

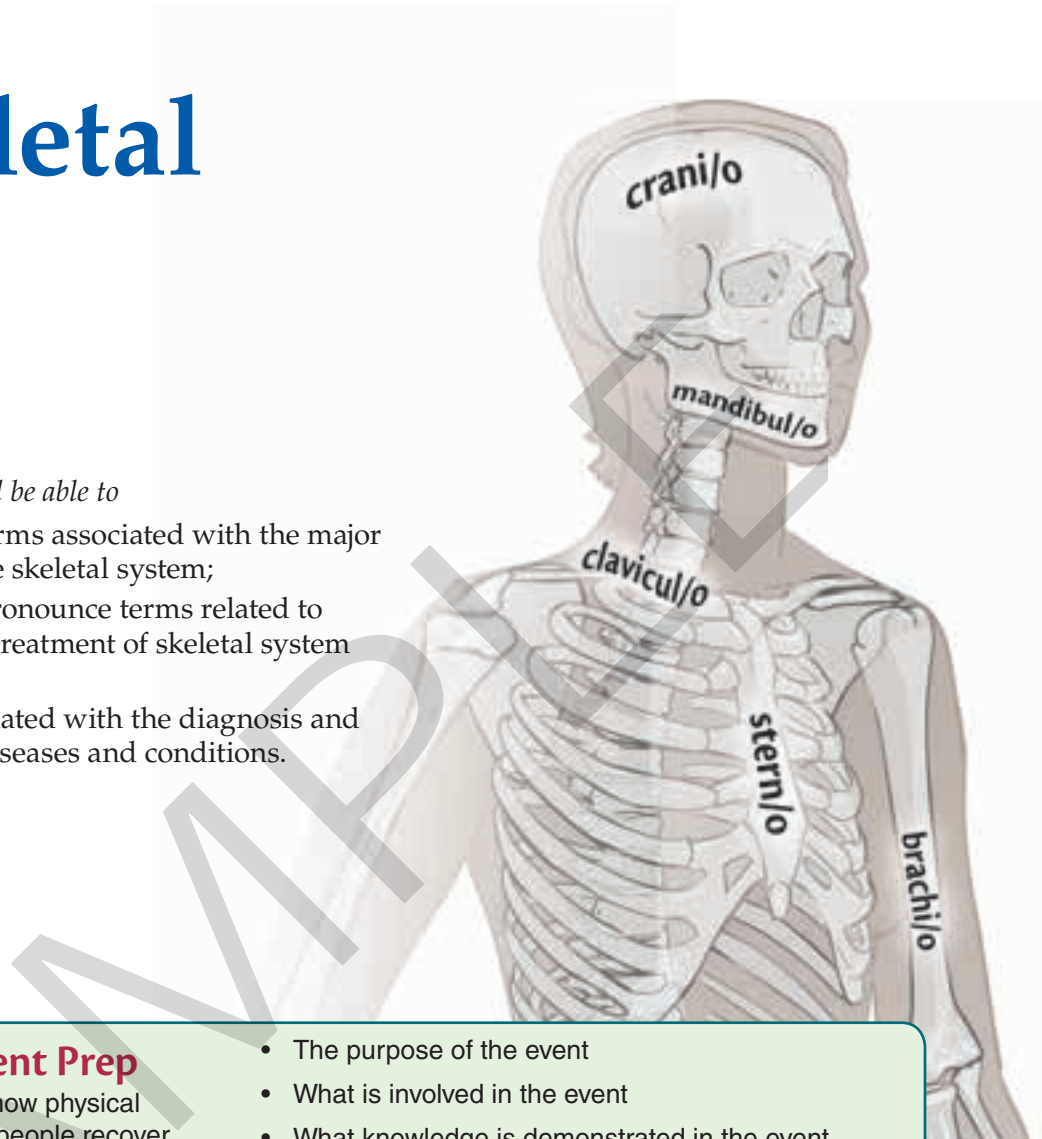
Chapter 4

The Skeletal System

LEARNING OUTCOMES

After studying this chapter, you will be able to

- identify and define medical terms associated with the major structures and functions of the skeletal system;
- recognize, define, spell, and pronounce terms related to the pathology, diagnosis, and treatment of skeletal system diseases and conditions; and
- identify medical careers associated with the diagnosis and treatment of skeletal system diseases and conditions.



HOSA Event Prep

Do you know how physical therapy helps people recover

from diseases and conditions? What skills can aid in recovery and help people function better? As you study this chapter, you will learn the answers to these questions and more. You can demonstrate your knowledge by participating in a HOSA—Future Health Professionals event. HOSA events provide opportunities to build the technical, leadership, and teamwork skills you need to pursue a career in the healthcare field.

One example of a HOSA competitive event is the HOSA *Physical Therapy* competitive event. Go to the HOSA website to learn more about the HOSA *Physical Therapy* event. Find out:

- The purpose of the event
- What is involved in the event
- What knowledge is demonstrated in the event

The information and activities in this chapter can help prepare you for this and other competitive events. In the chapter, Event Prep icons label these activities. As you prepare for HOSA competitive events, be sure to check the website and talk with your HOSA advisor for the most up-to-date guidelines and procedures. Once you have learned about the *Physical Therapy* event, answer the following questions:

1. How might participating in this event benefit you personally and your future career? Explain.
2. Are you interested in participating in this event? Why or why not?

Medical Term Scavenger Hunt

In this chapter, you will learn medical word parts and terms related to the skeletal system. Before you begin this chapter, read the scenario that follows.

Bella Sotelo, an active, 35 **y/o** female with a healthy lifestyle, came into the office with **c/o** of **arthralgia** and **edema** in her **Rt** elbow. Recently, Bella noticed increased aggravation of pain with movement. She has tried **OTC** pain medication, including **NSAID** Advil® and other **analgesics** such as Tylenol®, but with no relief. After enduring the pain for two weeks, Bella made an appointment with her family physician, Dr. Turnbull.

After examining Bella and getting an in-depth personal and family **Hx**, Dr. Turnbull ordered a **CT scan** and **RA** blood test. Testing revealed that Bella had **bursitis**. Dr. Turnbull then performed an **arthrocentesis** and an injection of **corticosteroid** to alleviate edema and pain.

For each highlighted medical term or abbreviation, search through this chapter to find the meaning. Some of these terms and abbreviations were introduced in previous chapters. Use Appendix B: Medical Abbreviations or the Glossary/Index if you cannot find the meaning of a term or abbreviation. The terms and abbreviations in the scenario are listed below. Define and look up the pronunciation of each term to help you understand Bella's story. Then rewrite the scenario in common language.

1. y/o
2. c/o
3. arthralgia
4. edema
5. Rt
6. OTC
7. NSAID
8. analgesics
9. Hx
10. CT scan
11. RA
12. bursitis
13. arthrocentesis
14. corticosteroid

Medical Word Parts

The many parts of the skeletal system can be distinguished by their unique names. Mastery of the combining forms, prefixes, and suffixes listed in the tables that follow will help you understand medical terms pertaining to the skeletal system.

Combining Forms

The combining forms that follow are common in medical terms used to describe conditions and procedures of the skeletal system.

Combining Form (Root Word plus Combining Vowel)	Meaning
acr/o	extremities
ankyl/o	crooked; bent; stiff; fused together
arthr/o	joint
brachi/o	arm
burs/o	bursa (sac of fluid near a joint)
calcane/o	calcaneus; heel bone
carp/o	wrist
cervic/o	neck; cervix (neck of uterus)

(Continued)

Combining Form (Root Word plus Combining Vowel)	Meaning
chir/o	hand
chondr/o	cartilage
clavicul/o	clavicle; collarbones
cost/o	rib
crani/o	skull
cubit/o	elbow
dactyl/o	digits (fingers or toes)
dextr/o	to the right
femor/o	thigh bone
fibul/o	fibula; lower leg bone
humer/o	humerus; upper arm bone
hy/o	hyoid bone
ili/o	ilium; top of the hip bone
kyph/o	humpback
ligament/o	ligament
lord/o	curve; swayback
lumb/o	lumbar region; loin
lux/o	slide
mandibul/o	mandible; lower jaw bone
menisc/o	meniscus; cartilage in the knee joint
myel/o	bone marrow; spinal cord

(Continued)

Combining Form (Root Word plus Combining Vowel)	Meaning
narc/o	numbness; sleep; stupor
nas/o	nose
orth/o	straight
oste/o	bone
patell/o	patella; kneecap
ped/o	foot; child
phalang/o	phalanges; fingers or toes
physi/o	nature; function
por/o	opening; passageway; porous
pod/o	foot
pub/o	pubis; pubic region
pyret/o	fever
rachi/o	spine; vertebra
rheumat/o	watery flow
rhin/o	nose
sacr/o	sacrum
sarc/o	flesh; connective tissue
scoli/o	crooked; bent
sinistr/o	to the left
spondyl/o	vertebra; backbone
ster/o	solid structure; steroid
stern/o	sternum; breastbone
styl/o	column; pillar; tube
synovi/o	lubricating fluid of joints
tars/o	ankle
ten/o, tendin/o, tendon/o	tendon
tibi/o	tibia; lower leg bone
uln/o	ulna; lower arm bone
vertebr/o	vertebrae; spinal column bones

Prefixes

The prefixes listed are not specific to skeletal system terminology. These universal prefixes are used in many other medical terms, which you will learn as you progress through this book.

Prefix	Meaning
a-, an-	not; without
ambi-	both sides
anti-	against
inter-	between
intra-	within; into
meta-	change; beyond
non-	not
peri-	around; surrounding
poly-	many; much
sub-	below; under
supra-	above
syn-	together; with

Student Challenge



Eight in Three

Read the eight definitions that follow and build the correct medical terms. See how many terms you can build in three minutes.

- condition of someone who has many fingers or toes
- pertaining to the area below the clavicle
- surgical repair of the nose
- to break down bones
- condition of curvature of the spine
- inflammation of a joint
- pertaining to both sides
- resembling a solid structure

Suffixes

The suffixes that follow are common in medical terms used to describe conditions and procedures of the skeletal system. You will encounter these suffixes in many other terms throughout this book.

Suffix	Meaning
-al, -an, -ic, -ous	pertaining to
-algia	pain
-ation	process; condition
-centesis	surgical puncture to remove fluid
-clast	to break down; destroy
-desis	to bind; tie together
-ectomy	surgical removal; excision
-graph	instrument for recording
-ism	process; condition
-itis	inflammation
-malacia	softening
-oid	like; resembling
-oma	tumor; mass
-osis	abnormal condition
-penia	deficiency
-physis	growth; growth plate
-plasty	surgical repair
-porosis	abnormal condition of small holes
-scope	instrument used to view
-scopy	visual examination using a scope
-tomy	process of cutting; incision

Student Challenge

Right and Left Hand

If a surgeon is able to perform surgical tasks equally well with the right or left hand, what is the medical term for this unique ability?

Anatomy and Physiology

The bones and related structures of the skeletal system aid body movement. The skeletal system is divided into two major parts: the axial skeleton and the appendicular skeleton (**Figure 4.1**).

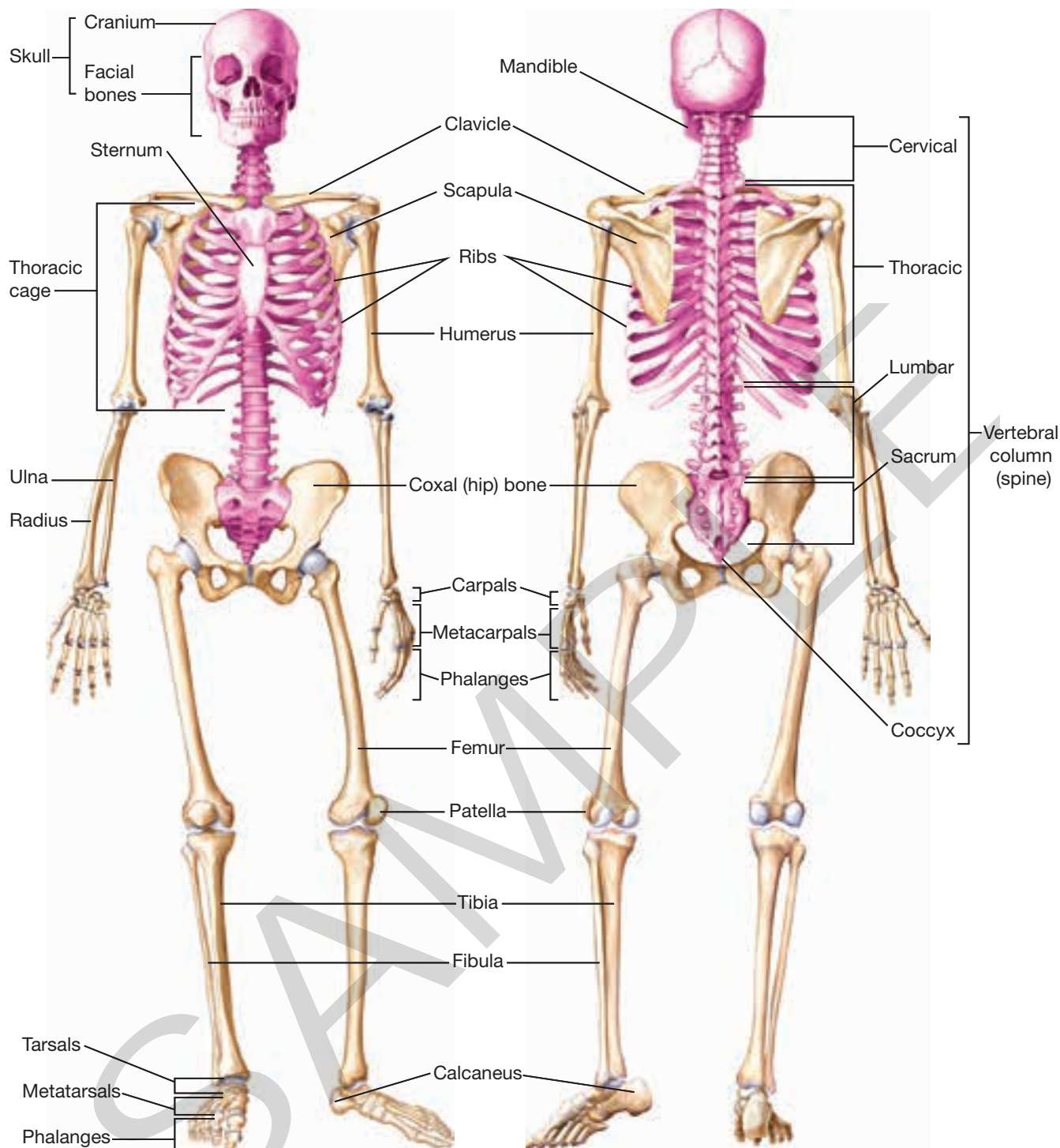
The axial skeleton includes the bones along the axis, or central line, of the human body. The axial skeleton consists of the skull, facial bones, sternum (breastbone), ribs, and vertebral column.

The appendicular skeleton contains the bones in the *appendages* of the body, as well as the structures that connect the appendages to the axial skeleton. Specifically, the appendicular skeleton includes the shoulder girdle; the arm, wrist, and hand bones; the pelvic girdle; and the leg, ankle, and foot bones.

Functions of Bone

The skeletal system serves five important functions in the human body.

- **Support**—The skeletal system provides structure and shape for the body.
- **Protection**—The skeletal system surrounds and protects the internal organs.
- **Mineral storage**—The bones store calcium and phosphorus, two minerals that the body needs for important regulatory functions.
- **Blood cell formation**—Red blood cells are manufactured in the bone marrow.
- **Anchoring and movement of muscles**—The bones of the skeletal system act as levers for muscular action. Muscular movement would not be possible without *tendons* (fibrous cords of tissue that attach muscle to bone) and *ligaments* (fibrous cords of tissue that attach bone to bone).



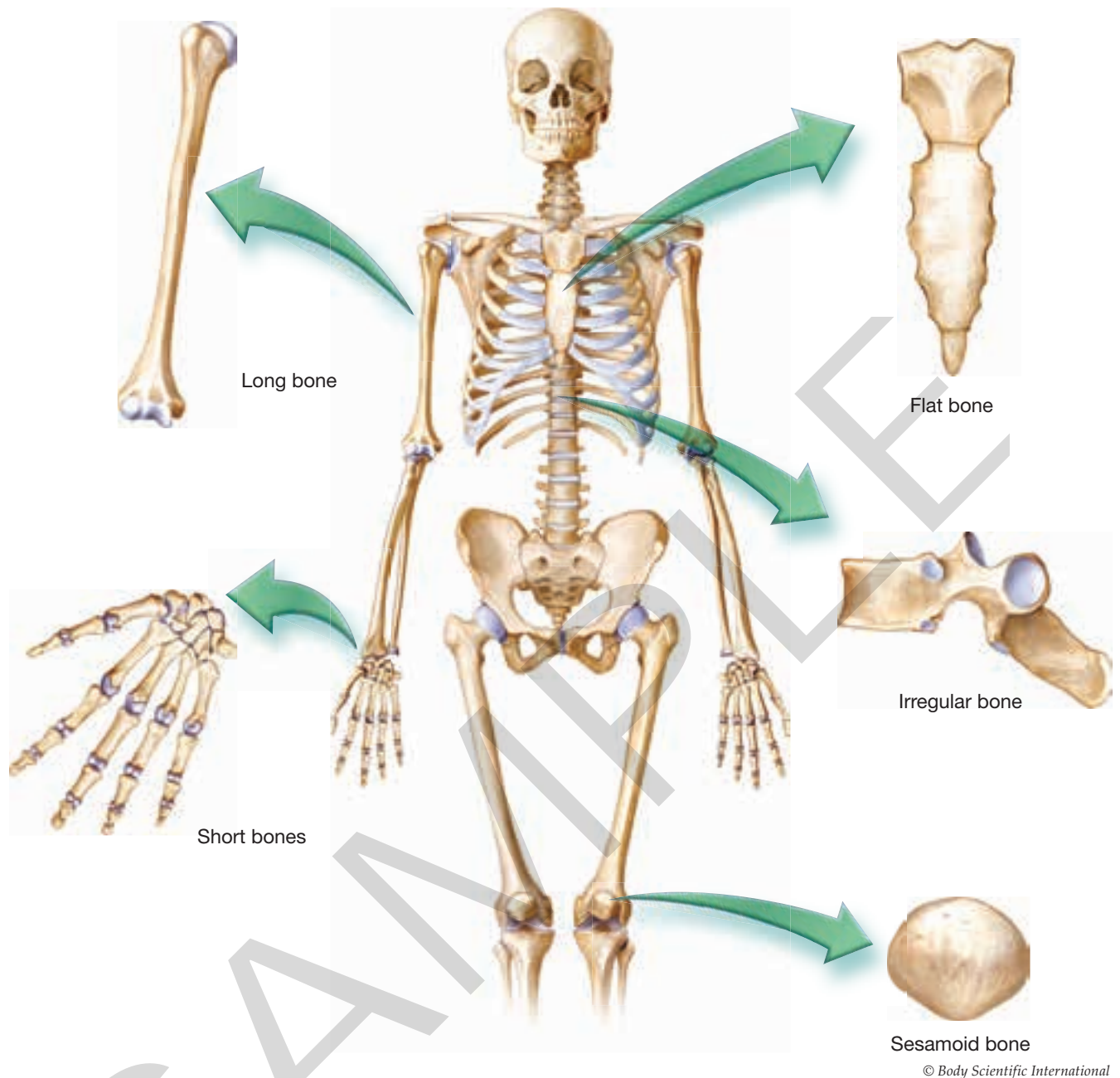
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Figure 4.1 In this diagram, the axial skeleton is shown in a light magenta color to distinguish it from the appendicular skeleton.

Bone Structure

Bone is a dense connective tissue made of collagen (KAH-luh-jen) fibers and minerals. Collagen fibers are resistant but flexible. They are also found in skin and cartilage. There are 206 bones of various sizes and shapes in the adult body (**Figure 4.2**). These bones can be classified in several ways.

The extremities contain **long bones**. **Short bones** are located in the hands and feet. They are cube-shaped and composed of spongy bone, which allows for flexible movement. **Flat bones** protect vital organs and provide a broad surface area for muscle attachment. Examples of flat bones include the cranium (bones of the head), facial



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Figure 4.2 The adult body contains bones of various shapes and sizes.

bones, scapulae (shoulder blades), and sternum (breastbone).

Sesamoid bones, so named because they resemble large sesame seeds, are embedded within tendons. Sesamoid bones enable joint movement and are found in the patella (kneecap), hands, wrists, and feet.

Irregular bones have an unusual or complex shape and, therefore, cannot be categorized as long, short, or flat. They provide support and protection yet allow flexible movement. Examples include the vertebrae (bones or bone segments of the spinal column), jawbones, and coccyx (tailbone).

The shaft of a long bone is called the **diaphysis** (digh-AF-uh-sis) (Figure 4.3). Each end of a long bone is called an **epiphysis** (uh-PIF-uh-sis). The **epiphyseal** (uh-PIF-uh-SEE-uhl) **plate**, also known as the *epiphyseal line* or *growth plate*, represents an area of cartilage tissue that is consistently being replaced by new, bony tissue as the bone grows. Cartilage cells at the edge of the growth plate form new bone. This process is responsible for the lengthening of bones during childhood and adolescence. The growth plate calcifies (hardens through calcium deposition) and disappears when the bone achieves its full growth.

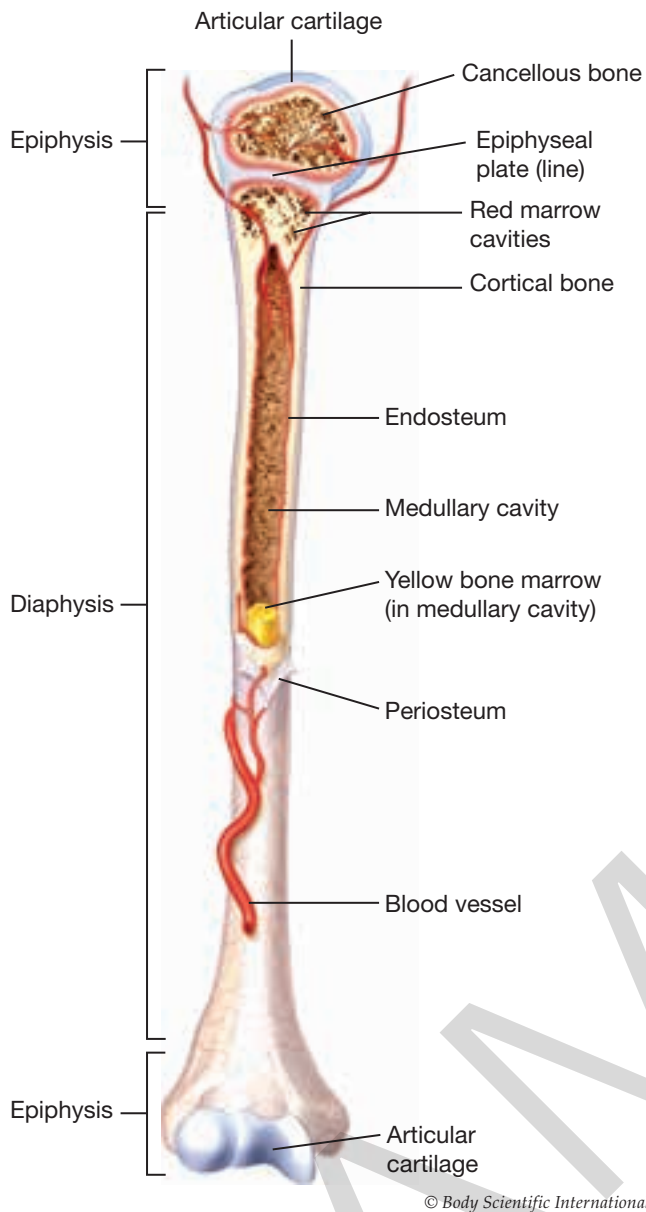


Figure 4.3 The anatomical structure of a long bone.

Fascinating Fact

The bones in your hands and feet add up to more than one-half of the bones in your whole body. Each hand has 27 bones. Each foot has 26.

Bone Composition

There are two basic types of bone tissue: cortical bone and cancellous bone (**Figure 4.3**).

Cortical bone, also called *compact bone*, is very dense, hard, and strong. This type of bone tissue lies under the **periosteum** (peer-ee-AHS-tee-um), or the outer membrane of a bone, and mainly around the diaphysis (shaft) of long bones. In long bones, cortical bone has a hollow center called the

medullary (MED-yoo-lair-ee) **cavity**, which contains yellow bone marrow composed chiefly of fat cells.

Cancellous bone, or *trabecular* (truh-BEK-yoo-ler) *bone*, is much more porous and much less dense than compact bone. For these reasons, cancellous bone is commonly called *spongy bone*.

Cancellous bone is found mainly in the epiphyses (uh-PIF-uh-seez), or ends, of long bones. Spaces in the cancellous bone contain red bone marrow, where red blood cells, white blood cells, and platelets are manufactured. The production of blood cells in the bone marrow is called **hematopoiesis** (HEE-muh-toh-poy-EE-sis).

Fascinating Fact

If bone and steel were the same weight, the bones of the human body would be six times stronger than steel.



Inquiring Minds

Understanding Calcium

Directions: What does the mineral calcium do for bones? Try this experiment at home or in class:

1. Overnight, soak two uncooked chicken legs in a jar of vinegar. Also soak two chicken legs in a jar of water.
2. Compare and contrast the vinegar-soaked and water-soaked chicken legs. What do you notice about the chicken legs that were soaked in vinegar compared to those soaked in water?
3. Record your findings and share them with the class.

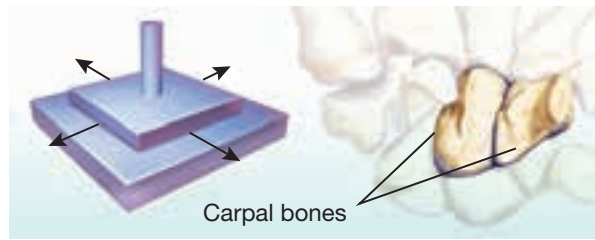
Joints

A joint is any place in the body at which two or more bones connect, or articulate. Connective bands of tissue called ligaments connect bone to bone.

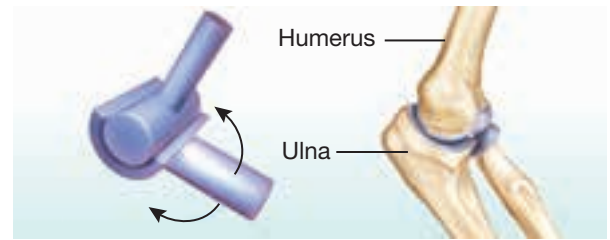
There are three main types of joints:

- **Diarthroses** (DIGH-ar-THROH-seez)—freely movable joints. Examples include ball-and-socket, hinge, gliding, pivot, condylar, and saddle joints. **Figure 4.4** shows the six categories of diarthrotic (freely movable) joints.
- **Amphiarthroses** (AM-fee-ar-THROH-seez)—slightly movable joints. Examples include the ribs and pelvis.

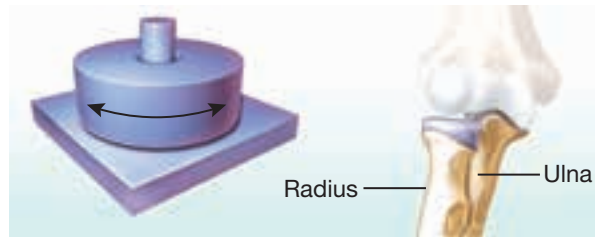
Gliding joint (intercarpal)



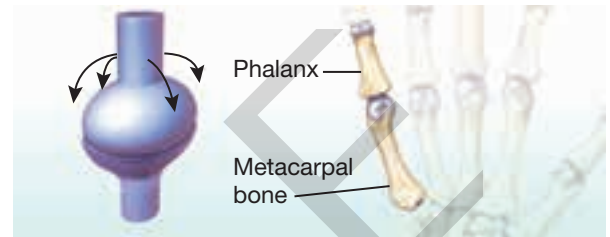
Hinge joint (humeroulnar)



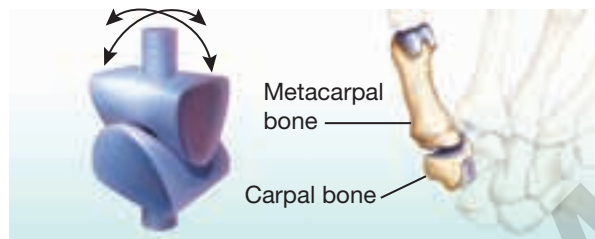
Pivot joint (radioulnar)



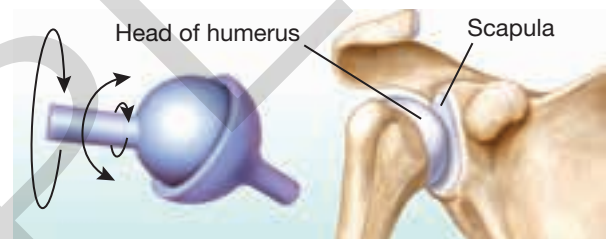
Condylar joint (metacarpophalangeal)



Saddle joint (trapeziometacarpal)



Ball-and-socket joint (humeroscapular)



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Figure 4.4 Examples of the six different types of diarthroses, or freely movable joints.

- Synarthroses (SIN-ar-THROH-seez)—immovable joints. An example is the cranium.

Both ball-and-socket joints and hinge joints are also known as **synovial** (sih-NOH-vee-uhl) **joints** because they contain a membrane that secretes synovial fluid. This fluid acts as a lubricant by reducing friction between bones during movement. The **bursa sac** contains the synovial fluid (**Figure 4.5**).

Fascinating Fact

You have more than 230 movable and semi-movable joints in your body.

Bone Processes and Depressions

Processes and depressions in bones help make up joints. **Bone processes** are areas on bones that extend outward and serve as attachment zones for muscles and tendons (**Figure 4.6**). Important processes include tubercles, trochanters, tuberosities, and condyles. A **tubercle** (TOO-ber-kuhl) is a small round process found on many bones. A

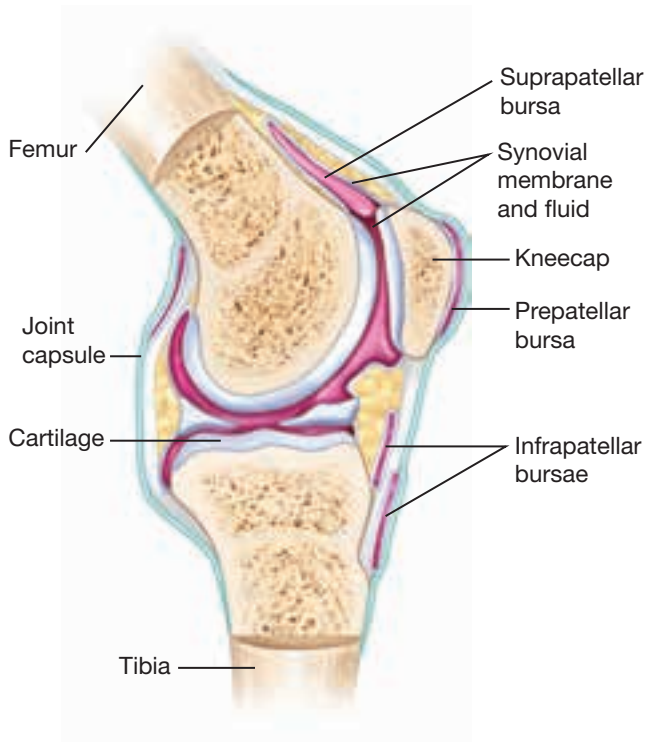
Team Challenge

Long Bones

For this activity, you will need six 8½" × 11" sheets of paper; tape; one paper plate; several coins (any denomination), small rocks, wooden blocks, and paperweights or a stapler.

Directions:

1. Roll up three sheets of paper (8½" × 11") about 1 inch wide into a cylinder. Tape the cylinder closed so it does not unroll. The sheets of paper represent hollow bones.
2. Test the strength of the paper bones by standing the "bones" on their ends and placing a paper plate on top of the bones.
3. Add weight to the paper plate using rocks, wooden blocks, coins, or household items such as a stapler or paperweights.
4. Observe how much weight the hollow paper bones can handle before they collapse.
5. Now, roll up three more sheets of paper, as tightly as you can, so there is no hollow section.
6. Repeat steps 2–4.
7. Record your observations. Then share them with the class.



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Figure 4.5 The small, fluid-filled bursa sacs of the knee act like cushions by reducing friction between bones, muscles, and tendons near the joints.

trochanter is one of two large processes found on the femur, or thigh bone. A **tuberosity** (TOO-buh-RAHS-ih-tee) is a large, rough process found on many bones. A **condyle** (KAHN-DIGH-uhl) is a rounded-knuckle process at a joint.

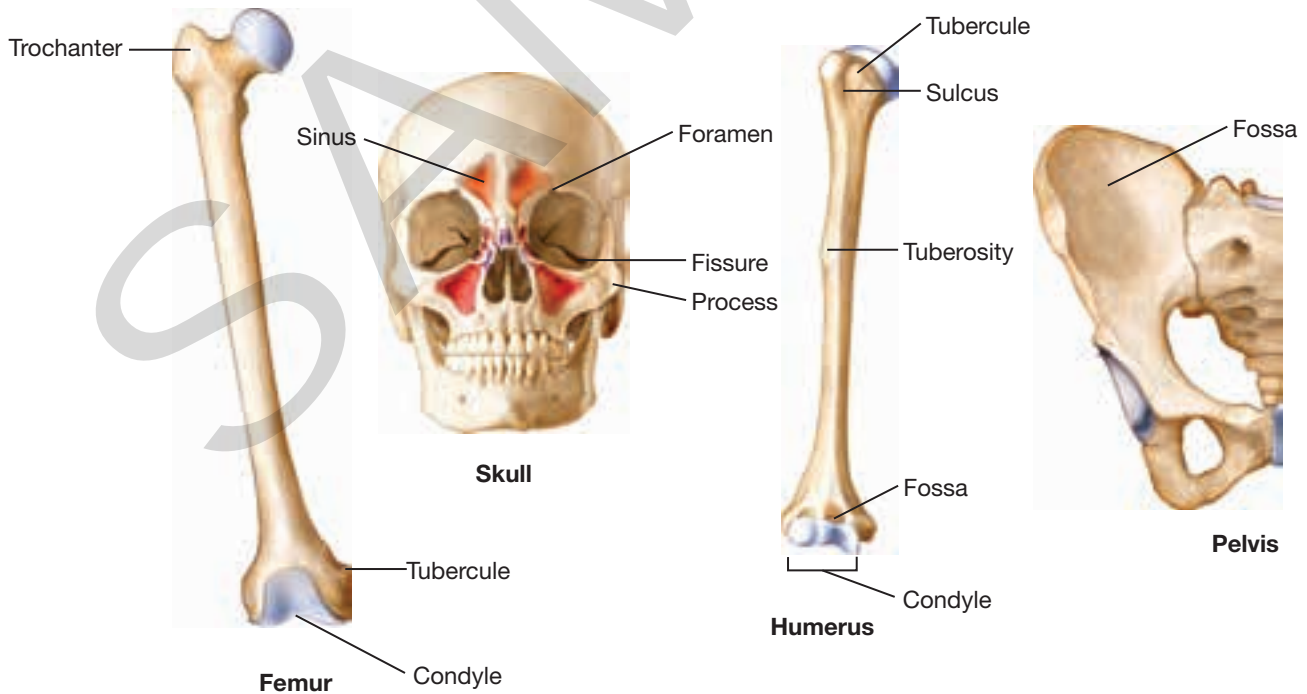
A **bone depression** is an opening or hollow region in the surface of a bone, where one bone articulates with another to form a joint (**Figure 4.6**). Bone depressions also serve as passageways for blood vessels and nerves. A commonly seen depression is a **fossa** (FAHS-uh), a shallow pit or cavity in or on a bone. A **foramen** (foh-RAY-men) is a passageway for blood vessels and nerves. A **fissure** (FIZH-yer) is a deep, narrow, slit-like opening. A **sulcus** (suhl-kus) is a groove or furrow, and a **sinus** is a hollow cavity within a bone.



Inquiring Minds

Foramens

The opening in the mandible for passage of the chin artery/nerve is known as the *mental foramen*. How many foramens are in the human body?



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Figure 4.6 Examples of bone processes and depressions in the femur, skull, humerus, and pelvis.

Axial Skeleton

The axial skeleton consists of the bones along the axis, or central part, of the human skeleton. It includes the skull, thoracic cage, and vertebral column (spine).

Bones of the Skull

The **skull** contains the cranial and facial bones. The **cranium** is made up of bones that protect the brain (Figure 4.7). The cranial bones attach to each

other at joints called **sutures**. In newborns, the cranial bones are not completely joined. Rather, there are soft spots called **fontanelles** (FAHN-tuh-nelz) between the cranial bones. These soft spots develop into bone in early infancy.

The cranium consists of the following bones:

- The **frontal bone** forms the forehead.
- **Parietal** (puh-RIGH-uh-tuhl) **bones** form the roof and upper sides of the cranium.

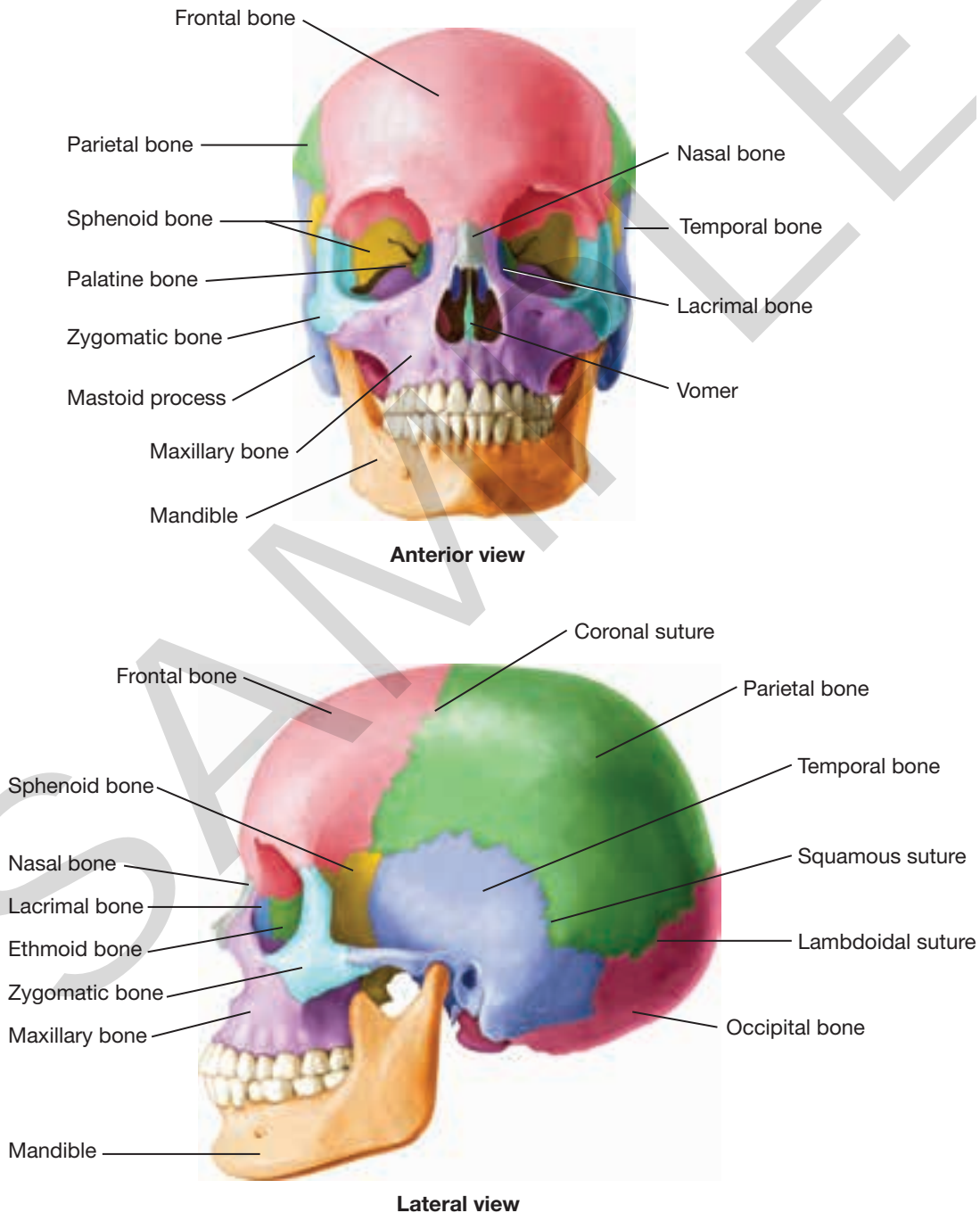


Figure 4.7 The bones of the skull.

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- **Occipital** (ahk-SIP-ih-tuhl) **bones** form the posterior floor and walls of the cranium.
- **Temporal** (TEM-puh-ruhl) **bones** form the sides and base of the cranium.
- The **sphenoid** (SFEE-noyd) **bone** forms part of the base of the skull, and the floor and sides of the eye sockets.
- The **ethmoid** (ETH-moyd) **bone** forms part of the nose, eye socket, and floor of the cranium.

Sutures join all facial bones except one, making them immovable. The **mandible**, or lower jawbone, is the only facial bone capable of movement. It enables you to speak and chew.

The bones that make up the face are as follows:

- **Nasal bones** form the bridge of the nose.
- The **vomer** (VOH-mer) **bone** is the septum, or dividing line, between the left and right cavities of the nose.
- The **zygomatic** (ZIGH-guh-MAT-ik) **bones** are the cheekbones.
- The **maxillary** (MAK-sih-lair-ee) **bones** form the upper jawbone.
- The **mandible** is the lower jawbone.
- The **palatine** (PAL-uh-tighn) **bone** forms the posterior part of the hard palate in the mouth.
- **Lacrimal** (LAK-rih-muhl) **bones** make up part of the eye socket. Each lacrimal bone contains a channel through which tears flow.

Fascinating Fact

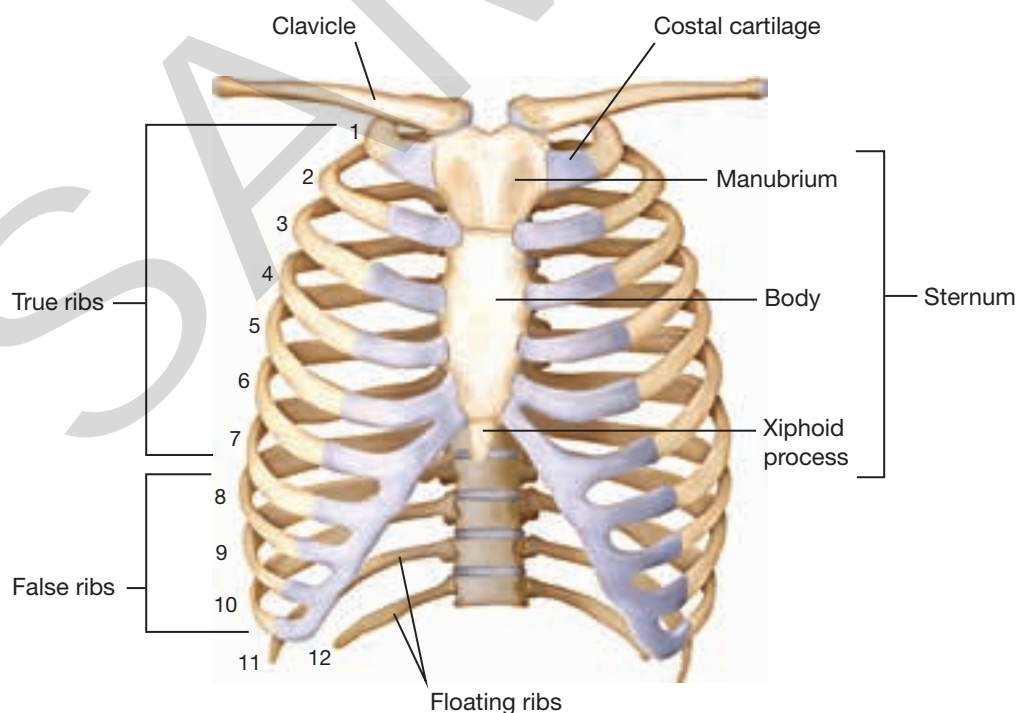
The stirrup bone of the middle ear is the smallest bone in the body. It is equivalent to the size of a grain of rice.

Bones of the Thoracic Cage

The **thorax**, or rib cage, is made up of the sternum, ribs, and thoracic (thoh-RAS-ik) vertebrae. The rib cage, formally called the *thoracic cage*, protects many vital organs (Figure 4.8). Plenty of cartilage on the anterior of the thoracic cage allows for movement of the thorax during the act of breathing.

The bones of the thoracic cavity include the following:

- The **sternum** forms the breastbone, which serves as the anterior attachment for the ribs. The sternum is made up of three smaller sections: the **manubrium** (muh-NOO-ree-um), the **body**, and the **xiphoid** (ZIGH-foyd) **process**.
- There are 12 pairs of ribs called **costals**, which attach posteriorly to the thoracic vertebrae. The rib cage contains 24 bones arranged in pairs of 12. The first seven pairs of costals are called **true ribs**, or *fixed ribs*, because they attach anteriorly to the costal cartilage. The remaining three pairs of ribs (8–10) are called **false ribs** because they indirectly attach to the sternum



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Figure 4.8 The bones of the thoracic cage.

by connecting with the cartilage of the ribs above them. The last two pairs of costals (11 and 12) are called **floating ribs** because they attach neither to the sternum nor to cartilage, but to the vertebrae.

- The **thoracic vertebrae**, made up of 12 vertebrae, serve as the posterior attachment for the ribs.

Bones of the Vertebral Column

Twenty-six bone segments make up the **vertebral column**, or *spine* (Figure 4.9). These segments are arranged in five sections that surround and protect the delicate spinal cord. Between most vertebrae lie **intervertebral** (IN-ter-VER-tuh-bruhl) **disks**, which are composed of cartilage and act as shock absorbers, allowing for movement of the spinal column. Bones that comprise the spinal column include the following:

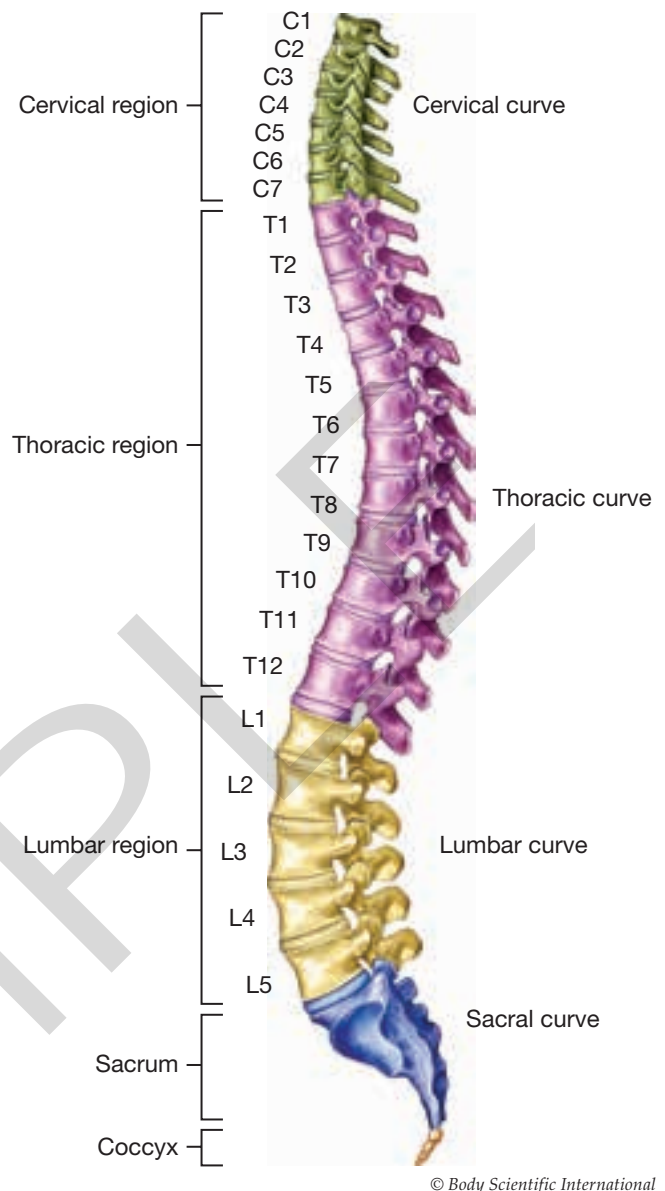
- Seven **cervical vertebrae**, also known as the *C-spine* (C1–C7), make up the neck region of the spine.
- Twelve small bones form the **thoracic vertebrae**, also known as the *T-spine* (T1–T12). The thoracic vertebrae connect to the ribs.
- Continuing down the spinal column, the next five vertebrae make up the **lumbar vertebrae**, known as the *L-spine* (L1–L5). The lumbar vertebrae, which curve in the lower back, are the strongest and largest vertebrae.
- The **sacrum** (SAY-krum), or *S-spine*, is a slightly curved, triangular bone composed of five segments that gradually fuse together to become one. This fusion process takes place during childhood.
- The **coccyx** (KAHK-siks) is made up of four small bones that fuse to become the tailbone. This fusion of coccygeal (kahk-SIJ-ee-uhl) vertebrae typically occurs in early adulthood.

Fascinating Fact

Humans and giraffes have the same number of bones in their necks, but the vertebrae in a giraffe's neck are much, much larger.

Appendicular Skeleton

The appendicular skeleton contains 126 bones that attach to the axial skeleton as appendages.



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Figure 4.9 The vertebral (spinal) column, lateral view.

The appendicular skeleton comprises the shoulder girdles, arms, wrists, and hands in the upper part of the body and the pelvic girdle, legs, ankles, and feet in the lower part of the body.

Shoulder Girdle

The **shoulder girdle** is composed of bones that support attachment of the upper extremities to the axial skeleton. The bones that make up the shoulder girdle include the **clavicle**, commonly known as the *collarbone*; the **sternum** (breastbone); and the **scapula**, or shoulder blade. (See Figure 4.1.) The clavicle connects the sternum to the scapula.

Student Challenge

Build the Term

The bony process of the shoulder blade, which extends over the lateral anterior area of the shoulder joint, is known as the *acromion*. Using one of the suffixes listed in this chapter, build the term that means “pertaining to the bony process of the shoulder blade.”

Upper Extremities

The bones of the upper extremities, shown in **Figure 4.1**, are as follows:

- The **humerus** is the upper arm bone.
- The **radius** is the smaller bone found on the thumb side of the forearm.
- The **ulna** is the larger forearm bone. The proximal end of the ulna forms the elbow.
- Eight **carpal** bones make up the wrist.
- Five **metacarpals** (MET-uh-KAR-puhlz) form the bones of the hand.
- Fourteen **phalanges** (fuh-LAN-jeez) make up the finger bones. Each finger (except the thumb) has three phalanges: proximal, medial, and distal. The thumb has only two phalanges: the proximal and distal phalanges.

Pelvic Girdle

The bones of the **pelvic girdle** support attachment of the lower extremities to the axial skeleton (**Figure 4.10**). The bones that comprise the pelvic girdle are as follows:

- The **ischium** (IS-kee-um) is the posterior part of the pelvic bone.
- The **ilium** is the broad, blade-shaped bone that forms the upper part of each side of the pelvis.
- The **pubis** (PYOO-bis) is the anterior part of the pelvic bone.

Lower Extremities

The bones that make up the lower extremities, shown in **Figure 4.1**, are as follows:

- The **femur**, or thighbone, is the upper leg bone. It is the longest bone in the human body.
- The **patella**, or kneecap, is the bone that forms the anterior part of the knee.
- The **tibia**, or shinbone, is the larger, more medially located lower leg bone.
- The **fibula**, located laterally to the tibia, is the smaller of the two lower leg bones.
- Seven **tarsal** bones make up the ankle. The largest of these bones, called the **calcaneus**

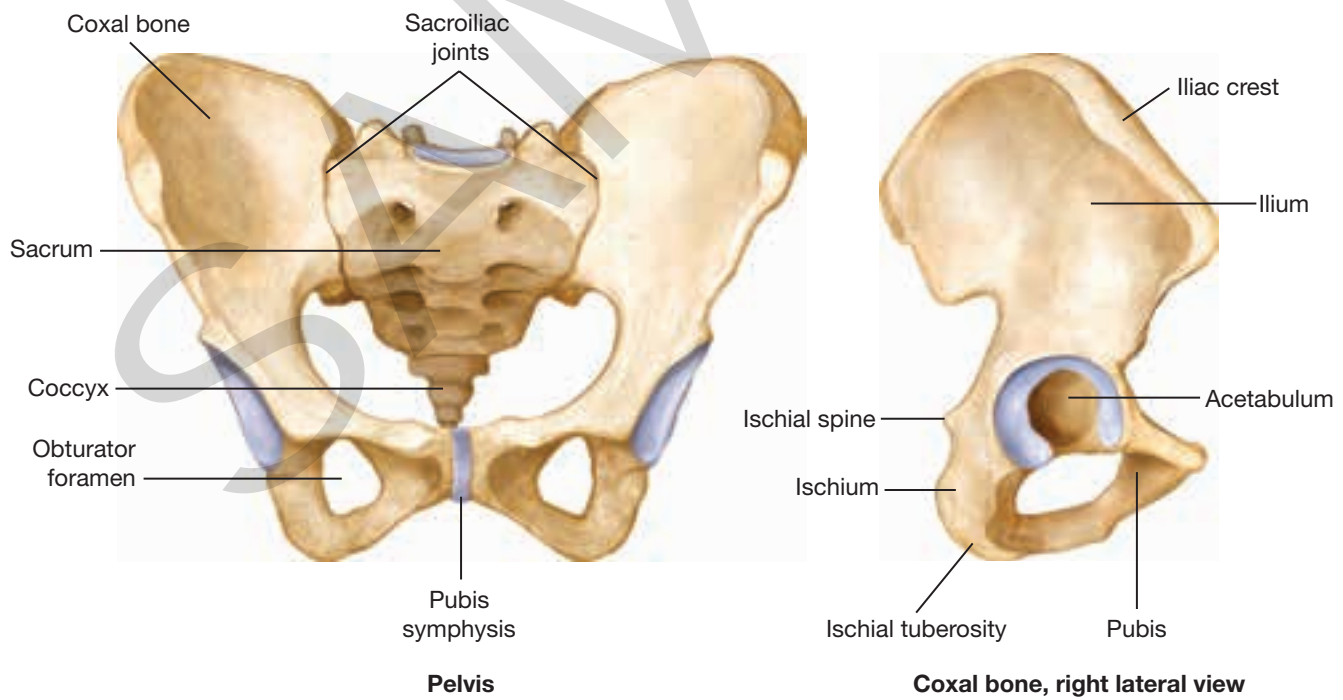


Figure 4.10 The bones of the pelvic girdle.

(kal-KAY-nee-us), is known as the heelbone. The next largest is the *talus* (anklebone).

- Five **metatarsals** (MET-uh-TAR-suhlz) comprise the bones of the foot.
- Each foot contains 14 **phalanges**. There are two phalanges (proximal and distal) in the big toe. There are three phalanges in each of the other four toes: proximal, medial, and distal phalanges.

Fascinating Fact

The longest bone in your body is your femur (thighbone). The femur is about one-quarter of your total height. The smallest bone in your body is the stirrup bone, or *stapes* (STAY-pee-z). Located inside the ear, the stapes can measure one-tenth of an inch. This tiny bone carries sound vibrations to the cochlea, a spiral-shaped structure in the inner ear that generates nerve impulses in response to the vibrations.

Diseases and Conditions

In this section, you will learn about pathological conditions that affect bones, joints, or both. Rheumatoid arthritis, for example, is a chronic disease that affects both the joints and the bones. A patient with rheumatoid arthritis experiences painful inflammation in the lining of the joints. This inflammation causes deformity of the joints and erosion of bone.

Diseases and conditions common to the skeletal system are described in the following list.

Disease/Condition

Definition

ankylosing spondylitis

ANG-kuh-LOH-sing
SPAHN-duh-LIGH-tis

CF: **ankyl/o** = crooked; bent; stiff; fused together
CF: **spondyl/o** = vertebra; backbone
S: **-itis** = inflammation

A form of rheumatoid arthritis characterized by inflammation of vertebral joints, which can become fused and stiff; *rheumatoid arthritis of the spine*.

ankylosis

ang-kuh-LOH-sis

CF: **ankyl/o** = crooked; bent; stiff; fused together
S: **-osis** = process; abnormal condition

A stiff joint caused by adhesion, or abnormal fusion of two bones into one.

arthralgia

ar-THRAL-jee-uh

CF: **arthr/o** = joint
S: **-algia** = pain

Pain in a joint or joints.

arthritis

ar-THRIGH-tis

CF: **arthr/o** = joint
S: **-itis** = inflammation

Inflammation of joints; usually accompanied by pain and, frequently, structural changes in bone and cartilage.

osteoarthritis

AHS-tee-oh-ar-
THRIGH-tis

CF: **oste/o** = bone
CF: **arthr/o** = joint
S: **-itis** = inflammation

Joint disease that mostly affects cartilage between the bone and joint; also known as *degenerative joint disease (DJD)*.

Fascinating Fact

Pectus excavatum (PEK-tus ek-skuh-VAY-tum), commonly known as “funnel chest,” is a condition in which the sternum (breastbone) is abnormally depressed (displaced inward). The condition is thought to be congenital. The term *pectus excavatum* comes directly from the Latin words *pectus* (breast), *ex-* (a prefix meaning “out” or “away from”), and *cavus* (“hollow”). The suffix *-um* is a noun form that means “structure.”



Timotheus Wolf/Shutterstock.com

Disease/Condition

Definition

arthritis (continued)

rheumatoid arthritis (RA)

ROO-muh-toyd
ar-THRIGH-tis

CF: **rheumat/o** =
watery flow
S: **-oid** = like;
resembling

gout

gowt

A chronic, systemic disease characterized by inflammation, pain, and stiffness in the joints; results in crippling deformities (**Figure 4.11**).

Form of arthritis in which uric acid builds up in the blood and causes joint swelling and pain; *gouty arthritis*.

bunion

BUN-yun

Joint swelling at the base of the great toe, caused by inflammation of the bursa.

bursitis

bur-SIGH-tis

CF: **burs/o** = bursa (sac of fluid near a joint)
S: **-itis** = inflammation

Inflammation of the bursa, usually between bony protrusions and muscle or tendon. Examples include rotator cuff injury in the shoulder, tennis elbow, and knee injury.

chondromalacia

KAHN-droh-muh-LAY-shee-uh

CF: **chondr/o** = cartilage
S: **-malacia** = softening

Softening of the cartilage.

dislocation

Total displacement of a bone from its joint; *luxation*.

fracture

A break in a bone.

Colles (KAH-leez) fracture

A fracture of the distal radius (bone on the thumb side of the forearm) that results from a fall onto an outstretched hand.

comminuted (KAH-mih-NEW-ted) fracture

A bone that has splintered or has been crushed (**Figure 4.12**).

compound fracture

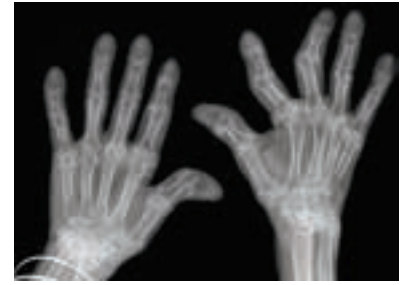
A broken bone with an open wound leading to the site of the fracture, or bone that protrudes through the skin; also called *open fracture* (**Figure 4.13**).

greenstick fracture

An incomplete fracture; the bone is bent and partially broken. This type of fracture occurs primarily in children (**Figure 4.14**).

longitudinal fracture

A fracture that runs parallel to the long axis of the bone (**Figure 4.15**).



WILLSIE/iStock/Getty Images Plus via Getty Images

Figure 4.11 Rheumatoid arthritis (RA) in the hands.

Ponder This ? ?

Broken Bones

What do you think is the most commonly broken bone in the human body? Share your response with your classmates, along with an explanation for your reasoning.



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Figure 4.12 Comminuted fracture.



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Figure 4.13 Compound fracture.



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Figure 4.14 Greenstick fracture.



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Figure 4.15 Longitudinal fracture.

Disease/Condition

Definition

fracture (continued)

oblique (ahb-LEEK) fracture

A break across the bone at an angle (Figure 4.16).

pathologic fracture

A fracture resulting from pressure on weakened bone; due to osteoporosis or cancer, for instance (Figure 4.17).

simple fracture

A broken bone that does not penetrate the skin; also called *closed fracture* (Figure 4.18).

spiral fracture

A fracture in which the bone has been twisted apart; a common sports injury (Figure 4.19).

stress fracture

A small crack in bone resulting from chronic, excessive impact; an overuse injury.

transverse fracture

A fracture that runs straight across the bone, at a right angle to the long axis. It is often caused by a direct blow or prolonged stress, such as from running (Figure 4.20).

herniated disk

Intervertebral disk that has slipped or ruptured (Figure 4.21).

lumbago

lum-BAY-goh

Pain in the lower back (lumbar) region.

myeloma

MIGH-uh-LOH-muh

CF: **myel/o** = bone marrow; spinal cord

S: **-oma** = tumor; mass

Cancer of the plasma cells (a type of white blood cell) that originates in the bone marrow.

ostealgia

AHS-tee-AL-jee-uh

CF: **oste/o** = bone

S: **-algia** = pain

Pain in the bone.

osteitis or otitis

AHS-tee-IGH-tis or ahs-TIGH-tis

CF: **oste/o** = bone

S: **-itis** = inflammation

Inflammation of the bone.

osteochondroma

AHS-tee-oh-kahn-DROH-muh

CF: **oste/o** = bone

CF: **chondr/o** = cartilage

S: **-oma** = tumor; mass

Tumor or bony projection that covers cartilage.



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Figure 4.16 Oblique fracture.



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Figure 4.17 Pathologic fracture.



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Figure 4.18 Simple fracture.



© Body Scientific International

Figure 4.19 Spiral fracture.



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Figure 4.20 Transverse fracture.



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Figure 4.21 Herniated disk.

Disease/Condition

Definition

osteoma

AHS-tee-OH-muh

CF: **oste/o** = bone

S: **-oma** = tumor; mass

osteomalacia

AHS-tee-oh-muh-LAY-shee-uh

CF: **oste/o** = bone

S: **-malacia** = softening

osteomyelitis

AHS-tee-oh-MIGH-uh-LIGH-tis

CF: **oste/o** = bone

CF: **myel/o** = bone marrow

S: **-itis** = inflammation

osteopenia

AHS-tee-oh-PEE-nee-uh

CF: **oste/o** = bone

S: **-penia** = deficiency

osteoporosis

AHS-tee-oh-puh-ROH-sis

CF: **oste/o** = bone

S: **-porosis** = abnormal condition of small holes

osteosarcoma

AHS-tee-oh-sar-KOH-muh

CF: **oste/o** = bone

CF: **sarc/o** = flesh; connective tissue

S: **-oma** = tumor; mass

Paget's disease

PAJ-ets

periostitis

PEER-ee-ahs-TIGH-tis

P: **peri-** = around; surrounding

CF: **oste/o** = bone

S: **-itis** = inflammation

sequestrum

suh-KWES-trum

Tumor of the bone.

Abnormal softening of the bone. In children, this condition is known as *rickets*.

Inflammation of the bone and bone marrow (**Figure 4.22**).

Bone deficiency; in a young person, less-than-average bone density.

Condition of small holes in the bones; noticeable loss of bone density (**Figure 4.23**).

Malignant tumor that arises from connective tissue and affects the bone.

Excessive breakdown of bone and abnormal, enlarged bone formation; *osteitis deformans* (AHS-tee-IGH-tis duh-FOR-menz).

Inflammation of the periosteum, the covering that surrounds the bone.

Bone tissue death that occurs when the bone has become *sequestered*, or separated, from the healthy tissue around it, due to lack of blood supply.



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Figure 4.22 Osteomyelitis.



A



B

Top to bottom:
angkhan/iStock/Getty Images Plus via Getty Images,
Puwadol Jaturawuttichai/Shutterstock.com

Figure 4.23 X-rays of a normal pelvic girdle (A) and a pelvic girdle with osteoporosis (B).

Disease/Condition

spina bifida

SPIGH-nuh BIF-ih-duh

spinal curvatures

kyphosis

kigh-FOH-sis

CF: **kyph/o** = humpback

S: **-osis** = process; abnormal condition

lordosis

lor-DOH-sis

CF: **lord/o** = curve; swayback

S: **-osis** = process; abnormal condition

scoliosis

SKOH-lee-OH-sis

CF: **scoli/o** = crooked; bent

S: **-osis** = process; abnormal condition

spondylosis

SPAHN-duh-LOH-sis

CF: **spondyl/o** = vertebra; backbone

S: **-osis** = process; abnormal condition

Definition

Split spine; congenital condition in which part of the membrane covering the spinal cord protrudes through a gap in the spine (**Figure 4.24**).

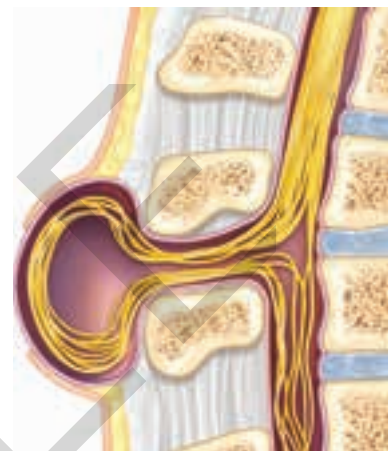
Abnormal curvatures of the spine.

Abnormal, outward curvature of the thoracic spine; humpback; called *Dowager's hump* in older females (**Figure 4.25**).

Abnormal, forward curvature of the lumbar spine; swayback (**Figure 4.26**).

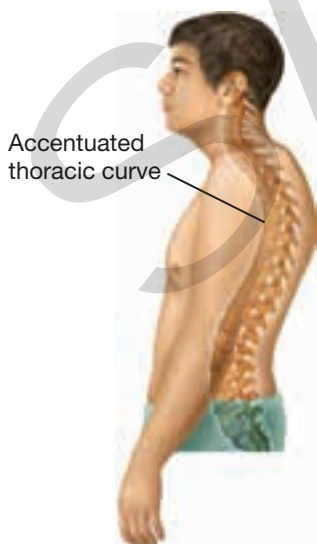
Abnormal, lateral curvature of the spine (**Figure 4.27**).

Stiffening of the spine; *spinal osteoarthritis*.



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Figure 4.24 Spina bifida is a congenital defect in which nerves protrude from the spine.



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Figure 4.25 Kyphosis.



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Figure 4.26 Lordosis.



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Figure 4.27 Scoliosis.

Team Challenge

Your Spine in Action

In a small group, practice sharing your knowledge of vertebral disorders using a homemade model of a section of the spine. For this activity, you will need rice cakes (bones), marshmallows (disks), straws (spine), string or yarn (nerves), water, and needles (to thread the nerves)

1. Place drops of water in the middle of several rice cakes. The rice cakes should become soft in the center.
2. Put a straw through rice cakes and marshmallows in alternating order (rice cake, marshmallow, rice cake, marshmallow) until the desired number.
3. Thread a needle with thread or yarn. Stitch through each marshmallow near the upper rice cake with a single thread. You may need to wipe the needle between use. This is your model of a healthy spine.
4. Make a second model of the spine using the same steps. Choose one vertebral disorder and make your model to reflect how this disorder affects the spine. Use this text and other reliable resources to find signs and symptoms, complications, and current treatments for the disorder.

Disease/Condition

Definition

sprain

Trauma to the ligaments surrounding a joint, causing pain and, in some cases, disability.

subluxation

Partial dislocation of a bone from its joint.

sub-luk-SAY-shun

P: sub- = below; under

CF: lux/o = slide

S: -ation = process; condition

talipes

Congenital deformity of the foot involving the talus (anklebone); *clubfoot* (Figure 4.28).

TAL-ih-pee-z

tendinitis, tendonitis

Inflammation of a tendon.

ten-duh-NIGH-tis

CF: tendin/o, tendon/o = tendon

S: -itis = inflammation



Bunsinth-Nan-Pua/Shutterstock.com

Figure 4.28 Talipes.

Diagnostic Tests and Procedures

A diagnostician uses different kinds of tools and methods to aid in pinpointing the cause of patients' health conditions. Following are some of the most common tests and procedures used to diagnose (identify) diseases and conditions of the skeletal system.

Case Study

Mary O'Toole, an active, 46-year-old female with a healthy lifestyle, has been experiencing lower back pain, as well as pain radiating down her right leg and calf. Recently, Mary noticed increased aggravation of pain when sitting. She has tried over-the-counter pain medication, including Advil® and Tylenol®, but with no relief. After two weeks of the pain, Mary made an appointment with her internist, Dr. Feeney. An internist, or internal medicine specialist, is a physician who specializes in the diagnosis, treatment, and prevention of disease in adults.

After examining Mary, Dr. Feeney referred her to Dr. Peter Lanips, who ordered X-rays of Mary's lumbosacral (LS) spine. The lumbosacral (LUM-boh-SAY-kruhl) spine is the lower part of the vertebral column, made up of the lumbar region and the sacrum (the bone segment that connects the spine to the pelvis). The X-rays revealed a 2-centimeter bulge between vertebral disks L5 and S1 (lumbar vertebra 5 and sacral vertebra 1).



Monkey Business Images/Shutterstock.com

Your Turn

Based on the facts mentioned in the case study, what kind of procedure do you think Mary's doctor will perform to alleviate her pain? Explain your answer. You will refer back to this case study when you interpret Mary's medical record in the Chapter Review.

Test/Procedure

arthroscopy

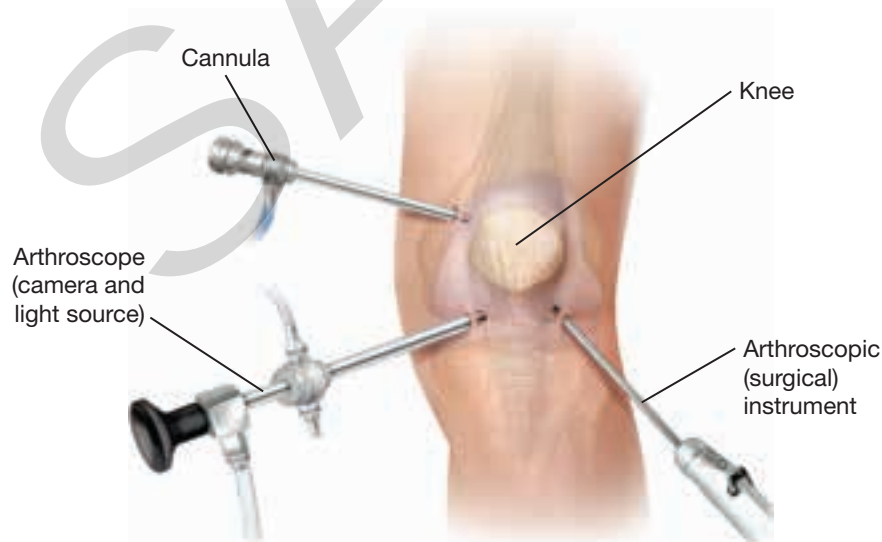
ar-THRAHS-koh-pee

CF: arthr/o = joint

P: -scopy = visual examination using a scope

Definition

Visual examination of a joint using a scope (**Figure 4.29**).



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Figure 4.29 Arthroscopy.



Assisting a Client to Ambulate Using a Transfer Belt

Estimated time: 7–10 minutes

Materials needed: one chair, gait belt, and call signal

Preparation

As one grows older, the probability of mobility issues increases. To decrease the risk of muscle tone loss and falls, people should include physical activity in their daily routines. Working in pairs, designate one person the client and the other the caregiver. The first caregiver will perform this skill on the client, then the client will take a turn at being the caregiver. The caregiver will assist the client to ambulate (walk) 15 feet safely using a transfer belt, without injuring self or the client.

Steps

1. Explain the entire ambulation procedure to the client before starting. Describe every step of the process, while maintaining face-to-face contact and speaking clearly.
2. Before ambulation:
 - Assist the client to move forward in the chair until the feet are flat on the floor and client is wearing shoes.
 - Place the transfer belt around the client's waist and secure until snug around the smallest portion of the abdominal area.
 - Coordinate the transfer with your client. For example, say "On the count of three, stand with me, then pivot...."

- Ask the client to hold the backs of your elbows.
 - Standing in front of the client, maintain a wide base with feet positioned outside the client's feet and knees stabilizing client's knees.
3. On your signal ("one, two, three"), help the client stand, using underhanded grasp on the transfer belt.
 4. Walk slightly behind and to one side (the weak side) of the client for 15 feet while holding the transfer belt using an underhanded grasp.
 5. Assist the client with ambulating back to the chair and remove the transfer belt.
 6. Give the client the call signal (a button that displays a light and sound to notify the caregiver when a client needs assistance).
 7. Store the gait belt.
 8. Wash your hands or use alcohol-based hand sanitizer for hand hygiene.

Discussion

- Did the ambulation go smoothly? Did the client know what to expect during ambulation? Communication is key to any skill or care.
- What conditions, injuries, or diseases could make your attempt to ambulate a client more difficult?
- What safety factors should you consider before ambulating a client?

Test/Procedure

bone density test

Definition

X-ray test that determines loss of, or changes in, bone density. It is used to diagnose diseases such as osteomalacia, osteoporosis, and osteopenia. Also called *bone densitometry* (den-sih-TAH-muh-tree) (**Figure 4.30**).

bone marrow aspiration

Process involving the use of a syringe and needle to withdraw bone marrow liquid; used in medical procedures such as stem-cell transplant.



izusek/E+ via Getty Images

Figure 4.30 Bone density test.

Test/Procedure

bone scan

Definition

A nuclear scanning test that identifies bone fractures, tumors, or infections.

computerized tomography (tuh-MAH-gruh-fee) or computed tomography (CT)

Process in which a computer analyzes radiographic images of a specific section of the body from multiple angles to identify bone injury or disease. CT scans provide more detailed imagery than standard X-rays (Figure 4.31).

lumbar puncture

Spinal tap; needle aspiration of spinal canal fluid in the lumbar area (Figure 4.32).

magnetic resonance imaging (MRI)

A noninvasive scanning test that involves use of an electromagnetic field and radio waves to visualize soft-tissue structures.

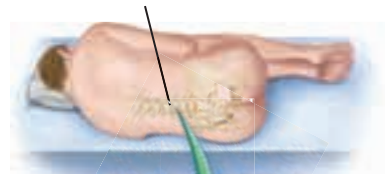
rheumatoid factor (RF)

A blood test performed to diagnose rheumatoid arthritis.

X-ray

Radiographic image used to diagnose skeletal changes in the body.

Spinal needle is inserted between 3rd and 4th lumbar vertebrae.



Cerebrospinal fluid

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Figure 4.32 Lumbar puncture.

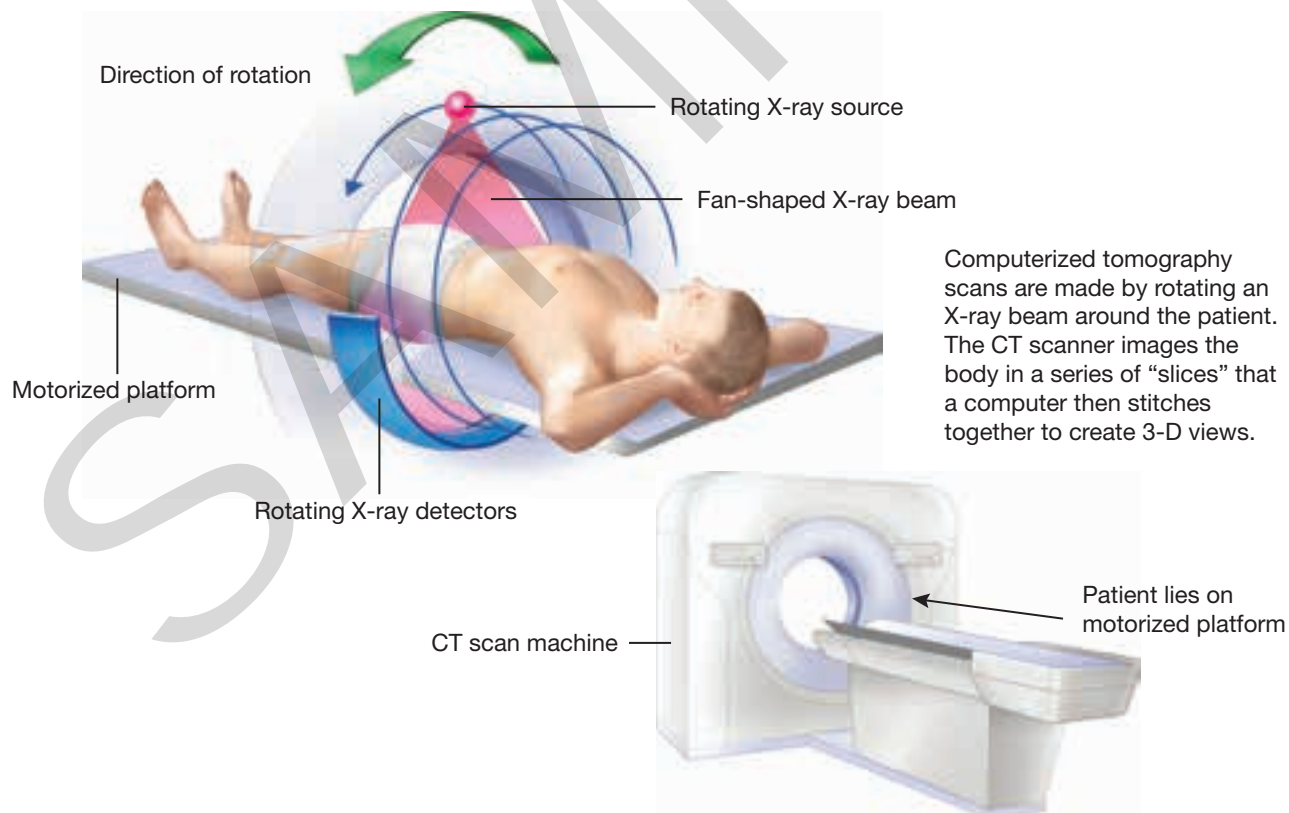


Figure 4.31 Anatomy of a CT scan.

Surgical Procedures and Therapeutics

After the diagnosis of a pathological condition, a treatment can be planned and implemented. For instance, when an X-ray shows a simple fracture of the wrist, the treatment of choice may be a closed reduction and internal fixation (CRIF). This procedure involves manual manipulation of the fracture to set the bones in proper alignment without surgical intervention.

Following is a list of common surgical and noninvasive treatments for diseases and conditions of the skeletal system.

Treatment	Definition
amputation	Removal of a limb, usually surgical; for example, above-the-knee amputation.
arthrocentesis AR-throh-sen-TEE-sis CF: arthr/o = joint S: -centesis = surgical puncture to remove fluid	Surgical puncture of the joint space with a needle to remove accumulated fluid (Figure 4.33).
arthrodesis AR-throh-DEE-sis CF: arthr/o = joint S: -desis = to bind; tie together	Surgical immobilization of a joint.
arthroplasty AR-throh-PLAS-tee CF: arthr/o = joint S: -plasty = surgical repair	Surgical repair of a joint.
bone grafting	Process of transplanting and implanting tissue from one part of the body to another; used to repair a defect or injury.
bursectomy bur-SEK-tuh-mee CF: burs/o = bursa S: -ectomy = surgical removal; excision	Surgical removal of the bursa.
closed reduction and internal fixation (CRIF)	External manipulation to restore a fractured bone to normal position.
cast	Solid mold of a body part; used to immobilize fractures or dislocations.
splint	An appliance made of bone, wood, metal, or plaster of Paris; used for fixation of an injured body part.
traction	Application of a pulling force to align a dislocated part of the body.

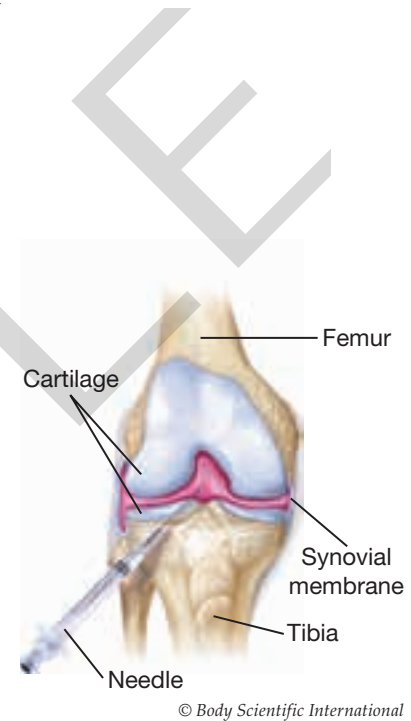


Figure 4.33 Arthrocentesis.

Treatment

diskectomy

dis-KEK-toh-mee

open reduction and internal fixation (ORIF)

orthosis

or-THOH-sis

CF: **orth/o** = straight

S: **-osis** = process;
abnormal condition

osteoplasty

AHS-tee-oh-PLAS-tee

CF: **oste/o** = bone

S: **-plasty** = surgical repair

osteotomy

AHS-tee-AH-tuh-mee

CF: **oste/o** = bone

S: **-tomy** = process of
cutting; incision

physical therapy

prosthesis

prahs-THEE-sis

spondylosyndesis

SPAHN-dih-loh-sin-DEE-sis

CF: **spondyl/o** = vertebra;
backbone

P: **syn-** = together; with

S: **-desis** = to bind; tie
together

tenotomy

teh-NAH-tuh-mee

CF: **ten/o** = tendon

S: **-tomy** = process of
cutting; incision

Definition

Surgical removal of a herniated (ruptured) vertebral disk.

Surgical procedure involving the use of steel rods, plates, or screws to realign a severe bone fracture to normal position.

Straightening or correction of a bone deformity.

Surgical correction of the bone.

Incision through the bone.

Rehabilitation that focuses on restoring physical function and preventing disability.

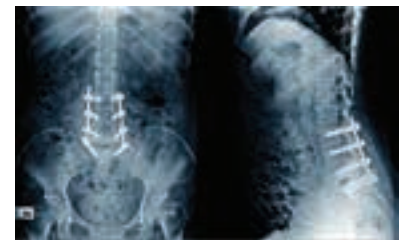
Artificial replacement for a missing body part, such as an extremity (arm or leg).

Surgical fusion of joints (ankylosis) between vertebrae; *spinal fusion* (**Figure 4.34**).

Incision to, or cutting of, a tendon.

Fascinating Fact

Ancient Egyptians developed the world's first functional prosthetic bone. This bone was the big toe.



ChooChin/Shutterstock.com

Figure 4.34
Spondylosyndesis.

Therapeutic Drug Treatments

Injuries and illnesses of the skeletal system often require treatment with medications. The following list includes common drugs and their pharmacodynamics (actions in the body).

Drug	Effect on Body
analgesic AN-uhl-JEE-zik	Drug that relieves pain.
anti-inflammatory	Agent that counteracts inflammation.
antipyretic AN-tee-pigh-RET-ik	Agent that reduces fever.
narcotic	Drug that relieves pain and induces sleep by depressing (reducing the activity of) the central nervous system.
nonsteroidal anti-inflammatory drug (NSAID)	Agent that relieves pain, counteracts inflammation, and reduces fever; commonly used to treat arthritis.

Student Challenge

Skeletal Alphabet

Directions: Working with a partner, see how fast you can recite the alphabet by naming a skeletal system term that begins with each letter of the alphabet. The first person names a term that starts with the letter *A*, the second person names a term that begins with the letter *B*, and so on. You might also do this activity by writing separate lists. After you have written as many terms as you can think of, exchange your results with your partner.

Common Medical Abbreviations

The following medical abbreviations are commonly used in reference to the skeletal system. These abbreviations provide a shorthand method of communication among healthcare professionals concerning pathological conditions, diagnostic tests, surgical procedures, and therapeutic treatments. These abbreviations can be found in this chapter and in the medical record activity that follows.

Abbreviation	Meaning	Abbreviation	Meaning
ATT PHYS	attending physician	NSAID	nonsteroidal anti-inflammatory drug
BP	blood pressure	OA	osteoarthritis
CRIF	closed reduction and internal fixation	ORIF	open reduction and internal fixation
CT	computerized tomography; computed tomography	OTC	over-the-counter
CV	cardiovascular	PO, p.o.	by mouth (from the Latin <i>per os</i>)
DJD	degenerative joint disease	PRN, p.r.n.	as needed (from the Latin <i>pro re nata</i>)
Fx	function; fracture	Pt, pt.	patient
GI	gastrointestinal	Q4H	every four hours (from the Latin <i>quaque quarta hora</i>)
L, Lt	left	R, Rt	right
L5–S1	lumbar vertebra 5 to sacral vertebra 1	RA	rheumatoid arthritis
LBP	lower back pain	RF	rheumatoid factor
LS	lumbosacral	Rx, Rhx	prescription
mg	milligram(s)	y/o	years old; year-old
MRI	magnetic resonance imaging		

Careers to Consider

If you pursue any of the following careers, you will interact on a regular basis with patients who have conditions or diseases of the skeletal system. For more detailed information on the career opportunities discussed on this page, visit the US Bureau of Labor Statistics website.

Chiropractor

Chiropractors treat illness and injury of the neuromusculoskeletal system, which includes nerves, muscles, ligaments, and tendons. These specialists treat patients primarily by manual manipulation or adjustment of parts of the body, especially the spinal column. They may use X-rays to help locate the source of a patient's health concern.

Chiropractors may combine manipulative therapy techniques with adjunctive therapies such as acupuncture and ultrasound. They also recommend dietary modifications, supportive devices, and exercises designed to improve physical health. They do not prescribe medications or surgery, but refer patients to other healthcare professionals when necessary.

Chiropractors must hold a Doctor of Chiropractic (DC) degree and a state license. A Doctor of Chiropractic program generally takes four years to complete. Most chiropractors work independently or in a group practice.

Physical Therapist

Physical therapists (PTs) work with a patient's doctor to develop a plan for restoring and maintaining the patient's maximum movement and functional ability. They use specific exercises, manual manipulation, and other physical therapy interventions, and they educate patients about ways to improve their mobility and manage their pain. PTs also work with individuals to prevent loss of mobility by developing customized fitness- and wellness-oriented programs.

Physical therapists are required to hold



antoniodiaz/Shutterstock.com

a Doctor of Physical Therapy (DPT) degree and a license in their state of practice. PTs typically work in private offices, hospitals, clinics, nursing homes, and rehabilitative centers.

Orthopedic Surgeon

Orthopedics (or-thoh-PEE-diks) is a branch of medicine focused on treating or correcting musculoskeletal conditions, including spine and joint injuries or deformities. **Orthopedic surgeons** are physicians who specialize in the diagnosis and treatment of spinal disorders, sports injuries, arthritis, and fractures. Orthopedic surgeons must hold a Medical Doctor (MD) or a Doctor of Osteopathic Medicine (DO) degree.

Prosthetist

A **prosthetist** (PRAHS-thuh-tist) measures, designs, fabricates, fits, and services a *prosthesis* (prahs-THEE-sis), or artificial limb. A licensed physician can prescribe a prosthesis for the replacement of an extremity due to amputation, congenital deformity, or absence. A prosthetist must have at least a master's degree and complete a one-year residency to obtain certification.

Radiologic Technologist

Radiologic technologists perform diagnostic imaging (X-rays) of the body for diagnosis or treatment of health conditions. They may find employment in hospitals, doctors' offices, or cancer treatment centers. A radiologic technologist typically holds an associate's degree. Some states require licensing or certification.



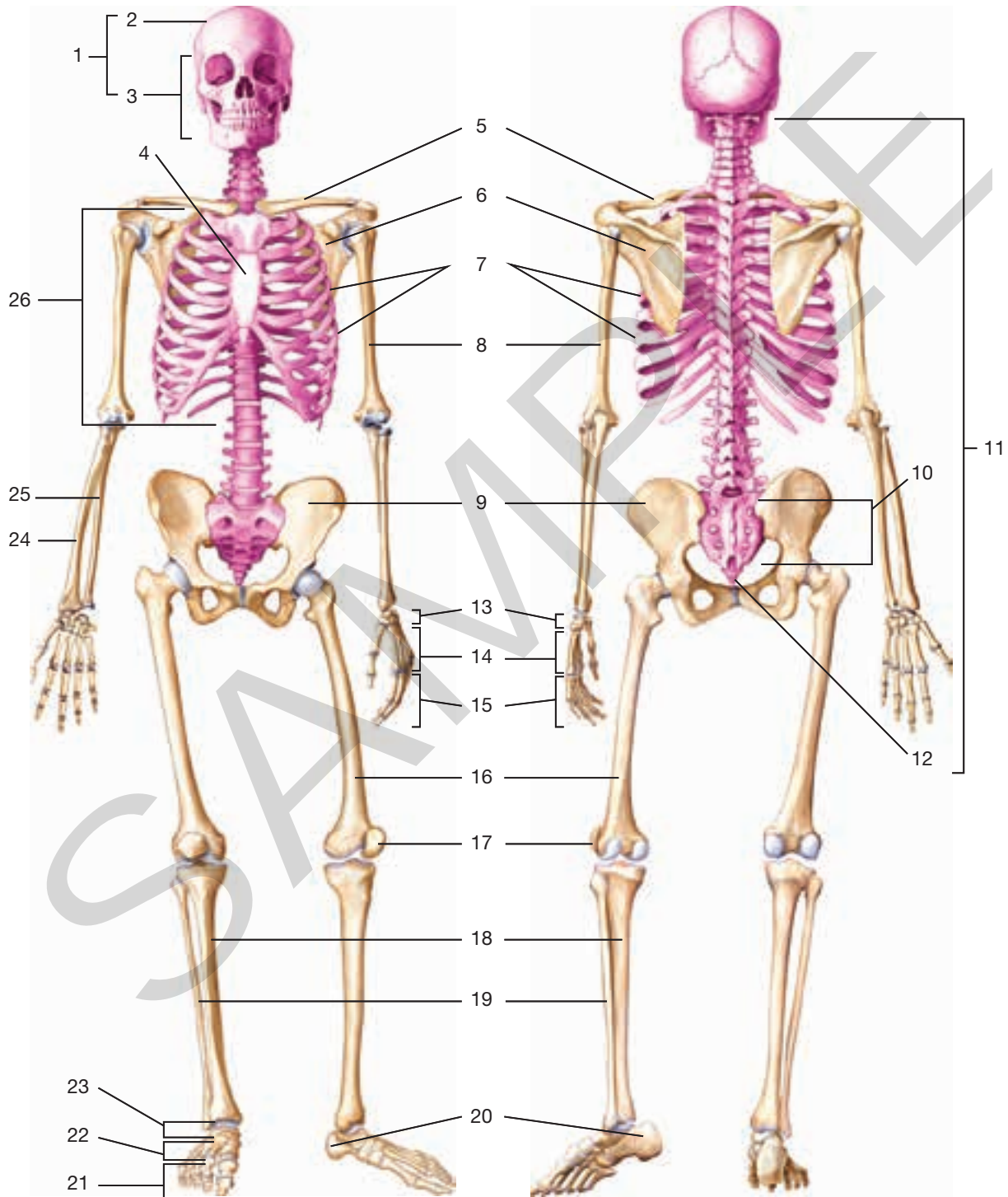
Marcus Chung/E+ via Getty Images

Chapter 4 Review

For each exercise that follows, write your answers in a separate document or sheet of paper.

Identify the Anatomical Structure

Directions: Identify the correct anatomical term that corresponds to each number in the diagram.



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Word Parts

Directions: Write the meaning(s) of each word part. Identify each word part by type (prefix, combining form, or suffix).

- | | |
|------------|--------------|
| 1. arthr/o | 8. sub- |
| 2. peri- | 9. -scopy |
| 3. oste/o | 10. lumb/o |
| 4. crani/o | 11. -porosis |
| 5. -itis | 12. -ectomy |
| 6. -oma | 13. orth/o |
| 7. scoli/o | 14. -malacia |

Anatomy and Physiology

Directions: Provide the correct term(s) for each item that follows.

- What are the two major parts of the human skeleton?
- Name two examples of long bones.
- Name two examples of flat bones.
- What is the term for the bones in the fingers and toes?
- What is the end of a long bone called?
- What is the term for the shaft of a long bone?
- Name the term for the growth zone located between the epiphysis and diaphysis.
- Name the structure within bone that contains yellow marrow composed mainly of fat cells.
- What is the term for the membrane that covers bone?
- Name the term for the point at which two or more bones articulate (join together).

Matching: Combining Forms

Directions: Match the combining form (root word and combining vowel) to the correct meaning.

- | | |
|---|------------|
| A. bone marrow; spinal cord | 1. anky/o |
| B. rib | 2. crani/o |
| C. crooked; bent; stiff; fused together | 3. ped/o |
| D. foot; child | 4. myel/o |
| E. wrist | 5. lumb/o |
| F. ankle | 6. cost/o |
| G. extremities | 7. orth/o |
| H. straight | 8. carp/o |
| I. skull | 9. tars/o |
| J. lumbar region; loin | 10. acr/o |

Spelling

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Directions: Identify the correctly spelled medical term in each numbered item. Then define each term. If you are not sure of the correct spelling, look up the term in a medical dictionary.

- | | |
|-------------------|----------------|
| 1. arthritis | artheritis |
| arthrytis | arthuritis |
| 2. apendicular | appendiculer |
| appendicular | apendiculator |
| 3. thoracic | thorasic |
| thorassic | thoracic |
| 4. craneal | cranial |
| cræniel | crannial |
| 5. osteoporosis | osteporosis |
| osteoporeosis | osteoperosis |
| 6. clavical | clavacle |
| clavicle | clavycle |
| 7. epyphysis | epiphysis |
| epiphasis | epiphasy |
| 8. amphearthrosis | amphiarthrasis |
| amphiarthrosis | amphiarthrosis |
| 9. epiphyseal | epyphiseal |
| epiphiseal | epiphysial |
| 10. synoveal | sinovial |
| sinoveal | synovial |

Pronunciation

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Directions: Pronounce each term that follows, then write the correct spelling and define. If you are not sure of the correct spelling or definition, look up the term in a medical dictionary.

- uh-PIF-uh-sis
- MED-yoo-lair-ee
- DIGH-ar-THROH-seez
- KAHK-siks
- fuh-LAN-jeez
- met-uh-TAR-suhlz
- MAK-sih-lair-ee
- sih-NOH-vee-uhl
- migh-uh-LOH-muh
- AHS-tee-oh-puh-ROH-sis
- AR-throh-PLAS-tee
- KAHN-droh-muh-LAY-shuh

Word Surgery

hosA Learn Health Professions EVENT PREP

Directions: Dissect each medical term into its word parts. Identify the word-part types (prefix, combining form, or suffix), and write the meaning(s) of each word part. Then write a definition of the term.

Chapter 4 Review

Example: osteomyelitis

Dissection: oste/o/myel/itis

oste/o (combining form) = bone

myel/o (combining form) = bone marrow

-itis (suffix) = inflammation

Definition: inflammation of the bone and bone marrow

- | | |
|-------------------|-------------------|
| 1. arthritis | 9. osteoarthritis |
| 2. ostealgia | 10. arthroscopy |
| 3. osteomalacia | 11. spondylosis |
| 4. osteoporosis | 12. synovial |
| 5. chondromalacia | 13. arthroscope |
| 6. myeloma | 14. chondrectomy |
| 7. osteitis | 15. patellar |
| 8. bursitis | |

14. blood pressure

16. lower back pain

15. right

Interpreting Abbreviations

Directions: Write the correct medical term or phrase for each abbreviation listed.

- | | |
|--------|-------------|
| 1. RA | 9. ATT PHYS |
| 2. LS | 10. L |
| 3. MRI | 11. LBP |
| 4. R | 12. mg |
| 5. y/o | 13. CT |
| 6. PRN | 14. Q4H |
| 7. DJD | 15. pt. |
| 8. BP | 16. PO |

Word Construction EVENT PREP

Directions: Using word parts and meanings presented in the chapter, build the medical term described in each definition that follows.

- surgical repair of a joint
- abnormal stiffening of a joint
- softening of cartilage
- incision to the skull
- pertaining to (being located) beyond the ankle
- inflammation of a tendon
- inflammation of the bursa sac
- pertaining to the wrist bone
- pertaining to around the bone
- pertaining to between the ribs
- pertaining to inside the ribs
- pertaining to below the ribs
- process of recording pictures of a joint
- pertaining to the calcaneus (heelbone)
- inflammation of the mastoid
- surgical repair of the tendon

Doctor's Orders

Directions: Each item that follows contains a doctor's lab order for a patient. Transcribe each order, with its abbreviations, symbols, and acronyms, into everyday language.

- Pt. c/o pain from DJD. Rx for NSAID p.o. q.i.d.
- L femur fx to pre-op for ORIF.
- Lab to ER room 3—RA, CBC, and UA.
- TPR and BP am and pm.
- 2 y/o wt 29 lbs 8oz, ht 30 in to X-ray for stat CT scan of skull.
- New pt OV obtain VS, CXR, EKG.
- MRI R knee.

Search the Source EVENT PREP

Directions: Using reliable and credible online resources, complete the following activities.

- Juvenile arthritis (JA) is being increasingly diagnosed in people younger than 16 years of age in the United States. Visit the Centers for Disease Control and Prevention (CDC) website and search for information about childhood arthritis. Then answer the following questions: What is the most common form of JA, and what main symptoms does it involve? In general, does JA occur more frequently in males or females? What does this fact suggest? How does geographic location impact JA?
- Make a list of what you think are the five most commonly broken bones in the human body. Then use reliable resources to research the answer. Prepare a report for the class, describing your findings in clear, concise, effective language. Ask classmates for feedback on the effectiveness of your language.

Identifying Abbreviations

Directions: Write the correct abbreviation for each medical term or phrase listed.

- | | |
|----------------------------|--------------------------------|
| 1. lumbosacral | 8. years old; year-old |
| 2. every four hours | 9. by mouth |
| 3. patient | 10. left |
| 4. milligram(s) | 11. degenerative joint disease |
| 5. computerized tomography | 12. magnetic resonance imaging |
| 6. as needed | 13. rheumatoid arthritis |
| 7. attending physician | |

Medical Record Practice

Directions: Following is a preoperative history report for Mary, the patient who was introduced in the Case Study. A preoperative history report is submitted to a hospital before a patient is admitted for surgery. Read Mary's medical report. Then, on a separate sheet of paper, write a definition for each highlighted term and abbreviation. These terms and abbreviations are also listed. You may encounter terms or abbreviations that were introduced in previous chapters.

HOLLAND MEDICAL CENTER

987 Medical Drive, Hospital City, US 12345-6789
 PHONE: (XXX) XXX-4321 FAX: (XXX) XXX-2910

PREOPERATIVE HISTORY

PT NAME: Mary O'Toole

ID NO: 43370056

ROOM NO: 304

DATE OF ADMISSION: 11/15/20XX

ATT PHYS: Peter Lanips, MD

History of Present Illness: The patient is a 46 **y/o** white female with a chief complaint of **LBP** radiating to **R** leg and calf. Pain worsens when patient bends over or attempts to touch toes. Sitting aggravates R leg and calf pain. Previous X-ray shows 2 cm bulge of disk between L5 and S1. Patient is admitted at this time for elective **L5–S1 diskectomy**. Surgery has been discussed with patient. The patient's internist is Fred Feeney, MD.

Medications: Tylenol 500 **mg 2 PO Q4H PRN**, pain; Advil 200 mg 2 PO Q4H PRN, pain.

Past Medical History: Usual childhood diseases.

Past Surgical History: None.

Family History: Mother and grandmother have history of **arthritis**.

Gynecological History: Regular menses (menstrual period).

Social History: **Pt.** is a nonsmoker. Alcohol use is limited to 2–3 glasses of wine a week. Drug use denied.

Review of Systems: CV (cardiovascular): No high **BP**, heart murmurs, or shortness of breath.

Pulmonary: No chronic lung disease; no asthma.

GI (gastrointestinal): No hepatitis (infection of the liver).

Renal (pertaining to the kidney): Negative for infections.

Endocrine (relating to hormone-secreting glands in the body): No diabetes or thyroid disease.

Musculoskeletal (pertaining to the muscles and bones): Positive for early signs of arthritis.

Hematologic (pertaining to study of the blood): No history of anemia (deficiency of red blood cells or hemoglobin, the main protein in blood cells) or bleeding tendencies.

Peter Lanips, MD

PL:cjk

D: 11/13/20XX

T: 11/14/20XX

- | | | | |
|-------------|---------------|---------------|---------------------|
| 1. ATT PHYS | 5. L5–S | 9. Q4H | 12. Pt. |
| 2. y/o | 6. diskectomy | 10. PRN | 13. BP |
| 3. LBP | 7. mg | 11. arthritis | 14. Musculoskeletal |
| 4. R | 8. PO | | |