great caution is exercised when prescribing these drugs, and all drugs in this family are by prescription only. There are some common, everyday items that have diuretic effects, such as the caffeine in your coffee or soda.
Urethra

Semen is a combination of fluid and spermatozoa, ejected from the body through the urethra. In the male, the genital orifice (opening) combines with the urinary urethral opening. The male urethra is part of the urinary system as well as the reproductive system because it aids in the output of both urine and semen.

Cowper’s glands, or bulbourethral glands, are just below the prostate gland and also secrete fluid into the urethra. The urethra passes through the penis to exit the body.

Prostate

At the region where the vas deferens enters the urethra, and almost encircling the upper end of the urethra, is the prostate gland. This gland secretes a thick alkaline fluid which, as part of the seminal fluid, aids in the motility of the sperm. This gland is also supplied with muscular tissue that aids in the expulsion of sperm during ejaculation. The alkaline also protects the sperm from acid present in the male urethra and the vagina of the female.

Prostate comes from the Greek pro meaning “before.” Statis means “standing”; by anatomy, it is the gland standing slightly before and below the bladder.

Penis

The penis is composed of three rounded masses of erectile tissue and at its tip expands to form a soft, sensitive region called the glans penis. The glans penis is covered with a retractable double fold of skin called the prepuce (foreskin). The penis contains the urethra that carries both seminal fluid and urine. It is the organ by means of which sperm is ejected into the female vagina.

Male Reproductive Root Words

To really stretch a metaphor, as the human race needs both male and female reproductive systems in order to survive by creating new life, the medical terms associated with the male reproductive system need both prefixes and suffixes to create new words.

Table 22-1 lists some prefixes and suffixes to know when it comes to male reproductive terminology.
Chapter 22: Check the Plumbing: Male Reproductive System

Venereal is derived from Venus, the goddess of love. A venereal disease was thought in ancient times to be one of the misfortunes of love.

Testing, Testing: Male Reproductive Radiology and Diagnostic Tests

It’s time to test those testes! Okay, bad pun, but you get the drift. Though there aren’t tons of laboratory tests and diagnostic procedures used for this system, they remain important methods for helping men of all ages find peace when it comes to issues of concern related to sexual health.

One very common test is semen analysis. This test is performed as part of fertility studies and also to establish infertile status. Sometimes the test is performed to determine sperm viability for couples having difficulty conceiving. It can also be performed following a vasectomy to assure that the procedure was successful. In this case, semen is collected in a sterile container and analyzed microscopically; sperm cells are counted and examined for motility and shape. Analysis is also done at six weeks following vasectomy and again at three months, to establish aspermia.

Another common test for men is the GC/Chlamydia test, performed by inserting a small cotton swab into the opening of the urethra to obtain a sample, which is then tested for gonorrhea and Chlamydia.

A general viral culture tests for herpes and HIV, and is performed simply by swabbing an open sore.

In VDRL, also known as the Venereal Disease Research Laboratory test, the blood is tested to diagnose syphilis. Because the syphilis antigen stays in the blood for a lifetime, it can have far-reaching effects.

The PSA (prostate specific antigen test) is a prescreening test that can be performed yearly on males over 50. This is a prescreening mechanism for precancerous conditions of the prostate gland. Any rise or elevation of PSA level is followed up by other investigations.

Prostate carcinoma is both serious and scary. Any time a disease, particularly cancer, is associated with a reproductive system, it can cause more than just physical symptoms. It can be emotionally and mentally devastating, because we associate our sexual identities with our sexual systems. Much as a woman feels devastated by breast cancer, a man can feel equally devastated by a cancer affecting his sexual health. Prostate cancer is one of the most common cancers associated with the male reproductive system.
Chapter 23: A Life Force: The Female Reproductive System

Vagina

The \textit{vagina} is a muscular tube approximately 6 inches long and lined with mucous membrane. The entrance to the vagina is called the \textit{introitus}.

The \textit{clitoris} is situated in front of the vaginal opening and the \textit{urethral meatus}. The clitoris is similar in structure to the penis in the male, being an organ made up of sensitive, erectile tissue.

\textit{Bartholin's glands} are two small glands on each side of the vaginal opening. They produce a mucous secretion that lubricates the vagina. \textit{Bartholin's gland} is named after Caspar Thomeson Bartholin, a Danish anatomist (1655–1738).

The region between the vaginal opening and the anus is called the \textit{perineum}. This may be torn during the process of childbirth in a vaginal delivery. To avoid a perineal tear, the perineum may be cut prior to delivery. This incision is called a \textit{ episiotomy}.

The external genitalia (organs of reproduction) of the female are together called the \textit{vulva}. The \textit{labia majora} are the outer lips of the vagina, and the \textit{labia minora} are the smaller inner lips. The \textit{hymen} is a mucous membrane partially covering the entrance to the vagina. The clitoris and Bartholin’s glands are also part of the vulva.

Time to accessorize!

The \textit{breasts} are considered accessory organs of the reproduction system. They are \textit{mammary}, or milk-producing glands, composed of fatty tissue, \textit{lactiferous} or milk-carrying ducts, and sinus cavities, which carry milk to the opening or nipple. The breast nipple is called the \textit{mammary papilla}, and the dark pigmented area around the nipple is the \textit{areola}.

During a pregnancy, hormones from the ovaries and placenta stimulate gland tissue in the breasts to their full development. After \textit{parturition} (giving birth), hormones from the pituitary gland stimulate milk production in a process known as \textit{lactation}.

There are two hormones involved in milk production: \textit{oxytocin} and \textit{prolactin}. These hormones also work to assist during labor, delivery, and the recovery of the mother. Oxytocin stimulates the uterus to contract, inducing parturition. Following delivery, oxytocin helps contract the uterus back to its normal size. It also reacts on the breasts to stimulate the release of milk. Prolactin stimulates breast development and the formation of milk in the postpartum period. The act of sucking promotes prolactin production, which in turn, promotes further milk production.


✓ **Vaginal hysterectomy:** Uterus and cervix surgically removed via vagina

✓ **Vaginoplasty:** Surgical repair of the vagina

✓ **Vulvectomy:** Surgical removal of the vulva

The surgical robot can be used in procedures involving cervical and endometrial cancers, ovarian tumors, uterine fibroids, and pelvic prolapse. Robotics are used to perform laparoscopic-assisted vaginal hysterectomies, and total hysterectomies. The da Vinci robot can perform a robotic myomectomy, allowing a future pregnancy to follow the surgery.

Of course, because creating life and giving birth are two huge jobs of this system, you would be remiss to miss these obstetrical terms:

✓ **Amniotomy:** Incision into the amnion to induce labor. It is also referred to as artificial rupture of membranes.

✓ **Amniocentesis:** This involves surgical puncture to aspirate amniotic fluid using ultrasound guidance. Fluid is used for the assessment of fetal health and maturity. The procedure is used to aid in diagnosis of fetal abnormalities. It is performed early in pregnancy at 16 weeks to determine fetal abnormalities such as Down syndrome, spina bifida, or to determine the sex of the fetus. It is done late in the pregnancy to determine lung maturity of the fetus.

✓ **Cesarean section:** This is surgical removal of the fetus through the abdominal and uterine walls. A C-section may be performed for a breech presentation (baby’s head is not in downward position), multiple births, placenta previa (placenta develops in the lower uterine wall and may cover the cervix, blocking the birth canal), abruptio placentae (premature separation of placenta from uterine wall), cephalopelvic disproportion (when a baby’s head or body is too large to fit through the mother’s pelvis), failure to progress in labor, or any sign that the fetus is in distress.

✓ **Episiotomy:** Refers to incision of vulva or perineum. This is done during delivery to prevent tearing of the perineum.

✓ **Obstetrical ultrasound:** Ultrasound of the abdomen and pelvis determine fetal development, growth rate, and estimate fetal age, weight, and maturity.

✓ **Pelvimetry:** The measurement of the mother’s pelvic to determine ability of fetus to pass through.

✓ **Salpingectomy:** Removal of a fallopian tube in order to remove an ectopic pregnancy.
In this next part...

- Checking out ten essential medical terminology references
- Memorizing stuff with ten or so useful mnemonic devices
- Twisting your tongue with ten tough diseases
Radial Nerve

The muscles supplied by the radial nerve are the BEST! Remember:

- Brachioradialis
- Extensors
- Supinator
- Triceps

That’s the BEST way to remember these muscles!

Face Nerves

You can recall what the major face muscles do by matching the action to the name. Think M and Facial. The mandibular nerve is in charge of mastication. The facial nerve is in charge of facial expression.

Perineal versus Peroneal

Can’t keep these two words straight? Just remember that perINEal is in between the legs. PerONeal is on the legs.

Sperm Path through Male Reproductive Tract

Poor Steve. He gets a tough break here, but he’s the best candidate for remembering the path sperm takes to exit the male body. Meet Steve:

- Seminiferous Tubules
- Epididymis
- Vas deferens
- Ejaculatory duct
simply indicates an instrument used to measure something, just as it does in English (like odometer). Geography, a term feared by many fifth graders the world over, ends with -graphy and means, more or less, “picturing lands.”

-algia Pain
-apheresis Removal
-ar, -ary Pertaining to
-ase Enzyme
-blast Immature
-capnia Carbon dioxide
-centesis Surgical puncture with needle to aspirate fluid
-chalasis Relaxation
-continence To stop
-cysis Hearing
-icles One who
-ism State of or condition
-itis Inflammation
-lithiasis Calculus or stone
-lysis Loosening, separating
-lytic Destruction or breakdown
-malacia Softening
-megaly Enlargement
-metrist Specialist in the measurement of
-metry Process of measuring
-ology Study of
-oma Tumor or mass
<table>
<thead>
<tr>
<th>Suffix</th>
<th>Medical Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>-opia</td>
<td>Vision (condition)</td>
</tr>
<tr>
<td>-opsy</td>
<td>View of, viewing</td>
</tr>
<tr>
<td>-optosis</td>
<td>Sagging</td>
</tr>
<tr>
<td>-orrhaphy</td>
<td>Surgical fixation or suturing</td>
</tr>
<tr>
<td>-orrhea</td>
<td>Flow, excessive discharge</td>
</tr>
<tr>
<td>-ory</td>
<td>Pertaining to</td>
</tr>
<tr>
<td>-oscopy</td>
<td>Visual examination of internal cavity using a scope</td>
</tr>
<tr>
<td>-ostomy</td>
<td>Creation of an artificial opening</td>
</tr>
<tr>
<td>-otomy</td>
<td>Process of cutting into</td>
</tr>
<tr>
<td>-oxia</td>
<td>Oxygen</td>
</tr>
<tr>
<td>-para</td>
<td>To bear, live birth</td>
</tr>
<tr>
<td>-paresis</td>
<td>Slight paralysis</td>
</tr>
<tr>
<td>-pathy</td>
<td>Disease</td>
</tr>
<tr>
<td>-pepsia</td>
<td>Digestion</td>
</tr>
<tr>
<td>-pexy</td>
<td>Surgical fixation</td>
</tr>
<tr>
<td>-phagia</td>
<td>Eating or swallowing</td>
</tr>
<tr>
<td>-phonia</td>
<td>Sound</td>
</tr>
<tr>
<td>-phoresis</td>
<td>Carrying/transmission</td>
</tr>
<tr>
<td>-plasty</td>
<td>Surgical repair or reconstruction</td>
</tr>
<tr>
<td>-plegia</td>
<td>Paralysis</td>
</tr>
<tr>
<td>-pnea</td>
<td>Breathing</td>
</tr>
<tr>
<td>-poiesis</td>
<td>Formation</td>
</tr>
<tr>
<td>-prandial</td>
<td>Meal</td>
</tr>
<tr>
<td>-ptosis</td>
<td>Drooping, sagging, prolapse</td>
</tr>
<tr>
<td>-rrhagia</td>
<td>Burst forth, excessive flow</td>
</tr>
<tr>
<td>-rrhaphy</td>
<td>Suture repair</td>
</tr>
<tr>
<td>-rrhea</td>
<td>Discharge or flow</td>
</tr>
<tr>
<td>-salpinx</td>
<td>Fallopian tube</td>
</tr>
<tr>
<td>-schisis</td>
<td>Cleft or splitting</td>
</tr>
<tr>
<td>-scope</td>
<td>Instrument used to visually examine</td>
</tr>
<tr>
<td>-scopy</td>
<td>Visual examination</td>
</tr>
<tr>
<td>-stasis</td>
<td>Stop or control</td>
</tr>
<tr>
<td>-stenosis</td>
<td>Narrowing or constricting</td>
</tr>
<tr>
<td>-thenia</td>
<td>Lack of strength</td>
</tr>
<tr>
<td>-thorax</td>
<td>Chest</td>
</tr>
<tr>
<td>-tocia</td>
<td>Labor</td>
</tr>
<tr>
<td>-tresia</td>
<td>Opening</td>
</tr>
<tr>
<td>-tripsy</td>
<td>Surgical crushing</td>
</tr>
<tr>
<td>-tropia</td>
<td>To turn</td>
</tr>
<tr>
<td>-uria</td>
<td>Urination, urine</td>
</tr>
<tr>
<td>-us</td>
<td>Condition</td>
</tr>
</tbody>
</table>
digestive tract. See gastrointestinal system
dilation, 71
directional terms, 100–102
discreet, 42
discrete, 42
diseases
cardiovascular system, 200–203, 337
endocrine system, 257–258, 338
female reproductive system, 318–319
gastrointestinal system, 239–240, 337–338
integumentary system, 161–163, 336
lymphatic system, 200–203, 337
male reproductive system, 297–299
muscular system, 150, 336
nervous system, 270–271, 338
reproductive system, 338–339
respiratory system, 221–223, 337
sensory system, 180–181, 336–338
skeletal system, 134–135, 335–336
urinary system, 289, 338–339
dislocation, 32
dissection, 62
diuresis, 289
diuretic, 289
diuretics, 290
diverticula, 238
diverticulitis, 239
Dorland’s Illustrated Medical Dictionary,
16, 328
dorsal region, 104
Down syndrome, 34
drug, 26, 67
dry, 27, 68
Duchenne muscular dystrophy, 336
ducts, 293
duodenal ulcer, 237
duodenum, 24, 65, 77
dupuytren’s contracture, 150
dwarfism, 255
dyscrasia, 199
dysfunctional, 61
dysgeusia, 179
dysosmia, 179
dyspepsia, 236
dysphagia, 42, 73, 236
dysphasia, 42, 235, 268
dyspnea, 73
dysuria, 289

• E •
Eales disease, 337
eardrum, 25, 27, 66, 68
ears
abbreviations associated with, 170
anatomy, 171
deafness, 172
inner, 172
middle, 172
organ of equilibrium or balance, 173
outer, 171
eating, 72
eating disorders, 35
eczema, 161
ECT (electroconvulsive therapy), 32
ECT (enteric-coated tablet), 32
ECT (euglobulin clot test), 32
eclampsia, 101
eczema, 42, 161
edema, 221
edentulous, 236
efferent, 41
effusion, 42
eiphysis, 123
either, 21
electroconvulsive therapy (ECT), 32
electrolysis, 165
embolism, 199, 221
embryology, 95
embryonic stage, 95
emesis, 236
endocardium, 189
endocervix, 61
endocrine system
adrenal conditions, 256
adrenals, 250
body function-related terms, 254
conditions, 255–257
described, 10–11, 97, 114–115, 245–246
diseases, 257–258, 338
gonads, 250–251
hormone-related terms, 253–254
hormones, 246
pancreas, 249–250
pancreas conditions, 256
parathyroid conditions, 256
uterus, 308
vagina, 309
femoropopliteal bypass, 208
femur, 17
fibers, 24, 65
fibromyalgia, 149
fingernails, 157
fingers, 21
fissure, 160
flanges, 43
flank, 81
flat bones, 123
flatus, 238
tooth bones, 127
fractures, 132–133
front, 33
frontal lobe, 263
frontal plane, 100, 106
fungal testing, 163
furuncle, 160

• G •
gallbladder, 24, 64, 76, 83, 231
gallstones, 237
gamete (sex) cell, 96
gangrene, 161
gastric ulcer, 237
gastritis, 51, 237
gastro, 51
gastrodynia, 51, 73, 237
gastroenteritis, 239
gastroesophageal reflux disease, 240
gastrointestinal system
described, 10, 97, 113–114
digestion process conditions, 236
diseases, 239–240, 337–338
eating disorders, 238
endoscopic procedures, 242
esophagus, 230
functions of, 227–228
gallbladder, 231
gallstone conditions, 237
inflammation, 239–240
intestines, 231–232
large and small intestine conditions, 237–238
liver, 231
mouth and pharynx, 228–230
organs, 229
pancreas, 231
pathology, 239–240
pharmacology, 244
prefixes, 233
radiology and diagnostic tests, 240–242
root words, 233–235
specialist treated conditions, 235–237
stomach, 230
stomach-related conditions, 236–237
suffixes, 233
surgeries and procedures, 242–244
gastropathy, 51
genupectoral position, 102
g.G.r. is m, 255
glaucoma, 236
glands, 23, 63, 83, 156–157, 194
Glans penis, 23, 64
Gleason grade, 34
glycosuria, 289
goiter, 255
gonads, 250–251
gouty arthritis, 133
goat, 43
graph, 43
Grave’s disease, 255
gray matter, 26
Greek origins, 17
greenstick fracture, 133
groin, 21, 81
growth hormone (hGH), 248
growth of development, 72
growth plate, 123
Guillain-Barre syndrome, 270
gums in mouth, 21, 81
gynecomastia, 257

• H •
Hailey-Hailey disease, 336
hair, 22, 157
halitosis, 236
hand, 21, 83
pernicious anemia, 202
peroneal, 43, 333
pertussis, 223
petechia, 161
Peyronie's disease, 35, 339
phalanges, 43
pharmacology
  cardiovascular system, 208–209
  common related terms, 63
  endocrine system, 260
  female reproductive system, 324
  gastrointestinal system, 244
  lymphatic system, 208–209
  male reproductive system, 301
  nervous system, 273
  respiratory system, 226
  sensory system, 183
  urinary system, 289
pharynx, 26, 67, 79, 213, 228, 230
phlebotomy, 208
photophobia, 74
physiology, 10, 96, 111–118
pineal gland, 249
pituitary, 247–248
pityriasis rosea, 162
plaque, 23
plasma, 192
platelet count, 205
platelets, 192
pleura, 26, 67, 79
pleuritis, 44
plural form
  English language rules, 39–40
  exceptions to rules, 40–41
  medical rules, 37–39
  nouns in, 31
  troublesome sound-alikes, 41–44
PNS (peripheral nervous system), 11, 115, 262, 265
polydipsia, 62, 257
polymyositis, 149
polyneuritis, 269
polyp, 160
polyposis, 238
polyuria, 50, 62, 257, 289
Pompe disease, 338
popliteal region, 104
positron emission tomography (PET), 135
posterior, 81
postnatal, 62
postoperative, 62
precede, 44
prefixes
  antonyms, 22, 59
  body-related words, 61–62
  combining word parts, 49
  common types, 28–29, 57–61, 341–42
  continuous, 22
  defined, 8, 14, 16
  defining, 86–87
  doctor's office and hospital related words, 62–63
  endocrine system, 252
  female reproductive system, 310–311
  gastrointestinal system, 233
  integumentary system, 159
  male reproductive system, 295
  nervous system, 266
  opposites, 60
  pharmacy and research lab related words, 63
  pronunciation, 46–48
  respiratory system, 216
  root words, 63–68
  sensory system, 176
  troublesome types, 22
  urinary system, 282
  word-building activity, 28
pregnancy and childbirth conditions, 317
premenstrual, 62
prenatal, 62
priapism, 339
procedures
  cardiovascular system, 206–207
  endocrine system, 259–260
  female reproductive system, 320–323
  gastrointestinal system, 242–244
  integumentary system, 164–165
  lymphatic system, 206–207
  male reproductive system, 300–303
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