Open Wounds

An open wound is a break in the skin's surface resulting in external bleeding. It may allow bacteria to enter the body, causing an infection. There are several types of open wounds. Recognizing the type of wound helps to give proper first aid. With an abrasion, the top layer of skin is removed, with little or no blood loss (Figure 9-1). Abrasions tend to be painful because the nerve endings often are abraded along with the skin. Ground-in debris may be present. This type of wound can be serious if it covers a large area or becomes embedded with foreign matter. Other names for an abrasion are scrape, road rash, and rug burn.

A laceration is cut skin with jagged, irregular edges (Figure 9-2). This type of wound is usually caused by a forceful tearing away of skin tissue. Incisions tend to have smooth edges and resemble a surgical or paper cut (Figure 9-3). The amount of bleeding depends on the depth, the location, and the size of the wound. Punctures are usually deep, narrow wounds in the skin and underlying organs such as a stab wound from a nail or a knife (Figure 9-4). The entrance is usually small, and the risk of infection is high. The object causing the injury may remain impaled in the wound.

With an avulsion, a piece of skin is torn loose and is hanging from the body or completely removed. This type of wound can bleed heavily. If the flap is still attached, lay it flat and realign it into its normal position. Avulsions most often involve ears, fingers, and hands (Figure 9-5). An amputation involves the cutting or tearing off of a body part, such as a finger, toe, hand, foot, arm, or leg.
Care for Open Wounds

1. Protect yourself against disease by wearing medical exam gloves. If they are not available, use several layers of gauze pads, clean cloths, plastic wrap or bags, or waterproof material. If none of these are available, you can have the victim apply pressure with his or her hand. Your bare hand should be used only as a last resort.

2. Expose the wound by removing or cutting away the clothing to find the source of the bleeding.

3. Control the bleeding by using direct pressure and, if needed, other methods described in Chapter 8.
Cleaning a Wound

A victim's wound should be cleaned to help prevent infection. Wound cleaning usually restarts the bleeding by disturbing the clot, but it should be done anyway for shallow wounds. For wounds with a high risk for infection, leave the pressure bandage in place because medical personnel will clean the wound.

1. Scrub your hands vigorously with soap and water. Put on medical exam gloves, if available.
2. Expose the wound.
3. Clean the wound.
   - For a shallow wound:
     - Wash inside the wound with soap and water.
     - Flush the wound with water (use water that is clean enough to drink) (Figure 9-6). Run water directly into the wound and allow the water to run over the wound and out, thus carrying the dirty particles away from the wound. Flushing with water needs pressure (at least 5 to 8 psi) to adequately cleanse the tissue. Water from a faucet provides sufficient pressure and quantity. Pouring water on the wound or using a bulb syringe will not generate enough force for adequate cleaning.
   - For a wound with a high risk for infection (such as an animal bite, a very dirty or ragged wound, or a puncture), seek medical care for wound cleaning. If you are in a remote setting (more than 1 hour from medical care), clean the wound as best you can.
4. Remove small objects not flushed out with sterile tweezers. A dirty abrasion or other wound that is not properly cleaned will leave a “tattoo” on the victim's skin.
5. If bleeding restarts, apply direct pressure over the wound.

Do not
- clean large, extremely dirty, or life-threatening wounds. Let the hospital emergency department personnel do the cleaning.
- scrub a wound. The benefit of scrubbing a wound is debatable, and it can bruise the tissue.

Wound Irrigation

This study compared the effectiveness of tap water with saline solution for irrigating simple skin lacerations to remove bacteria. The results showed no significant difference between bacterial counts in wounds irrigated with normal saline and those irrigated with tap water. The removal of bacteria from a wound depends more on the mechanical effects (speed and pressure) than on the type of solution. Tap water has these advantages over saline—it is readily available; it is more continuous and, therefore, takes less time; it is less expensive; and it does not require other materials such as sterile syringes or splash guards. Other irrigation solutions with bactericidal properties and detergents have an antacellular effect that impairs wound healing and/or resistance to infection. Irrigation pressures more than the 20 to 30 psi range are discouraged because the higher pressure can damage tissue.


High-Risk Wounds

These types of wounds have a high potential for infection:
- Bite wounds
- Very dirty, contaminated wounds
- Crushing, ragged wounds
- Wounds over injured bone, joint, or tendon
- Puncture wounds
Covering a Wound

For a small wound that does not require sutures:

1. Cover it with a thin layer of antibiotic ointment such as Polysporin or Bacitracin. These ointments can kill many bacteria and rarely cause allergic reactions. No physician prescription is needed.

2. Cover the wound with a sterile dressing. Do not close the wound with tape or butterfly bandages. Bacteria may remain, leading to a greater chance of infection than if the wound were left open and covered by a sterile dressing. Closing a wound should be left to a physician.

3. If a wound bleeds after a dressing has been applied and the dressing becomes stuck, leave it on as long as the wound is healing. Pulling the scab loose to change the dressing retards healing and increases the chance of infection. If you must remove a dressing that is sticking, soak it in warm water to help soften the scab and make removal easier.

4. If a dressing becomes wet or dirty, change it. Dirt and moisture are both breeding grounds for bacteria.

Dressings and bandages are two different kinds of first aid supplies. A dressing is applied over a wound to control bleeding and prevent contamination. A bandage holds the dressing in place. Dressings should be sterile or as clean as possible; bandages need not be.

When to Seek Medical Care

High-risk wounds should receive medical care. Examples of high-risk wounds include those with embedded foreign material (such as gravel), animal and human bites, puncture wounds, and ragged wounds. Sutures, if needed, are best placed within 6 to 8 hours after the injury. Anyone who has not had a tetanus vaccination within 10 years (5 years in the case of a dirty wound) should seek medical attention within 72 hours to update his or her tetanus inoculation status.

Wound Infection

Any wound, large or small, can become infected. Once an infection begins, damage can be extensive, so prevention is the best way to avoid the problem. A wound should be cleaned using the procedures described earlier in this chapter.

FYI

Wound Care: What the Medical Literature Says

- Soaking wounds is not effective.
- The benefit of scrubbing wounds is debatable.
- Irrigating wounds requires a minimum pressure of 5 to 8 psi for tissue cleansing.
- Not closing a wound (for example, with butterfly bandages, Steri-Strips), especially a dirty wound, reduces the risk of infection.
- Applying antiseptic solutions such as Merthiolate, Mercurochrome, iodine, isopropyl alcohol, and hydrogen peroxide can injure wounded tissues.
- Applying an antibiotic ointment such as Neosporin or Polysporin reduces the risk of infection.


FYI

Over-the-Counter Treatments for Wounds and Days Needed for the Wound to Heal

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Days Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polysporin</td>
<td>8.2</td>
</tr>
<tr>
<td>Neosporin</td>
<td>9.2</td>
</tr>
<tr>
<td>Johnson &amp; Johnson First Aid Cream</td>
<td>9.8</td>
</tr>
<tr>
<td>Mercurochrome</td>
<td>13.1</td>
</tr>
<tr>
<td>No treatment</td>
<td>13.3</td>
</tr>
<tr>
<td>Bactine spray</td>
<td>14.2</td>
</tr>
<tr>
<td>Merthiolate</td>
<td>14.2</td>
</tr>
<tr>
<td>Hydrogen peroxide (3%)</td>
<td>14.3</td>
</tr>
<tr>
<td>Campho-Phenique</td>
<td>15.4</td>
</tr>
<tr>
<td>Tincture of iodine</td>
<td>15.7</td>
</tr>
</tbody>
</table>

It is important to know how to recognize and treat an infected wound. The signs and symptoms of infection include the following:

- Swelling and redness around the wound
- A sensation of warmth
- Throbbing pain
- Pus discharge
- Fever
- Swelling of lymph nodes
- One or more red streaks leading from the wound toward the heart

The appearance of one or more red streaks leading from the wound toward the heart is a serious sign that the infection is spreading and could cause death. If chills and fever develop, the infection has reached the circulatory system (known as blood poisoning). Seek immediate medical care.

Factors that increase the likelihood for wound infection include the following:

- Dirty and foreign material left in the wound
- Ragged or crushed tissue
- Injury to an underlying bone, joint, or tendon
- Bite wounds (human or animal)
- Hand and foot wounds
- Puncture wounds or other wounds that cannot drain

In the early stages of an infection, a physician may allow a wound to be treated at home. Such home treatment would include the following:

- Keeping the area clean
- Soaking the wound in warm water or applying warm, wet packs
- Elevating the infected portion of the body
- Applying antibiotic ointment
- Changing the dressings daily
- Seeking medical help if the infection persists or becomes worse

**Tetanus**

Tetanus is also called lockjaw because of its best-known symptom, tightening of the jaw muscles. Tetanus is caused by a toxin produced by a bacterium. The bacterium, which is found throughout the world, forms a spore that can survive for years in a variety of environments. The World Health Organization reports that tetanus causes at least 500,000—perhaps even up to 1 million—deaths each year.

**FYI**

**Tetanus Prevalence**

Despite the wide availability of immunization against tetanus in the United States, many people are inadequately protected against this uncommon but often lethal disease. Protection was found in only 70% of people studied, with levels of immunity varying widely.

About 50 cases of tetanus occur in the United States each year, principally among elderly people and people who never received a primary series of vaccinations. Adults should have booster shots for tetanus every 10 years.


Millions of adults in the United States have let their tetanus immunizations lapse; a smaller number have never been vaccinated. In addition, antibody levels in immunized children decline over time; one fifth of youngsters ages 10 to 16 years do not have protective levels. Tetanus is not communicable from one person to another.

The tetanus bacterium by itself does not cause tetanus. When it enters a wound, such as a puncture wound that contains little oxygen, the bacterium can produce a powerful, poisonous toxin. The toxin travels through the nervous system to the brain and the spinal cord. It then causes contractions of certain muscle groups, particularly in the jaw. There is no known antidote to the toxin once it enters the nervous system. It is not just stepping on a rusty nail that can bring on the disease. Tetanus bacteria are commonly found in soil, street dust, organic garden fertilizers, and pet feces, and even minor cuts can introduce them into the bloodstream.

A tetanus vaccination can completely prevent the disease. Everyone needs an initial series of vaccinations to prepare the immune system to defend against the toxin.
but then only a booster shot every 5 to 10 years is sufficient to maintain immunity.

The guidelines for tetanus immunization boosters are as follows:

- Anyone with a wound who has never been immunized against tetanus should be given a tetanus vaccine and booster immediately.
- A victim who was once immunized but has not received a tetanus booster within the last 10 years should receive a booster.
- A victim with a dirty wound who has not had a booster within the past 5 years should receive a booster.
- Tetanus immunization shots must be given within 72 hours of the injury to be effective.

Amputations

In the majority of cases, an amputated extremity can be successfully replanted (reattached).

Types of Amputations

Amputations usually involve fingers, hands, and arms rather than legs. Amputations are classified according to the type of injury:

- A guillotine amputation is a clean-cut, complete detachment. Examples would include a finger cut off with an ax or an arm severed with a power tool.
- A crushing amputation occurs when an extremity separates by being crushed or mashed off, such as when a hand is caught in a roller machine.
- Degloving is when the skin is peeled off, much as you would take off a glove (Figure 9-8).

In a crushing amputation, the most common type, the chance of reattachment is poor. In a guillotine type, the chance of reattachment is much better because it is clean cut. Many amputations can be replanted by an experienced surgeon, and time is a critical element in success. Function may be nearly normal in many cases.

A complete amputation may not involve heavy blood loss because blood vessels tend to go into spasms, recede into the injured body parts, and shrink in diameter, resulting in a surprisingly small blood loss. More blood is seen in a partial amputation.

Care for Amputation

1. Control the bleeding with direct pressure and elevate the extremity. Apply a dry dressing or bulky cloths. Be sure to protect yourself against disease. Tourniquets are rarely needed and, if used, will destroy tissue, blood vessels, and nerves necessary for replantation.
2. Treat the victim for shock.
3. Recover the amputated part and, whenever possible, take it with the victim to the hospital. However, in multicasualty cases, in reduced lighting conditions, or when untrained people transport the victim, someone may be requested to locate and take the severed body part to the hospital after the victim’s departure.
4. To care for the amputated body part (Figure 9-9):
   - Do not clean the amputated portion.
   - Wrap the amputated part with dry, sterile gauze or other clean cloth.
   - Put the wrapped amputated part in a plastic bag or other waterproof container.
   - Place the bag or container with the wrapped part on a bed of ice. Keep the amputated part cool, but do not freeze.
5. Seek medical care immediately.

Amputated body parts left uncooled for more than 6 hours have little chance of survival; 18 hours is probably the maximum time allowable for a part that has been cooled properly. Muscles without blood lose viability within 4 to 6 hours. Fingers with tendons and ligaments can tolerate a longer amputated time than limbs.
Amputations

Control the bleeding.

Did you find the severed body part?

- Yes
  - Request others to locate and take it to hospital.

- No
  - Care for the severed part:
    1. Wrap the part in dry sterile gauze or a clean cloth.
    2. Put the wrapped part in a waterproof container such as a plastic bag or a cup.
    3. Place the wrapped part and container on bed of ice; do not submerge it in ice or cold water.

Seek medical care.
A blister is a collection of fluid in a “bubble” under the outer layer of skin. (Note: This section applies only to friction blisters and does not apply to blisters from burns, frostbite, drug reactions, insect or snake bites, or contact with a poisonous plant.)

Repeated rubbing of a small area of the skin will produce a blister. Blisters are so common that many people assume they are a fact of life. However, blisters are avoidable, and life for many people could be more comfortable if they knew how to treat and prevent blisters.

Rubbing—as between a sock and a foot—causes stress on the skin's surface because the underlying supporting tissue remains stationary. The stress separates the skin into two layers, and the resulting space fills with fluid. The fluid may collect under or within the skin's outer layer, the epidermis. Because of differences in skin, blister formation varies considerably from person to person.

**Care for Blisters**

When caring for a friction blister, try to (1) avoid the risk of infection, (2) minimize the victim's pain and discomfort, (3) limit the blister's development, and (4) promote a fast recovery. The best care for a particular blister is determined mainly by its size and location.

If an area on the skin becomes a “hot spot” (painful, red area), tightly apply a piece of tape (adhesive or duct), or apply several layers of moleskin or molefoam cut in a doughnut shape and secure.
If a blister on a foot is closed and not very painful, a conservative approach is to tape the blister tightly with duct tape or waterproof adhesive tape. The tape must remain on the blister for several days; removing it may tear off the blister’s “roof” and expose unprotected skin. Unfortunately, the tape may become damp and contaminated and have to be replaced, risking a tear. You could also cut a hole in several pieces of moleskin or molefoam in layered stacks around the blister, make a doughnut-shaped pad, and apply it over the blister. Small blisters, especially on weight-bearing areas, generally respond better if left alone.

If a blister on the foot is open or a very painful closed blister affects walking or running:

1. Clean the area with soap and water.
2. Drain all fluid out of the blister by making several small holes at the base of the blister with a sterilized needle. Press the fluid out. Do not remove the blister’s roof unless it is torn.
3. Apply several layers of moleskin or molefoam cut in a doughnut shape on top of each other.
4. Apply antibiotic ointment in the hole and cover it tightly with tape. The pressure dressing ensures that the blister’s roof sticks to the underlying skin and that the blister does not refill with fluid after it has been drained.

With a few exceptions, the blister’s roof (which is the best and most comfortable “dressing”) should be removed only when an infection is present. Once a blister has been opened, the area should be washed with soap to prevent further infection. For 10 to 14 days, or until new skin forms, a protective bandage or other cover should be used. Even with no evidence of infection, consider removing the blister’s roof when a partially torn blister roof may tear skin adjacent to the blister site, resulting in an even larger open wound. In such cases, use sterilized scissors to remove the loose skin of the blister’s roof up to the edge of the normal tissue. Treat it the same as for an open blister. Rubbing alcohol is effective for sterilizing instruments such as needles or scissors.

**Impaled (Embedded) Objects**

Impaled objects come in all shapes and sizes, from pencils and screwdrivers to knives, glass, steel rods, and fence posts. Proper first aid requires that the impaled object be stabilized because there can be significant internal damage.
Blisters

It is best to leave a blister unbroken.

No

Is the blister causing unbearable pain?

Prevent further injury by covering the blister with tape, moleskin, or a doughnut of molefoam.

Has the blister been broken?

Yes

Break the blister by:
1. Washing the area with soap and water
2. Making small holes at the blister’s base with a sterile needle
3. Draining the fluid
4. Applying a sterile dressing
5. Leaving the blister’s roof on
6. Watching for signs of infection

Yes

Drain the fluid.
Apply a sterile dressing.
Leave the blister’s roof on.
Watch for signs of infection.

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Care for Impaled Objects

1. Expose the area. Remove or cut away any clothing surrounding the injury. If clothes cover the object, leave them in place; removing them could cause the object to move.

2. Do not remove or move the object. Movement of any kind could produce additional bleeding and tissue damage. Cheeks are the exception because the object or the bleeding could cause an airway obstruction. See the following section on impaled object in the cheek for more information.

3. Control any bleeding with pressure around the impaled object. Straddle the object with gauze. Do not press directly on the object or along the wound next to the cutting edge, especially if the object has sharp edges.

4. Stabilize the object with bulky dressings or clean cloths around the object. Some experts suggest securing 75% of the object with bulky dressings or cloths to reduce motion.

5. Shorten the object only if necessary. In most cases, do not shorten the object by cutting or breaking it. There are times, however, when cutting or shortening the object allows for easier transportation. Be sure to stabilize the object before shortening it. Remember that the victim will feel any vibrations from the object being cut away; also the injury could be worsened by this action.

Impaled Object in the Cheek

The only time it is safe to remove an impaled object outside a medical setting is when the object is in the victim's cheek.

1. Examine the injury inside the mouth. If the object extends through the cheek and you are more than 1 hour from medical help, consider removing it.

2. To remove the object: Place two fingers next to the object, straddling it; then gently pull it in the direction from which it entered. If it cannot be removed easily, leave it in place and secure it with bulky dressings.

3. Control the bleeding. After you have removed the object, place dressings over the wound inside the mouth between the cheek and the teeth. The dressings will help control the bleeding and will not interfere with the victim's airway. Also place a dressing on the outside wound.

Impaled Object in the Eye

If an object is impaled in the eye, it is vital that pressure not be put on the eye. The eyeball consists of two chambers, each filled with fluid. Do not exert any pressure against the eyeball because fluid can be forced out of it, worsening the injury.

1. Stabilize the object. Use bulky dressings or clean cloths to stabilize a long, protruding object. You can place a protective paper cup or cardboard folded into a cone over the affected eye to prevent bumping of the object. For short objects, surround the eye—without touching the object—with a doughnut-shaped (ring) pad held in place with a roller bandage.

2. Cover the undamaged eye. Most experts suggest that the undamaged eye should be covered to prevent sympathetic eye movement (that is, the injured eye moves when the undamaged eye does, thus aggravating the injury). Remember that the victim is unable to see when both eyes are covered and may be anxious. Make sure you explain to the victim everything you are doing.

3. Seek medical care immediately.

Slivers

Small slivers of wood, glass, thorns, or metal can be painful and irritating and they also can cause infection. Because of their size (and common location in the fingers), these slivers can usually be easily removed with tweezers. Sometimes, it is necessary to tease one end of the object with a sterile needle to place it in a better position for removal.
removal with tweezers. After you have removed the sliver, clean the area with soap and water and apply an adhesive strip (such as a Band-Aid).

**Cactus Spines**

Cacti are a part of the desert environment, and they also are used as ornamental plants. Infection from cactus-spine punctures is rare. Removing cactus spines is time-consuming because they usually are acquired in groupings, are difficult to see, and are designed by nature to resist removal. Usually spines can easily, yet tediously, be removed with tweezers.

Another method for removing a large number of cactus spines is to coat the area with a thin layer of white woodworking glue or rubber cement and allow it to dry for at least 30 minutes. Slowly roll up the dried glue from the margins. Applying the glue in strips rather than puddles will make the rolling procedure go more smoothly. A single layer of gauze gently pressed onto the still-damp glue helps to remove it after it has dried. The combination of using tweezers and glue will remove most of the spines.

Using adhesive tape, duct tape, or Scotch brand-type tape, although quick and easy, removes only about 30% of the spines, even after multiple attempts. Do not use Super Glue (or other similar products) to remove cactus spines. Not only does it fail to roll up when applied to the skin, but it also welds the spines to the skin. In addition, there is the risk that the skin will permanently bond to anything it touches.

**Fishhooks**

Tape an embedded fishhook in place and do not try to remove it if injury to a nearby body part such as the eye or an underlying structure such as a blood vessel or nerve is possible or if the victim (such as a young child) is uncooperative.

If the point of a fishhook has penetrated the skin but the barb has not, remove the fishhook by backing it out. Then treat the wound like a puncture wound. Seek medical advice for a possible tetanus shot.

If the hook's barb has entered the skin, follow these procedures:

1. If medical care is near, transport the victim and have a physician remove the hook.
2. If you are in a remote area, far from medical care, remove the hook using either the pliers method or the fishline method.

**Care for Fishhooks**

Use extreme care with the pliers method of fishhook removal because it can produce further severe injury if the hook is pushed into blood vessels, nerves, or tendons. Use pliers with tempered jaws that can cut through a hook (Figure 9-13). The proper kind of pliers is often unavailable, or sometimes the barb is buried too deep to be pushed through. Test the pliers by first cutting a similar fishhook.

1. Use cold or hard pressure around the hook to provide temporary numbness.
2. Push the embedded hook further in, in a shallow curve, until the point and the barb come out through the skin.

3. Cut the barb off, then back the hook out the way it came in.

4. After removing the hook, treat the wound and seek medical attention for a possible tetanus shot.

Another method to remove a fishhook is the fishline method.

1. Loop a piece of fishline over the bend or curve of the embedded hook (Figure 9-14).

2. Stabilize the part of the victim's body in which the hook is embedded.

3. Use cold or hard pressure around the hook to provide temporary numbness.

4. With one hand, press down on the hook's shank and eye while the other hand sharply jerks the fishline that is over the hook's bend or curve. The jerk movement should be parallel to the skin's surface. The hook will neatly come out of the same hole it entered, causing little pain.

5. After removing the hook, care for the wound and seek medical attention for a possible tetanus shot.

**Closed Wounds**

A closed wound happens when a blunt object strikes the body. In other words, the skin is not broken, but tissue and blood vessels beneath the skin's surface are crushed, causing bleeding within a confined area. There are three types of closed wounds:

1. Bruises and contusions occur when blood collects under the skin in the injured area. The victim will experience pain and swelling (immediately or within 24 to 48 hours). As blood accumulates, a black-and-blue mark may appear.

2. A hematoma is a clot of blood under the skin. There may be a lump or bluish discoloration.

3. Crush injuries are caused by extreme forces, which can injure vital organs and bones without breaking open the skin. Crush injuries may indicate an underlying problem such as a fracture. Signs and symptoms include discoloration, swelling, pain, and loss of use.

**Care for Closed Wounds**

1. Control bleeding by applying an ice pack over the area for no more than 20 minutes.

2. If the injury involves a limb, apply an elastic bandage for compression.

3. Check for a possible fracture.

4. Elevate an injured extremity above the victim's heart level to decrease the pain and swelling.

**Wounds That Require Medical Care**

At some point, you will probably have to decide whether medical care is needed for a wounded victim. As a guideline, seek medical care for the following conditions as offered by the American College of Emergency Physicians:

- Wounds that will not stop bleeding after 5 minutes of applying direct pressure
- Long or deep cuts that need stitches
- Cuts over a joint
- Cuts that may impair function of a body area such as an eyelid or lip
- Cuts that remove all of the layers of the skin; such as those from slicing off the tip of a finger
- Cuts from an animal or human bite
- Cuts that have damaged or may have damaged underlying nerves, tendons, or joints
- Cuts over a possible broken bone
- Cuts caused by a crushing injury
- Cuts with an object embedded in them
- Cuts caused by metal object or a puncture wound

Call 9-1-1 immediately if:

- Bleeding from a cut does not slow during the first 15 minutes of steady pressure
- Signs of shock occur
- Breathing is difficult because of a cut to the neck or chest
- A deep cut to the abdomen causes moderate to severe pain
- A cut occurs to the eyeball
- A cut amputates or partially amputates an extremity
Sutures

If sutures (stitches) are needed, they usually should be placed by a physician within 6 to 8 hours of the injury. Suturing wounds allows faster healing, reduces infection, and lessens scarring. Some wounds do not usually require sutures:

- Wounds in which the skin's cut edges tend to fall together
- Shallow cuts less than 1 inch long

Rather than close a gaping wound with butterfly bandages or Steri-Strips, cover the wound with sterile gauze. Closing the wound might trap bacteria inside, resulting in an infection. In most cases, a physician can be reached in time for sutures to be placed; if not, a wound without sutures will still heal but with scars. Scar tissue can be attended to later by a plastic surgeon.

Gunshot Wounds

Guns are abundant in the United States; it is estimated that about one half of all American homes have a firearm. There are two general types of firearms: low velocity, such as most civilian firearms, and high velocity, such as military weapons. Shotguns have low velocity but create severe tissue damage.

A bullet causes injury in the following ways, depending on its velocity, or speed:

- **Laceration and crushing.** When the bullet penetrates the body, it crushes tissue and forces it apart. That is the main effect of low-velocity bullets. The crushing and laceration caused by the passage of the bullet usually are not serious unless vital organs or major blood vessels are injured. The bullet damages only the tissues that it contacts directly, and the wound is comparable to that caused by weapons such as knives.

- **Shock waves and temporary cavitation.** When a bullet penetrates the body, a shock wave exerts outward pressure from the bullet's path. The shock wave pushes tissues away and creates a temporary cavity that can be as much as 30 times the diameter of the bullet. As the cavity forms, a negative pressure develops inside, creating a vacuum. The vacuum then draws debris in with it. Temporary cavitation occurs only with high-velocity bullets and is the main reason for their immensely destructive effect. The cavitation lasts only a millisecond but can damage muscles, nerves, blood vessels, and bone.

In a **penetrating** wound, there is a bullet entry point but no exit. In a **perforating** wound, there are both entry and exit points. The exit wound of a high-velocity bullet is larger than the entrance wound; the exit wound from a low-velocity bullet is about the same size as the entry wound (Figure 9-15). If the bullet was fired at very close range, the entrance wound may be larger than the exit wound because the gases from the gun's muzzle contribute to the surface-tissue damage.

Bullet wounds sometimes hit hard tissue such as bones and may bounce around in the body cavities, causing a great deal of damage to tissue and organs. Moreover, bone chips can ricochet to other body areas and cause damage. Because a split or misshapen bullet tumbles and exerts its force over a larger area, it does more damage than a smooth bullet going in a straight line.

**Care for Gunshot Wounds**

Regardless of the type of gunshot wound, initial care is roughly the same as for any other wound.
1. Monitor the patient’s breathing.
2. Expose the wound(s). Look for entrance and exit wounds.
3. Control the bleeding with direct pressure.
4. Apply dry, sterile dressings to the wound(s) and bandage them securely in place.
5. Treat the victim for shock.
6. Keep the victim calm and quiet.
7. Seek immediate medical care.

**Legal Aspects**

Because interactions with victims of gunshot wounds will involve contact with law enforcement agencies and possibly have you testifying in court, carefully observe the scene and the victim. Keep an accurate record of your observations. Preserve possible evidence, such as cartridge casings or shells, for the police. Do not touch or move anything unless absolutely necessary to treat the victim. All gunshot wounds must be reported to the police regardless of whether they are intentional (suicide, assault, murder, self-defense) or unintentional.

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**Table 9-1**

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<thead>
<tr>
<th>What to Look For</th>
<th>What to Do</th>
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<td><strong>Wound care</strong></td>
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<tr>
<td>1. Wash with soap and water.</td>
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<tr>
<td>2. Flush with running water under pressure.</td>
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<tr>
<td>3. Remove remaining small object(s).</td>
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<tr>
<td>4. If the bleeding restarts, apply pressure on the wound.</td>
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<tr>
<td>5. Apply antibiotic ointment.</td>
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<tr>
<td>6. Cover with sterile or clean dressing.</td>
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<tr>
<td>7. For wounds with a high risk for infection, seek medical care for cleaning, possible tetanus booster, and closing.</td>
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</tr>
<tr>
<td><strong>Special wounds</strong></td>
<td><strong>Amputation</strong></td>
</tr>
<tr>
<td><strong>Embedded (impaled) object</strong></td>
<td><strong>Embedded (impaled) object</strong></td>
</tr>
<tr>
<td>Do not remove object.</td>
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</tr>
<tr>
<td>Control bleeding with pressure around the object.</td>
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</tr>
<tr>
<td>Stabilize the object with bulky dressings or clean clothes.</td>
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</tbody>
</table>
An open wound is a break in the skin's surface resulting in external bleeding. Knowing what type of open wound the victim has will help you in providing first aid. In the majority of cases, an amputated extremity can be successfully replanted.

A blister is a collection of fluid in a bubble under the outer layer of skin. Proper first aid of an impaled object requires that the object be stabilized because significant internal damage can occur.

A closed wound happens when a blunt object strikes the body and while the skin remains unbroken, the tissue and blood vessels beneath the skin's surface are crushed, causing bleeding within a confined area.

Wounds that require medical care include:
- Wounds that will not stop bleeding after 5 minutes of applying direct pressure
- Long or deep cuts that need stitches
- Cuts over a joint
- Cuts that may impair function of a body area such as an eyelid or lip
- Cuts that remove all of the layers of the skin such as those from slicing off the tip of a finger
- Cuts from an animal or human bite
- Cuts that have damaged or may have damaged underlying nerves, tendons, or joints
- Cuts over a possible broken bone
- Cuts caused by a crushing injury
- Cuts with an object embedded in them
- Cuts caused by metal object or a puncture wound

Call 9-1-1 immediately if:
- Bleeding from a cut does not slow during the first 15 minutes of steady pressure
- Signs of shock occur
- Breathing is difficult because of a cut to the neck or chest
- A deep cut to the abdomen causes moderate to severe pain

A cut occurs to the eyeball
A cut amputates or partially amputates an extremity
Guns are abundant in the United States, thus raising the risk of an accidental gunshot wound.

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Vital Vocabulary

- **abrasion** An injury consisting of the loss of the partial thickness of skin from rubbing or scraping on a hard, rough surface; also called brush burn, friction burn, or rug burn.
- **amputation** Complete removal of an appendage.
- **avulsion** An injury that leaves a piece of skin or other tissue either partially or completely torn away from the body.
- **bandage** Used to cover a dressing to keep it in place on the wound and to apply pressure to help control bleeding.
- **crushing amputation** An extremity separates by being crushed or mashed off.
- **degloving** The skin is peeled off of the extremity.
- **dressing** A sterile gauze pad or clean cloth covering that is placed over an open wound.
- **guillotine amputation** A clean-cut, complete detachment of an extremity.
- **incisions** A wound usually made deliberately in connection with surgery; clean cut as opposed to a laceration.
- **laceration** A wound made by the tearing or cutting of body tissues.
- **punctures** Deep, narrow wounds in the skin and underlying organs.

Assessment in Action

While taking your morning walk, you hear a yelp from behind a fence. You stop and peer over to find your neighbor rubbing her hand. “Darn cat,” she mutters. She was trying to coax her old tabby inside with a can of tuna when the cat jumped up and knocked the tuna can out of her hand. As she bent down to pick up the can that the cat was now eating out of, the cat bit her hand between the thumb and forefinger.

**Directions:** Circle Yes if you agree with the statement, and circle No if you disagree.

1. This wound is not more likely to become infected.
Yes  No  2. The next morning, your neighbor wakes up with a fever and a throbbing pain in her hand. Is her hand infected?
Yes  No  3. You advise your neighbor to soak the wound in warm water.
Yes  No  4. Your neighbor should not apply antibiotic ointment.
Yes  No  5. She does not need to seek medical help.

Answers: 1. No; 2. Yes; 3. Yes; 4. No; 5. No

**Check Your Knowledge**

*Directions:* Circle Yes if you agree with the statement, and circle No if you disagree.

Yes  No  1. An open wound may allow bacteria to enter the body, causing an infection.
Yes  No  2. A laceration is cut skin with regular edges.
Yes  No  3. A dressing is applied over a wound to control bleeding and prevent contamination.
Yes  No  4. A bandage is also applied over a wound to control bleeding.
Yes  No  5. Any wound can become infected.
Yes  No  6. The signs and symptoms of an infection include swelling and redness around the wound, throbbing pain, and a lack of fever.
Yes  No  7. A bite wound is more likely to become infected.
Yes  No  8. Impaled objects should be removed immediately.
Yes  No  9. Tetanus is communicable from one person to another.
Yes  No  10. In the majority of cases, an amputated extremity cannot be successfully reattached.