The Musculoskeletal System—Orthopedics

4

Learning Outcomes

Upon completion of this chapter, you will be able to:

4.1 Identify the **roots/word parts** associated with the **musculoskeletal system.**

4.2 Translate the **Subjective** terms associated with the **musculoskeletal system.**

4.3 Translate the **Objective** terms associated with the **musculoskeletal system.**

4.4 Translate the **Assessment** terms associated with the **musculoskeletal system.**

4.5 Translate the **Plan** terms associated with the **musculoskeletal system.**

4.6 Distinguish terms associated with the **musculoskeletal system** in the context of **electronic health records.**

Introduction and Overview of the Musculoskeletal System

Think of a crane at a construction site. It's an impressive piece of machinery. All the parts work together to move some very heavy objects.

Your body, specifically your musculoskeletal system, is also an amazing machine. All the parts work in just the right way to allow you to make big movements, like lifting a heavy box, and fine movements, like writing a note on the box.

Continuing the crane analogy, your bones are like the metal fused together to make the framework of the crane. Like the metal, your bones are strong and sturdy. They make the framework of your body. This framework supports your body and protects your internal organs. Your bones are lighter than the steel of a crane, but like steel, they are incredibly strong.

Unlike steel, however, your bones are living organs. They can grow, maintain themselves, and even self-repair.

If you look at a crane up close, you'll notice that the framework is not one solid piece. Instead, it is made up of many smaller pieces that are welded, bolted, or hinged together. Some connection points are immobile, while others allow movement. Your joints are the connection points in your body. They keep the parts together and allow for movement so the crane can actually move things.

The crane couldn't move anything without any power, though. Your muscles are the workhorses of your musculoskeletal system. They act as powerful movers and stabilizers. Some muscles, like those in your thighs, are thick and strong, while others, like those in your hands, are smaller and are made for delicate movements. In fact, the muscles of your eyes are at work even now as you read these words. Together, your bones, joints, and muscles move you, protect you, and give your body support.

4.1 Word Parts of the Musculoskeletal System

The Skeleton

Your bones make up the framework of your body—your skeleton. Like any good design, your skeleton has a specific layout. The bones in the middle of the skeleton are called the *axial* part of your skeleton. Your skull (*cranio*) is attached to your spine.

Your spine is made of many smaller bones (*vertebra*) that connect together. They protect your spinal cord, a very fragile and important body structure. Your spine has four sections: the neck section (*cervical*), chest/upper back section (*thoracic*), and lower back (*lumbar* and *sacral*). Your ribs (*costo*) attach to the vertebra of the thoracic section.

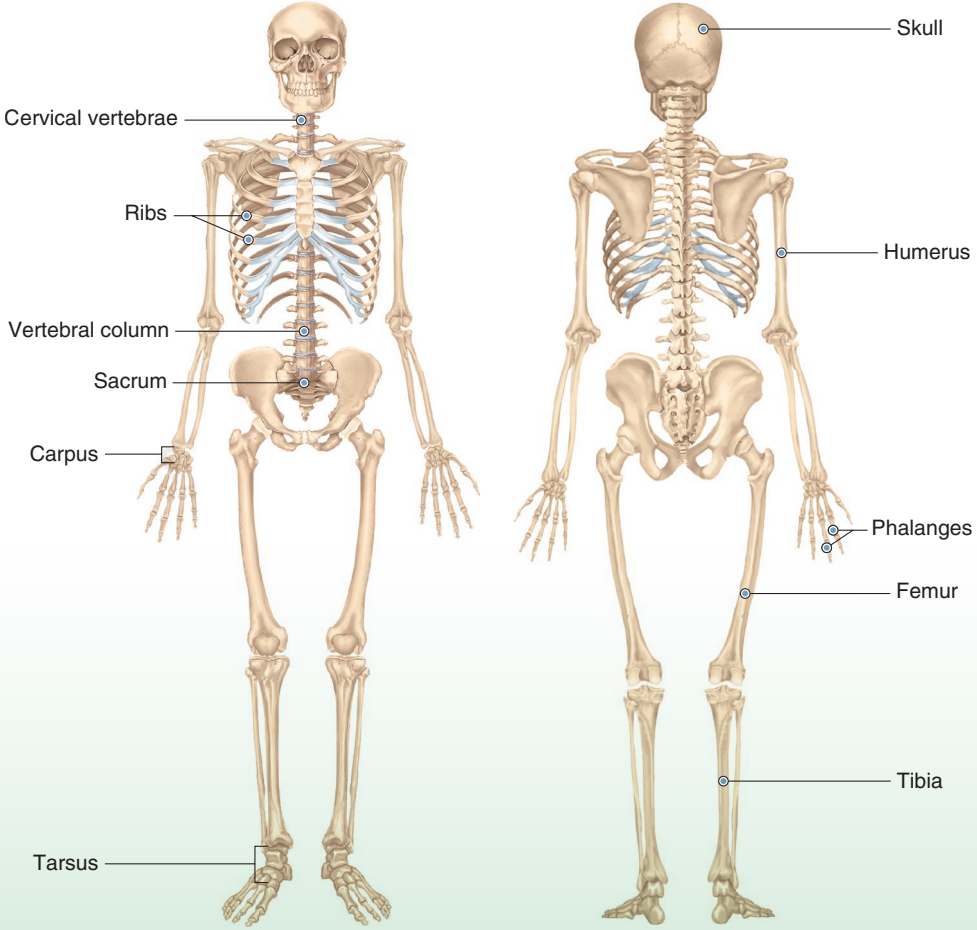
Your arms and legs branch off both sides of this central part of the skeleton. Your upper arm (*brachio*) leads to the two bones of your forearm (*radius* and *ulna*), then to your wrist (*carpo*), and finally to your fingers (*phalanges*). Your legs begin with your thigh bone (*femur*), work down to the two shin bones (*tibia* and *fibula*), move on to your ankle (*tarsal*), and ultimately reach your toes (*phalanges* again, just like the fingers).

bone

ROOT: ***oste/o***

EXAMPLES: osteopathy, periosteum

NOTES: At birth, you had over 300 bones but no kneecaps. As a full-grown adult, you now have 206 bones—including two kneecaps—a net loss of at least 96 bones. A human's neck also contains the same number of bones as a giraffe's.

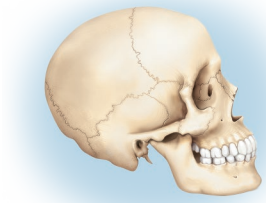


head, skull

ROOT: ***crani/o***

EXAMPLES: craniometer, craniomalacia

NOTES: The term *migraine* comes from the word *hemicrania,* meaning *half the head.* The term reflects the fact that most migraines are localized in half the patient's head.



neck

ROOT: ***cervic/o***

EXAMPLES: cervical spine, cervicitis

NOTES: Remember: When a *c* is followed by *a, o,* or *u,* it is pronounced hard like a *k.* When followed by *e* or *i,* it is pronounced soft like an *s.* Therefore, the two example words above are pronounced SIR-vih-kal and SIR-vih-SAI-tis.

vertebra

ROOT: ***spondyl/o***

EXAMPLES: spondylodynia, spondylitis

NOTES: *Vertebra* comes from Latin, for *to turn.* It is called this because the spine was once thought of as the hinge or center around which all other bones turned.

loin, lower back

ROOT: ***lumb/o***

EXAMPLES: lumbar, lumbodynia

NOTES: The root *lumbo* comes from the Latin *lumbo,* for *loin.* It refers to the region between the rib cage and the pelvis, but frankly, it makes us think about steak.

finger

ROOT: ***dactyl/o***

EXAMPLES: adactyly, dactylalgia

NOTES: The flying dinosaur called the pterodactyl gets its name from *ptero* (winged) + *dactly* (fingers), which obviously literally means *winged fingers.*

wrist

ROOT: ***carp/o***

EXAMPLES: carpectomy, metacarpal

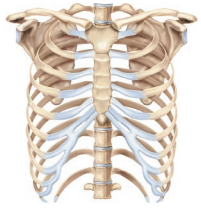
NOTES: The *carpal tunnel* is the area in the wrist where the nerves enter the hand. Repetitive motions using the wrist can cause the nerve to swell, press against the walls of the carpal tunnel, and result in numbness in the hand; this condition is called *carpal tunnel syndrome.*

rib

ROOT: ***cost/o***

EXAMPLES: costectomy, intercostal

NOTES: The English word *coast* comes from this word. Think of a country's coasts as its ribs or sides. Also, the word *accost,* which means *to come alongside someone,* comes from this word.



femur (thighbone)

ROOT: ***femor/o***

EXAMPLES: femoral artery

NOTES: The femur is the strongest bone in the human body (nonetheless, a hyena can bite right through it—*ouch*). The femur makes up about a fourth of a person's overall height.

tibia (shinbone)

ROOT: ***tibi/o***

EXAMPLES: tibiaglia

NOTES: The term *tibia* originally meant *pipe* or *flute.* Evidently, the person who named this bone thought the shinbone bore a resemblance to this instrument.

Joints

"The toe bone's connected to the heel bone. The heel bone's connected to the foot bone . . ." and so it goes. While it doesn't exactly reflect the way anatomy is taught in medical school, the old children's song has the right idea. Every bone in the body, except the hyoid bone, is connected to another, and these connection points are known as *joints.*

Not all joints allow movement. For example, the bones in your skull are bound tightly together. Usually when we think of joints, we picture the moving ones, because after all, these are the ones that we hurt when participating in sports or that cause problems in older age.

Moving joints allow motions like bending and rotating. When a joint bends, it's called *flexion.* When it straightens, it's called *extension. Abduction* is the widening of a joint to move parts away from the body. The term *adduction* means just the opposite—during adduction, the joint narrows to bring parts back toward the body.

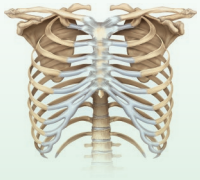
Moving joints often have surrounding support tissues to absorb shock, keep the bones aligned, and keep the bones moving smoothly. *Tendons* hold muscle to bone. *Ligaments* hold bone to bone. *Cartilage* surrounds bones at the joints and allows smooth movement among them. Under many tendons lie sacs of fluid, known as *bursae,* that help keep muscles and bones moving smoothly as well.

cartilage

ROOT: ***chondr/o***

EXAMPLES: chondritis, chondrodynia

NOTES: People who always think they are sick are called *hypochondriacs.* This term comes from *hypo-* (beneath) + *chondro* (cartilage—here specifically referring to the ribs) and reflected an ancient belief that such thoughts came from deep within the rib cage.



joint

ROOT: ***arthr/o***

EXAMPLES: arthritis, arthroscopic surgery

NOTES: Insects, spiders, scorpions, and shellfish belong to the animal family known as *arthropods.* This term comes from *arthro* (joint) + *pod* (feet) and refers to their segmented limbs. If you have ever eaten crab legs, you know exactly what I mean.

bursa

ROOT: ***burs/o***

EXAMPLES: bursitis, bursectomy

NOTES: A *bursa* is a small fluid-filled sac found near the body's joint. Bursae reduce friction and act as cushions. The word comes from the Greek word meaning *purse* or *bag.* In some places, the treasurer of an organization is called a *bursar* because he or she handles the purse. Also, to be *reim**burs**ed* means to have money *put back in your purse.*

Muscles

Think of a thick rope. Unlike a piece of string, it is not one strand but numerous strands bundled together. This design makes the rope much stronger. Your skeletal muscles are similar, as they are a collection of thousands of muscle fibers bundled together. The bundles are grouped together to form a muscle.

The muscle is encased in a thick membrane called *fascia.* The fascia helps keep the muscle together. Muscles attach to bones. If they didn't, they wouldn't be very useful. Their job is to move the bones, after all. Muscles attach to bones via *tendons,* which are thick bands of connective tissue.

tendon (connective tissue attaching muscle to bone)

ROOTS: ***ten/o, tend/o, tendin/o***

EXAMPLES: tenodynia, tendolysis, tendinitis

NOTES: From Latin, for *to stretch.* This root is also found in the English word *attend,* which means *to stretch toward.*

muscle

ROOTS: ***muscul/o, my/o, myos/o***

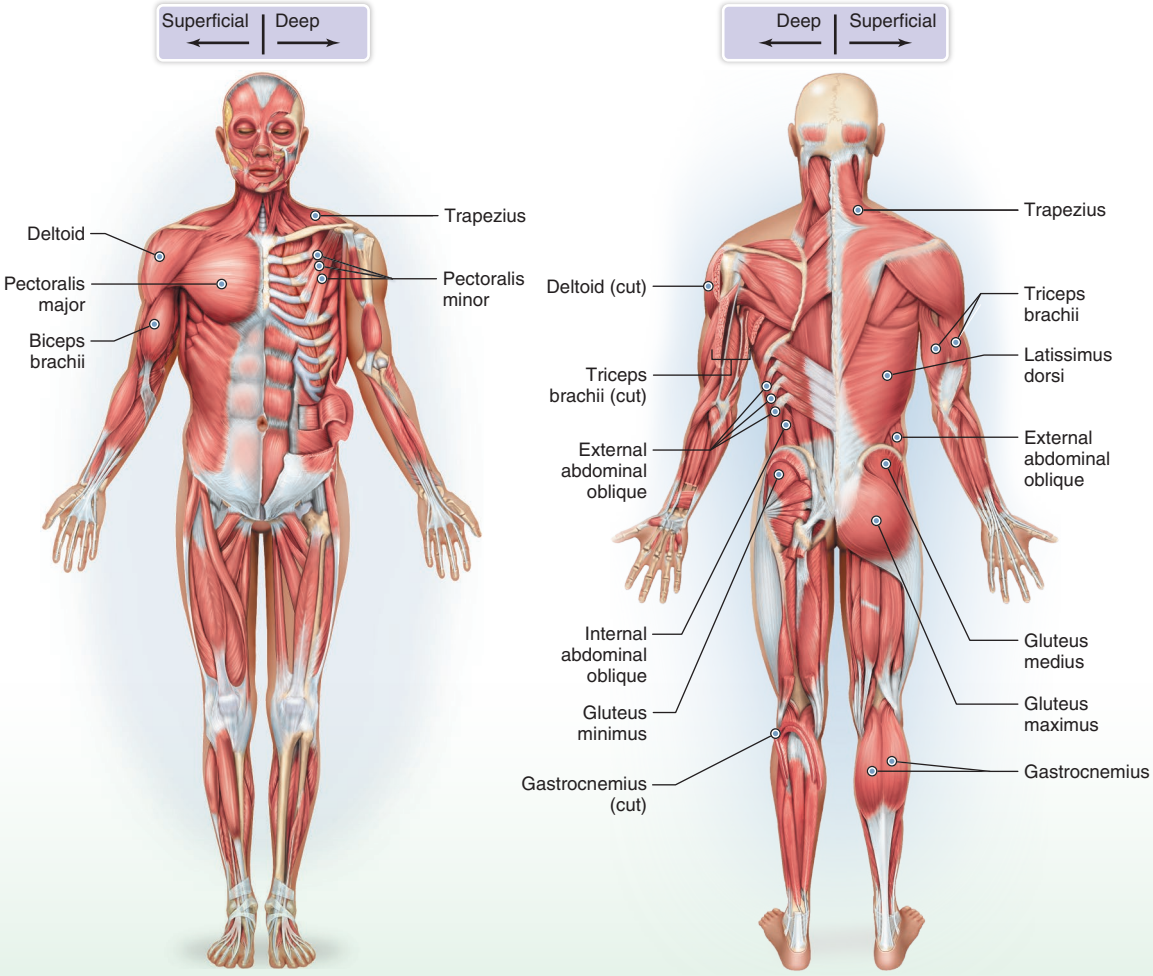
EXAMPLES: musculoskeletal, myopathy, myositis

NOTES: The term *muscle* comes from Latin, for *little mouse*. It was once thought that the movement of certain muscles looked like mice running underneath the skin. Personally, we don't see the connection, but linking muscle and mouse must have been commonplace, as Greek, German, and Arabic all have similar words for *muscle* and *mouse*.

Motion

Usually when you think about your muscles, you think of movement (*kinesio*). While this is a very important part of what they do, they're also hard at work when they're not moving. Your muscles not only move you, but they also support you.

This constant holding together—the built-in strength of your muscles—is your muscles' tone (*tono*). Without any muscle tone, your body would be completely limp. Your muscles require input from your nervous system to move and coordinate (*taxo*).



If you have problems transferring this input from the nervous system, you may suffer from partial paralysis (*paresis*) or complete paralysis (*plegia*).

tone, tension

ROOT: ***ton/o***

EXAMPLES: dystonia, tonograph

NOTES: *Tonic* is a word for a medicinal drink. This term was used because medicinal drinks were once thought to restore a person's good muscle tone.

Today, tonic water still has medicinal value. Although some people think tonic water is simply another name for carbonated soda water, tonic is actually a form of carbonated soda water in which quinine, a drug used to treat malaria, has been dissolved. Tonic water was developed to treat people who lived in tropical areas, where malaria is often prevalent.

movement, motion

ROOTS: ***kinesi/o*** **(also sometimes** ***kinet/o*****)**

EXAMPLES: kinesiology, hyperkinesia, kinetic energy

NOTES: *Akinetopsia* (pronounced ah-KEE-no-TOP-see-ah) comes from the roots *a* (no) + *kinet* (movement) + *opsia* (vision) and refers to a condition where a patient can see an object if it is still but is unable to see it if it is moving.

arrangement, order, coordination

ROOT: ***tax/o***

EXAMPLES: ataxia, hypotaxia

NOTES: *Syntax* is an English grammar term made up of the roots *syn* (together) + *tax* (arrangement) and refers to the study of the way words are arranged in a sentence.

Taxidermy, which comes from *taxo* (arrange) + *dermy* (skin), refers to the practice of removing and displaying the head and skin of an animal killed during a hunt.

The arrangement of military forces before a battle is called *tactics*.

Learning Outcome 4.1 Exercises

Additional exercises available in connect®

TRANSLATION

EXERCISE 1 Match the word part on the left with its definition on the right.

_____ 1. crani/o	a. bone
_____ 2. oste/o	b. head, skull
_____ 3. lumb/o	c. loin, lower back
_____ 4. femor/o	d. neck
_____ 5. cervic/o	e. rib
_____ 6. cost/o	f. thighbone
_____ 7. carp/o	g. vertebra
_____ 8. spondyl/o	h. wrist

EXERCISE 2 Translate the following word parts.

1. femor/o _____
2. crani/o _____
3. oste/o _____
4. cervic/o _____
5. lumb/o _____
6. cost/o _____
7. carp/o _____
8. spondyl/o _____

Learning Outcome 4.1 Exercises

EXERCISE 3 Match the word part on the left with its definition on the right. Some definitions will be used more than once.

_____ 1. burs/o	a.	arrangement, order, coordination
_____ 2. muscul/o	b.	bursa
_____ 3. arthr/o	c.	cartilage
_____ 4. ten/o, tend/o, tendin/o	d.	joint
_____ 5. ton/o	e.	movement, motion
_____ 6. my/o, myos/o	f.	muscle
_____ 7. kinesi/o	g.	tendon
_____ 8. chondr/o	h.	tone, tension
_____ 9. tax/o		

EXERCISE 4 Translate the following word parts.

1. arthr/o _____
2. burs/o _____
3. chondr/o _____
4. kinesi/o _____
5. muscul/o _____
6. my/o, myos/o _____
7. tax/o _____
8. ten/o, tend/o, tendin/o _____
9. ton/o _____

GENERATION

EXERCISE 5 Identify the word parts for the following definitions.

1. tibia _____
2. tone, tension _____
3. thighbone _____
4. cartilage _____
5. head, skull _____
6. loin, lower back _____
7. neck _____
8. finger _____
9. rib _____

EXERCISE 6 Identify the word parts for the following definitions.

1. tendon (3 roots) _____
2. bursa _____
3. tone, tension _____
4. joint _____
5. movement, motion _____
6. muscle (3 roots) _____
7. arrangement, order, coordination _____
8. cartilage _____

EXERCISE 7 Build a medical term from the information provided.

1. inflammation of the tendon _____
2. inflammation of the bursa _____
3. joint inflammation _____
4. decrease in muscle tone or tightness _____
5. decrease in muscle movement or activity _____
6. softening of a muscle _____
7. abnormal softening of the cartilage _____

4.2 Patient History, Problems, Complaints

Pain is the most common musculoskeletal medical complaint. A patient could have pain in a bone (*ostealgia*), joint (*arthralgia/arthrodynia*), tendon (*tenalgia*), or muscle (*myalgia/myodynia*). A patient may also notice a change in a muscle's appearance—a muscle may be wasting away (*atrophy*) or abnormally large (*hypertrophy*). Most of the other problems people experience relate to a change in how their muscles or joints are working.

Pain is the most common musculoskeletal medical complaint.

bones

TERM	WORD ANALYSIS
costalgia kaws-TAL-jah DEFINITION rib pain	cost / algia rib / pain
ostealgia aw-stee-AL-jah DEFINITION bone pain	oste / algia bone / pain
osteodynia aw-stee-oh-DAI-nee-ah DEFINITION bone pain	osteo / dynia bone / pain
spondylodynia spawn-dih-loh-DAI-nee-ah DEFINITION vertebra pain	spondylo / dynia vertebra / pain
tibialgia tih-bee-AL-ja DEFINITION tibia (shin) pain	tibi / algia tibia / pain

joints

TERM	WORD ANALYSIS
arthralgia ar-THRAL-jah DEFINITION joint pain	arthr / algia joint / pain
arthrodynia ar-throh-DAI-nee-ah DEFINITION joint pain	arthro / dynia joint / pain
cervicodynia sir-vih-koh-DAI-nee-ah DEFINITION neck pain	cervico / dynia neck / pain

muscles

TERM	WORD ANALYSIS
bradykinesia bray-dih-kih-NEE-zhah DEFINITION slow movement	brady / kinesia slow / movement
dyskinesia dis-kih-NEE-zhah DEFINITION inability to control movement	dys / kinesia bad / movement
dystaxia dis-TAK-see-ah DEFINITION poor coordination	dys / taxia bad / coordination
dystonia dis-TOH-nee-ah DEFINITION poor muscle tone	dys / tonia bad / muscle tone
hyperkinesia hai-per-kih-NEE-zhah DEFINITION increase in muscle movement or activity	hyper / kinesia over / movement
hypotonia hai-poh-TOH-nee-yah DEFINITION decrease in muscle tone or tigtness	hypo / tonia under / muscle tone

muscles *continued*	
TERM	**WORD ANALYSIS**
myalgia mai-AL-jah **DEFINITION** muscle pain	my / algia muscle / pain
myasthenia mai-as-THEH-nee-ah **DEFINITION** muscle weakness	my / asthenia muscle / weakness

muscles *continued*	
TERM	**WORD ANALYSIS**
tenalgia ten-AL-jah **DEFINITION** tendon pain	ten / algia tendon / pain

Learning Outcome 4.2 Exercises

TRANSLATION

EXERCISE 1 Underline and define the word parts from this chapter in the following terms.

1. tenalgia _____
2. tibialgia _____
3. costalgia _____
4. spondylodynia _____
5. cervicodynia _____
6. dyskinesia _____
7. dystaxia _____
8. dystonia _____

EXERCISE 2 Translate the following terms as literally as possible.

EXAMPLE: nasopharyngoscope *an instrument for looking at the nose and throat*

1. dystonia _____
2. dyskinesia _____
3. hyperkinesia _____
4. myasthenia _____

GENERATION

EXERCISE 3 Build a medical term from the information provided.

EXAMPLE: inflammation of the sinuses *sinusitis*

1. tendon pain _____
2. tibia (shin) pain _____
3. rib pain _____
4. vertebra pain _____
5. neck pain _____
6. decrease in muscle tone _____
7. slow movement _____
8. poor coordination _____

Learning Outcome 4.2 Exercises

EXERCISE 4 Multiple-choice questions. Select the correct answer(s).

1. Select the term that means *bone pain.*
   a. arthralgia
   b. myalgia
   c. ostealgia
   d. arthrodynia
   e. osteodynia

2. Select the term that means *joint pain.*
   a. arthralgia
   b. myalgia
   c. ostealgia
   d. arthrodynia
   e. osteodynia

3. Select the term that means *muscle pain.*
   a. arthralgia
   b. myalgia
   c. ostealgia
   d. arthrodynia
   e. osteodynia

OBJECTIVE

4.3 Observation and Discovery

Evaluation of bone issues is commonly performed with imaging, including MRI.

When a patient with musculoskeletal problems is evaluated, the physical exam is very important. The exam of the muscles and bones focuses mainly on typical signs of inflammation: redness, swelling, heat, and pain. Any of these symptoms can indicate that an infection or inflammation is present.

There are not many skills that are specific to evaluating bones. Patients with fractured bones may present with a limp or pain upon touching or pressure.

Much evaluation of bone issues is performed with imaging. The bread-and-butter imaging method for bones is the simple x-ray. An x-ray can reveal fractures, bone destruction (*osteolysis*), and even extra bone growth (*exostosis*). More involved imaging methods include computed tomography (CT), computed axial tomography (CAT), or magnetic resonance imaging (MRI).

Examining a patient's joint is usually more involved. While the health care provider also checks for the same signs of inflammation, the joint's ability to move also needs to be checked. This is called the joint's range of motion (ROM). The provider also checks to make sure the joint is not moving in a direction that it's not supposed to move in. This extra movement is called *joint laxity.* The provider also checks for fluid around the joint (*effusion*). There are several diagnostic procedures specific to the joints.

4.3 Observation and Discovery

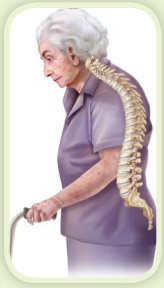
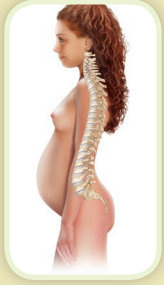
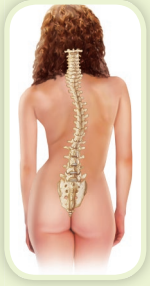
To get a better view, the health care provider can inject dye into the joint and perform an MRI. Other means of investigating a joint include injecting a needle and collecting fluid to send to the lab (*arthrocentesis*) or even using a camera-like device to look inside the joint (*arthroscope*).

Examining muscles often means checking how they work. The function of muscles can be evaluated by checking their tone (*myotonia*) or strength. A more involved way to check this is electromyography. In this procedure, two needles are inserted into a muscle to measure the muscle activity.

diagnostic procedures

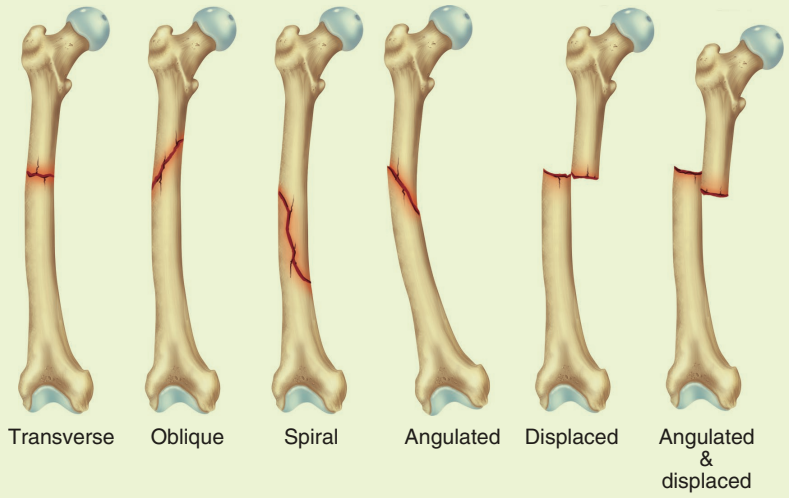
TERM	WORD ANALYSIS
arthrocentesis ar-throh-sin-TEE-sis **DEFINITION** puncture of a joint 	arthro / centesis joint / puncture
arthrogram AR-throh-gram **DEFINITION** visual record of a joint	arthro / gram joint / record
arthroscope AR-throh-skohp **DEFINITION** instrument for looking into a joint	arthro / scope joint / instrument for looking
arthroscopy ar-THRAW-skoh-pee **DEFINITION** procedure of looking into a joint 	arthro / scopy joint / looking procedure
computed axial tomography (CAT) kom-PYOO-ted AK-see-al taw-MAW-grah-fee **DEFINITION** imaging procedure using a computer to produce cross sections along an axis	axi / al axis / pertaining to tomo / graphy cut / recording procedure

spinal curvatures

TERM	WORD ANALYSIS
kyphosis kai-FOH-sis **DEFINITION** humped back; abnormal forward curvature of the upper spine 	kyph / osis bent / condition
lordosis lor-DOH-sis **DEFINITION** sway back; abnormal forward curvature of the lower spine 	lord / osis bent backward / condition
scoliosis SKOH-lee-OH-sis **DEFINITION** crooked back; abnormal lateral curvature of the spine 	scoli / osis crooked / condition

bones

TERM	WORD ANALYSIS
fracture FRAK-shur **DEFINITION** a bone break	**from Latin, for** *break*
osteodystrophy aw-stee-oh-DIH-stroh-fee **DEFINITION** poor bone development	**osteo / dys / trophy** bone / bad / nourishment
spondylitis spawn-dih-LAI-tis **DEFINITION** vertebra inflammation	**spondyl / itis** vertebra / inflammation
spondylomalacia spawn-dih-loh-mah-LAY-shah **DEFINITION** softening of the vertebra	**spondylo / malacia** vertebra / softening
tarsoptosis tar-sawp-TOH-sis **DEFINITION** flat feet	**tarso / ptosis** ankle / drooping condition



muscles

TERM	WORD ANALYSIS
atrophy A-troh-fee	a / trophy no / nourishment
DEFINITION underdevelopment, decrease, or loss of muscle tissue	

Normal

muscles *continued*

TERM	WORD ANALYSIS
hypertrophy hai-PER-troh-fee	hyper / trophy over / nourishment
DEFINITION overdevelopment of muscle tissue	
myolysis mai-AW-lih-sis	myo / lysis muscle / loss
DEFINITION loss of muscle tissue	

Learning Outcome 4.3 Exercises

TRANSLATION

EXERCISE 1 Underline and define the word parts from this chapter in the following terms.

1. spondylitis _____
2. arthroscopy _____
3. tarsoptosis _____
4. osteodystophy _____
5. myotonia (2 roots) _____

Learning Outcome 4.3 Exercises

EXERCISE 2 Match the term on the left with its definition on the right.

_____	1. fracture	a. imaging procedure using a computer to produce cross sections along an axis
_____	2. atrophy	b. humped back; abnormal forward curvature of the upper spine
_____	3. scoliosis	c. sway back; abnormal forward curvature of the lower spine
_____	4. computed axial tomography	d. crooked back; abnormal lateral curvature of the spine
_____	5. hypertrophy	e. from Latin, for *break;* a bone break
_____	6. lordosis	f. underdevelopment, decrease, or loss of muscle tissue
_____	7. kyphosis	g. overdevelopment of muscle tissue

EXERCISE 3 Translate the following terms as literally as possible.

EXAMPLE: nasopharyngoscope *an instrument for looking at the nose and throat*

1. tarsoptosis _____
2. kyphosis _____
3. lordosis _____
4. scoliosis _____

GENERATION

EXERCISE 4 Build a medical term from the information provided.

EXAMPLE: inflammation of the sinuses *sinusitis*

1. vertebra inflammation _____
2. softening of the vertebra _____
3. instrument for looking into a joint _____
4. procedure of looking into a joint _____

EXERCISE 5 Multiple-choice questions. Select the correct answer(s).

1. Select the terms that pertain to bone.
   a. fracture
   b. arthrocentesis
   c. atrophy
   d. hypertrophy
   e. osteodystrophy
2. Select the terms that pertain to joints.
   a. fracture
   b. arthrocentesis
   c. atrophy
   d. hypertrophy
   e. osteodystrophy
3. Select the terms that pertain to muscle.
   a. fracture
   b. arthrocentesis
   c. atrophy
   d. hypertrophy
   e. osteodystrophy
4. What does the abbreviation *CAT* stand for?
   a. chondro-arthrodysplasia tenotomy
   b. computed axial tomography
   c. computed arthrography telectasia
   d. chondro-axial tomography
5. Which of the following terms means *fluid build-up?*
   a. affusion
   b. effusion
   c. effision
   d. exfusure

EXERCISE 6 Briefly describe the difference between each pair of terms.

1. arthrogram, myogram _____

_____

4.4 Diagnosis and Pathology

As mentioned earlier, fractures are a common reason why patients see health care providers. Fractures are more common in people with weaker bones. Bone loss (*osteopenia*) can be related to age or to a diet that is deficient in calcium. Osteopenia leads to soft bones in children (*osteomalacia*) or weak, frail bones in adults (*osteoporosis*). Some patients suffer from infections of the bone (*osteomyelitis*), a serious illness that often requires hospitalization.

The vertebral column of bones is susceptible to injury. Gymnasts, football players, or weight lifters who bend their backs too far can suffer small stress fractures of their vertebra (*spondylolysis*). If the fracture is severe, the vertebrae can slip onto one another (*spondylolisthesis*). A very serious version of this condition can advance to problems with a narrowing of the space for the spinal cord (*spinal stenosis*).

You move your joints all the time. They act as shock absorbers for your body, and they take a lot of abuse. It should come as no surprise, then, that joint problems are a very common medical concern. A swollen, painful joint (*arthritis*) can have many causes—the most common being excessive wear and tear. This type is called *osteoarthritis.* As the cartilage between the bones in a joint breaks down, the bones eventually rub together and the joint becomes painful to move. This is a very common reason for a joint replacement surgery.

Other causes of arthritis include infection (*septic arthritis*) and a disease of joint inflammation (*rheumatoid arthritis*). Other parts of the joint area that can cause problems are the bursa (*bursitis*) and tendon (*tendonitis*). These are not usually caused by an injury; instead, they are a result of normal wear and tear over time.

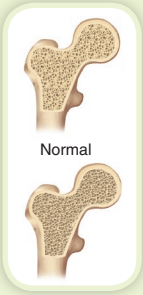
Unusual inflammatory conditions also affect the muscles. Muscles can become inflamed (*myositis*). Sometimes this can involve the skin as well (*dermatomyositis*). General problems with all the muscles are called *myopathies. Myasthenia gravis* and *muscular dystrophy* are two of the most common types of myopathy.

Like any system in the body, the musculoskeletal system can develop tumors. Tumors can develop in the bones (*osteosarcoma, osteocarcinoma, osteochondroma*), or they can spread to the bones from other parts of the body. Your muscles can get tumors (*myoma*) as well—one example is an *osteosarcoma.*

bones

TERM	WORD ANALYSIS
osteitis AW-stee-AI-tis	oste / itis bone / inflammation
DEFINITION bone inflammation	
osteochondritis AW-stee-oh-kon-DRAI-tis	osteo / chondr / itis bone / cartilage / inflammation
DEFINITION inflammation of bone and cartilage	
osteochondroma AW-stee-oh-kon-DROH-mah	osteo / chondr / oma bone / cartilage / tumor
DEFINITION a tumor made up of bone and cartilage, also known as an exostosis made up of cartilage	
osteomalacia AW-stee-oh-mah-LAY-shah	osteo / malacia bone / softening
DEFINITION softening of the bone	
osteomyelitis AW-stee-oh-MAI-eh-LAI-tis	osteo / myel / itis bone / marrow / inflammation
DEFINITION inflammation of the bone and bone marrow	
osteopenia AW-stee-oh-PEE-nee-yah	osteo / penia bone / deficiency
DEFINITION reduction in bone volume	

bones *continued*

TERM	WORD ANALYSIS
osteoporosis AW-stee-oh-por-OH-sis **DEFINITION** loss of bone density  	osteo / por / osis bone / pore / condition
spondylolisthesis SPAWN-dih-loh-lis-THEE-sis **DEFINITION** the slipping or dislocation of a vertebra 	spondylo / listhesis vertebra / slipping
spondylosis SPAWN-dih-LOH-sis **DEFINITION** vertebra condition	spondyl / osis vertebra / condition

joints

TERM	WORD ANALYSIS
arthritis ar-THRAI-tis **DEFINITION** joint inflammation	arthr / itis joint / inflammation
arthropathy ar-THRAW-pah-thee **DEFINITION** joint disease	arthro / pathy joint / disease
bursitis bur-SAI-tis **DEFINITION** inflammation of the bursa 	burs / itis bursa / inflammation

joints *continued*

TERM	WORD ANALYSIS
osteoarthritis AW-stee-oh-ar-THRAI-tis **DEFINITION** inflammation of the joints, specifically those that bear weight	osteo / arthr / itis bone / joint / inflammation
rheumatoid arthritis ROO-mah-toyd ar-THRAI-tis **DEFINITION** inflammation of the joints; it is called *rheumatoid* because its symptoms resemble those of rheumatic fever 	rheumat / oid rheumatic fever / resembling arthr / itis joint / inflammation

muscles

TERM	WORD ANALYSIS
chondroma kawn-DROH-mah **DEFINITION** a tumor-like growth of cartilage tissue	chondr / oma cartilage / tumor
costochondritis KAW-stoh-kawn-DRAI-tis **DEFINITION** inflammation of the cartilage of the rib	costo / chondr / itis rib / cartilage / inflammation
muscular dystrophy MUS-kyoo-lar DIS-troh-fee **DEFINITION** disorder characterized by poor muscle development 	muscul / ar muscle / pertaining to dys / trophy bad / nourishment
myoma mai-OH-mah **DEFINITION** a muscle tumor	my / oma muscle / tumor
myopathy mai-AW-pah-thee **DEFINITION** muscle disease	myo / pathy muscle / disease

muscles *continued*	
TERM	**WORD ANALYSIS**
myosarcoma MAI-oh-sar-KOH-mah	myo / sarc / oma muscle / flesh / tumor
DEFINITION a cancerous muscle tumor	
myositis MAI-oh-SAI-tis	myos / itis muscle / inflammation
DEFINITION muscle inflammation	

muscles *continued*	
TERM	**WORD ANALYSIS**
tendinitis TEN-dih-NAI-tis	tendin / itis tendon / inflammation
tendonitis TEN-dah-NAI-tis	tendon / itis tendon / inflammation
DEFINITION tendon inflammation	
NOTE: These words are both accepted spellings for the same condition.	

Learning Outcome 4.4 Exercises

TRANSLATION

EXERCISE 1 Underline and define the word parts from this chapter in the following terms.

1. osteitis _____
2. tendinitis _____
3. tendonitis _____
4. myositis _____
5. rheumatoid arthritis _____
6. myoma _____
7. muscular dystrophy _____
8. osteomalacia _____
9. osteopenia _____
10. osteochondroma (2 roots) _____
11. spondylolisthesis _____
12. costochondritis (2 roots) _____

EXERCISE 2 Match the term on the left with its definition on the right.

_____	1. myosarcoma	a. loss of bone density
_____	2. osteoporosis	b. vertebrate condition
_____	3. spondylosis	c. a cancerous muscle tumor
_____	4. rheumatoid arthritis	d. a tumor made up of bone and cartilage
_____	5. myoma	e. inflammation of the joints, the symptoms of which resemble rheumatic fever
_____	6. chondroma	f. muscle tumor
_____	7. osteochondroma	g. a tumor-like growth of cartilage tissue

Learning Outcome 4.4 Exercises

EXERCISE 3 Translate the following terms as literally as possible.

EXAMPLE: nasopharyngoscope *an instrument for looking at the nose and throat*

1. tendinitis _____
2. tendonitis _____
3. arthropathy _____
4. osteomyelitis _____
5. osteoporosis _____
6. spondylolisthesis _____

GENERATION

EXERCISE 4 Build a medical term from the information provided.

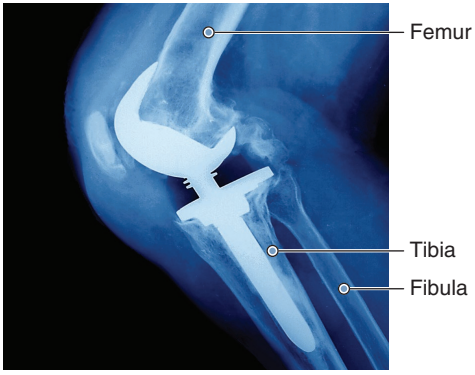
EXAMPLE: inflammation of the sinuses *sinusitis*

1. inflammation of the bursa _____
2. inflammation of the cartilage and rib _____
3. overdevelopment (*trophic*) vertebrae inflammation _____
4. bone deficiency _____

EXERCISE 5 Multiple-choice questions. Select the correct answer(s).

1. Select the terms that have the root meaning *muscle.*
   a. osteitis
   b. arthritis
   c. myositis
   d. osteoarthritis
   e. osteochondritis
2. Select the terms that have the root meaning *joint.*
   a. osteitis
   b. arthritis
   c. myositis
   d. osteoarthritis
   e. osteochondritis
3. Select the terms that have the root meaning *cartilage.*
   a. osteitis
   b. arthritis
   c. myositis
   d. osteoarthritis
   e. osteochondritis
4. Select the terms that have the root meaning *bone.*
   a. osteitis
   b. arthritis
   c. myositis
   d. osteoarthritis
   e. osteochondritis
5. A disorder characterized by poor muscle development is known as
   a. myositis
   b. myosarcoma
   c. myopathy
   d. muscular dystrophy

4.5 Treatments and Therapies



Common procedures for the musculoskeletal system include knee and hip replacements.

The medicines used to treat musculoskeletal problems are designed to decrease pain (*analgesic*) or inflammation (*anti-inflammatory*). The most commonly used medicines for both are known as *nonsteroidal anti-inflammatory drugs* (NSAIDs). Ibuprofen is a common example of this type of medicine. Other nonsurgical treatments include *physical therapy,* in which patients exercise and stretch in order to heal injuries, or wearing a device used to relieve tension on a joint (*orthotics*). Shoe inserts are a very common type of orthotic.

When nonsurgical treatment fails, surgery may be necessary. *Orthopedic* surgery deals with joints and bones. Many of the tools used in orthopedic surgery look like they came from a home improvement store—including drills, saws, and hammers. These tools are used to cut into bone (*osteotomy*), joints (*arthrotomy*), or muscle (*myotomy*). Sometimes they remove part or all of these structures (*osteectomy, arthrectomy, myectomy*).

When defective areas or cancer are present in a bone, the diseased area of bone must be removed before new bone (*graft*) or artificial hardware (*prosthesis*) can be installed. This reconstruction of bone procedure is called *osteoplasty.*

Similar procedures exist for joints. Sometimes, removal of a diseased joint (*arthrectomy*) is necessary, followed by a reconstruction of the joint with a prosthesis (*arthroplasty*). These are common treatments for diseased knees and hips. A less aggressive surgery for fixing diseased joints, *chondroplasty,* involves fixing the bad cartilage of a joint. It is very common in athletes and older patients with chronic osteoarthritis.

Not all orthopedic surgery involves complete reconstruction of a bone or joint. Sometimes something that has snapped must be repaired, as in a tendon repair (*tenorrhaphy*) or a muscle repair (*myorrhaphy*). Other times, new attachments must be made. This can involve attaching leftover muscle to bone (*myodesis*) after an amputation or fixing two bones surrounding a joint (*arthrodesis*). While the latter procedure results in immobility of the joint, it may be necessary to relieve pain.

drugs

TERM	WORD ANALYSIS
analgesic A-nal-JEE-zik **DEFINITION** a drug that relieves pain	an / alge / sic no / pain / agent 
antiarthritic AN-tee-ar-THRIH-tik **DEFINITION** a drug that opposes joint inflammation	anti / arthri / tic against / joint (pain) / agent
anti-inflammatory AN-tee-in-FLA-mah-TOR-ee **DEFINITION** a drug that opposes inflammation	anti / inflammatory against / inflammation

4.5 Treatments and Therapies

bones

TERM	WORD ANALYSIS
carpectomy kar-PEK-toh-mee	carp / ectomy wrist / removal
DEFINITION removal of all or part of the wrist	
costectomy kaws-TEK-toh-mee	cost / ectomy rib / removal
DEFINITION removal of a rib	
craniectomy KRAY-nee-EK-toh-mee	crani / ectomy skull / removal
DEFINITION removal of a portion of the skull	
craniotomy KRAY-nee-AW-toh-mee	cranio / tomy skull / incision
DEFINITION removal of a portion of the skull NOTE: The difference between a craniectomy and a craniotomy is whether or not the piece of bone is replaced. After a craniotomy, the piece of bone that was removed to allow surgical access to the brain is replaced. In a craniectomy, the piece of bone is not replaced.	

joints

TERM	WORD ANALYSIS
arthroplasty AR-throh-PLAS-tee	arthro / plasty joint / reconstruction
DEFINITION reconstruction of a joint	
arthrotomy ar-THRAW-toh-mee	arthro / tomy joint / incision
DEFINITION incision into a joint	
chondrectomy kawn-DREK-toh-mee	chondr / ectomy cartilage / removal
DEFINITION removal of cartilage	

muscles

TERM	WORD ANALYSIS
myectomy mai-EK-toh-mee	my / ectomy muscle / removal
DEFINITION removal of muscle	
myomectomy MAI-oh-MEK-toh-mee	my / om / ectomy muscle / tumor / removal
DEFINITION removal of a muscle tumor NOTE: It is easy to miss the *oma* root in this word because the *o* looks like it belongs with *myo* and the *a* gets swallowed up by *ectomy*. The *m* is your clue. Don't just read over it—it needs to be explained.	
myoplasty MAI-oh-PLAS-tee	myo / plasty muscle / reconstruction
DEFINITION muscle reconstruction	
myorrhaphy mai-OR-ah-fee	myo / rrhaphy muscle / suture
DEFINITION muscle suture	
myotomy mai-AW-toh-mee	myo / tomy muscle / incision
DEFINITION incision into muscle	
tenorrhaphy ten-OR-ah-fee	teno / rrhaphy tendon / suture
DEFINITION suture of a tendon	

Learning Outcome 4.5 Exercises

TRANSLATION

EXERCISE 1 Underline and define the word parts from this chapter in the following terms.

1. myodesis _____
2. arthroplasty _____
3. costectomy _____
4. craniectomy _____
5. myomectomy _____

Learning Outcome 4.5 Exercises

EXERCISE 2 Match the term on the left with its definition on the right.

_____	1. arthrotomy	a. incision into a joint
_____	2. carpectomy	b. incision into a muscle
_____	3. chondrectomy	c. incision into the skull
_____	4. craniotomy	d. removal of all or part of the wrist
_____	5. myectomy	e. removal of cartilage
_____	6. myotomy	f. removal of muscle

EXERCISE 3 Translate the following terms as literally as possible.

EXAMPLE: nasopharyngoscope *an instrument for looking at the nose and throat*

1. myotomy _____
2. analgesic _____
3. antiarthritic _____
4. anti-inflammatory _____

GENERATION

EXERCISE 4 Build a medical term from the information provided.

EXAMPLE: inflammation of the sinuses *sinusitis*

1. reconstruction of a joint _____
2. reconstruction of a muscle _____
3. removal of a rib _____
4. removal of all or part of the wrist _____
5. removal of cartilage _____
6. muscle reconstruction _____
7. suture of a muscle _____
8. suture of a tendon _____

EXERCISE 5 Briefly describe the difference between each pair of terms.

1. myectomy, myomectomy _____
2. craniectomy, craniotomy _____

4.6 Electronic Health Records

Orthopedic Clinic Note

S Subjective

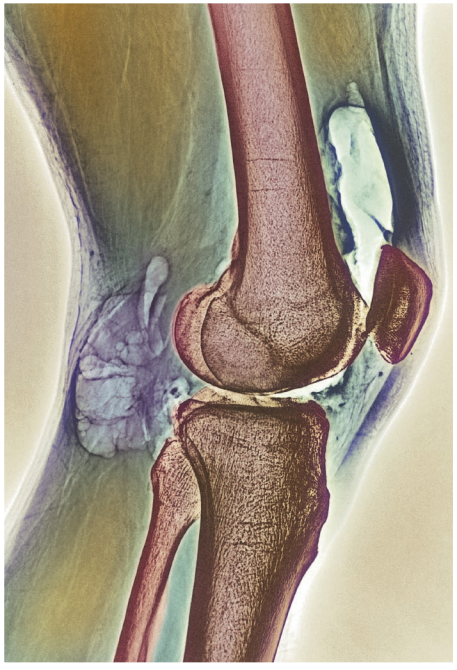
History of Present Illness:
Mrs. Maureen Goldman presented to the orthopedic clinic with a chronic history of **arthralgia.** She was previously diagnosed with **osteoarthritis.** She was initially treated with **NSAIDs** and an **orthotic** that helped for a time; however, Mrs. Goldman's condition worsened and was eventually treated with an intraarticular steroid injection. She reported improved pain and range of motion. The knee pain returned last year, however, and she was treated in our clinic with **arthroscopic** surgery. While it helped some, she reports it didn't completely get rid of her symptoms, and she returns today for evaluation.
PMHx: **Septic arthritis** requiring hospitalization and **IV** antibiotics 4 years ago.

O Objective

Physical Exam:
RR: 16; HR: 70; Temp: 98.6; BP: 110/60
Gen: Alert, oriented.
CV: RRR, no murmurs.
Resp: CTA.
Musculoskeletal: **Crepitation** in right knee, decreased **ROM.** Mild **effusion.** Mild muscular **atrophy** of right quadriceps muscle compared to left.
Labs: **ESR** normal, joint **aspiration** normal.
X-ray: **Subchondral cysts, subchondral sclerosis,** joint space narrowing.

A Assessment

DDx: Includes **osteoarthritis, rheumatoid arthritis,** and bursitis. Given her history of osteoarthritis on exam and the results of the x-ray and joint aspiration, I believe Mrs. Goldman has **OA** that has failed to respond to previous treatments.



P Plan

I have discussed treatment options, and the patient prefers surgery. I have explained the risks and benefits of a **total knee replacement arthroplasty** and she understands. I have scheduled her for surgery next month.
—Electronically signed by
Ricchelle Mitchell, MD
01/26/2015 11:22 AM

Learning Outcome 4.6 Exercises

EXERCISE 1 Match the term on the left with its definition on the right.

_____ 1. ROM	a.	underdevelopment, decrease, or loss of muscle tissue
_____ 2. atrophy	b.	procedure of looking into a joint
_____ 3. osteoarthritis	c.	beneath the cartilage
_____ 4. arthroplasty	d.	reconstruction of a joint
_____ 5. arthroscopy	e.	range of motion
_____ 6. subchondral	f.	inflammation of the joints, specifically those that bear weight

EXERCISE 2 Fill in the blanks.

1. Mrs. Goldman was previously diagnosed with _____ (abbreviation for inflammation of the joints, specifically those that bear weight).
2. Along with _____ (nonsteroidal anti-inflammatory drugs), she was given an *orthotic* (give definition: _____).

EXERCISE 3 True or false questions. Indicate true answers with a T and false answers with an F.

1. Mrs. Goldman has a chronic history of bone pain. _____
2. Mrs. Goldman was initially treated with nonsteroidal anti-inflammatory drugs. _____
3. After the intraarticular steroid injection, Mrs. Goldman reported improved arthralgia and ROM. _____
4. Mrs. Goldman was previously hospitalized for joint inflammation caused by infection. _____
5. Mrs. Goldman's right quadricep muscle had an unusual new growth. _____
6. Mrs. Goldman's x-ray revealed hardening of the cartilage. _____
7. After understanding the risks involved, Mrs. Goldman has agreed to a TKR joint reconstruction. _____

EXERCISE 4 Multiple-choice questions. Select the correct answer.

1. *Arthroscopic surgery* is
   a. closed reduction
   b. external fixation
   c. surgery on a bone
   d. surgery on a joint
2. *Septic arthritis* requires which of the following forms of treatment?
   a. antibiotics
   b. prosthesis
   c. osteectomy
   d. myomectomy
3. The term *subchondral* means
   a. beneath the cartilage
   b. beneath the knee
   c. beneath the joint
   d. beneath the muscle
4. The term *arthrostenosis* means
   a. joint narrowing
   b. muscle narrowing
   c. joint hardening
   d. muscle hardening

Additional exercises available in connect®

Chapter Review exercises, along with additional practice items, are available in Connect!

Quick Reference

quick reference glossary of roots

ROOT	Definition	ROOT	Definition
arthr/o	joint	**kinesi/o**	movement, motion
burs/o	bursa	**lumb/o**	loin, lower back
carp/o	wrist	**muscul/o**	muscle
cervic/o	neck	**my/o, myos/o**	muscle
chondr/o	cartilage	**oste/o**	bone
cost/o	rib	**spondyl/o**	vertebra
crani/o	head, skull	**tax/o**	arrangement, order, coordination
dactyl/o	finger	**ten/o, tend/o, tendin/o**	tendon
femor/o	femur	**tibi/o**	tibia
		ton/o	tone, tension

musculoskeletal system abbreviations

ABBREVIATION	DEFINITION
Fx	fracture
ACL	anterior cruciate ligament
MCL	medial collateral ligament
LCL	lateral collateral ligament
PCL	posterior cruciate ligament
C1–C7	cervical (of the neck) vertebrae
T1–T12	thoracic (of the chest) vertebrae
L1–L5	lumbar (of the loin) vertebrae
S1–S5	sacral vertebrae
CAT	computed axial tomography
CT	computed tomography
CTS	carpal tunnel syndrome
EMG	electromyogram
FROM	full range of motion
MD	muscular dystrophy
NSAID	nonsteroidal anti-inflammatory drug
OA	osteoarthritis
PT	physical therapy
RA	rheumatoid arthritis
ROM	range of motion
TKR	total knee replacement