prep kit

Assessment in Action

You are on the first aid team at a local scout camp. The scout leaders are conducting a funny skit on a stage at the main lodge. One of the scouts in the skit jumps in the air and lands on his side. As he runs off the stage toward you, he is in obvious pain and is clutching his side. He lies down and a knife falls to the ground. You hear a sucking sound coming from the wound on his side whenever the victim inhales.

Directions: Circle Yes if you agree with the statement; circle No if you disagree.

Yes No **1.** You should check the victim's breathing and treat accordingly.

Yes No **2.** Blood bubbling out of the wound during breathing is a sign of a sucking chest wound.

Yes No **3.** This wound should be sealed on three sides to prevent air from being trapped in the chest cavity.

Yes No **4.** If the victim begins to have trouble breathing, do not remove the seal to reapply.

Yes No **5.** This is a medical emergency and 9-1-1 should be called immediately.

Check Your Knowledge

Directions: Circle Yes if you agree with the statement; circle No if you disagree.

Yes No **1.** Stabilize a broken rib with a soft object, such as a pillow or blanket, tied to the chest.

Yes No **2.** Cover a sucking chest wound with a piece of plastic taped down on three sides.

Yes No **3.** Remove a penetrating or impaled object from the chest or the abdomen.

Yes No **4.** A flail chest refers to a single broken rib.

Yes No **5.** Keep the victim with a broken pelvis still.

Yes No **6.** Sharp pain while breathing can be a sign of a rib fracture.

Yes No **7.** Rib fractures should be treated by tightly taping the chest.

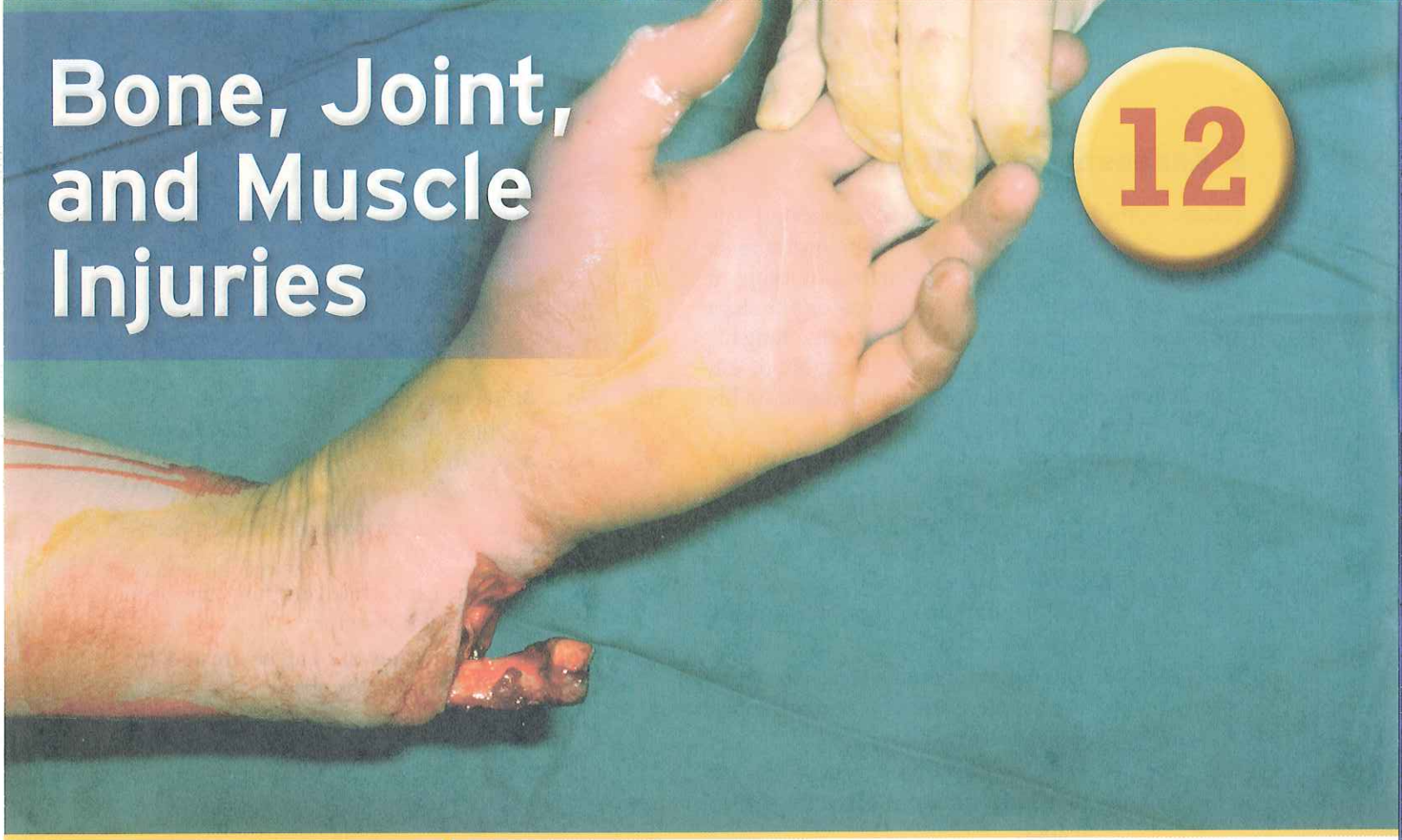
Yes No **8.** Most victims with abdominal injuries are more comfortable with their knees bent.

Yes No **9.** Leave a chest wound alone if you hear air being sucked in and out.

Yes No **10.** A broken pelvis can threaten life because of the large amount of blood lost.

Bone, Joint, and Muscle Injuries

12



chapter at a glance

Bone Injuries

Bone, joint, and muscle injuries are among the most common reasons for seeking medical care. Although rarely fatal, they often result in short- or long-term disability.

Fractures

The real problems are not the broken bones themselves but rather the potential injury to the vital organs next to them. People usually do not die of broken bones. They die of airway obstruction, blood loss, and brain injury. However, broken bones can be painful and debilitating and can cause lifelong aggravation, disability, and deformity.

The terms *fracture* and *broken bone* have the same meaning: a break or crack in a bone. There are two categories of fractures:

- Closed fracture. The skin is intact, and no wound exists anywhere near the fracture site Figure 1A.
- Open fracture. The skin over the fracture has been broken. The wound may result from the bone protruding through the skin or from a direct blow that cut the skin at the time of the fracture. The bone may not always be visible in the wound Figure 1B.

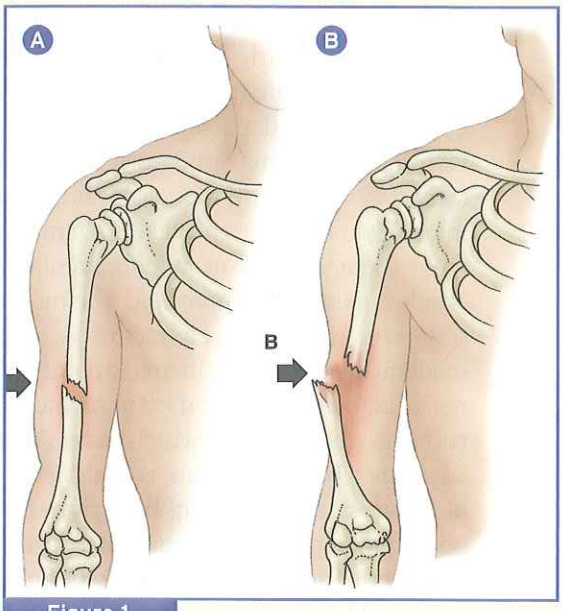


Figure 1

A. Closed fracture. B. Open fracture.

Recognizing Fractures

It may be difficult to tell if a bone is broken Figure 2. When in doubt, treat the injury as a fracture. Use the mnemonic DOTS to assess for an injury—Deformity, Open wound, Tenderness, Swelling.

- *Deformity* might not be obvious. Compare the injured part with the uninjured part on the other side.
- *Open wound* may indicate an underlying fracture.
- *Tenderness* and pain are commonly found only at the injury site. The victim usually will be able to point to the site of the pain. A useful procedure for detecting a fracture is to feel along the bone gently; a victim's complaint about pain or tenderness serves as a reliable sign of a fracture.
- *Swelling* caused by bleeding happens rapidly after a fracture.

Additional signs and symptoms include the following:

- *Loss of use* may or may not occur.
- *Guarding* occurs when motion produces pain; the victim refuses to use the injured part. Sometimes, however, the victim is able to move a fractured limb with little or no pain.

Figure 2

X-rays of a victim's forearm showing the fracture before and after setting.

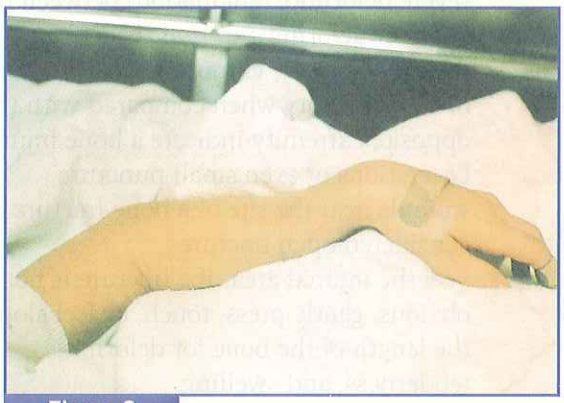


Figure 3

Forearm fracture.

- A *grating sensation*, called crepitus, can be felt and sometimes even heard when the ends of the broken bone rub together. Do not move the injured limb in an attempt to detect it Figure 3.
- The history of the injury can lead you to suspect a fracture whenever a serious accident has happened. The victim may have heard or felt the bone snap.

Care for Fractures

1. Perform a primary check for life-threatening conditions. A fracture, even an open fracture, seldom presents an immediate threat to life.

Treatment should be deferred until after you have handled any life-threatening conditions such as opening an airway or controlling massive bleeding. Only when all life-threatening conditions have been dealt with is it appropriate to identify and stabilize fractures. Determine what happened and the location of the injury.

2. Gently remove clothing covering the injured area. Cut clothing at the seams if necessary.
3. Examine the area by looking and feeling for DOTS.
   - Look at the injury site. Swelling and black-and-blue marks, which indicate escape of blood into the tissues, may come from the bone end or associated muscular and blood vessel damage. Shortening or severe deformity (angulation) between the joints or deformity around the joints, shortening of the extremity, and rotation of the extremity when compared with the opposite extremity indicate a bone injury. Lacerations or even small puncture wounds near the site of a bone fracture are considered open fractures.
   - Feel the injured area. If a fracture is not obvious, gently press, touch, or feel along the length of the bone for deformities, tenderness, and swelling.
4. Check blood flow and nerves. Use the mnemonic CSM (circulation, sensation, movement) as a way of remembering what to do Skill Drill 1:
   - *Circulation.* For an arm injury, feel for the radial pulse (located on the thumb side of the wrist); use the posterior tibial pulse (located between the inside ankle bone and the Achilles tendon) for a leg injury. A pulseless arm or leg is a significant emergency that requires immediate surgical care. If there is no pulse, gently realign the extremity to try to restore the blood flow. Some experts recommend the capillary refill test. (Press on a fingernail or toenail, then release it. If circulation is normal, the nail bed should return to its normal color within 2 seconds.) Performing the capillary refill test in the dark or the cold may limit its accuracy (**Steps** 1 and 2).
   - *Sensation.* This is the most useful early sign. Lightly touch or squeeze one of the victim's toes or fingers and ask the victim what he or she feels (**Steps** 3 and 4). Loss of sensation is an early sign of nerve damage.
   - *Movement.* Inability to move develops later. Check for nerve damage by asking the victim to wiggle his or her toes or fingers (**Steps** 5 and 6). If the toes or fingers are injured, do not have the victim attempt to move them. A quick nerve and circulatory check is extremely important. The most serious complication of a fracture is inadequate blood flow in an extremity. The major blood vessels of an extremity tend to run close to the bones, which means that any time a bone is broken, the adjacent blood vessels are at risk of being torn by bone fragments or pinched off between the ends of the broken bone. The tissues of the arms and legs cannot survive for more than 3 hours without a continuing blood supply. If you note any disruption in the nerve or circulatory supply, seek immediate medical attention. Major nerve pathways also travel close to bone and may be torn or pinched off between the ends of the broken bone.
5. Stabilize the injured part to prevent movement.
   - If emergency medical services (EMS) will arrive soon, stabilize the injured part with your hands until they arrive.
   - If EMS will be delayed or if you are taking the victim to medical care, stabilize the injured part with a splint.
6. If the injury is an open fracture, do not push on any protruding bones Figure 4. Cover

Figure 4

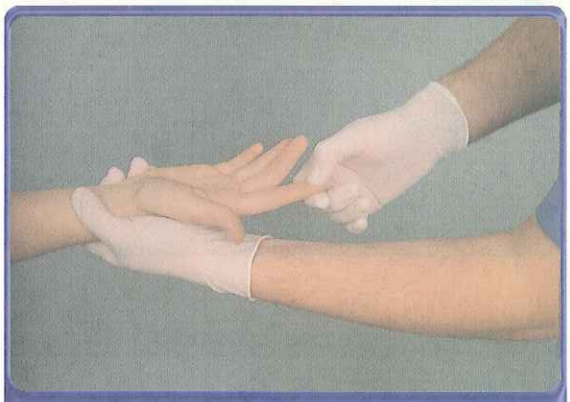
Open tibia, fibula fracture of the leg.

the wound and exposed bones with a dressing. Place rolls of gauze around the bone and bandage the injury without applying pressure on the bone.

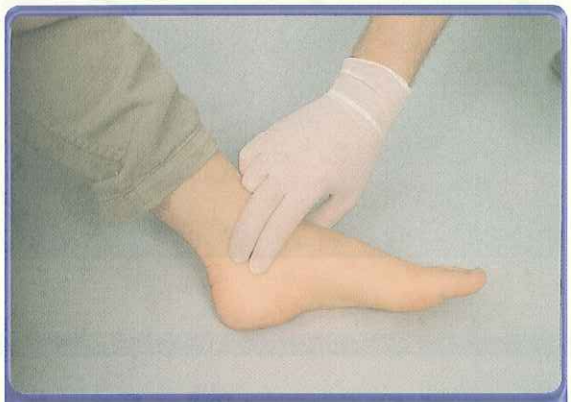
7. Apply an ice pack, if possible, to help reduce swelling and pain.
8. Seek medical care. Call 9-1-1 for any open fractures or large bone fractures (such as the femur) or when transporting the victim would be difficult or would aggravate the injury.

skill drill

1 Checking CSM in an Extremity



1 Check an upper extremity for: Circulation–radial pulse.



2 Check a lower extremity for: Circulation–radial pulse.

3 Sensation–squeeze fingers.

4 Sensation–squeeze toes.

(continues)

skill drill

1 Checking CSM in an Extremity (*continued*)

5 Movement—wiggle fingers.

6 Movement—wiggle toes.

Joint Injuries

A joint is where two or more bones come together.

Dislocations

A *dislocation* occurs when a joint comes apart and stays apart with the bone ends no longer in contact. The shoulders, elbows, fingers, hips, kneecaps (patellas), and ankles are the joints most frequently affected.

Recognizing Dislocations

Dislocations cause signs and symptoms similar to those of fractures: deformity, severe pain, swelling, and inability of the victim to move the injured joint. The main sign of a dislocation is deformity. Its appearance will be different from that of an uninjured joint Figure 5.

Figure 5

Dislocation

Care for Dislocations

1. Check the CSM. If the end of the dislocated bone is pressing on nerves or blood vessels, numbness or paralysis may exist below the dislocation. Always check the pulses. If there is no pulse in the injured extremity, transport the victim to a medical facility immediately.
2. Use the RICE (rest, ice, compression, elevation) procedures.

3. Use a splint to stabilize the joint in the position in which it was found.
4. Do not try to reduce the joint (put the displaced parts back into their normal positions) because nerve and blood vessel damage could result.
5. Seek medical care to reduce the dislocation. Call 9-1-1 for dislocations when transporting the victim would be difficult or would aggravate the injury.

Sprains

A sprain occurs when a joint is twisted or stretched beyond its normal range of motion. Bones are held together at joints by tough bands of tissue called ligaments. When a joint is sprained, the ligaments are either partially or completely torn. There are different degrees of sprains, but it is difficult for a first aider to classify the degree of a sprain. Sprains most often occur in the knee and the ankle, but can occur in any joint.

Ankle sprains most often occur when the foot turns inward and stress is placed on the outside (lateral side) of the ankle. A severe lateral ankle sprain, if not correctly treated, can result in a chronically unstable ankle that is prone to sprains. Any ligament or bone injury on the inner side of the ankle usually represents a serious problem and requires medical care.

Recognizing Sprains

It is often difficult to distinguish between a severe sprain and a fracture because their signs and symptoms are similar.

- Severe pain
- Pain prevents the victim from moving or using the joint.
- Swelling
- Skin around the joint may be discolored because of bleeding from torn blood vessels.

Care for Sprains

1. Follow the RICE procedures. Apply an ice pack for 20 minutes; apply compression with an elastic bandage for 3 to 4 hours; repeat the cycles of an ice pack for 20 minutes and 3 hours of compression. Raise the injured part to reduce the flow of blood to the injury. For more information on the RICE procedure, see page 150.
2. Swelling in a joint can lead to stiffness in a matter of hours. It is important to keep a joint from swelling by using cold promptly; it is equally important to help the swelling recede as quickly as possible with compression and elevation.

Muscle Injuries

Although muscle injuries pose no real emergency, first aiders have ample opportunities to care for them.

Strains

A *muscle strain*, also known as a *muscle pull*, occurs when a muscle is stretched beyond its normal range of motion and tears the muscle. There are different degrees of strains, but it is difficult for a first aider to classify the degree of a strain. When muscle fibers tear, fluid from nearby tissues leaks out and starts to build up near the injury. The area becomes inflamed, swollen, and tender. Inflammation begins immediately after an injury, but it can take 24 to 72 hours for enough tissue fluid to build up to cause pain and stiffness.

Recognizing Strains

Any of the following signs and symptoms may indicate a muscle strain:

- Sudden, sharp pain in the affected muscle
- Extreme tenderness when the area is touched
- Swelling
- Weakness and inability to use the injured part
- Stiffness and pain when the victim moves the muscle
- After a few days, the skin around the injury may be discolored because of bleeding from torn blood vessels.

Care for Strains

To care for strains, simply follow the RICE procedures.

Cramps

A cramp occurs when a muscle goes into an uncontrolled spasm and contraction. Although scientific literature has yet to confirm the causes of muscle cramps,

several factors are associated with them. For example, muscle cramping is associated with certain diseases such as diabetes and atherosclerosis. Muscle cramps are often associated with physical activity. Roughly, muscle cramps can be divided into two categories: *night cramps*, which include any cramp occurring at night or while an individual is at rest, and *heat cramps*, which are related to dehydration and electrolyte imbalance. (The electrolytes potassium and sodium carry an electric charge that helps trigger muscles to contract and relax.)

Recognizing Cramps

- Sudden, severe pain, usually in the legs
- A knotting of the muscle may be felt and sometimes seen.
- Restricted movement

Care for Cramps

Many treatments for cramps are available. Try one or more of the following:

1. Have the victim gently stretch the affected muscle. Because a muscle cramp is an uncontrolled muscle contraction or spasm, a gradual extension of the muscle may help lengthen the muscle fibers and relieve the cramp.
2. Relax the muscle by pressing and massaging it.
3. Apply an ice pack to help relieve the cramping pain (unless you are in a cold environment).

CAUTION

DO NOT give salt tablets to a person with muscle cramps. They can cause stomach irritation, nausea, and vomiting.

4. Pinch the upper lip hard (an acupressure technique) to reduce calf-muscle cramping.
5. Drink lightly salted cool water (dissolve ¼ teaspoon salt in a quart of water) or a commercial sports drink.

Contusions

A muscle contusion or bruise results from a blow to the muscle.

Recognizing Contusions

- Swelling
- Pain and tenderness
- After a few days, the skin in the area may become discolored due to bleeding from torn blood vessels.

Care for Contusions

To care for muscle contusions, follow the RICE procedures.

Emergency Care Wrap-up

Condition	What to Look For	What to Do
Bone Injuries	Fractures (broken bones) DOTS (deformity, open wound, tenderness, swelling) Inability to use injured part normally Grating or grinding sensation felt or heard Victim heard or felt bone snap	Expose and examine the injury site. Bandage any open wound. Splint the injured area. Apply ice or cold pack. Seek medical care: Depending on the severity, call 9-1-1 or transport to medical care.
Joint Injuries	Dislocation or sprain Deformity Pain Swelling Inability to use injured part normally	**Dislocation** Expose and examine the injury site. Splint the injured area. Apply ice or cold pack. Seek medical care. **Sprain** Use RICE procedures.
Muscle Injuries	**Strain** Sharp pain Extreme tenderness when area is touched Indentation or bump Weakness and loss of function of injured area Stiffness and pain when victim moves the muscle **Contusion** Pain and tenderness Swelling Bruise on injured area **Cramp** Uncontrolled spasm **Pain** Restriction or loss of movement	Use RICE procedures. Use RICE procedures. Stretch and/or apply direct pressure to the affected muscle.

prep kit

Ready for Review

- Broken bones can be painful and debilitating and can cause lifelong aggravation, disability, and deformity.
- A joint is where two or more bones come together. Joints can be dislocated or sprained.
- Muscles can be strained, bruised, or cramped.

Vital Vocabulary

closed fracture A fracture in which there is no wound in the overlying skin.

cramp A painful spasm of a muscle.

crepitus A grating sound heard and the sensation felt when the fractured ends of a bone rub together.

fracture A break or rupture in a bone.

open fracture A fracture exposed to the exterior; an open wound lies over the fracture.

sprain A trauma to a joint that injures the ligaments.

Assessment in Action

While walking through your neighborhood, you see two boys yelling for help on the sidewalk. One is on the ground in pain and clutching his arm. The other boy explains that the injured boy lost control while skateboarding and crashed. The victim said he heard a snap when he crashed and landed on his arm.

Directions: Circle Yes if you agree with the statement; circle No if you disagree.

Yes No **1.** You should look and feel for DOTS.

Yes No **2.** You notice a severe deformity on the victim's forearm but the skin is not broken. This is a closed fracture.

Yes No **3.** You should check the injured arm for circulation, sensation, and movement.

Yes No **4.** You should not splint the arm because of the deformity.

Yes No **5.** Applying ice helps reduce swelling.

Check Your Knowledge

Directions: Circle Yes if you agree with the statement; circle No if you disagree.

Yes No **1.** Apply cold on a suspected sprain.

Yes No **2.** The letters RICE stand for rest, ice, compression, and elevation.

Yes No **3.** DOTS stands for deformity, open wound, tenderness, and swelling.

Yes No **4.** Guarding occurs when motion produces pain.

Yes No **5.** Crepitus cannot be heard, but it can be felt by the victim.

Yes No **6.** A dislocation is cared for much differently than a fracture.

Yes No **7.** Check a suspected fracture by having the victim move the extremity.

Yes No **8.** Treat a muscle cramp by stretching the affected muscle.

Yes No **9.** CSM stands for cold, swelling, and motion.

Yes No **10.** Do not push on a protruding bone.