2014 Northern Regional Mine Rescue Contest

JUDGES' PACKET
First Aid Competition

June 19, 2014
Findley Lake, New York

2014 Northern Mine Rescue Contest
Findley Lake, NY

First Aid Station #1

A. One Person CPR

B. Artificial Respiration

C. Foreign Body Obstructed Airway – Unconscious Victim

2014 Northern Mine Rescue Contest
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First Aid Station #2 – Patient Assessment Scenario

A laborer was unloading large equipment batteries utilizing a truck with a hydraulic lift gate. The lift gate failed and when it came down it landed on the laborer's right leg. Several batteries fell as well breaking open and spilling battery acid. His partner was able to lift the gate long enough for the victim to slide out from under it. Shortly after that the victim became unresponsive.

Judges:

1. The patient will have an open fracture of the tibia on his right leg.

2. The patient also has first and second degree burns to his torso and left arm

Treatment:
Someone will initially check to see if he's breathing. Should someone ask about his breathing, as they check his vitals, tell them that he is breathing. Likewise if they ask about his pulse, state it is rapid and weak.

The team will need to stop bleeding and splint the injury to the leg. Treatment of the burns consists of stopping the burning process and removing the irritant. Chemical burns require 20 minute water flush followed by a clean dry dressing. However the team will be limited to the materials that are readily available to them.

The team should then treat the patient for shock and prepare him for transport.

FIRST AID FIELD PROBLEM

Control Of Bleeding

TABLE 17.1 | Blood Volumes and Serious Blood Loss

PATIENT	TOTAL BLOOD VOLUME	LETHAL BLOOD LOSS (RAPID)
Adult male (154 pounds)	6.6 liters	2.2 liters
Adolescent (105 pounds)	3.3 liters	1.3 liters
Child (early to late childhood: depends on size)	1.5 to 2.0 liters	0.5 to 0.7 liters
Infant (newborn, normal weight range)	300+ milliliters	30 to 50 milliliters

capillary ► the smallest of the body's blood vessels.

The oxygen and nutrients carried by arteries are passed off to the body's cells when the blood reaches a small system of vessels called **capillaries**. Capillaries act as an exchange point for nutrients and wastes. Some of our organs act as disposal and maintenance organs, such as the kidneys and liver, but the heart is the organ that works with the lungs to replenish oxygen. Once the blood has dropped off its supply of oxygen for the body's cells to use, it travels from the capillary system into the veins and back to the heart, through the lungs to pick up oxygen, and back to the heart again to be pumped through vessels to the body. By the time blood reaches the capillaries, pressure and speed are greatly reduced and the beating action of the heart no longer causes pulsations. The adequate supply of well-oxygenated blood to the vital organs and tissues is called *perfusion*. Good perfusion is essential to life.

Bleeding

Understanding the circulatory system and how it functions will assist you in assessing and caring for patients with soft-tissue injuries. Keep the following general considerations in mind while you learn how to provide emergency care for patients with soft-tissue injuries:

OBJECTIVE

2. Explain the importance of utilizing appropriate body substance isolation (BSI) precautions when caring for a patient with external bleeding.

shock ► the condition that results when there is an inadequate supply of well-oxygenated blood to all body systems.

- *Body substance isolation (BSI) precautions.* The risk of infectious disease should always be assessed and minimized when caring for bleeding patients. BSI precautions must be taken routinely to avoid direct contact with blood and other potentially infectious body fluids. Gloves should be worn during every patient encounter. Additional equipment (goggles, gown, mask) also should be used when there is an increased risk of contact with blood or other body fluids, such as in cases of childbirth or when a patient is spitting or vomiting blood.
- *Severity of blood loss.* The severity of blood loss should be based on the patient's signs and symptoms and an estimation of visible blood loss. If signs and symptoms of **shock** are present, bleeding should be considered serious. Shock will be discussed in more detail in Chapter 18.
- *Body's normal response to bleeding.* The body's automatic response to bleeding is blood vessel constriction and clotting. In cases of major bleeding, however, clotting may not occur because the flow of blood from the wound is too great to allow for the formation of a clot.

Uncontrolled bleeding always should be taken seriously. If not stopped, it will lead to shock and eventually death.

External Bleeding

OBJECTIVE

4. Differentiate the characteristics of arterial, venous, and capillary bleeding.

Bleeding can be classified as external or internal. The assessment and care of both kinds of bleeding are presented in this chapter. External bleeding may be classified as (Figure 17.3):

- *Arterial bleeding.* Arterial bleeding occurs when the arteries carrying blood away from the heart are damaged. The bleeding is often characterized by a spurting action with each beat of the heart. The color of arterial blood is bright red because it

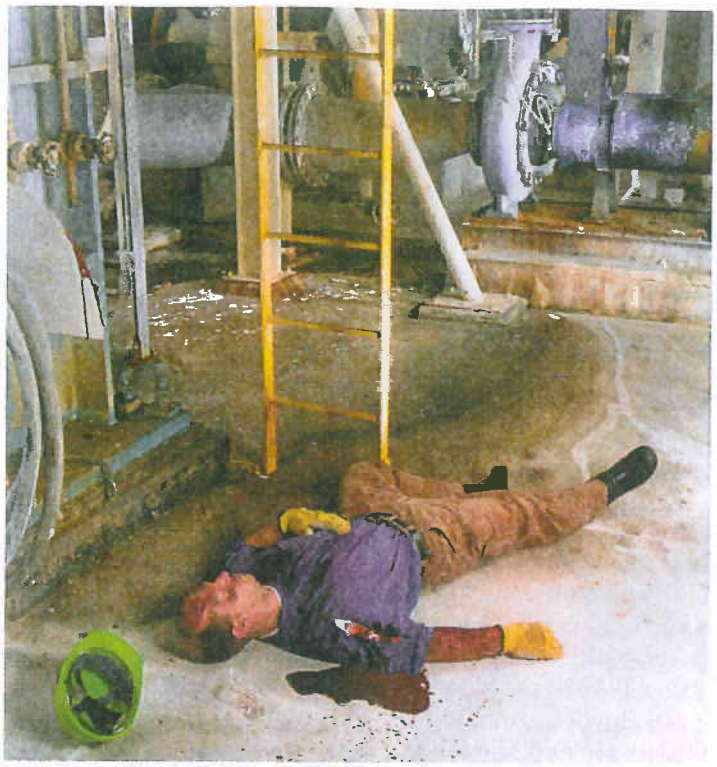


Figure 17.4 • External blood loss of about one-half liter (approximately one pint).

OBJECTIVE

5. Explain the proper care for a patient with active external bleeding.

bandage ▶ a device used to secure a dressing in place on the body, typically made of cloth or similar material.

Controlling External Bleeding

There are three steps to controlling external bleeding (Figure 17.5 and Scan 17.1): direct pressure, including the use of a pressure **bandage**; elevation combined with direct pressure; and the tourniquet, which may be used when all other bleeding control steps have failed.

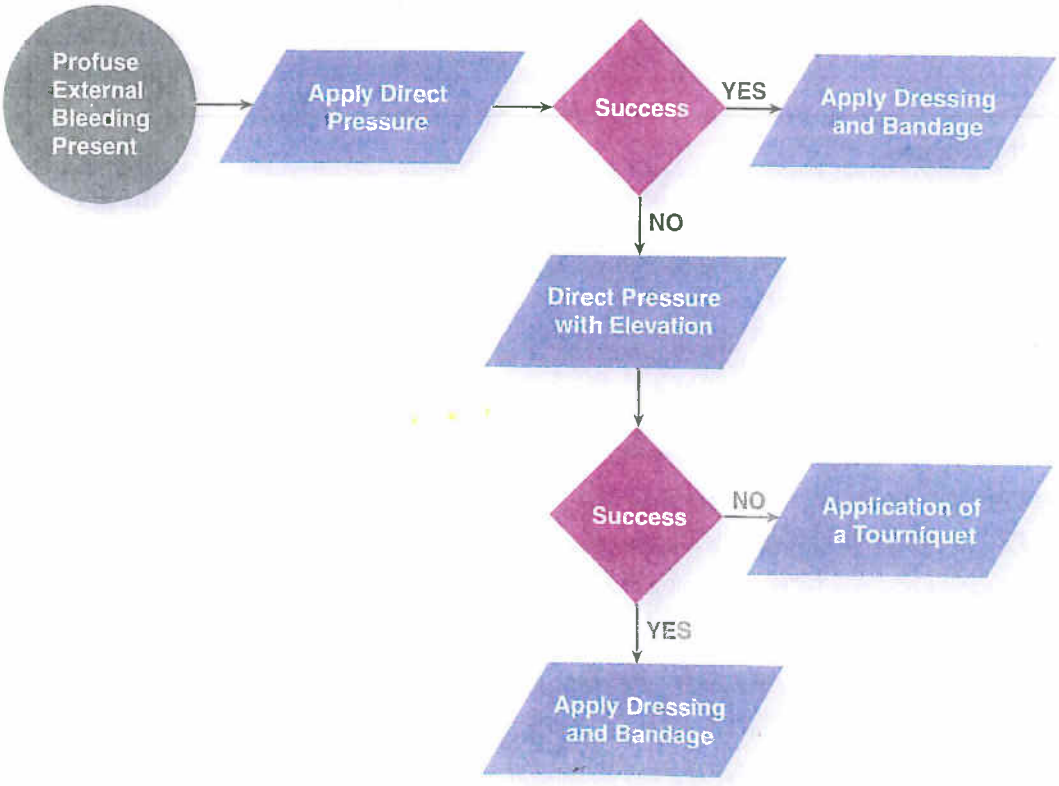


Figure 17.5 • Algorithm for control of external bleeding.

Figure 17.6 • In cases of profuse bleeding, use your gloved hand. Do not waste time hunting for a dressing.

▶ GERIATRIC FOCUS ◀

Often, the elderly are taking medications that contain "blood thinners" such as Coumadin. This prevents their blood from clotting. As a result, minor cuts may bleed profusely. Be prepared to aggressively treat any bleeding in the elderly with direct pressure and pressure bandages.

The application of a pressure bandage can be helpful during the early stages of attempting to control bleeding. To apply a pressure bandage, follow these steps:

1. Place several layers of clean dressings directly on the wound. Maintain pressure with your gloved hands.
2. Use a *roller bandage* or *cravat* (folded triangular bandages) to secure the dressings in place. It should be wrapped firmly over the dressing and above and below the wound.
3. Wrap the bandage to produce enough pressure to control the bleeding.
4. Check for a distal pulse to be certain that the pressure has not restricted circulation beyond the wound.

Figure 17.7 • (A) To control bleeding, place several (a small stack) 4 × 4s on the wound and apply direct pressure. (B) If the wound bleeds through the dressings, apply several more 4 × 4s.

Resource Central

Get more information about tourniquets.

From the Medical Director

Tourniquet

Once banned from EMS use, tourniquets have gained favor again after military studies showed success in saving lives of those with extremity injuries secondary to explosions.

FIRST ON SCENE

continued

Taine runs across the busy parking lot and crashes through the doors of the truck stop. He is breathing too heavily to say anything, and, as the store's tinny overhead speakers play an upbeat tune, all eyes turn silently toward him. He catches his breath and shouts, "Somebody call an ambulance! A guy just tore his finger off out back."

He then turns, heads back out the door, and stumbles across the parking lot. A woman standing in line at the register sets a soft drink down on a candy display and runs out the door after him. They both reach the semi at the same time.

The woman kneels down and puts her hand on Casey's shoulder. "Sir," she says. "My name is Gina, and I'm an Emergency Medical Responder. I'm trained to provide emergency care for injuries. May I help you?"

"Oh God." Casey is still squeezing his left hand, trying to make the overwhelming pain go away. "Only if you can knock me out!"

KEY POINT

For years the use of tourniquets fell out of favor for many EMS systems. Recent research by the military suggests that a tourniquet can be an effective tool for controlling severe bleeding and ultimately saving lives. The use of a tourniquet does not mean the person will lose the injured limb. In the vast majority of cases the patient will get to the hospital in time to save the limb.

If all other methods have failed and you must apply a tourniquet, carefully follow these steps (Figure 17.9):

1. Place the tourniquet just above (proximal) to the wound, but as close to the wound as possible without interfering with it.
2. Place a four-inch roller gauze or similar material on the site you have selected over the artery. This pad also can be a folded handkerchief or similar material.
3. If you are using a manufactured tourniquet, carefully place it around the limb just above the wound. Pull the free end of the band through the friction catch or buckle and draw it tightly over the pad. Tighten the tourniquet to the point where bleeding is stopped. Do not tighten it beyond this point.

   If you do not have a commercially manufactured tourniquet or would have to leave the patient to retrieve one, use a necktie, stocking, or long bandage material. Flat materials are best. The band should be at least one inch wide. Do not use any material that could cut into the patient's skin. Carefully slip the tourniquet around the patient's limb and tie a half knot on the top side of the limb. A device such as a long stick, wooden dowel, or metal rod should then be placed over the half knot. Next, tie a full knot over the stick or rod. Then turn the device until bleeding has been stopped. Do not tighten the tourniquet beyond this point.

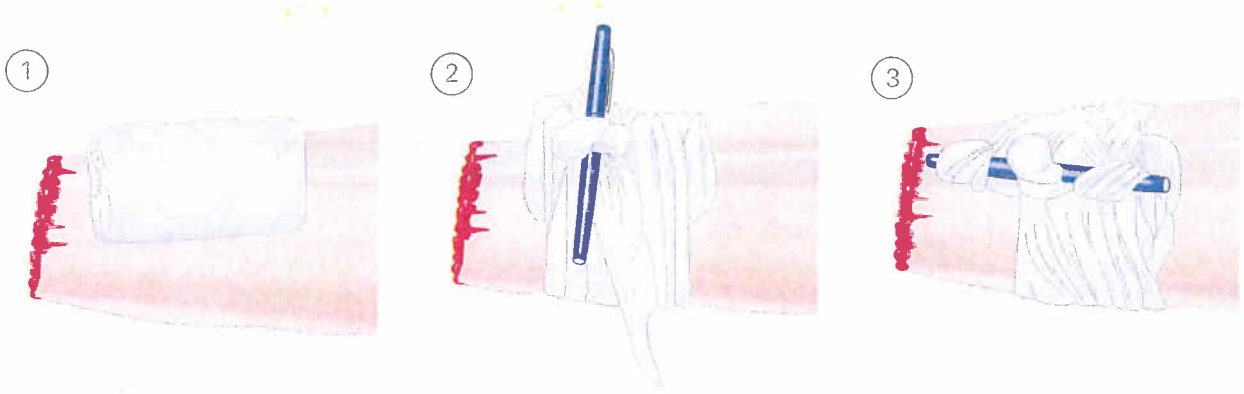


Figure 17.9 • Application of a tourniquet.

(See Chapter 19.) The air splint can be used even when there is no suspected fracture to the bones of the limb.

Combining the use of an air splint and elevation can work well on long, bleeding wounds. The splint also serves to immobilize the limb, helping reduce the chance of restarting bleeding due to patient movement. Because obtaining and applying air splints consumes time, this procedure is best done in cases of minor bleeding. The skilled rescuer can use air splints to control more serious bleeding if the splint is immediately at hand.

Dressing and Bandaging

OBJECTIVES

17. Explain the purpose of a dressing.
18. Explain the purpose of a bandage.

One of the most basic skills an Emergency Medical Responder must learn is that of properly dressing and bandaging wounds. If you follow the basic principles of dressing and bandaging, you will provide effective emergency care for the patient.

A dressing is any material (preferably sterile) placed over a wound to help control bleeding and prevent additional contamination. A bandage is any material used to hold a dressing in place.

Dressings, whenever possible, should be sterile. This means that they have been processed so that all germs and spores are killed. Commercially prepared dressings are usually sterile. They come in a variety of sizes. The most common size is four inches square. Dressings are referred to according to size, such as 2 × 2s, 4 × 4s, 5 × 9s, and 10 × 30s.

Throughout this text, you will find reference to *bulky dressings*, or multi-trauma dressings. They are thick dressings, often large enough to allow for the complete covering of large wounds. They are used to help control very serious bleeding and to stabilize impaled objects. Sanitary pads can be used in their place. They are available individually wrapped and are very clean. Bulky dressings also can be formed by applying many layers of smaller dressings.

There are a variety of specialized dressings available for use in EMS. One such dressing is the *occlusive dressing*. Occlusive dressings are typically made of sterile gauze that has been saturated with petroleum jelly. These dressings are used to create an airtight seal over a wound that penetrates a body cavity. Commercially prepared occlusive dressings are available. If they are not on hand, you can use folded plastic wrap or a plastic bag to help seal off an open wound to the chest or abdomen.

As an Emergency Medical Responder, you may not have any dressing materials at the scene of an emergency. In such cases, you might have to use clean handkerchiefs, towels, sheets, or a piece of clothing or other similar materials. When you improvise a dressing, it will not be sterile, but it can be used to help provide proper emergency care for the patient. Because the patient's wound has already been contaminated, your task is to avoid further contamination by using the cleanest material available. In the field, you must be concerned with controlling bleeding and minimizing contamination.

To be most effective, dressings must be secured in place over the wound. In most instances the dressing should be secured to the wound using a bandage. Common bandages include roller gauze, cravats, a handkerchief, strips of cloth, or any other material that will not cut into the patient's skin. Avoid the use of elastic bandages, as they can restrict circulation to the tissues if applied improperly.

The use of the self-adherent, form-fitting roller bandage makes the task of bandaging much easier (Figure 17.11). It clings to itself, making the task of wrapping around a dressing easier, quicker, and more efficient.

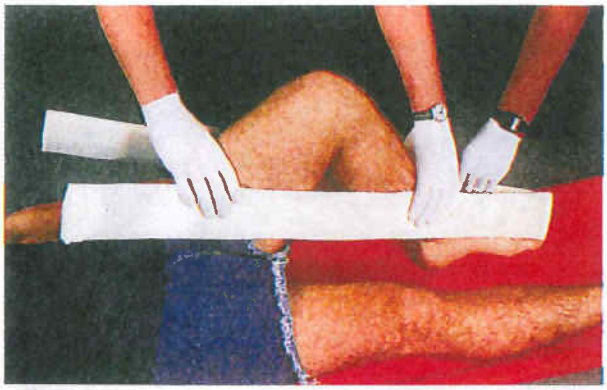
The following rules apply to dressing wounds:

- A dressing and bandage are of little value if they do not help control bleeding. Continue to apply dressing material and pressure as needed to control bleeding.
- Use sterile or clean materials. Avoid touching dressings in the area that will come into contact with the wound.
- Cover the entire surface of the wound and, if possible, the immediate area surrounding the wound.
- Once a dressing is applied to a wound, it must remain in place. Add new dressings on top of blood-soaked dressings. When a dressing is removed from a wound, bleeding may restart or increase in rate.

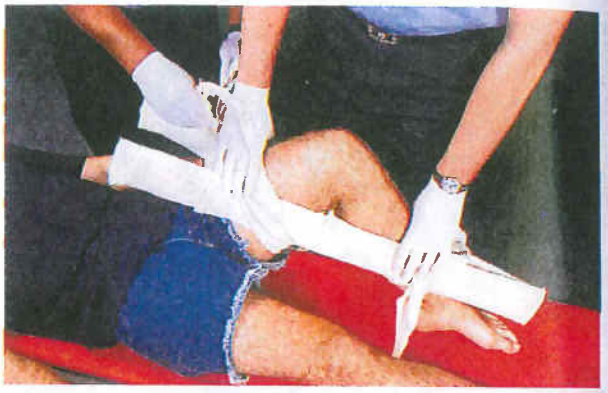
Treatment Of Lower Leg Injury

19.9.1 | Assess distal circulation, sensation, and motor function (CSM).

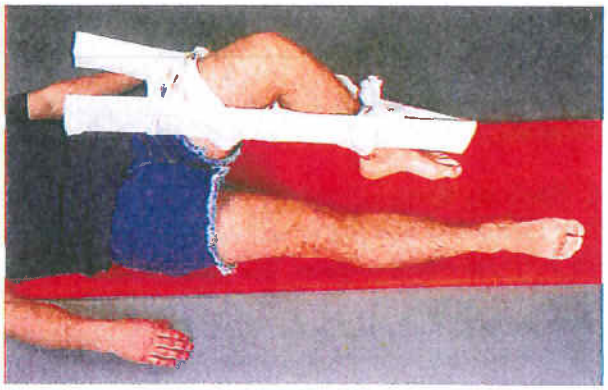
19.9.2 | Stabilize the knee above and below the injury site.



19.9.3 | Place the padded side of the splints next to the injured extremity. Note that they should be equal in length and extend 6–12 inches beyond the midthigh and midcalf.



19.9.4 | Secure splints at both ends, using cravats or similar material.



19.9.5 | Using a figure-eight configuration, secure one cravat to the ankle and the boards and the second cravat to the thigh and the boards. Reassess distal circulation, sensation, and motor function (CSM).

Injuries to the Lower Leg

You can provide care for injuries to the lower leg with either rigid or soft splints. A blanket roll between the legs is an effective soft splint. Secure it as you did for pelvic, thigh, and knee injuries described previously. Once you assist the EMTs in placing the patient on the spine board or scoop (orthopedic) stretcher, a form of rigid splinting, you have completed immobilizing all joints above and below the injury site (Scan 19.10).

Treatment Of Burns

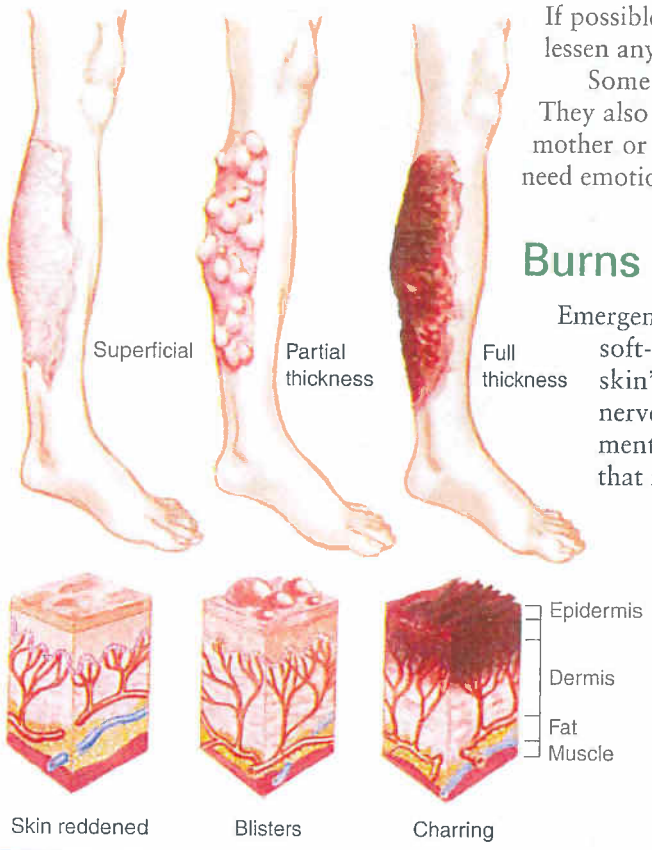


Figure 17.31 • Burns are classified by depth.

If possible, the caregiver should be of the same gender as the patient to lessen any fears that the patient may have.

Some genital injuries are self-inflicted or are the result of abuse. They also may be caused by an attempt to abort an unborn fetus by the mother or other unlicensed person. Whatever the cause, the patient will need emotional support and understanding.

Burns

Emergency Medical Responders should consider burns to be complex soft-tissue injuries that can range from a superficial burn to the skin's surface (epidermis) to a serious deep injury that involves nerves, blood vessels, muscles, and bones. Careful patient assessment is necessary to avoid missing injuries or medical problems that may be far more serious than obvious burns.

Classification of Burns

Burns are classified in a number of ways. One way is to categorize burns based on the agent that caused the injury (source of the burn). This information should be gathered and forwarded to more highly trained personnel during transfer of care. Categories of burns based on source include:

- *Heat (thermal) burns,* which may be caused by fire, steam, or hot objects
- *Chemical burns,* which may be caused by caustics, such as acids and alkalis
- *Electrical burns,* which originate from outlets, frayed wires, and faulty circuits
- *Lightning burns,* which occur during electrical storms
- *Light burns,* which occur with intense light. Light from the arc welder or industrial laser will damage unprotected eyes. Also, ultraviolet light (including sunlight) can burn the eyes and skin.
- *Radiation burns,* which usually result from nuclear sources

OBJECTIVE

13. Differentiate superficial, partial-thickness, and full-thickness burns.

KEY POINT ▼

Even though the nerves have been damaged by full-thickness burns and may not be painful, the areas surrounding the burns will be very painful.

Most often burns are categorized according to the depth of the burn (Figure 17.31). *Superficial burns* involve the top layer of skin known as the *epidermis*. Signs and symptoms include reddening of the skin and pain at the site. A common example is sunburn. *Partial-thickness burns* involve both the epidermis and the dermis (the top two layers of skin) (Figure 17.32) and present with intense pain, white to red skin that is moist and mottled (in light-skinned patients), and blisters. A classic example is a steam burn. *Full-thickness burns* extend through all dermal layers and may involve subcutaneous layers, muscle, bone, or organs (Figure 17.33). Full-thickness burns can be dry and leathery and may appear white, dark brown, or charred. Because there is often nerve damage present, there may be little to no sensation of pain present.

Figure 17.32 • Partial-thickness burn.

Severity of Burns

An important aspect of emergency care is being able to assess the severity of a burn, or extent of the damage. Defining the severity of a burn will involve evaluating the depth of burn as well as the total body surface area affected. A superficial or partial-thickness burn that involves less than 9% of the patient's total body surface area is considered a minor burn. The exceptions are if the burn

- Any burn that encircles a body part
- Burns estimated at greater than 15% of the patient's body
- Burns that include respiratory involvement

- When in doubt, over-classify.
- Always consider the effects of a burn to be more serious if the patient is a child, elderly, the victim of other injuries, or someone with a medical condition (e.g., respiratory disease).

OBJECTIVES

15. Explain the proper care for a patient with a superficial, partial-thickness, and full-thickness burn.

16. Differentiate the care for electrical, chemical, and thermal burns.

For emergency care of a patient with burns, take BSI precautions. For the contents of a typical burn kit. Then follow these steps:

1. Stop the burning process immediately. This may require the patient to stop, drop, and roll to extinguish the flames. You might also have to smother the flames and wet down or remove smoldering clothing.
2. Flush minor burns with cool or running water (or saline) for several minutes. For serious burns, do not flush burns with cool water unless they involve an area of less than 9% of the total body surface area. Follow local protocol. Flushing large burn areas may chill the patient and increase the risk of developing shock and infection.
3. Remove smoldering clothing and jewelry. Do not remove any clothing that is melted onto the skin.
4. Continually monitor the airway. Any burns to the face or exposure to smoke may cause airway problems. Administer oxygen as per local protocols.
5. Prevent further contamination. Keep the burned area clean by covering it with a dressing. Infection is common with burns.
6. Cover the burn area with dry, clean dressing. In some EMS systems, you may be instructed to moisten dressings before placing them on the patient. Otherwise, place dry, sterile dressings onto the burned area. Follow local protocols.
7. Give special care to the eyes. If the eyes or eyelids have been burned, place clean dressings or pads over them. Moisten these pads with sterile water if possible.
8. Give special care to the fingers and toes. If a serious burn involves the hands or feet, always place a clean pad between toes or fingers before completing the dressing.
9. Provide oxygen and care for shock.

Thermal Burns

See Scan 17.4 for a summary of caring for thermal burns.

Chemical Burns

Many chemicals are harmless if they are used properly or remain contained. However, if those chemicals come in contact with the human body, they can cause harm. Some irritate the skin and create burns very quickly. Others create a slow, painful burning process. In either case, it is crucial to stop the burning process and remove the irritant (Figure 17.35).

Figure 17.35 • Chemical burns: (A) Brush away dried powders and then (B) flush the skin with water.

Scenes involving patients with chemical burns can be very dangerous. Thus, completing a scene size-up and ensuring scene safety is important. If you believe there are hazards at the scene that will place you in danger, do not attempt a rescue unless you have been trained to do so and have the necessary equipment.

The primary method of caring for chemical burns is to wash away the chemical with water. A simple wetting of the burned area is not enough. Flush the area of the patient's body that has been exposed. Continue to flush the area for at least 20 minutes. Be sure to remove all contaminated clothing, shoes, socks, and jewelry from the patient during the wash.

Once you have flushed the area for at least 20 minutes, apply a dry, clean dressing, care for shock, and make sure EMS has been notified. If the patient begins to complain of increased burning or irritation once a dressing is in place, remove the dressing and flush the burned area with water for several minutes more. Then apply a new dry dressing.

Remember, when providing emergency care for chemical burns:

1. Flush the burned area for at least 20 minutes. If possible and if it can be done quickly, try to identify any chemical powders before applying water. Water could cause a reaction that will produce heat and increase burning of the skin.
2. Apply a dry, clean dressing.
3. If burning continues, remove dressing and flush again.

If dry lime is the agent causing the burn, *do not* begin by flushing with water. Instead, use a *dry* dressing to *brush* the substance off the patient's skin, hair, and clothing. Also have the patient remove any contaminated clothing or jewelry. Once this is done, you may flush the area with water.

Chemical burns to the eyes require immediate attention. Assume that both eyes are involved. When caring for chemical burns to the eyes, you should:

1. Taking appropriate BSI precautions.
2. Perform a primary assessment and support the ABCs as necessary.
3. Immediately flush the eyes with clean water.
4. Keep the water flowing from a faucet, bucket, or other source into the eye. Use caution not to contaminate the good eye, if one eye is not affected, as you flush.
5. Continue flushing for at least 20 minutes.
6. After flushing the eyes, cover both of them with moistened pads.
7. Remove the pads and flush again if the patient begins to complain about increased burning sensations or irritation.

Electrical Burns

On the scene of an electrical injury, burns are not usually the most serious problem a patient sustains. Cardiac arrest, nervous system damage, fractures, and injury to internal organs may occur with these incidents (Figure 17.36).

The scene of an electrical injury is often very hazardous. Make sure that the source of electricity has been turned off before caring for the victim. If the electricity is still active, do not attempt a rescue unless you have been trained to do so and have the necessary equipment.

To provide emergency care to a patient with an electrical burn, you should:

1. Perform scene size-up and take appropriate BSI precautions.
2. Perform a primary assessment. Electricity passing through a patient's body will cause cardiac arrest. Even if the patient appears stable, be prepared for complications involving the airway and heart. Administer oxygen as per local protocols.
3. Evaluate the burn. Look for two burn sites—an entrance and an exit wound. The entrance wound (often the hand) is where the electricity entered the body. The exit wound is where the electricity came into contact with a ground (often a foot). The entrance wound may be small, and you may need to look very carefully for it. The exit wound may be large and obvious.

Treatment For Shock

- *Pale, cool, moist skin.* As blood is redirected to the vital organs from the skin, the skin will become pale and feel cool to the touch. Stimulation from the sympathetic nervous system also causes sweating.
- *Changes in mental status.* As adequate circulation to the brain continues to fail, the patient will become confused, disoriented, sleepy, or unresponsive.
- *Respiratory and cardiac arrest* can develop.

▶ GERIATRIC FOCUS ◀

In a younger person, the heart rate will increase steadily in an attempt to maintain an adequate blood pressure. In the geriatric patient, the heart is limited in its ability to beat faster due to the effects of aging. Many geriatric patients take medications that are designed to keep their heart rate low and thus may counteract the body's normal compensatory mechanisms.

KEY POINT ▼

Provide care for all injured patients as if shock will develop. Do the same for all patients with problems involving the heart, breathing, abdominal pain, diabetes, drug abuse, poisoning, and abnormal childbirth. Carefully monitor all patients for the early signs of shock.

If the cause of the shock is not stopped, the normal compensatory mechanisms mentioned above will begin to fail, resulting in decompensated shock. The following are the late signs and symptoms of shock, the ones that appear as the patient enters decompensated shock: unresponsiveness, decreasing heart rate, very low blood pressure, slow and shallow respirations, skin that is pale, cool, and moist, and dilated, sluggish pupils.

Mechanism of Injury and Shock

One of the keys to the successful care of shock is early detection. Do not want to wait for signs and symptoms to develop before you begin caring for shock. In cases of trauma or injury, examine and consider the mechanism of injury carefully. If there is any chance that the patient may have suffered blunt trauma to the head, chest, abdomen, or pelvis, suspect that internal bleeding exists and care for the patient accordingly. Of course, you also must identify and stop all external bleeding immediately upon discovery.

Caring for Shock

OBJECTIVE

6. Explain the proper care of a patient presenting with signs and symptoms of shock.

In most cases the patient will require more advanced care both in the field and in the hospital. However, if recognized early, the Emergency Medical Responder can provide care that will minimize the progression of shock and ensure prompt transport to the hospital.

Help delay the progression of shock by doing the following (Figure 18.6):

1. Perform a primary assessment and ensure the ABCs are properly supported.
2. Control external bleeding.
3. Administer oxygen per local protocol.
4. Keep the patient in a supine position.
5. Calm and reassure the patient, and maintain a normal body temperature.
6. Monitor and support the ABCs.

Resource Central

Learn more about bleeding.

From the Medical Director

Hypothermia

Even after finding success with tourniquets for bleeding injuries, the military continued to lose patients to shock. Research found that complications with hypothermia was the cause. Keep the victims warm because they are unable to maintain normal body temperature.

2014 Northern Invitational Mine Rescue Contest
Findley Lake, NY
First Aid Contest

APPEAL RESULTS

Judge No. _____ **Discount No. _____**

Appeal Accepted _____ **Appeal Denied _____** **Points Restored _____**

Reasons:

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Judge No. _____ **Discount No. _____**

Appeal Accepted _____ **Appeal Denied _____** **Points Restored _____**

Reasons:

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Chief Judge

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Contest Director

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Contest Director

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