

# Seabee Combat Handbook Volume 1

## Chapter 10

### First Aid and Field Sanitation

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## CHAPTER 10

# FIRST AID AND FIELD SANITATION

This chapter will help you understand the importance of first aid to an injured person and will provide you with an explanation of the first-aid measures that you can apply to yourself and to other persons before trained medical personnel arrive. How-to instructions in lifesaving measures are provided for clearing the upper airway, giving artificial ventilation, stopping bleeding, controlling shock, and protecting the wound. In addition, the fundamentals of field sanitation are presented.

First aid is the emergency care given to sick or injured persons. Emergency care must not take the place of proper medical or surgical treatment but should consist only of furnishing temporary assistance until competent medical aid is available.

The purposes of first aid are (1) to save life, (2) to prevent further injury, and (3) to preserve vitality and resistance to infection.

Everyone in the Navy must know when and how to apply first-aid measures. They also must be prepared to provide competent assistance to persons injured in battle, collision, fire, and other accidents that may occur on land, on sea, or in the air. A real knowledge of first aid and its purposes, when applied properly, can mean the difference between life and death, between rapid recovery and long hospitalization, and between temporary disability and permanent injury.

When administering first aid, you have three primary tasks. They are (1) to maintain breathing, (2) to stop bleeding, and (3) to prevent or reduce shock

You must work quickly, but do not rush around frantically. Do not waste time looking for ready-made materials, but do the best you can with whatever is at hand. Also, send for medical help as soon as possible.

### GENERAL FIRST-AID RULES

Although each case of injury or sickness presents its own special problems, there are some general rules that apply to practically all situations. Before proceeding to learn the specific first-aid treatment for various types of injuries, you should have a thorough understanding of the following rules:

1. Keep the victim lying down, with his head level with his body, until you have determined what type of injury the person has and how serious it is; however, if the victim has one of the following problems, you need to place him in a different position:

a. Vomiting or bleeding about the mouth and semiconscious. When the victim is in danger of sucking in blood, vomited matter, or water, place him on his side or back, with his head turned to one side, lower than his feet.

b. Shortness of breath. When the victim has a chest injury or breathing difficulties, place him in a sitting or semisitting position.

c. Shock When the victim is in shock place him on his back with his head slightly lower than his feet. When injuries permit, the victim's feet should be raised and supported 6 to 12 inches off the deck.

2. In examining the victim, move him no more than is absolutely necessary. You may need to remove some clothing to determine the extent of his injuries. Remove enough clothing to get a clear idea of the extent of the injury. If done incorrectly, removing clothing may do great harm, especially in fracture injuries. When necessary, rip or cut the clothing along the seams. When clothing is removed, ensure the victim does not become chilled. Shoes may have to be cut off to avoid causing pain or increasing an injury.

3. Keep the victim reassured and as comfortable as possible. Often a restoration of confidence is very helpful. Assure the victim that his injuries are understood and that he will receive medical attention as soon as possible.

4. Do not touch open wounds or burns with your fingers or other objects, except when sterile compresses or bandages are not available and it is absolutely necessary to stop severe bleeding.

5. Do not try to give an unconscious person solid food or liquid by mouth. The victim may vomit and get some of the material into his lungs when he breathes, causing choking. Death could result.

6. When a bone is broken or when you suspect that one is broken, do not move the victim until you have

immobilized the injured part. This may prove to be lifesaving in cases of severe bone fractures or spinal cord injuries, because a jagged bone may sever nerves and blood vessels, damage tissues, and increase shock. Of course, the threat of fire and other similar situations may require that the victim be moved. But the principle should always be kept firmly in mind and considered against other factors.

7. When transporting an injured person, always make sure the litter is carried feet forward no matter what injuries the victim has. This enables the rear bearer to observe the victim for any respiratory obstruction or breathing problem.

8. Keep the injured person comfortably warm-warm enough to maintain normal body temperature.

Very serious and mutilating injuries may require heroic first-aid measures on your part. Most injuries require minimum physical effort but a maximum effort in judgment and self-control to prevent everyone from trying to do too much.

*Basic life support* is a term you have probably heard before. It consists of emergency techniques for recognizing and treating failures of the respiratory system and heart function. The primary emphasis is placed on maintaining an open AIRWAY to counter upper-airway obstruction, restoring BREATHING to counter respiratory arrest, and restoring CIRCULATION to counter cardiac arrest. These are the ABCs of basic life support. This chapter attempts to cover some of the essentials of basic life support. Remember: this chapter does not substitute for a formal course in basic life support. Formal courses, such as those given by the American Red Cross or the American Heart Association, provide hands-on training, using manikins. This training is essential for proper execution of the emergency techniques necessary in basic life support.

### UPPER AIRWAY OBSTRUCTION

Most people who are choking automatically clutch at their throat. This is recognized as the universal distress signal for upper airway obstruction (fig. 10-1). The most common cause of upper airway obstruction in a conscious person is improperly chewed food.

**PARTIAL OBSTRUCTION.** When the victim coughs or when there is adequate air exchange, encourage the victim to continue with his own efforts to expel the foreign body. Do not interfere with the victim's

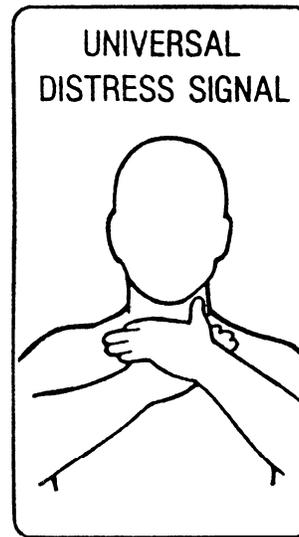


Figure 10-10.—Universal distress signal.

efforts to remove the obstruction. Observe the victim closely for increased distress, and be prepared to treat him for a completely blocked airway.

When there is inadequate air exchange, which is indicated by a weak or ineffective cough, high-pitched noises while the victim attempts to inhale, and bluish discoloration of the skin (especially around the nails and lips), handle the problem as though it were a complete airway obstruction.

**COMPLETE AIRWAY OBSTRUCTION.** Complete airway obstruction is indicated by no air exchange and an inability to speak, cough, or breathe. If the victim is conscious, he may exhibit the universal distress signal, as identified above.

When the victim is unconscious, check for breathing. When the victim is not breathing, his tongue or some other object may be blocking the air passage. The airway may be opened by tilting his head back and lifting his chin. Or when his head should not be moved, in the case of neck injuries, his jaw may be thrust forward. These techniques are described below.

### OPEN THE AIRWAY

The most important action for successful resuscitation is to open the airway immediately. In the absence of sufficient muscle tone, the tongue or epiglottis will obstruct the pharynx or the larynx, respectively (fig. 10-2, Top). The tongue is the most common cause of obstruction in an unconscious victim.

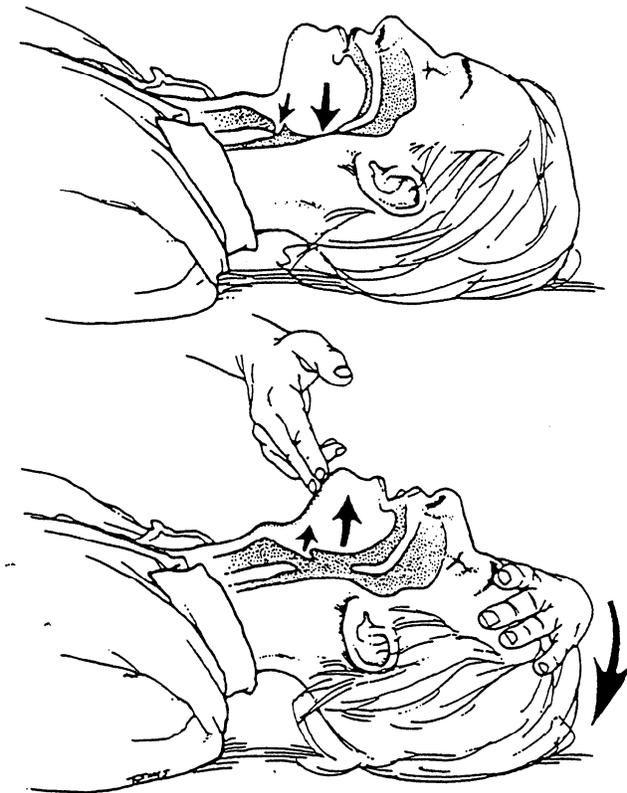


Figure 10-2.—Opening the airway. Top: Airway obstruction produced by the tongue and epiglottis. Bottom: Relief by head tilt or chin lift.

Since the tongue is attached to the lower jaw, moving the jaw forward lifts the tongue and the epiglottis away from the back of the throat and opens the airway (fig. 10-2, Bottom). Also, either the tongue or the epiglottis, or both, may produce obstruction when negative pressure is created in the airway by inspiratory effort, causing a valve type of mechanism to include the entrance to the trachea. Opening the airway maybe all that is needed to relieve the obstruction and allow the victim to breathe.

### HEAD TILT OR CHIN LIFT

The rescuer should use the head-tilt or chin-lift maneuver, described below (fig. 10-3), to open the airway. When foreign material or vomitus is visible in the mouth, it should be removed. Excessive time must not be taken. Liquids or semiliquids should be wiped out with the index and middle fingers covered by a piece of cloth; solid material should be extracted with a hooked index finger.

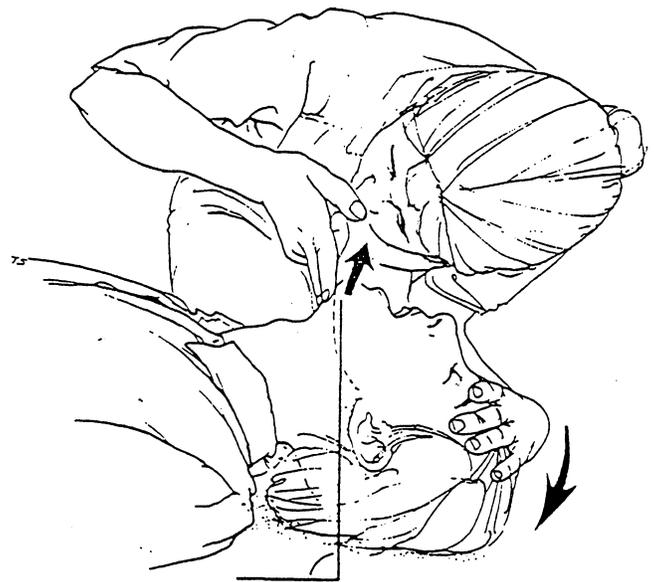


Figure 10-3.—Head-tilt or chin-lift maneuver. Perpendicular line reflects proper neck extension; that is, a line along the edge of the jawbone should be perpendicular to the surface on which the victim is lying.

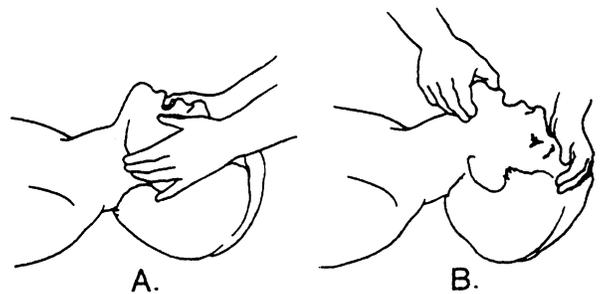


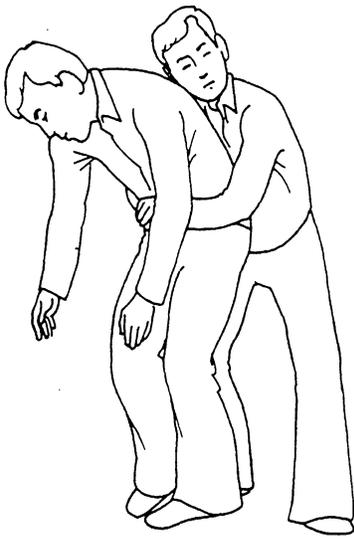
Figure 10-4.—Jaw thrust.

### JAW THRUST TECHNIQUE

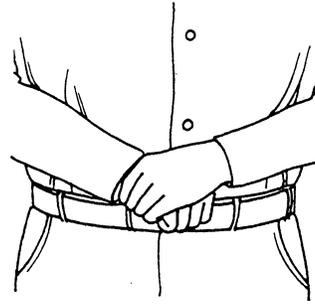
Another technique for opening the airway is the jaw thrust. This technique is accomplished by kneeling by the top of the victim's head and placing your fingers behind the angles of the lower jaw, or hooking your fingers under the jaw, then bringing the jaw forward. Separate the lips with your thumbs to allow breathing through the mouth as well as the nose, as shown in figure 10-4. This technique should be used when a neck injury is suspected. Note that the head is not tilted.

Each of these techniques offer some relief for most forms of airway obstruction. They also prepare the way for artificial ventilation.

After having opened the airway, check the mouth for mucus, food particles, foreign objects, or loose dentures. When present, open the victim's mouth and



**Figure 10-5.—Position for standing abdominal thrust.**



**Figure 10-6.—Correct hand positioning.**

clear away the matter by inserting a finger into the mouth and gently sweeping from the inside of one cheek to the other. Be careful not to force the material into the victim's throat. Next, reposition the victim's head, ensuring an open airway, and place your ear next to the victim's nose and mouth. While in this position, listen and feel for air exchange, and look at the victim's chest and abdomen for movement.

If the airway is still obstructed, it may be necessary to try to remove the obstruction by using the abdominal thrust or chest thrust methods.

### **ABDOMINAL THRUST TECHNIQUE**

When the back blows are unsuccessful, use the abdominal thrust. This procedure pushes air from the lungs and forces the object from the air passage.

#### **ABDOMINAL THRUST STANDING TECHNIQUE**

1. Stand behind the victim and wrap your arms around the victim's waist, as shown in figure 10-5.
2. Make a fist with one hand and place it thumb side against the abdomen, slightly above the navel.
3. Grasp the fist with the other hand (fig. 10-6).
4. Give four quick upward thrusts to the victim. The obstruction should pop out like a champagne cork.

### **ABDOMINAL THRUST RECLINING TECHNIQUE**

This technique is performed with the victim lying flat, faceup.

1. Position yourself for the thrust by straddling the victim at the hips.
2. Place the heel of one hand on top of the other, slightly above the navel, with the fingers pointing toward the head.
3. Give four quick upward thrusts to the abdomen.

Following the cycle of 6 to 10 abdominal thrusts, turn the victim's head to one side, and check for loose foreign matter with a sweeping movement of the index finger inside the mouth, then ventilate. Repeat cycles of 6 to 10 abdominal thrusts, finger sweeps, and ventilation until the obstruction is dislodged or until a rescue team arrives.

### **CHEST THRUSTS TECHNIQUE**

For obese or pregnant victims, the chest thrust method is recommended for removing airway obstructions, since manual pressure to the abdominal area of these people would either be ineffective or cause internal damage.

#### **CHEST THRUSTS STANDING TECHNIQUE**

1. Bring your arms under the arms of the victim and encircle the lower chest, as shown in figure 10-7.
2. Position your hands as described for the abdominal thrust standing technique.
3. Keep your fist on the middle of the sternum (breastbone), not the lower part.
4. Apply pressure to the chest with quick, backward thrusts.



Figure 10-7.—Position for standing chest thrust.

### CHEST THRUSTS RECLINING TECHNIQUE

This technique is performed with the victim lying flat, faceup.

1. kneel at the victim's side.
2. Place the heel of one hand on the middle of the sternum and cover with the other hand, keeping your fingers off the chest.
3. Give four downward thrusts.
4. Repeat cycles of chest thrusts and finger sweeps, following the same technique you would use with abdominal thrusts.

### SELF-HELP FOR AIRWAY OBSTRUCTION

If you are alone and you are the victim of an airway obstruction, do not be afraid for you can help yourself. Using your own fist, you can perform the abdominal thrust standing technique. You may also use the back of a chair to exert abdominal pressure. (See fig. 10-8.)

### BREATHING

The second aspect of basic life support is to restore breathing in cases of respiratory arrest (the victim has stopped breathing). Failure of the breathing mechanism may be caused by various factors. They include complete airway obstruction, acute trauma, suffocation, electric shock drowning, and drug overdose. Unless something is done when the victim is not breathing, the

### PROCEDURE FOR:



Figure 10-8.—Procedure for self-help.

heart will soon stop beating. In such instances, be prepared to start cardiopulmonary resuscitation (CPR).

The signs of respiratory arrest are an absence of respiratory effort, a lack of detectable air movement through the nose or mouth, unconsciousness, and a bluish discoloration of the lips and nail beds.

### ARTIFICIAL VENTILATION

The purpose of artificial ventilation is to provide a method of air exchange until natural breathing is reestablished. Artificial ventilation should be given only when natural breathing has stopped; it must not be given to any person who is breathing naturally. Do not assume that a person's breathing has stopped merely because the person is unconscious or has been rescued from the water, from poisonous gas, or from contact with an electric wire. Remember: **DO NOT GIVE ARTIFICIAL VENTILATION TO A PERSON WHO IS BREATHING NATURALLY.**

In the last section, we discussed the methods to open the blocked airway. When the victim is not breathing, it is essential for the airway to be open so the rescuer can begin respiratory life support. When the victim does not begin spontaneous breathing after opening the airway, begin artificial ventilation immediately. When ventilation is inadequate, readjust the head, using one of the methods described earlier and attempt to ventilate again. If the airway is obstructed, use the thrust techniques discussed previously, followed by another attempt at artificial ventilation.



Figure 10-9.—Feeling for the carotid pulse.

### Mouth-to-Mouth Ventilation

To perform mouth-to-mouth ventilation, place one hand under the victim's neck; place the heel of the other hand on his forehead; use the thumb and index finger to pinch his nostrils shut. Tilt his head back to open the airway. Take a deep breath, cover the victim's mouth with your own, and blow into the victim's mouth. Briefly remove your mouth from the victim's mouth to allow exhalation. Initially, give four quick breaths in succession, allowing the lungs to deflate, only partially. Observe the victim's chest for movement. Check the victim's neck pulse (carotid artery), as shown in figure 10-9. When a pulse is present, continue rescue breathing at the rate of 12 ventilations per minute (one breath every 5 seconds).

### Mouth-to-Nose Ventilation

Mouth-to-nose ventilation is effective when the victim has extensive facial or dental injuries; this permits an effective air seal.

To administer this method, seal the victim's mouth with your hand, take a deep breath, and place your lips over the victim's nose and blow. To assist the victim to exhale, you may open the lips. Start artificial ventilation with four quick breaths in succession, allowing the lungs to deflate, only partially. Check the victim's neck pulse. If a pulse is present, continue rescue breathing at the rate of 12 ventilations per minute (one breath every 5 seconds).

### Gastric Distention

Sometimes during artificial ventilation, air enters the stomach instead of the lungs, and the abdomen

appears bloated. This condition is called gastric distention. If gastric distention develops, open the airway even more and cut down on the amount of air you are providing, BUT DO NOT attempt to expel the stomach contents by pushing on the abdomen. If the patient vomits while you are giving mouth-to-mouth ventilation, turn his head to one side and clear the airway.

## CIRCULATION

Cardiac arrest occurs when the heart stops functioning. If the victim is to live, take action immediately to restore the victim's heart function. The signs of cardiac arrest include the absence of a pulse, because the heart is not beating, and the absence of breathing.

A rescuer who knows how to administer CPR increases the chances of a victim's survival. CPR consists of artificial ventilation and external heart compressions. The lungs are ventilated by using the mouth-to-mouth or mouth-to-nose technique; the compressions are performed by pressing the chest with the heels of your hands. The victim should be laying faceup on a firm surface.

CPR should not be attempted by a rescuer who has not been properly trained, as mentioned earlier in this chapter. To learn this technique, contact your medical education department.

The rescuer must not assume that cardiac arrest has occurred solely because the victim is lying on the deck and appears to be unconscious (fig. 10-10). First, try to arouse the victim by gently shaking his shoulders and by trying to obtain a response; loudly ask, "Are you OK?" Be careful if the victim shows signs of head and spinal injuries. If there is no response, place the victim faceup on a firm surface. Kneel at a right angle to the victim, and open the airway, using the head tilt-neck lift, the head tilt-chin lift, or the jaw thrust methods previously discussed. Look for chest movement. Listen and feel for air coming from his nose or mouth for at least 5 seconds. If the pulse is absent, call for help and begin CPR.

Locate the lower margin of the victim's rib cage on the side closest to you by using your middle and index fingers. Then move your fingers up along the edge of his rib cage to the notch (xiphoid process) where the ribs meet the sternum in the center of his lower chest. Your middle finger should be placed on the notch with your index finger next to it. The heel of your other hand should be placed along the midline of his sternum, next to your index finger. You must keep the heel of your hand

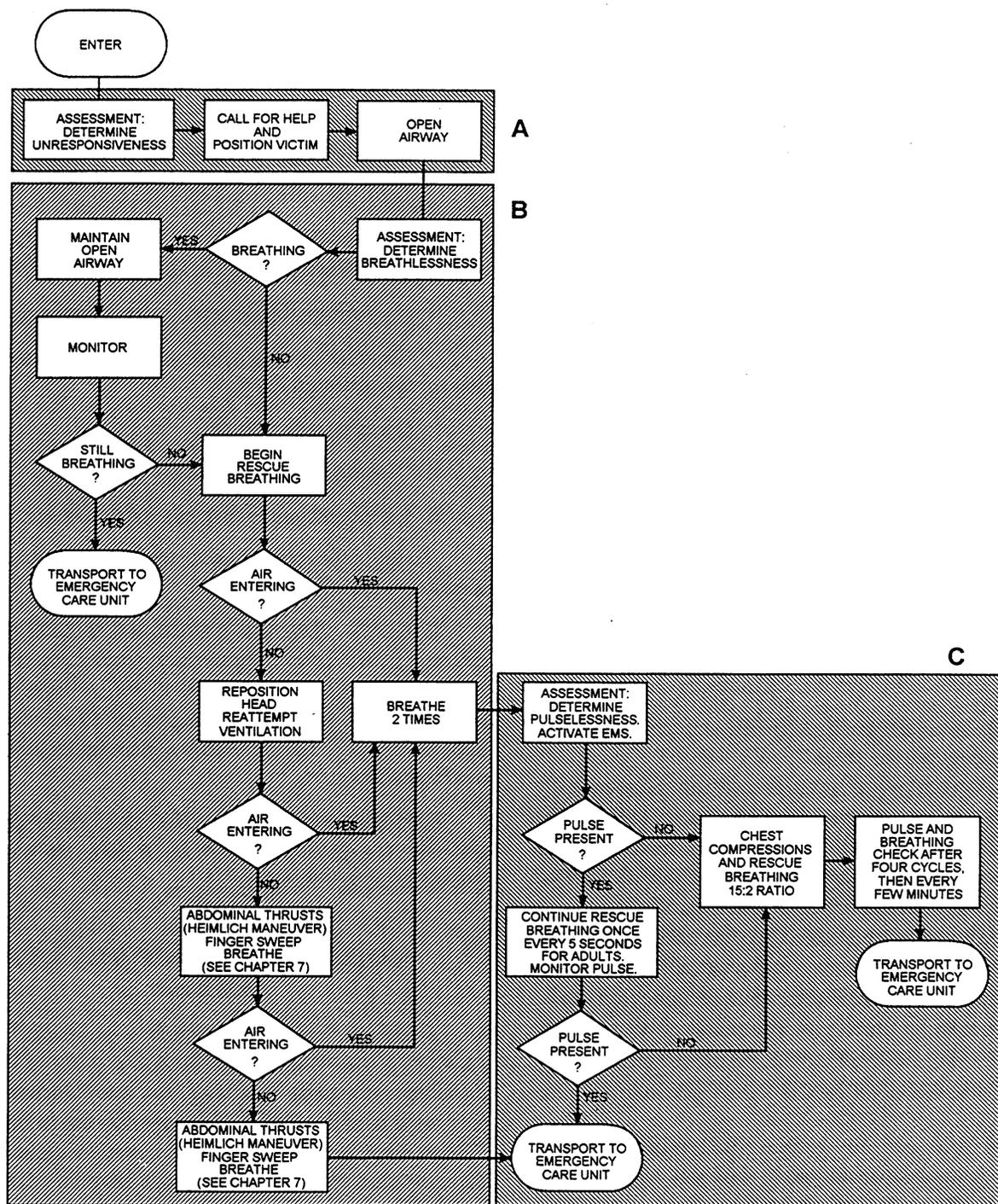
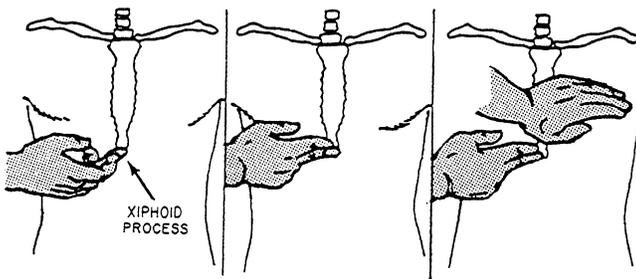


Figure 10-10.—One-rescuer CPR decision tree.



POSITION OF HANDS

Figure 10-11.—Xiphoid process.

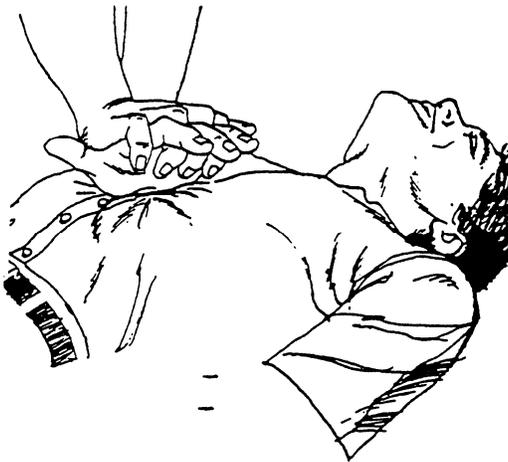


Figure 10-12.—Interlocking fingers to help keep fingers off the chest wall.

off the xiphoid process (fig. 10-11). A fracture in this area could lacerate the liver.

Place the heel of one hand directly on the lower half of the sternum two fingers up from the notch and the heel of the other on top of the first hand. Interlock your fingers or extend them straight out, and **KEEP THEM OFF THE VICTIM'S CHEST!** (See fig. 10-12.)

With your elbows locked, apply vertical pressure straight down to depress the sternum (adult) from 1 1/2 to 2 inches. Then release the pressure, keeping the heels of your hands in place on his chest. This process compresses the heart between the sternum and the victim's back thus pumping blood to the vital parts of the body.

When you use the proper technique, a more effective compression will result, and you will feel less fatigue. Ineffective compression occurs when the elbows of the rescuer are not locked, he is not directly over the sternum, or his hands are improperly placed on the sternum.

When one rescuer performs CPR, the ratio of compressions to ventilations is 15 to 2, and it is performed at a rate of 80 compressions per minute. Vocalize "1, and 2, and 3," and so forth, until you reach

15. After 15 compressions, you must give the victim 2 ventilations. Continue for four full cycles of 15 compressions and 2 ventilations. Then take 5 seconds to check for the carotid pulse and spontaneous breathing. When there are still no signs of recovery, continue CPR. If a periodic check reveals a return of pulse and respiration, discontinue CPR; but closely monitor the victim's pulse and respirations, and be prepared to start CPR again, if required. When a pulse is present but no respiration, continue to give the victim one ventilation every 5 seconds and check his pulse frequently.

Before moving on to the next technique, let us review the following steps for one-rescuer CPR:

1. Determine whether the victim is conscious.
2. Open the airway (it maybe necessary to remove the airway obstruction).
3. Look, listen, and feel.
4. Ventilate for four cycles.
5. Check his pulse-if none, call for help.
6. Begin the compression-ventilation ratio of 15 to 2 for four complete cycles.

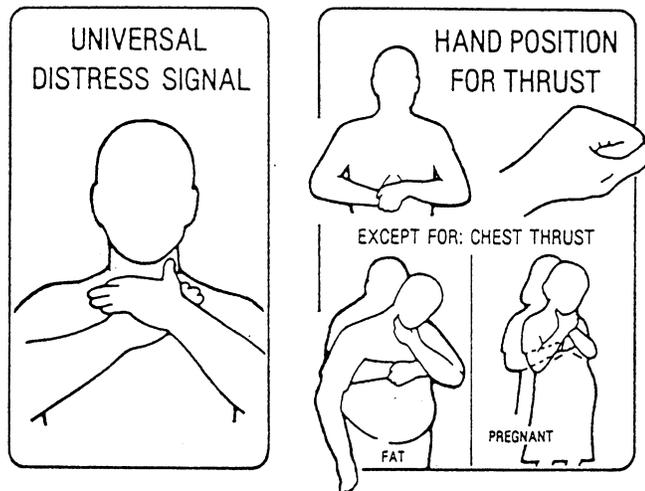
7. Check again for a pulse and breathing. If no change, continue the compression-ventilation ratio of 15 to 2 until the victim is responsive, until you are properly relieved, until you can no longer continue because of exhaustion, or until the victim is pronounced dead by a medical officer.

The diagrams in figures 10-13 and 10-14 show the step-by-step methods discussed in this chapter, and it serves as a good review.

## TRANSPORTATION OF SICK AND INJURED

Knowing how to transport a seriously injured casualty is one of the most important parts of first aid. Careless or rough handling not only increases the seriousness of his injury but may also cause his death. Unless there is a good reason for transporting a casualty, do not attempt this until some means of medical evacuation is provided. Sometimes when the situation is urgent and you know that no medical evacuation facilities are available, you may have to transport the casualty yourself. This is the reason why you should know the different ways of transporting a casualty. Give the appropriate first aid before leaving with him. If he has a broken bone, do not transport him until you have splinted or immobilized it.

## DEFINITIONS



## PROCEDURE

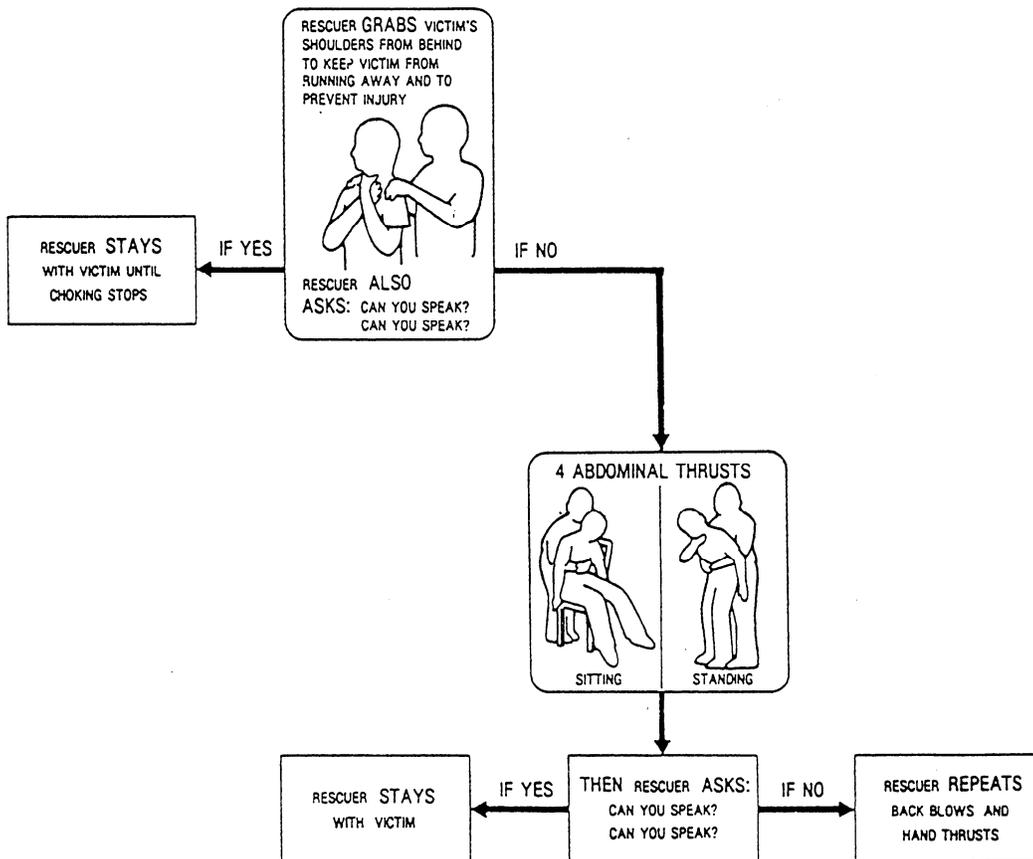
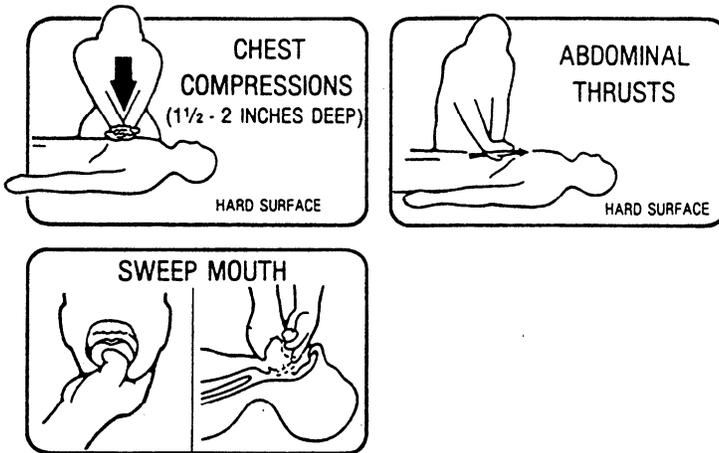


Figure 10-13.—Choking procedures.

## DEFINITIONS



## PROCEDURE

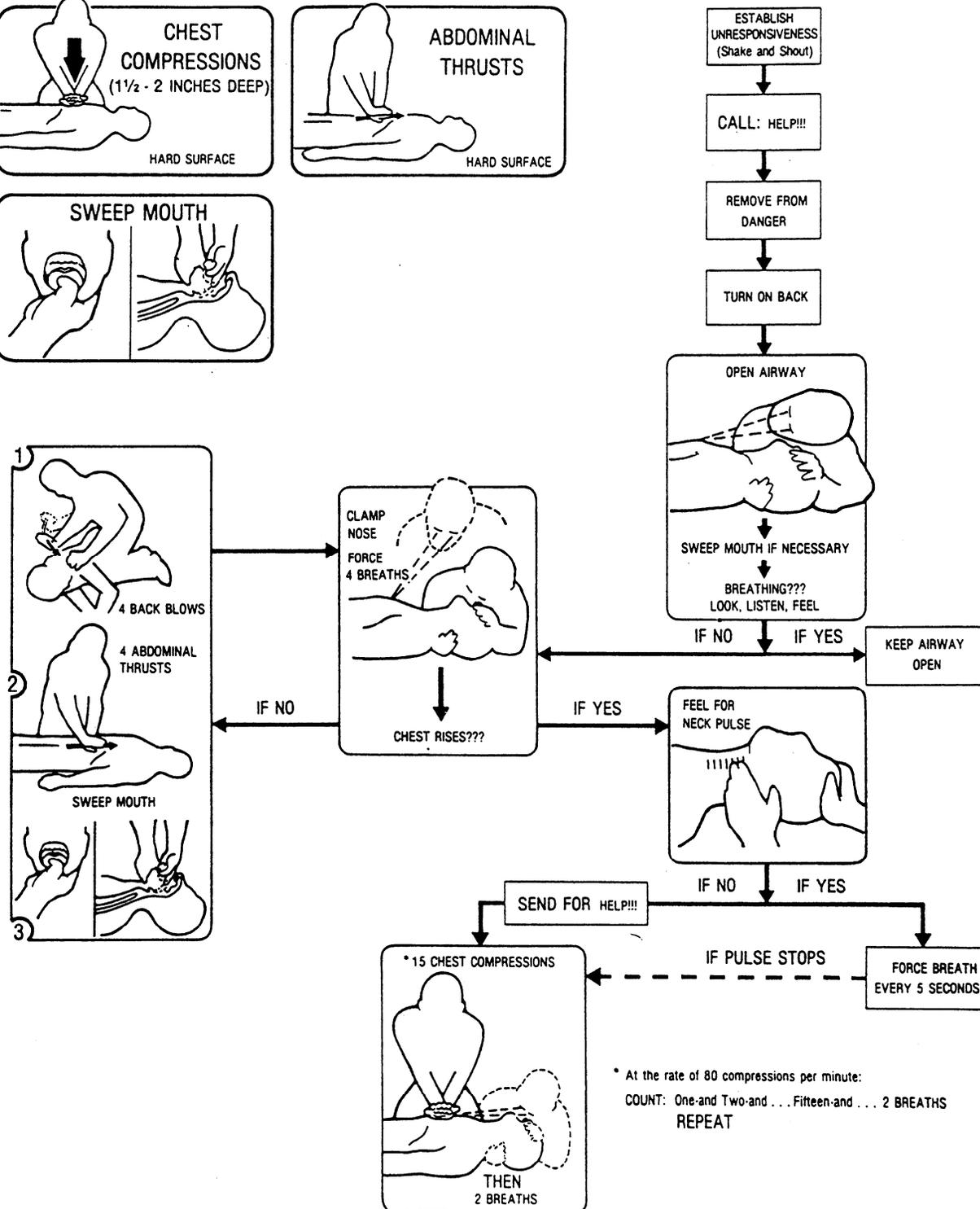


Figure 10-14.—One-rescuer CPR.

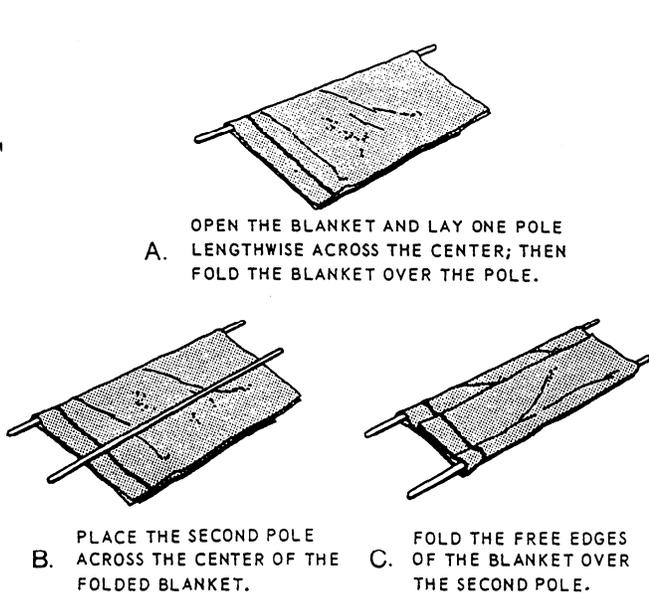


Figure 10-15.—Litter made with poles and blanket.

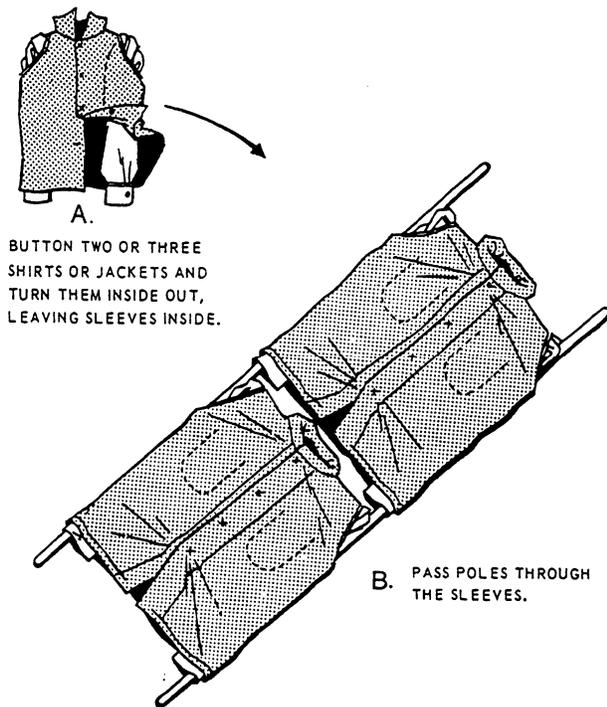


Figure 10-16.—Litter made with poles and jackets.

Do not transport a casualty with a fractured back or neck without a litter. When the casualty has a fracture of any other bodily part, transport him in such a way that it does not aggravate the fracture. An unconscious casualty should be transported on a litter or carried in such away that he will not fall. Transportation by litter is safer and more comfortable for all casualties as well as easier for you. When carrying the casualty is the only

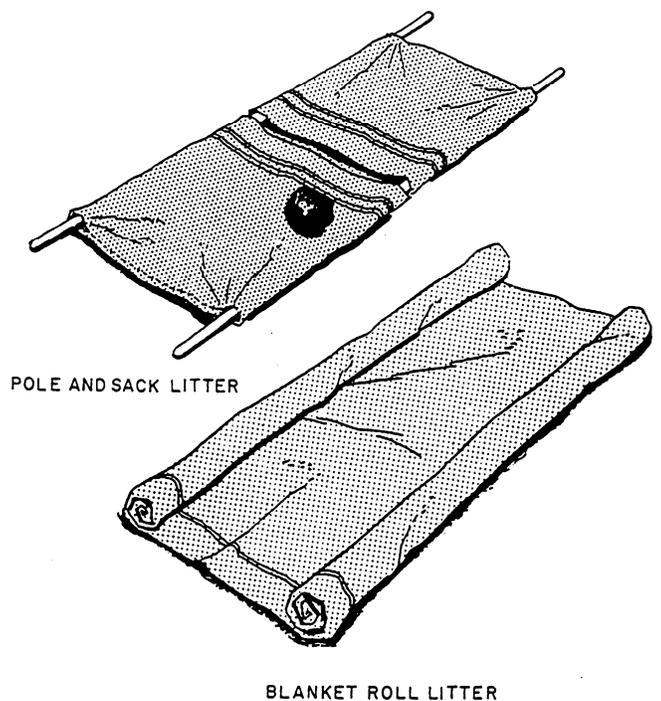


Figure 10-17.—Litters made by inserting poles through sacks and by rolling blanket.

feasible method because of the terrain or the combat situation or is necessary to save the casualty's life, it should be used; but the casualty should be transferred to a litter as soon as one can be made available or improvised.

### IMPROVISED LITTERS

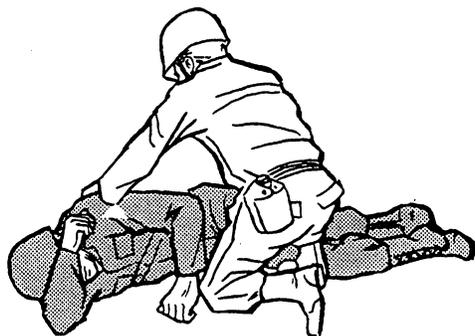
A litter can be improvised from many different things. Most flat-surfaced objects of suitable size can be used as litters. Such objects include boards, doors, window shutters, benches, ladders, cots, and poles tied together. If possible, such objects should be padded

Satisfactory litters can also be made by securing poles inside such items as blankets, shelter halves, tarpaulins, jackets, shirts, sacks, bags, and mattress covers. Poles can be improvised from strong branches, rifles, tent supports, skis, and other items.

### CAUTION

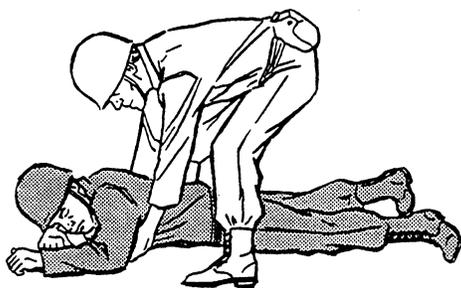
When weapons are used as splints, be absolutely sure they are unloaded.

When poles cannot be obtained, a large item, such as a blanket, can be rolled from both sides toward the center; then the rolls can be used to obtain a firm grip for carrying the casualty. Several methods of improvising litters are shown and explained in figures 10-15 through 10-17.

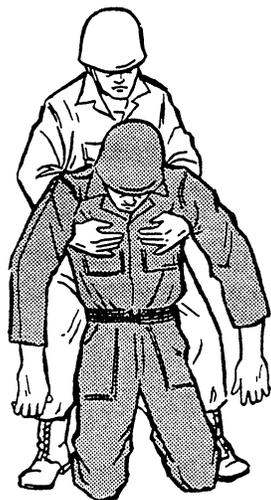


STEP ONE: IF THE CASUALTY IS LYING ON HIS BACK, KNEEL AT HIS UNINJURED SIDE, PLACE ONE OF HIS ARMS ACROSS HIS FACE, AND GENTLY ROLL HIM TOWARD YOU ONTO HIS ABDOMEN. HIS ARM PROTECTS HIS FACE FROM THE GROUND.

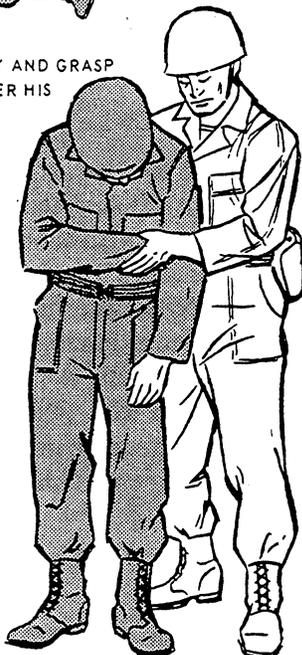
Figure 10-18.—Fireman's carry (step one).



STEP TWO: STRADDLE THE CASUALTY AND GRASP HIM BY EXTENDING YOUR HANDS UNDER HIS ARMPITS AND AGAINST HIS CHEST.

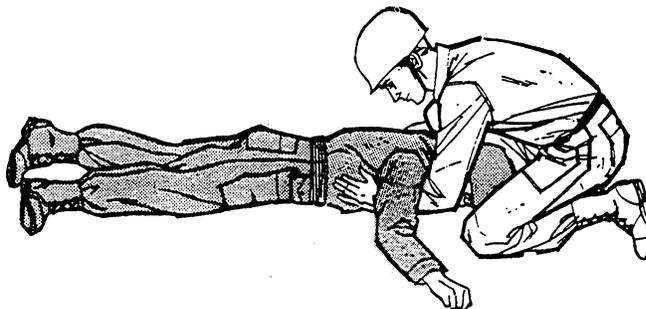


STEP THREE: LIFT THE CASUALTY TO HIS KNEES; THEN SECURE YOUR HOLD AND RAISE HIM TO A STANDING POSITION UNTIL HIS KNEES LOCK.



STEP FOUR: SUPPORTING THE CASUALTY WITH YOUR RIGHT ARM AROUND HIS WAIST, TAKE HOLD OF HIS RIGHT WRIST WITH YOUR LEFT HAND AND MOVE IN FRONT OF HIM.

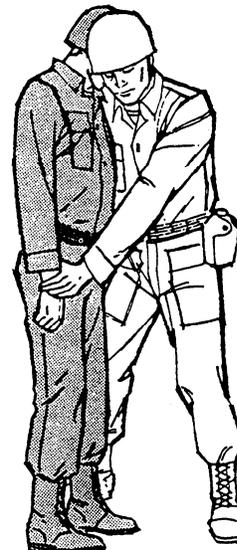
Figure 10-19.—Fireman's carry (steps two, three, and four).



STEP TWO: KNEEL ON ONE KNEE AT THE CASUALTY'S HEAD, FACING HIS FEET; THEN GRASP HIM BY EXTENDING YOUR HANDS UNDER HIS ARMPITS, DOWN HIS SIDES, AND ACROSS HIS BACK.



STEP THREE: AS YOU RISE, LIFT THE CASUALTY TO HIS KNEES; THEN SECURE YOUR HOLD AND RAISE HIM TO A STANDING POSITION UNTIL HIS KNEES LOCK.



STEP FOUR: SUPPORTING THE CASUALTY WITH YOUR RIGHT ARM AROUND HIS WAIST, TAKE HOLD OF HIS RIGHT WRIST WITH YOUR LEFT HAND.

Figure 10-20.—Fireman's carry (steps two, three, and four alternate method).

## METHODS OF CARRYING A CASUALTY

A casualty may be transported by using one-man and two-man carries. The two-man carries should be used whenever possible, as they provide more comfort to the casualty, are less likely to aggravate his injury, and are less tiring to the carriers. The particular one-man or two-man carries selected for use should be the one that is least likely to aggravate the casualty's injury.

### Fireman's Carry

This method is one of the easiest ways for one man to get a casualty off the ground and to carry him. Figures 10-18 through 10-22 show the steps in the fireman's



STEP FIVE: RAISE THE CASUALTY'S RIGHT ARM OVER YOUR HEAD.

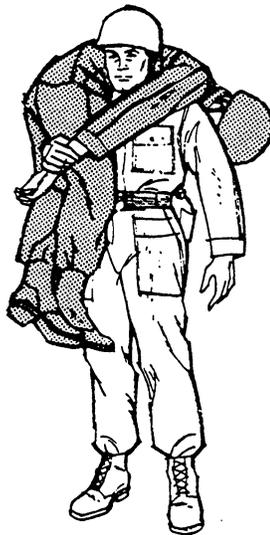


STEP SIX: BEND AT THE WAIST AND KNEES; THEN PULL THE CASUALTY'S ARM OVER AND DOWN YOUR LEFT SHOULDER, THUS BRINGING HIS BODY ACROSS YOUR SHOULDERS. AT THE SAME TIME PASS YOUR RIGHT ARM BETWEEN HIS LEGS AND GRASP HIS RIGHT KNEE WITH YOUR HAND.

Figure 10-21.—Fireman's carry (steps five and six).



STEP SEVEN: STAND WITH CASUALTY ON YOUR SHOULDERS.



STEP EIGHT: GRASP THE CASUALTY'S RIGHT WRIST WITH YOUR RIGHT HAND, LEAVING YOUR LEFT HAND FREE. A MAN CAN CARRY ANOTHER PERSON SOME DISTANCE IN THIS MANNER.

Figure 10-22.—Fireman's carry (steps seven and eight).

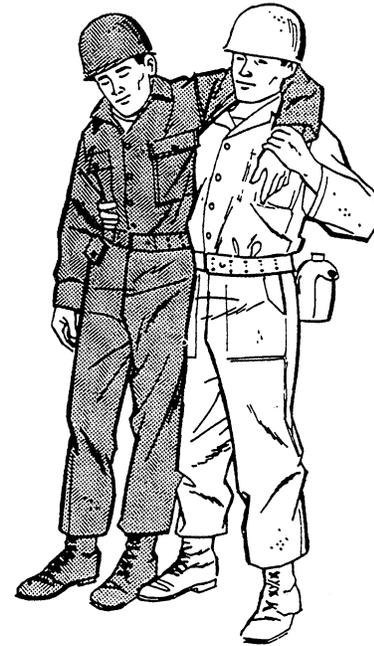


Figure 10-23.—Supporting carry.

The steps (two, three, and four) for getting the casualty off the ground may be accomplished in one of two ways, depending upon the location of the casualty's injury. The carrier should decide which method would be better for the casualty. Furthermore, the carrier should bring the casualty onto his back from the side that will avoid pressure on the injured part.

### Supporting Carry

This carry is useful when the casualty is only slightly injured.

1. Lift the casualty off the ground as shown in the first three steps of the fireman's carry (figs. 10-18 through 10-20).

2. Grasp the wrist of the casualty's uninjured arm and draw his arm around your neck (fig. 10-23).

3. Let the casualty walk using you as a crutch.

### Arms Carry

This carry is useful for a short distance.

1. Lift the casualty off the ground as shown in the first three steps of the fireman's carry (figs. 10-18 and 10-19).

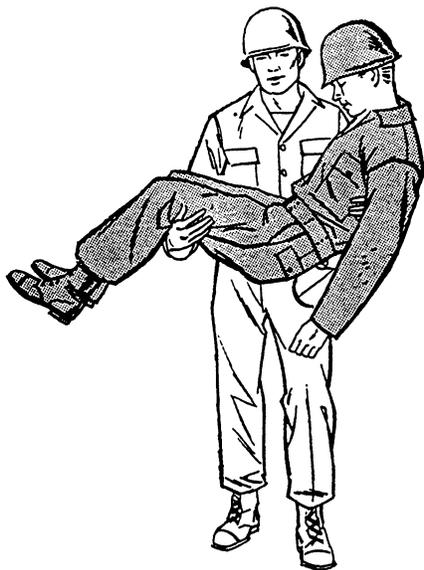


Figure 10-24.—Arms carry.



Figure 10-25.—Saddleback carry.

2. Position your arms on the casualty, as shown in figure 10-24, and lift him into your arms.
3. Carry the casualty high to lessen fatigue.

### Saddleback Carry

1. Lift the casualty off the ground as shown in the first three steps of the fireman's carry (figs. 10-18 through 10-20).
2. Supporting the casualty with one of your arms around him, turn so the casualty can encircle your neck with his arms; then stoop, clasp your hands beneath his thighs, and raise him upon your back (fig. 10-25).



Figure 10-26.—Pack-strap carry.

### Pack-Strap Carry

1. Lift the casualty off the ground as shown in the first three steps of the fireman's carry (figs. 10-18 through 10-20).
2. Supporting the casualty with your arm around him, grasp his wrist closest to you and place his arm over your head and across your shoulders; then move in front of him while supporting his weight against your back grasp his other wrist, and place this arm over your shoulder (fig. 10-26, view A).
3. Bend forward and hoist him as high on your back as possible so all his weight is resting on your back (fig. 10-26, view B).

### Back Lift and Carry

For use of this carry, the casualty must be conscious and able to stand on at least one leg.

1. Raise the casualty to a standing position and place your back to his back; then have him stretch out his arms sideways.

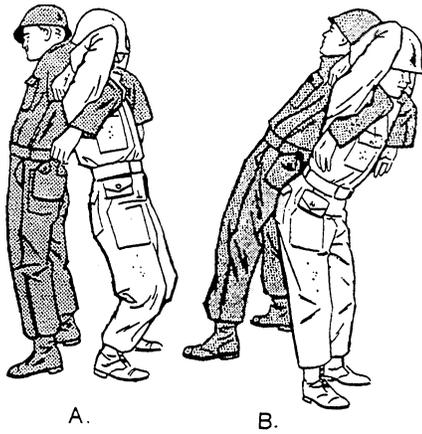
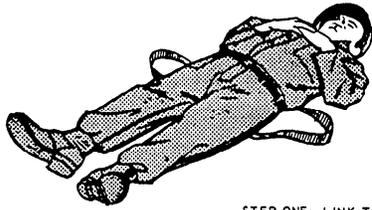


Figure 10-27.—Back lift and carry.



STEP ONE: LINK TOGETHER TWO PISTOL BELTS TO FORM A SLING. PLACE THE SLING UNDER THE CASUALTY'S THIGHS AND LOWER BACK SO THAT A LOOP EXTENDS FROM EACH SIDE.



STEP TWO: LIE BETWEEN THE CASUALTY'S OUTSTRETCHED LEGS. THRUST YOUR ARMS THROUGH THE LOOPS. GRASP CASUALTY'S HAND AND TROUSER LEG ON HIS INJURED SIDE.

Figure 10-28.—Pistol-belt carry (steps one and two).

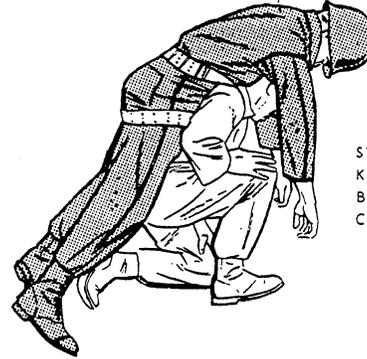
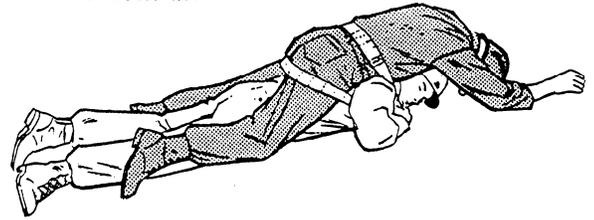
2. Bending backward, put your hands under his arms and grasp his upper arms near the armpits (fig. 10-27, view A).

3. Bend forward, pulling him onto your back (fig. 10-27, view B).

### Pistol-Belt Carry

This method can be used for a long distance without undue fatigue on the carrier. When pistol belts are not available, other items can be used, such as one rifle sling, two cravat bandages, two litter straps, or any suitable material that will not cut or bind the casualty. The steps in this method are provided in figures 10-28 through 10-30.

STEP THREE: ROLL TOWARD THE CASUALTY'S UNINJURED SIDE ONTO YOUR ABDOMEN, BRINGING THE CASUALTY ONTO YOUR BACK. ADJUST SLING AS NECESSARY.



STEP FOUR: RISE TO A KNEELING POSITION. THE BELT WILL HOLD THE CASUALTY IN PLACE.

Figure 10-29.—Pistol-belt carry (steps three and four).



STEP FIVE: PLACE ONE HAND ON YOUR KNEE FOR SUPPORT AND RISE TO AN UPRIGHT POSITION. THE CASUALTY IS NOW SUPPORTED ON YOUR SHOULDERS.

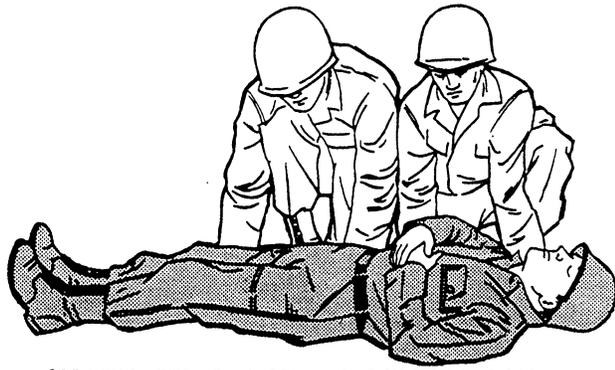


STEP SIX: CARRY THE CASUALTY WITH YOUR HANDS FREE FOR USE IN FIRING RIFLE, CLIMBING BANKS, OR SURMOUNTING OBSTACLES.

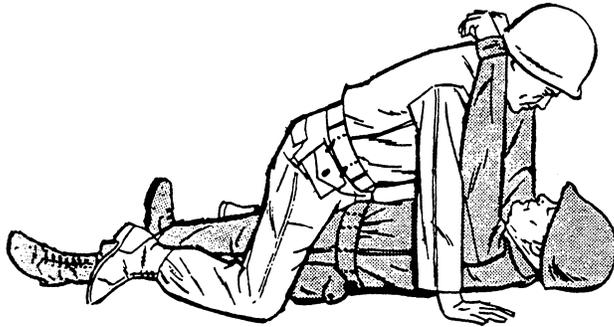
Figure 10-30.—Pistol-belt carry (steps five and six).



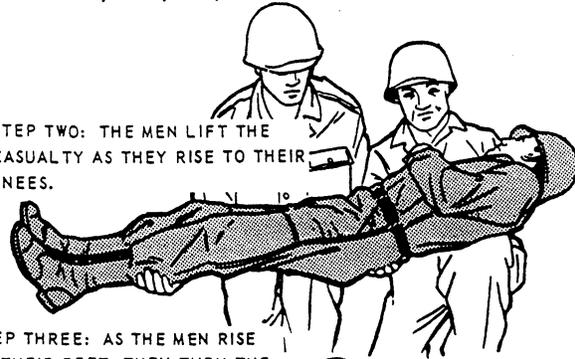
Figure 10-31.—Pistol-belt drag.



STEP ONE: TWO MEN KNEEL AT ONE SIDE OF THE CASUALTY AND PLACE THEIR ARMS BENEATH THE CASUALTY'S SHOULDERS, BACK, HIPS, AND KNEES.



STEP TWO: THE MEN LIFT THE CASUALTY AS THEY RISE TO THEIR KNEES.



STEP THREE: AS THE MEN RISE TO THEIR FEET, THEY TURN THE CASUALTY TOWARD THEIR CHESTS. THEY CARRY HIM HIGH TO LESSEN FATIGUE.

Figure 10-32.—Neck drag.

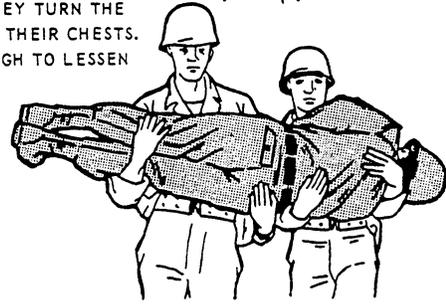


Figure 10-34.—Two-man arms carry (steps one, two, and three).



Figure 10-33.—Two-man supporting carry.

### Pistol-Belt Drag

This method (fig. 10-3 1) enables you and the casualty to remain low on the ground, more protected from enemy fire; however, it is satisfactory for only a short distance.

1. Form a sling by extending two pistol belts or other suitable items to their full length and connecting the ends.

2. With the casualty on his back, pass the sling over his head and position it across his chest and under his armpits.

3. Cross the sling straps at a point near the casualty's shoulder, forming a loop for your shoulder.

4. Lie on your back alongside the casualty and slip the loop over your arm that is closer to the casualty; then turn away from the casualty onto your abdomen, thus causing the loop to fit tightly around your shoulder.

5. Place your arm, the one nearer the casualty, underneath his head to protect it during movement.

6. Crawl along, dragging the casualty with you.

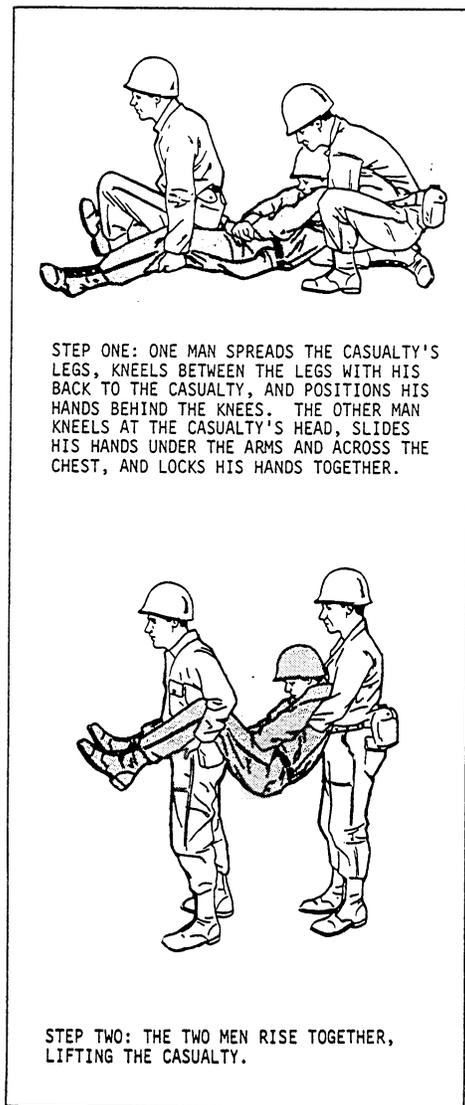


Figure 10-35.—Two-man saddleback carry(steps one and two).

### Neck Drag

This method (fig. 10-32) enables you and the casualty to remain close to the ground.

1. Tie the casualty's hands together and loop them around your neck.
2. Crawl along, dragging the casualty with you.

### Two-Man Supporting Carry

1. Two men help the casualty to his feet and support him with their arms around his waist(fig. 10-33).
2. They grasp the casualty's wrists and draw his arms around their necks.
3. The casualty walks, using the two men as crutches.

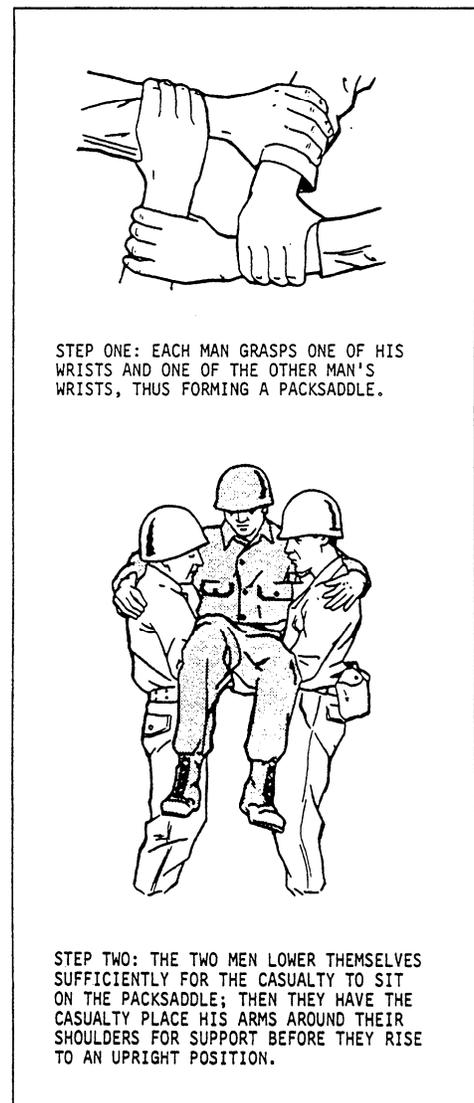


Figure 10-36.—Four-hand (packsaddle) carry (steps one and two).

### Two-Man Arms Carry

Two men lift and carry the casualty, as shown and explained in figure 10-34.

### Two-Man Saddleback Carry

This carry is useful for a short distance. Two men lift and carry the casualty, as shown and explained in figure 10-35.

### Four-Hand (Packsaddle) Carry

Two men make a packsaddle and carry the casualty on it, as shown and explained in figure 10-36.

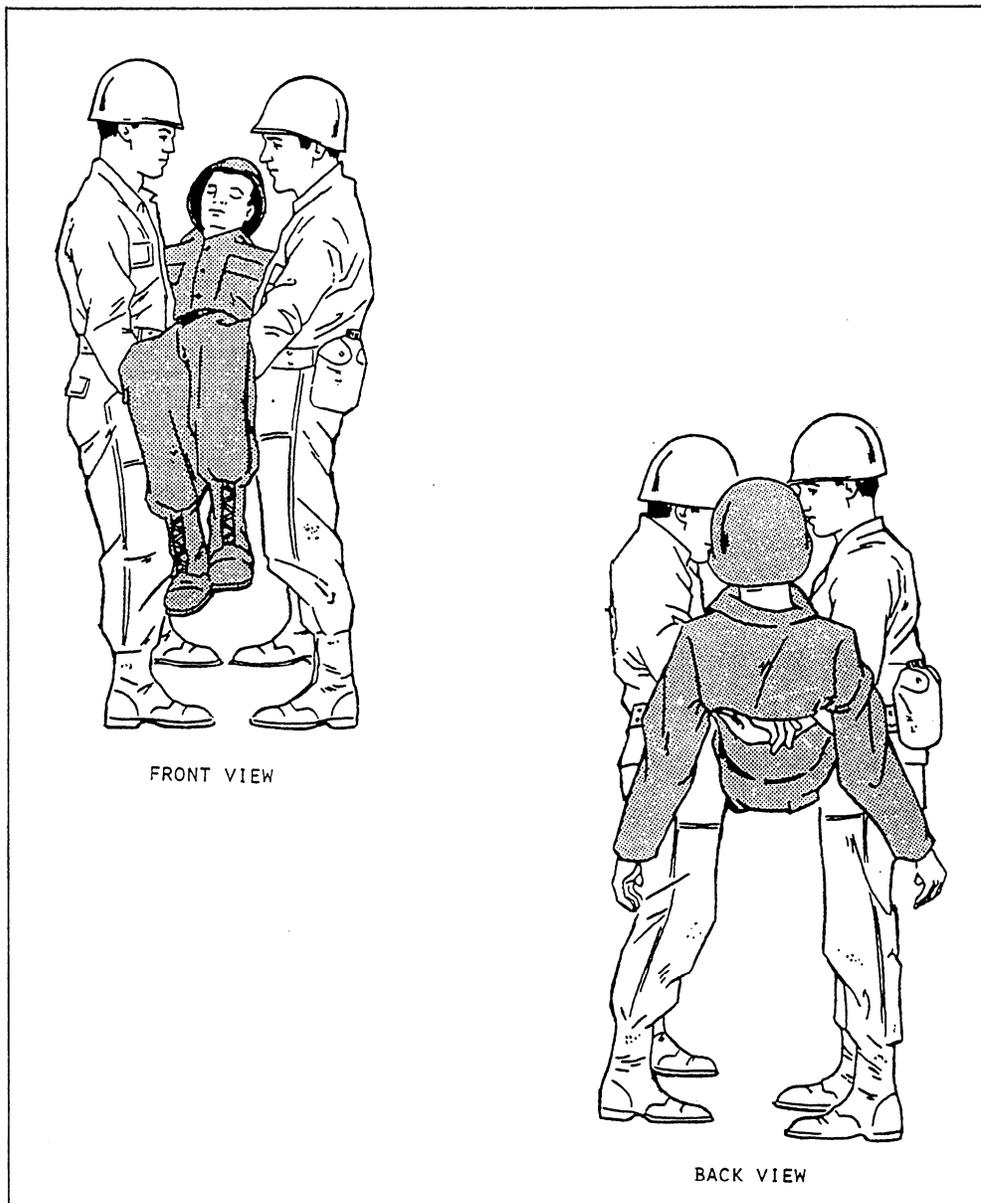


Figure 10-37.—Four-hand arms carry (front and back views).

### Four-Hand Arms Carry

1. Two men kneel on opposite sides of the casualty at his hips (fig. 10-37).
2. Each man passes his arms under the casualty's thigh and back and grasps the other man's wrist.
3. The two men rise, lifting the casualty.

### HEMORRHAGE

Blood is circulated throughout the body by means of three different types of blood vessels: arteries, veins, and capillaries. ARTERIES are large vessels that carry

blood away from the heart, VEINS are large vessels that carry blood back to the heart, and CAPILLARIES form a connecting network of smaller vessels between the arteries and the veins.

Hemorrhage (bleeding) occurs whenever there is a break in the wall of one or more blood vessels. In most small cuts, only the capillaries are injured. Deeper wounds result in injury to veins or arteries. Injury to the capillaries is not serious and can generally be controlled by a small bandage strip or pad. Injury to veins or arteries is serious and may endanger life.

One twelfth to one fifteenth of the body weight is blood. A person weighing 150 pounds has

approximately 10 to 12 pints of blood. One pint of blood can usually be lost without harmful effect; in fact, this is the amount usually given by blood donors. However, the loss of 2 pints usually causes shock, and shock becomes greater and greater as the amount of blood loss increases. If one half of the blood in the body is lost, death usually results.

Capillary blood is usually brick red in color. When capillaries are cut, the blood oozes out slowly. Blood from the veins is dark red. When a vein is cut, the blood escapes in a steady flow. When an artery near the surface is cut, the blood gushes out in spurts that are synchronized with heart beats; but if the cut artery is deeply buried, the bleeding appears in a steady stream. Arterial blood is usually bright red in color.

In actual practice, you may find it difficult to decide whether the bleeding is venous or arterial, but the distinction is usually not important. A person can bleed to death quickly from a cut artery; prolonged bleeding from any large cut can, of course, have the same effect. The important thing to know is that all bleeding must be controlled as quickly as possible.

## CONTROL OF HEMORRHAGE

When administering first aid to a bleeding victim, you must remain calm. Loss of blood is a dramatic event and always appears severe. In fact, most bleeding is less severe than it may appear to be at first glance. Most of the major arteries are deep and well protected by tissue and bony prominence. Although bleeding can be fatal, you usually have enough time to think and act calmly before the victim expires. Remember that most errors in first aid are made because of acting without thinking.

The four methods for controlling hemorrhage are direct pressure, elevation, indirect pressure, and the use of a tourniquet.

### Direct Pressure

Direct pressure is the first method to use when you are trying to control hemorrhage. In almost every case, bleeding can be stopped by the application of pressure directly on the wound, as shown in figure 10-38. Use a sterile first-aid dressing, when available, and tie the knot directly over the wound, only tight enough to stop the bleeding. Any clean material can be used in the absence of regular first-aid dressings. If the bleeding does not stop, firmly apply another dressing over the first dressing, or apply direct pressure with your hand or fingers over the dressing. This pressure may be applied by the victim himself or by a buddy. Under no

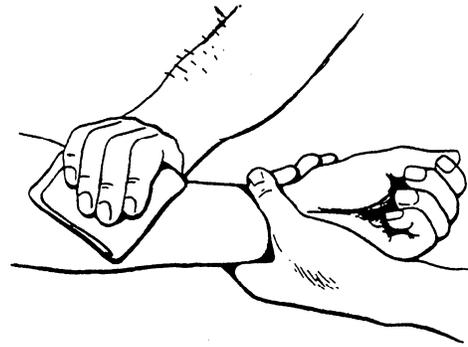


Figure 10-38.—Direct pressure.

circumstances should a dressing be removed once it is applied.

In cases of severe hemorrhage, do not worry too much about the dangers of infection. Although the prevention of infection is important, the basic problem is to stop the flow of blood. When no material is available, simply thrust your hand onto the wound.

### Elevation

Elevating or raising an injured limb above the level of the heart helps to control the bleeding. Elevation should be used together with direct pressure; however, do not elevate a limb when you suspect a fracture until the fracture has been splinted and you can be reasonably certain that elevation will not cause further injury. Use a stable object to maintain elevation, for propping the limb on an unstable object can do more harm than good.

### Indirect Pressure

In instances of severe bleeding where direct pressure and elevation are not controlling the bleeding, indirect pressure may be used. Bleeding from a cut artery or vein can often be controlled by applying pressure to the appropriate pressure point. This pressure point is a place where the main artery to the injured part lies near the skin surface and over a bone. Pressure at such a point is applied with the fingers, thumb, or with the heel of the hand; no first-aid materials are required. The object of the pressure is to compress the artery against the bone, thus shutting off the flow of blood from the heart to the wound.

### CAUTION

Use of pressure points may cause damage to the limb as a result of an inadequate flow of

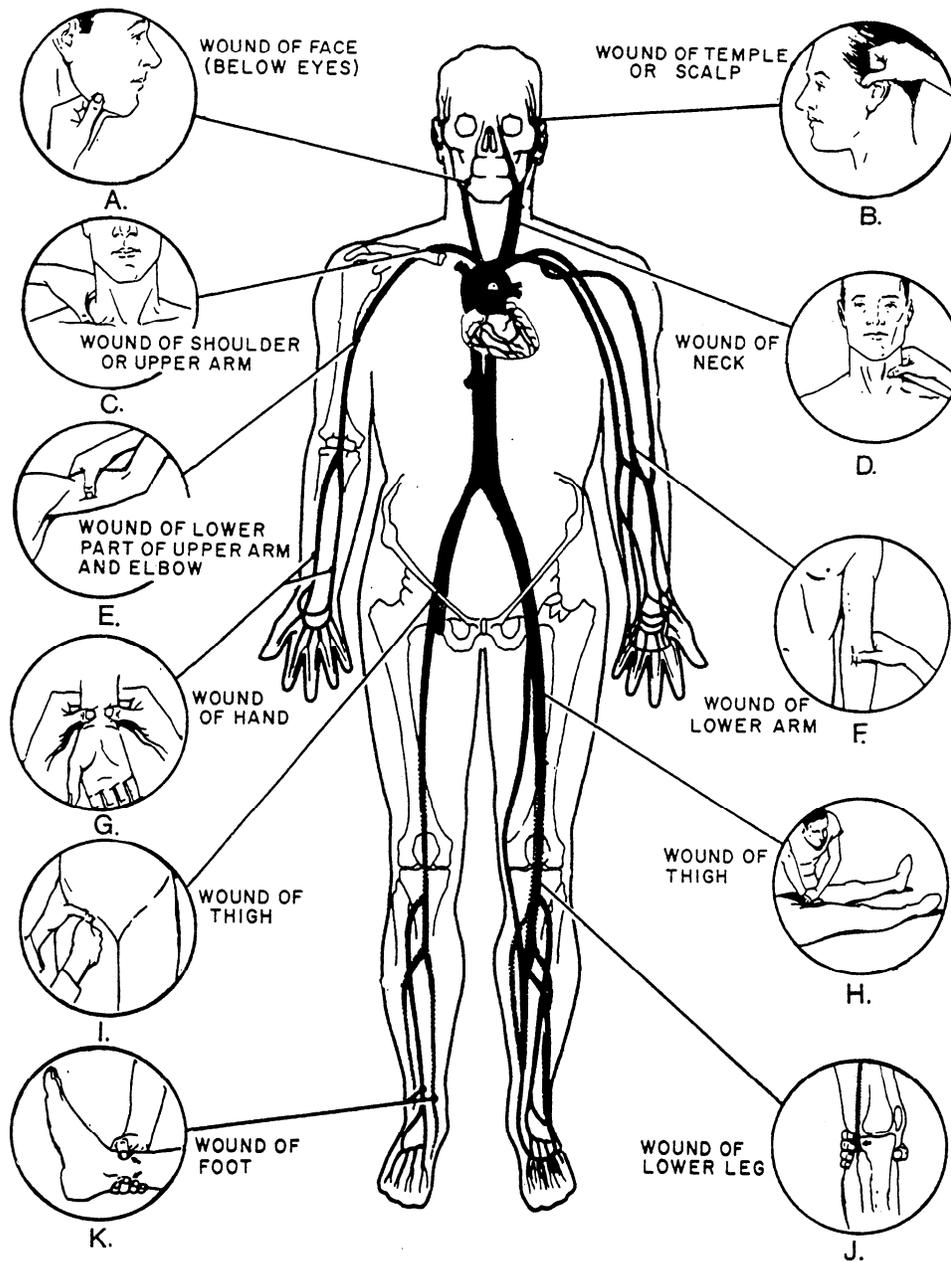


Figure 10-39.—Pressure points for control of bleeding.

blood. When the use of indirect pressure at a pressure point is necessary, do not substitute indirect pressure for direct pressure; use both. Figure 10-39 shows the locations of pressure points and the area of bleeding they control. Pressure points on the arms (brachial pressure points) and in the groin (femoral pressure points) are the ones that are most often used in first-aid treatment. These pressure points should be thoroughly understood.

Pressure on the brachial artery is used to control severe bleeding from an open wound on the upper extremity (arm). This pressure point is located in a

groove on the inside of the arm and the elbow. Using either the fingers or the thumb, apply pressure to the inner aspect of the arm. Figure 10-39, view E, shows the proper location for the digital pressure.

The femoral artery is used to control severe bleeding from a wound on the lower extremity (leg). The pressure point is located in the front, center part of the crease in the groin area. This is where the artery crosses the pelvic basin on the way into the lower extremity. To apply pressure, position the victim flat on his back, if possible. Kneeling on the opposite side from the wounded limb, place the heel of one hand directly on the pressure point, and lean forward to apply the small amount of pressure

needed to close the artery (fig. 10-39, view H). If bleeding is not controlled, it may be necessary to press directly over the artery with the flat surface of the fingertips and to apply additional pressure on the fingertips with the heel of the other hand.

## Tourniquet

A tourniquet should be used only as a last resort for severe, life-threatening hemorrhage that cannot be controlled by any other method. First-aiders should thoroughly understand the dangers and limitations of its use.

### CAUTION

A tourniquet may be dangerous. Its application may cause tissue injury or even loss of the injured limb. It is only rarely required and should be used only in cases of partial or complete severance of a limb or when bleeding is uncontrollable.

The standard tourniquet is usually a piece of web belting about 36 inches long, with a buckle or snap device to hold it tightly in place when applied. A tourniquet can be improvised from a strap, belt, neckerchief, or other similar material. A tourniquet should be at least 2 inches wide to distribute pressure over tissues. Never use wire, cord, or anything that will cut into the flesh.

To apply an emergency tourniquet made from material resembling a cravat or neckerchief, wrap the material once around the limb, and tie an overhand knot. Place a short stick on the overhand knot, and tie a square knot over it. Then twist the stick to tighten the tourniquet. The stick may be tied in place with another strip of material. Figure 10-40 demonstrates the proper method for applying a tourniquet.

The following are major points that you must know about the use of a tourniquet:

- Do not use a tourniquet unless you cannot control the bleeding by any other means.
- Only use a tourniquet on an arm or a leg.
- Always apply a tourniquet between the wound and the heart, making it as close to the wound as possible. When the wound is just below the elbow or knee, the tourniquet may have to be placed above the joint to get good compression on the limb.

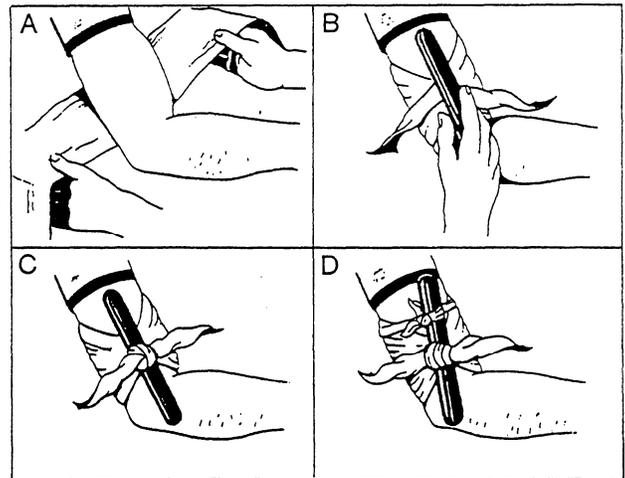


Figure 10-40.—Applying a tourniquet.

- Make sure you draw the tourniquet tight enough to stop the bleeding but do not make it tighter than necessary.
- Never loosen a tourniquet once it has been applied. The loosening of a tourniquet may dislodge clots and result in enough blood loss to cause severe shock and death.
- Do not cover a tourniquet with a dressing. If it is necessary to cover the injured person, make sure all the other people concerned with the case know about the tourniquet. Using crayon, skin pencil, or blood, mark a large “T” on the victim’s forehead and on a medical tag attached to the victim’s wrist. The time the tourniquet was applied must also be indicated.

## Armpit Tourniquet

A deep wound high up on the arm or an amputation at the upper part of the arm may require a tourniquet at the armpit to control bleeding. If needed, apply as follows:

1. Place the center of a narrow cravat bandage in the armpit over a firm pad or padded object.
2. Cross the ends on the shoulder over a pad.
3. Carry the ends around the back and chest to the opposite side and tie them over the pad.
4. To tighten, insert a small stick or smaller object under the cross of the bandage on the shoulder and twist. Twist only until the bleeding is controlled. Then secure or anchor the stick to prevent untwisting (fig. 10-40, view D).

5. Again, do not loosen the tourniquet except if directed to do so by a physician.

## **EMERGENCY SITUATIONS**

Bleeding from most external wounds is fairly easy to control; however, when some of the larger arteries are cut, hemorrhage may be so rapid that death will result within a few minutes. Methods of controlling the flow of blood in some of these emergency situations are briefly described below.

Wounds of the neck are often caused by sharp objects, such as knives, razors, and glass fragments. Sometimes a large artery is cut, sometimes a large vein, and sometimes both. In any event, the blood loss is extremely rapid. In treating wounds to the neck, an occlusive dressing should be applied over a sterile absorbent dressing to prevent air from entering the circulation system. It may also be possible to control the bleeding from these wounds by applying hand pressure above and below the cut; such pressure must be maintained until a medical officer gives further instructions. It is a good idea to use cloth under your hands, if any is available, because the blood makes his neck very slippery and difficult to hold.

When the large artery in the leg is cut, the bleeding is very rapid. At least partial (and perhaps complete) control of the hemorrhage can be attained by applying extreme pressure directly over the wound. Cover your clenched fist with clothing or type of other cloth that is available, and thrust your fist directly onto the wound. (If no cloth is available, use your fist alone; but you will find it more difficult to control the bleeding by this method because your fist and the wound will both become very slippery.) If a tourniquet becomes necessary, continue to apply direct pressure with your hand while the tourniquet is being applied.

Internal bleeding may be caused by deep wounds or by heavy blows that rupture internal blood vessels. When you suspect internal bleeding, anticipate that the victim may vomit blood. Give the victim nothing by mouth and keep him lying down, preferably on his side with a loosened collar and belt. Make him as comfortable as possible and reassure him. The victim should always be treated for shock (discussed below).

## **GENERAL FIRST-AID MEASURES**

In addition to knowing ways to control serious bleeding by the application of pressure, you must be familiar with the following measures that are important in the first-aid treatment of a person who has suffered

severe bleeding. Any person who has lost a large amount of blood must be treated by medical personnel as soon as possible. In the meantime, you can greatly improve his chances for recovery by treating him for shock as soon as possible and by keeping the person quiet.

Shock is always present in persons who have lost a great amount of blood. If you do not notice symptoms of shock treat the victim for it anyway. Since the measures used to prevent shock are the same as those used to treat it, you may prevent its occurrence or, at least, lessen its severity.

Equally important, you must keep the casualty quiet. Try to keep him from getting excited. Do not move the victim unnecessarily, and do not handle him roughly. Keeping him quiet allows a clot to form in the wound and also helps to prevent the occurrence of shock. Try in every way to be careful and gentle in handling the victim, and do everything you can to make him as comfortable as possible under the circumstances.

## **SHOCK**

You recall that in our discussion of hemorrhage, we said that the loss of 2 or more pints of blood usually causes shock. You should also know that shock can occur with any injury. And, in fact, some degree of shock usually accompanies serious injuries. You should, therefore, consider shock whenever handling a person who has been injured.

To understand how shock develops, let us look at what happens when you hit the end of your finger with a hammer. Your whole body responds. Since your finger hurts, you might think it is the only part of you that is responding to the injury; but, in fact, a great many changes are taking place in your body while you are concerned with the immediate pain. Your body AS A WHOLE is injured and your body AS A WHOLE attempts to recover from the injury. A series of changes takes place, designed to restore the body to its normal, healthy condition.

Sometimes, however, the changes that occur may in themselves cause further damage to the body. To some extent, this is what happens in shock. When a person is injured, the blood flow in his entire body is disturbed. To overcome this difficulty, the heartbeats faster and the blood vessels near the skin and in the arms and legs constrict, thus sending most of the available blood supply to the vital organs of the body and to the nerve centers in the brain that control all vital functions.

While this is occurring, the other cells do not receive enough blood and, therefore, do not receive enough oxygen or food. The blood vessels, like the rest of the body, suffer from this lack and eventually lose their ability to constrict. When this happens, the vital organs and the brain do not receive enough blood, and the condition of shock becomes worse and worse. If this continues, the present damage becomes so extensive that recovery is impossible. In less severe cases, prompt first-aid treatment for shock may mean the difference between life and death. In mild cases of shock, recovery usually occurs naturally and rather quickly.

Basically, then, SHOCK is a condition in which the circulation of the blood is seriously disturbed. As we will see later, the measures used to combat shock are aimed at helping the body recover from this disturbance of the blood flow.

## CAUSES OF SHOCK

Serious shock occurs as a result of severe injury to any part of the body.

- Crush injuries, fractures, burns, poisoning, and prolonged bleeding are very likely to cause serious shock.
- An interruption of breathing, from whatever cause, is usually followed by severe shock.
- Blast and concussion injuries, caused by pressure waves resulting from the detonation of high explosives in the air or underwater, may severely damage the internal organs of the body and cause extensive shock (as a matter of fact, signs of shock are sometimes the only outward indication of a blast or concussion injury).

As noted above, any damage to the body is accompanied by or followed by some degree of shock.

There are a number of factors that affect the seriousness of shock. Age, for example, is often a determining factor. Very young children and very old people do not usually have as much resistance to shock as young or middle-aged adults. Pain can produce shock or increase its severity. People who have been starved, deprived of water, or exposed to the extremes of cold or heat can go into shock very easily. Excessive fatigue can increase the severity of shock. In general, people who have any chronic illness are more likely to go into shock than healthy individuals. In addition to these factors, there are some unexplained differences between individuals in regard to their resistance to shock—an injury that might cause mild shock in one person could cause serious, perhaps fatal, shock in another.

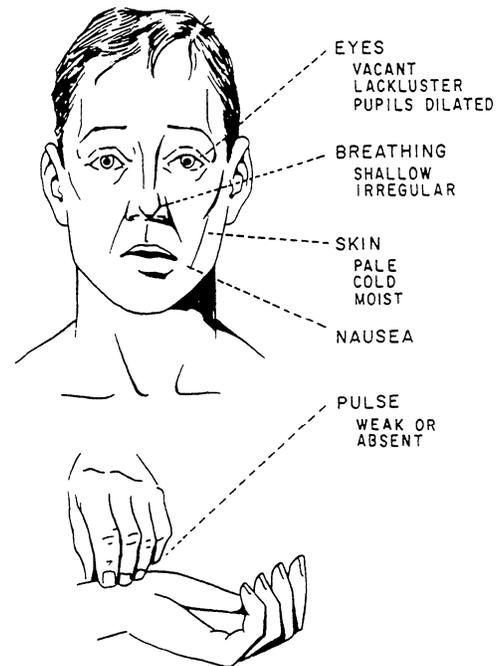


Figure 10-41.—Symptoms of shock.

There are many different causes and types of shock. It is not within the scope of this text to identify all of them here. You should remember, however, that shock is certain to accompany or follow a serious injury and is often the most serious consequence of the injury.

## HOW TO RECOGNIZE SHOCK

A person who is going into shock may show quite a few signs or symptoms. Some of these are indicated in figure 10-41 and are discussed below. Remember, however, that the signs of shock do not always appear at the onset of the injury; in fact, in many very serious cases, the signs may not appear until hours later.

The symptoms shown by a person suffering from shock are, directly or indirectly, due to the fact that the circulation of the blood is disturbed.

- The pulse is weak and rapid.
- Breathing is likely to be shallow, rapid, and irregular, because poor circulation of the blood affects the breathing center in the brain.
- The face, arms, and legs feel cold to the touch. The temperature near the surface of the body is lowered because of the poor blood flow.
- Sweating is likely to be very noticeable.

- A person in shock is usually very pale; but in some cases, there may be a bluish or reddish color to the skin.

- The pupils of the eyes are usually dilated (enlarged).

When the victim is conscious, the additional symptoms of shock may be displayed. He may do the following:

- complain of thirst;
- have a feeling of weakness, faintness, or dizziness;
- feel nauseous; or
- be very restless and feel frightened and anxious.

As shock deepens, these signs gradually disappear and the victim becomes less and less responsive to what is going on around him. Even pain may not arouse him. Finally, the victim may become unconscious.

It is unlikely that you will see all of these symptoms of shock in any one case. Some of them appear only in the later stages of shock when the disturbance of the blood flow has become so great that the victim's life is in serious danger. Sometimes the signs of shock maybe disguised by other signs of injury. It is important to know what symptoms indicate the presence of shock, but do not ever wait for symptoms to develop before beginning treatment for shock Remember, **EVERY SERIOUSLY INJURED PERSON IS LIKELY TO DEVELOP SERIOUS SHOCK.**

## **PREVENTION AND TREATMENT OF SHOCK**

In many emergency situations, the most helpful thing you can do for an injured person is to begin treatment for shock. When shock has not yet developed, the treatment may actually prevent its occurrence; if it has developed, you may be able to keep it from reaching a critical point. As we have seen, shock creates a vicious cycle; that is, the worse it is, the worse it becomes. It is extremely important that you begin treatment at the earliest opportunity.

It is important to keep the victim as calm as possible because excitement and fright affects his condition and may even bring on shock. Try to prevent the victim from seeing his injuries, and reassure him that he will receive proper care. Keep unnecessary persons away, as their conversation regarding the victim's injuries may increase his agitation.

## **Fluids**

A person in shock is often thirsty. No particular harm will be done if you allow the victim to moisten his mouth and lips with cool water. But, in general, there is no need to give him anything to drink unless you are in a position whereby medical assistance will not be available for along period of time.

When medical care is not available, you should give the victim **SMALL AMOUNTS** of warm water, preferably mixed with 1 teaspoon of salt and 1/2 teaspoon of baking soda per quart or liter. This should only be done when he is conscious, able to swallow, and has not suffered internal injuries.

In the case of burns, an exception must be made to the rule of not giving a person liquids. A seriously burned person has an overwhelming need for fluids. It is, therefore, a permissible and even desirable part of first-aid treatment. Sweet tea, fruit juices, or sugar water may be given when the casualty is conscious and able to swallow, has no internal injuries, and vomiting is not a problem.

One final precaution must be given concerning the use of liquids: **NEVER GIVE ALCOHOL TO A PERSON IN SHOCK OR A PERSON WHO MAY GO INTO SHOCK.** Alcohol increases the blood supply to surface vessels, and it diminishes the blood supply to the brain and other vital organs.

## **Heat**

Heat is important in the treatment of shock to the extent that the injured person's body heat must be conserved. Exposure to cold, with resulting loss of body heat, can cause shock to develop or to become worse. You must judge the amount of covering to use by considering the weather and the general circumstances of the accident. Often a light covering is enough to keep the casualty comfortable. Wet clothing should be removed and dry covering provided, even on a hot day. Use blankets or other dry material to conserve body heat. Under normal circumstances, artificial means of warming (for example, hot-water bottles, heated bricks, or heated sand) should not be used. Artificial heat can cause the loss of body fluids (by sweating), and it brings the blood close to the surface, thus defeating the body's own efforts to supply blood to the vital organs and to the brain. Also, the warming agent may burn the victim. **KEEP AN INJURED PERSON WARM ENOUGH FOR COMFORT, BUT DO NOT OVERHEAT HIM.**

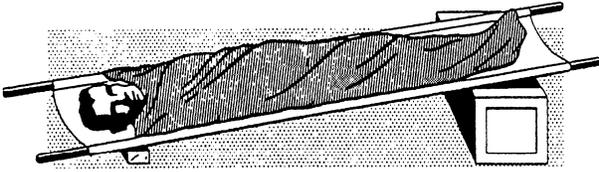


Figure 10-42.—Position for treatment of shock.

### Position

The best position to use for the prevention or treatment of shock is one that encourages the flow of blood to the brain. When it is possible to place the injured person on his back on a bed, cot, or stretcher, you should raise the lower end of the support about 12 inches so his feet are higher than his head, as shown in figure 10-42. When the circumstances of the accident make it impossible to do this, you should still endeavor to raise his feet and legs enough to help the blood flow to his brain. Sometimes it is possible to take advantage of a natural slope of ground and place the casualty so his head is lower than his feet.

In every case, of course, you have to consider what type of injury is present before you can decide on the best position; for example, a person with a chest wound may have so much trouble breathing that you must raise his head slightly. When his face is flushed rather than pale or if you have any reason to suspect head injury, do not raise his feet. Rather, you should keep his head level with or slightly higher than his feet. When the person has broken bones, you will have to judge what position is best both for the fractures and for shock. A fractured spine must be immobilized before the victim is moved to avoid further injuries. When you are in doubt about the correct position to use, have the victim lie flat on his back. **THE BASIC POSITION FOR TREATING SHOCK IS ONE IN WHICH THE HEAD IS LOWER THAN THE FEET.** Do the best you can, under the particular circumstances, to get the injured person into this position. In any case, never let a seriously injured person sit, stand, or walk around.

### MYTHS AND FACTS ABOUT PAIN

The following is a list of common myths and facts concerning pain:

**MYTH:** All extensive injuries are associated with severe pain and the more extensive the injury, the worse the pain.

**FACT:** Severe and even fatal injuries may be considerably less painful than a mashed fingertip, which can cause agony.

**MYTH:** With similar injuries, everyone experiences the same amount of pain.

**FACT:** Some feel pain far more severely than others. Also, those who would not be in much pain from a wound when they are rested, relaxed, and confident might experience severe pain from the same wound when exhausted, tense, and fearful.

**MYTH:** Only people in severe pain go into shock.

**FACT:** Persons in shock tend to feel less pain; however, pain, unless relieved, can cause or increase shock.

### RELIEF OF PAIN

Relief of pain can often be accomplished without the use of drugs. Reassure the injured person and make him realize that his injuries are understood and that he will get the best possible care. He should also be informed of plans to get medical help or plans to move him to a place where medical assistance is available.

Pain can often be relieved by furnishing adequate support for an injury. Fractures of bones in which the surrounding tissue swells rapidly are extremely painful when left unsupported. Adequate immobilization of fractures not only relieves pain but prevents further tissue damage and shock. Needless suffering can often be eliminated by unlacing or slitting a shoe or loosening tight clothing in the region of the injury. Often a simple adjustment of a bandage or splint is of much benefit to the casualty, especially when accompanied by a few encouraging words.

### HEAT EXPOSURE INJURIES

Excessive heat affects the body in a variety of ways. When a person exercises in a hot environment, heat builds up inside the body. The body automatically reacts to get rid of this heat through the sweating mechanism. When the body loses large amounts of water and salt from sweating, heat cramps and heat exhaustion are likely to follow. When the body becomes overheated and cannot eliminate the excessive heat, heatstroke will result.

### HEAT CRAMPS

Heat cramps usually affect people who work in hot environments or who engage in strenuous exercise

without acclimatization and proper training. Excessive sweating may result in painful heat cramps in the muscles of the abdomen, legs, and arms. Heat cramps may also result from drinking ice water or other cold drinks either too quickly or in too large a quantity after exercise. Muscle cramps are often an early sign of approaching heat exhaustion. Muscle spasms or heat cramps usually last only a few minutes and disappear spontaneously.

**TREATMENT.** To provide first-aid treatment for heat cramps, move the person to a cool place. Since heat cramps are caused by loss of salt and water, give the victim plenty of water to drink adding about 1 teaspoon of salt to a quart of water. Apply manual pressure to the cramped muscle, or gently massage the muscle to relieve the spasm. In the event that the heat cramps do not pass or become more severe, other symptoms may follow and the victim should be treated as a heat exhaustion casualty and then transferred to a medical facility for treatment.

## HEAT EXHAUSTION

Heat exhaustion is the most common condition resulting from exposure to hot environments. Heat exhaustion can be a combination of several entities and is, therefore, not an easy condition to diagnose. Because of different causes, for example, water depletion or salt depletion or a combination of both, the signs and symptoms vary.

As a general rule, heat exhaustion involves a serious disturbance of blood flow to the brain, heart, and lungs that may cause the victim to experience weakness, fatigue, headache, loss of appetite, and nausea. He may faint but will probably regain consciousness when his head is lowered to improve the blood supply to his brain. The victim appears ashen gray; his skin is cold, moist, and clammy; and the pupils of his eyes are dilated (enlarged). The vital signs are usually normal; however, the victim may have a weak pulse, together with rapid and shallow breathing. The body temperature may be below normal. Heat exhaustion is a complex malady and is often misdiagnosed, even by medical personnel. You, as a first-aider, should treat prolonged heat cramps and any heat injury that is obviously not heatstroke as heat exhaustion.

**TREATMENT.** Care for the victim as if he were in shock. Move the victim to a cool or air-conditioned area. Loosen clothing, applying cool wet cloths to the head, axilla, groin, and ankles, and fan the victim. Do not allow the victim to become chilled (if this does occur,

then cover the victim with a light blanket and move him into a warmer area). When the victim is conscious, give him a solution of 1 teaspoon of salt dissolved in a quart of cool water. If the victim vomits, do not give him any more fluids. Transport the victim to a medical facility as soon as possible.

## HEATSTROKE

Sunstroke is more accurately called heatstroke since it is not necessary to be exposed to the sun for this condition to develop. It is a less common but far more serious condition than heat exhaustion since it carries a 20-percent mortality rate. The most important feature of heatstroke is the extremely high body temperature (105°F [41°C] or higher) that accompanies it. In heatstroke, the victim has a breakdown of his sweating mechanism and is unable to eliminate excessive body heat. When the body temperature rises too high, the brain, kidneys, and liver may be permanently damaged.

Sometimes the victim may have preliminary symptoms, such as headache, nausea, dizziness, or weakness. Breathing is deep and rapid at first; later, it is shallow and almost absent. Usually the victim is flushed, very dry, and very hot. His pupils are constricted (pinpointed) and the pulse is fast and strong. See figure 10-43 for a comparison of these symptoms with those of heat exhaustion.

**TREATMENT.** When providing first aid for heatstroke, keep in mind that this is a true life and death emergency. The longer the victim remains overheated, the more likely he is to suffer irreversible body damage.

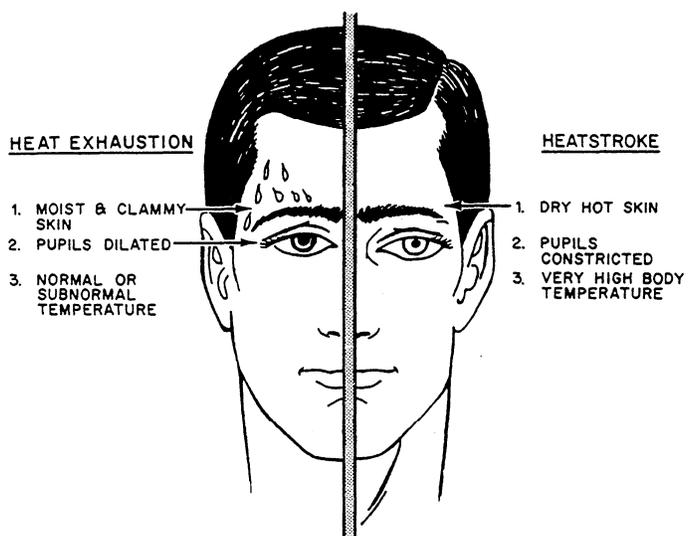


Figure 10-43.—Symptoms of heatstroke and heat exhaustion.

or death. The main objective of first aid is to get the body temperature down as quickly as possible.

Move the victim to the coolest possible place, and remove as much clothing as possible. Body heat can be reduced quickly by immersing the victim in a cold-water bath. When a cold-water bath is not possible, give the victim a sponge bath by applying wet, cold towels to the whole body. Exposing the victim to a fan or air conditioner also promotes body cooling. When cold packs are available, place them under his arms, around his neck at his ankles, and in his groin. When the victim is conscious, give him cool water to drink Do NOT give him hot drinks or stimulants.

Because of the seriousness of heatstroke, it is important to get the victim to a medical facility as soon as possible. Cooling measures must be continued during transportation.

## **COLD WEATHER INJURIES**

When the body is subjected to severely cold temperatures, blood vessels constrict and body heat is gradually lost. As the body temperature drops, tissues are easily damaged or destroyed.

All cold injuries are similar, varying only in degree of tissue injury. The extent of injury depends on such factors as wind speed, temperature, type and duration of exposure, and humidity. Tissue freezing is accelerated by wind, humidity, or a combination of the two. Injury caused by cold, dry air is less than that caused by cold, moist air, or exposure to cold air while you are wearing wet clothing. Fatigue, smoking, drugs, alcoholic beverages, emotional stress, dehydration, and the presence of other injuries intensify the harmful effects of cold.

You should also know that in cold weather, wounds bleed easily because the low temperatures keep the blood from clotting and increased bleeding, of course, increases the likelihood of shock. Also, wounds that are open to the cold weather freeze quickly. The body loses heat in the areas around the injury, as blood soaks the skin around the wound, and clothing is usually torn. Therefore, early first-aid treatment becomes even more important during periods of low temperatures.

## **GENERAL COOLING (HYPOTHERMIA)**

General cooling of the entire body is caused by continued exposure to low or rapidly dropping temperatures, cold moisture, snow, or ice. Those persons exposed to low temperatures for extended periods may

suffer ill effects, even if they are well protected by clothing, because cold affects the body system slowly, almost without notice. As the body temperature drops, there are several stages of progressive discomfort and disability. The first symptom is shivering, which is an attempt by the body to generate heat. This is followed by a feeling of listlessness, drowsiness, and confusion. Unconsciousness may follow quickly. You will have already noted signs of shock. As the temperature drops even lower, the extremities (arms and legs) freeze. Finally, death results.

**TREATMENT.** Hypothermia is a **MEDICAL EMERGENCY. THE VICTIM NEEDS HEAT.** Rewarm the victim as soon as possible. It may be necessary, however, to treat other injuries before the victim can be moved to a warmer place. Severe bleeding must be controlled and fractures splinted over clothing before the victim is moved.

When the victim is inside a warm place and is conscious, the most effective method of warming him is immersion in a tub of warm water (100°F to 105°F [38°C to 41°C]) or warm to the elbow-never hot). When a tub is not available, apply external heat to both sides of the victim, using covered hot-water bottles or, if necessary, any sort of improvised heating pads. Do not place artificial heat next to bare skin. When immersion is used, only the body, not the limbs, should be immersed. Immersion of the arms and legs causes cold blood to flow from them to the body core, causing further detrimental cooling of the core. Dry the victim thoroughly when water is used to rewarm him. The most frequently recommended field treatment is "buddy warming." Since the victim is unable to generate body heat, merely placing him under a blanket or in a sleeping bag is not sufficient. For best results, the nude victim should be placed in a sleeping bag with two volunteers stripped to their shorts to provide body-to-body heat transfer. This technique can be used by untrained personnel in a tent in the field and **WILL SAVE LIVES!!!**

When the victim is conscious, give him warm liquids to drink. Hot tea with lots of sugar is particularly good. No alcoholic beverages, please.

As soon as possible, transfer the victim to a medical facility, keeping him warm in route. Be alert for signs of respiratory failure and cardiac arrest during transfer.

## **IMMERSION FOOT (TRENCH FOOT)**

Immersion foot, which may also occur in the hands, is a cold injury resulting from prolonged exposure to

wet, cold temperatures just above freezing. It is often associated with limited motion of the extremities and water-soaked clothing. Remember that the temperature does not need to be below 32°F (0°C) to cause this injury.

In the early stages, the feet and toes are pale and feel cold, numb, and stiff. Walking becomes difficult. When preventive action is not taken, the feet swell and become painful. In extreme cases, the flesh dies and amputation of a foot or of a leg maybe necessary.

**TREATMENT.** In treating immersion feet (or hands), handle the injured parts very gently. They should not be rubbed or massaged.

Get the victim off his feet as soon as possible. Remove wet shoes, socks, and gloves to improve circulation. Do not rupture blisters or apply salves or ointments. The feet may be cleansed carefully with soap and water, dried, elevated, and exposed to dry air. Keep the victim warm and transport him to a medical facility as soon as possible. Always evacuate immersion foot victims by litter.

## **FROSTBITE**

Frostbite occurs when ice crystals form in the skin or deeper tissues after exposure to temperatures of 32°F (0°C) or lower. Depending upon temperature, altitude, and wind speed, the exposure time necessary to produce frostbite varies from a few minutes to several hours. The areas most commonly affected are the face and extremities.

The symptoms of frostbite are progressive. Victims generally incur this injury without being acutely aware of it. Initially, the affected skin reddens, and there is an uncomfortable coldness. With continued heat loss, there is a numbness of the affected area because of reduced circulation. As ice crystals form, the frozen extremity appears white, yellow-white, or mottled blue-white, and it is cold, hard, and insensitive to touch or pressure.

Frostbite is classified as superficial or deep, depending on the extent of tissue involvement.

### **Superficial Frostbite**

In superficial frostbite, the surface of the skin feels hard, but the underlying tissue is soft, allowing it to move over bony ridges. This is evidence that only the skin and the region just below it are involved.

**TREATMENT.** A minor case of superficial frostbite is fairly common and serves as a warning. Superficial

frostbite can usually be thawed with body heat. Hands can be rewarmed by placing them under the armpit, against the abdomen, or between the thighs. Feet can be rewarmed by using armpit or abdomen of a buddy. Other areas of superficial frostbite can be rewarmed by warmwater immersion, skin to skin contact, or covered hot-water bottles. NEVER RUB a frostbitten area.

### **Deep Frostbite**

In deep frostbite, the freezing reaches into the deep tissue layers. There are ice crystals in the entire thickness of the extremity. The skin does not move over the bony ridges and feels hard and solid.

**TREATMENT.** The objectives of treatment are to protect the frozen area from further injury, to thaw the affected area rapidly, and to be prepared to respond to circulatory or respiratory difficulties.

Carefully assess and treat other injuries first. Constantly monitor the pulse and breathing of the victim since respiratory and heart problems can develop rapidly. Be ready to administer CPR.

Make no attempt to thaw the frostbitten area when there is a possibility of refreezing. Freeze-thaw-freeze will result in extension of the injury and may result in amputation.

Treat all victims with injuries to feet or legs as litter cases. When this is not possible, it has been proven that walking does not lessen the chances of successful treatment as long as the limb has not been thawed out.

When adequate protection from further cold exposure is available, prepare the victim for rewarming by removing all constricting items of clothing, such as gloves, boots, and socks. Boots and clothing frozen on the body should be thawed by immersing them in warm water before removal.

Rapidly rewarm frozen areas by immersion in water at 100°F to 105°F (38°C to 41°C). Keep the water warm by adding fresh hot water, but do not pour it directly on the injured area. Ensure that the frozen area is completely surrounded by water; do not let it rest on the side or bottom of the tub. After rewarming has been completed, pat the area dry with a soft towel. Avoid pressure, rubbing, or constriction of the injured area. Keep the skin dry with sterile dressings, and place cotton between the toes and fingers to avoid their sticking together.

The general morale and comfort of the victim may improve by giving him hot, stimulating fluids, such as tea or coffee. Do not allow the victim to smoke or use

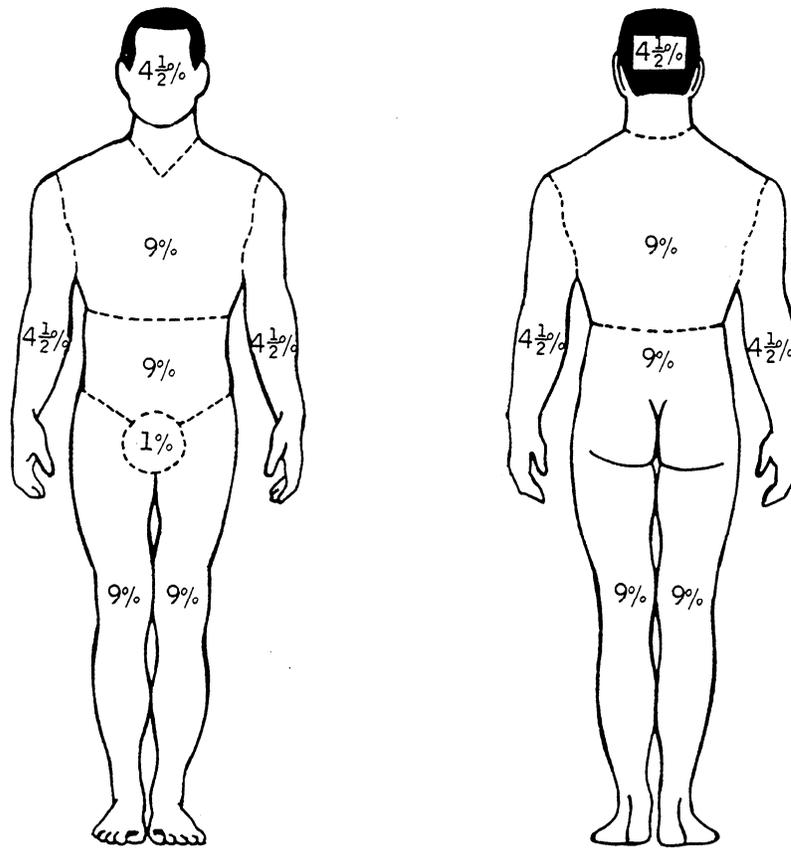


Figure 10-44.—Rule of nines.

alcoholic beverages while he is being treated at the first-aid level.

NEVER attempt to thaw frozen limbs by rubbing, exercising, or heating them in front of an open fire.

Transport the victim to a medical facility as soon as possible. During transportation, slightly elevate the frostbitten area and keep the victim and the injured area warm. DO NOT ALLOW THE INJURED AREA TO BE EXPOSED TO THE COLD.

### BURNS AND SCALDS

Burns and scalds are caused by exposure to intense heat, such as that generated by fire, bomb flash, sunlight, hot liquids, hot solids, and hot gases. Contact with electric current also causes burns, especially when the skin is dry. Dry skin offers about 20 times more resistance than moist skin to the passage of electric current. Therefore, when the skin is dry, the local heating effects (burns) are greater, even though the total damage to the body is less than when the skin is wet.

Note that burns and scalds are essentially the same type of heat injury. When the injury is caused by dry heat, it is called a burn; when caused by moist heat, it is called a scald. Treatment is the same in both cases.

**CLASSIFICATION OF BURNS.** Burns are classified in several ways: by the extent of the burned surface, by the depth of the burn, and by the cause of the burn. Of these, the extent of body surface burned is the most important factor in determining the seriousness of the burn, and it plays the greatest role in the casualty's chances for survival.

In calculating the extent of burned surface, the **RULE OF NINES** is used, which is shown in figure 10-44. These figures aid in determining the correct treatment for a burned person. Shock can be expected in adults with burns over 15 percent or in small children with burns over 10 percent of the body surface area. In adults, burns involving more than 20 percent of the body surface endanger life, and 30-percent burns are usually fatal if adequate medical treatment is not received.

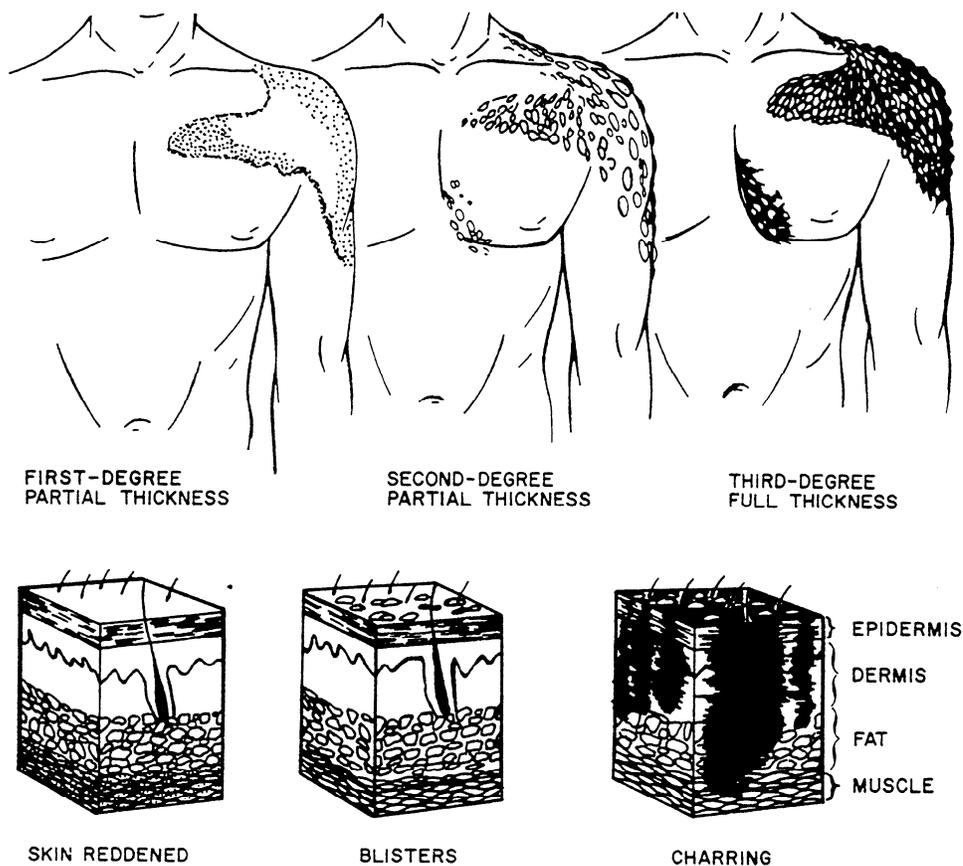


Figure 10-45.—First-, second-, and third-degree burns.

The depth of injury to the tissues is spoken of in degrees.

1. **FIRST-DEGREE** burns are the mildest. These produce redness, increased warmth, tenderness, and mild pain.

2. **SECOND-DEGREE** burns redden and blister the skin. They are characterized by severe pain.

3. **THIRD-DEGREE** burns destroy the skin. They can destroy muscle tissue and bone in severe cases.

Severe pain may be absent because nerve endings have been destroyed. The color may vary from white and lifeless (scalds) to black (charred from gasoline explosions). Figure 10-45 shows the appearance of first-, second-, and third-degree burns.

It is important to remember that the size of the burned area may be far more important than the depth of the burn. A first-degree or second-degree burn that covers a large area of the body is usually more serious than a small, third-degree burn. A first-degree sunburn, for example, can cause death when a large area of the body is burned.

The causes of burns are generally classified as thermal (heat), chemical, electrical, and radiation (as discussed in chap. 9). Another type of burn (white phosphorous) is also discussed in this chapter. Whatever the cause, shock always results when the burns are extensive.

### THERMAL BURNS

Thermal burns are caused by exposure to intensely hot solids, liquids, or gases. Their care depends upon the severity of the burn and the percentage of the body area involved.

**TREATMENT.** Minor burns, such as first-degree burns over less than 20 percent of the body area and small second-degree burns, do not usually require immediate medical treatment. Burns of the face are the exception to this rule. The following are general rules for treating burn victims:

1. Examine for and relieve respiratory distress. Always anticipate respiratory difficulty when there are burns around the face or when the victim has been exposed to hot gases or smoke, since these may cause

the airway to swell shut. Keep the airway open by tilting the chin up and forward, or if necessary, by holding the tongue down with a flat object. Place the victim with facial burns in a sitting position, as this will further ease his breathing. Transport victims with facial burns to a medical facility as soon as possible for further evaluation.

2. Remove all rings, bracelets, and similar articles, even from unburned areas, since swelling may develop rapidly and be severe.

3. To relieve pain initially, apply cold compresses to the affected area or submerge it in cold water. Cold water not only minimizes pain but also reduces the burning effects in the deep layers of the skin. Gently pat dry the area with a lint-free cloth or gauze. Aspirin is also effective for the relief of pain.

4. Cover the burned area with a sterile dressing, clean sheet, or unused plastic bag. When the hands and feet are involved, dressings must be applied between the fingers and toes to prevent the skin surfaces from sticking to one another. Coverings, such as blankets or other materials with a rough texture, should not be used because lint may contaminate and further irritate the injured tissue.

5. Do not attempt to break blisters, and do not remove shreds of tissue or adhered particles of charred clothing. Never apply greasy substances (butter, lard, or petroleum jelly), antiseptic preparations, or ointments. These may cause further complications and interfere with later treatment by a physician.

6. When the victim is conscious and not vomiting, prepare a weak solution of salt (1 teaspoon) and baking soda (1/2 teaspoon) in a quart of warm water. Allow the victim to sip the drink slowly.

7. Treat for shock. Maintain the victim's body heat, but do not allow him to become overheated.

8. When the victim's hands, feet, or legs are affected, they should be elevated higher than the heart.

9. When a burn victim must be transported to a medical facility, try to contact the facility before he arrives to allow the facility time to prepare for immediate treatment. Inform them of the degree of the burn, the location, and the percentage of the body area involved.

## **CHEMICAL BURNS**

When acids, alkalis, or other chemicals come in contact with the skin or other body membranes, they can

cause injuries that are generally referred to as chemical burns. For the most part, these injuries are not caused by heat, but by direct chemical destruction of body tissues. The areas most often affected are the extremities, mouth, and eyes. Alkali burns are usually more serious than acid burns for alkalis penetrate deeper and burn longer.

**TREATMENT.** When such burns occur on board a ship or in the shop, emergency measures must be carried out immediately, without waiting for the arrival of medical personnel. The following procedures should be followed when you are treating chemical burns:

1. Begin flushing the area immediately with large amounts of water, using a shower or hose, when available. Do not apply water too forcefully. Continue to flood the area while his clothing, including shoes and socks, is being removed, as well as afterwards.

**NOTE:** There are two exceptions to the above treatment: they are alkali burns and acid burns. For alkali burns caused by dry lime, the mixing of water and lime creates a very corrosive substance. Dry lime should be brushed from the skin and clothing, unless large amounts of water are available for rapid and complete flushing. For acid burns caused by phenol (carbolic acid), wash the affected area with alcohol because phenol is not water soluble. Then wash with water. When alcohol is not available, flushing with water is better than no treatment at all.

2. After thorough washing, neutralize the chemicals that remain on the affected area.

## **WARNING**

Do not attempt to neutralize a chemical unless you are exactly sure what it is and what substance can effectively neutralize it. Further damage may be done by a neutralizing agent that is too strong or incorrect. For acid burns, mix a solution of 1 teaspoon of baking soda in a pint of water and flush it over the affected area.

3. Flush the area again with water and gently pat it dry with sterile gauze. Do not rub the area.

4. Transport the victim to a medical facility.

**CHEMICAL BURNS OF THE EYE.** Flush the eye immediately with large amounts of fresh, clean water. Acid burns should be flushed at least 5 minutes, and alkali burns flushed for as long as 20 minutes. Because of the intense pain, the victim maybe unable to open his eyes. When this occurs, hold the eyelids apart so water can flow across the eyes.

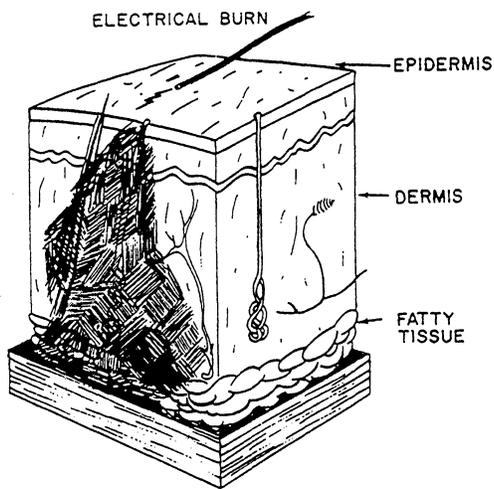


Figure 10-46.—Electrical penetration of the skin.

A drinking fountain maybe used to supply a steady stream of water. Hold the victim's head in a position that allows water to flow from the inside corner of the eye toward the outside. Do not allow the water to fall directly on the eye, nor use greater force than is necessary to keep the water flowing across the eye.

### CAUTION

Never use chemical antidotes, such as vinegar, baking soda, or alcohol, in treating burns of the eye.

After thorough irrigation, loosely cover both eyes with a clean dressing.

The aftercare for all chemical burns is similar to that for thermal burns; cover the affected area and get the victim to a medical facility at once.

### ELECTRICAL BURNS

Electrical burns are more serious than they first appear. The entrance wound may be small, but as electricity penetrates the skin, it burns a large area below the surface, as shown in figure 10-46. Usually there are two external burn areas: one where the current enters the body and another where it leaves.

Before administering first aid, remove the victim from the electrical source. When power equipment is involved, shut it off or disconnect it immediately. If the victim is in an automobile accident and a live wire is lying on the car, pull the wire from the car, using a nonconducting dry rope or similar object. Stay away from the severed end of the power line, because it can jump.

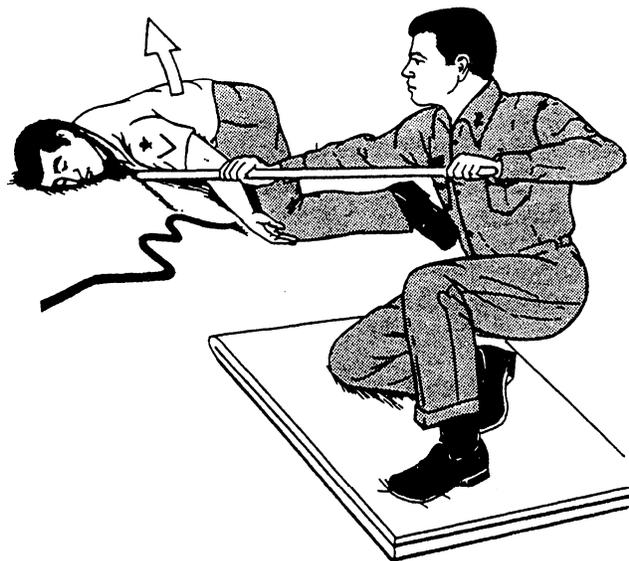


Figure 10-47.—Pushing a victim away from a power line.

When rescuing a victim who has come into direct contact with a power line, stand on a well-insulated object, and use a dry rope or a wooden pole to either push or pull the wire away from the victim or the victim away from the wire. (See fig. 10-47.) Do not touch the victim until this is done or you, too, may become a casualty.

Electrical burns are often accompanied by respiratory failure and cardiac arrest, which are of more immediate danger to the victim than the burn itself. Start CPR immediately and continue until the victim regains a normal heartbeat and breathing pattern. Finally, lightly cover the site of the burn with a dry, preferably sterile dressing, treat for shock and transport the victim to a medical facility.

### WHITE PHOSPHOROUS BURNS

A special category of burns, which may affect military personnel in either a wartime or training situation, is that caused by exposure to white phosphorous (WP or 'Willie Peter'). First aid for this type of burn is complicated by the fact that white phosphorous particles ignite upon contact with air.

**TREATMENT.** Superficial burns caused by simple skin contact or burning clothes can be flushed with water and treated like thermal burns. Partially embedded white phosphorous particles must be continuously flushed with water while the first-aider removes them with whatever tools are available, such as tweezers and needle-nose pliers. Do this quickly but gently. Firmly or deeply embedded particles that cannot be removed by

the first-aid-er must be covered with a saline-soaked dressing, which must be kept wet until the victim reaches medical personnel. When rescuing victims from a closed space where white phosphorous is burning, protect your lungs with a wet cloth over your nose and mouth.

## FRACTURES

Many kinds of accidents cause injuries to the bones, joints, and muscles. In providing first aid to an injured person, you must always look for signs of fractures (broken bones), dislocations, sprains, strains, and contusions (bruises).

An essential part of the first-aid treatment for fractures consists of immobilizing the injured part with splints so the sharp ends of broken bones do not move around and cause further damage to the nerves, blood vessels, or vital organs. Splints are also used to immobilize severely injured joints or muscles and to prevent the enlargement of extensive wounds. You must have a general understanding of the use of splints before going onto learn detailed first-aid treatment for injuries to the bones, joints, and muscles.

### USE OF SPLINTS

In an emergency almost any firm object or material will serve as a splint. Thus umbrellas, canes, swords, rifles, tent pegs, laths, sticks, oars, paddles, spars, wire, leather, boards, pillows, heavy clothing, corrugated cardboard, and folded newspaper may be used as splints. A fractured leg may sometimes be splinted by fastening it securely to the uninjured leg.

Splints, whether ready-made or improvised, must fulfill certain requirements. They should be lightweight, strong, fairly rigid, and long enough to reach the joints above and below the fracture. Splints should be wide enough so the bandages used to hold them in place do not pinch the injured part. Splints must be well padded on the sides touching the body. If they are not properly padded, they do not fit well and will not adequately immobilize the injured part. When you have to improvise the padding for a splint, you may use articles of clothing, bandages, cotton, blankets, or other soft material. When the victim is wearing heavy clothes, you may be able to apply the splint on the outside, thus allowing clothing to serve as part of the required padding.

To apply splints to an injured limb, fasten them in place with bandages, strips of adhesive tape, articles of clothing, or other available material. Whenever

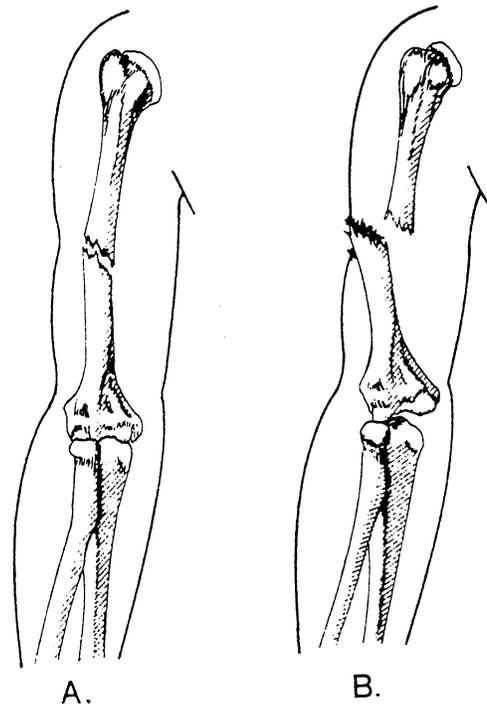


Figure 10-48.—Types of fractures.

possible, one person should hold the splints in position while another person fastens them.

Although splints should be applied snugly, they should NEVER be so tight as to interfere with the circulation of blood. When you are applying splints to an arm or leg, try to leave the fingers or toes exposed. If the tips of the fingers or toes become blue or cold, you will know that the splints or bandages are too tight. You should examine a splinted limb approximately every half hour, and loosen the fastening when the circulation appears to be impaired. Remember that an injured limb is likely to swell, and splints or bandages that are applied correctly may later become too tight.

### INJURIES TO BONES

A break in a bone is called a FRACTURE. There are two main types of fractures. A CLOSED FRACTURE is one in which the injury is entirely internal; that is, the bone is broken but there is no break in the skin. An OPEN FRACTURE is one in which there is an open wound in the tissues and skin. This type of break and wound is also referred to as a compound fracture. Sometimes the open wound is made when a sharp end of the broken bone pushes out through the flesh; sometimes it is made by an object, such as a bullet, that penetrates from the outside. Figure 10-48 shows closed and open fractures.

Open fractures are far more serious than closed fractures. They usually involve extensive tissue damage and are likely to become infected. Closed fractures are sometimes converted into open fractures by rough or careless handling of the victim. Therefore, **ALWAYS USE EXTREME CARE AND CAUTION WHEN TREATING A SUSPECTED FRACTURE.**

It is not always easy to recognize a fracture. All fractures, whether closed or open, are likely to cause severe pain or shock but other symptoms may vary considerably. A broken bone sometimes causes the injured part to become deformed or to assume an unnatural position; however, this is not always the case. Pain and swelling may be localized at the fracture site, and there may be a wobbly movement if the bone is broken clear through. It may be difficult or impossible for the victim to move the injured part. When movement is possible, the victim may feel a grating sensation as the ends of the broken bone rub against each other. However, when a bone is cracked rather than broken through, the victim may be able to move the injured part without much difficulty. An open fracture is easy to recognize if an end of the broken bone protrudes through the flesh. When the bone does not protrude, you might see the external wound but fail to recognize the broken bone.

When you are required to give first aid to a person who has suffered a fracture, follow these general rules:

1. When there is any possibility that a fracture has been sustained, treat the injury as a fracture.
2. Get the victim to a medical facility at the first opportunity. All fractures require medical treatment.
3. Do not move the victim until the injured part has been splinted, unless you must move out of a life-threatening environment to prevent further injury.
4. Treat for shock.
5. Do not attempt to locate a fracture by grating the ends of the bone together.
6. Do not attempt to set a broken bone.
7. When a long bone in the arm or leg is fractured, the limb should be carefully straightened so splints can be applied. Never attempt to straighten the limb by applying force or traction. Pulling gently with your hands in the direction of the long axis of the limb is permissible and may be all that is necessary to get the limb back into position.
8. Apply splints. When the victim must be transported for some distance or when a considerable

period of time will elapse before treatment by a medical officer, it may be better to remove enough of the victim's clothing so you can apply well-padded splints directly to the injured part. However, when the victim is to be transported only a short distance or when treatment by a medical officer will not be delayed, it is probably best to leave the clothing on and apply emergency splinting over it. If you decide to remove the clothing over the injured part, extreme care must be taken. Cut away the clothing or rip it along the seams. Remember, rough handling of the victim may convert a closed fracture into an open fracture, increase the severity of shock and cause extensive damage to the blood vessels, nerves, muscles, and other tissues around the broken bone.

9. When the fracture is open, you must take care of the wound before you can treat the fracture. Bleeding from the wound may be quite serious; however, most bleeding can be stopped by applying direct pressure on the wound or by applying digital pressure at the appropriate pressure point. When these methods are not successful, use a tourniquet. Then treat the fracture.

We have now completed the general rules for treating fractures. The symptoms and emergency treatment for fractures for the forearm, upper arm, thigh, lower leg, kneecap, collarbone, rib, nose, jaw, skull, spine, and pelvis are also discussed in this chapter.

## **FRACTURE OF THE FOREARM**

There are two large bones in the forearm. When both are broken, the arm usually appears to be deformed. When only one bone is broken, the other acts as a splint and the arm, therefore, retains a more or less natural appearance. Any fracture of the forearm is likely to result in pain, tenderness, an inability to use the forearm, and a wobbly motion at the point of injury. When the fracture is open, there is an open wound through which the bone may show.

**TREATMENT.** When the fracture is open, stop the bleeding and treat the wound. Apply a sterile dressing over the wound.

Carefully straighten the forearm. (Remember that rough handling of a closed fracture may convert it into an open fracture.)

Apply two well-padded splints to the forearm, one on the top (backhand side) and one on the bottom (palm side). Make sure the splints are long enough to extend from the elbow to the wrist. Use bandages to hold the splints in place.



Figure 10-49.—Sling used to support a fractured forearm.

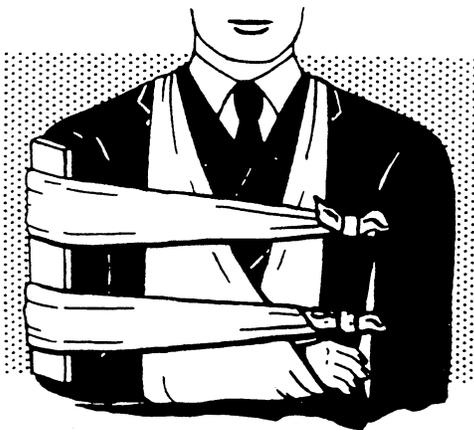


Figure 10-50.—Splint and sling for a fractured upper arm.

Put the forearm across the chest. The palm of the hand should be turned in, with the thumb pointing upward. Support the forearm in this position by means of a wide sling, as shown in figure 10-49. The hand should be raised about 4 inches above the heel of the elbow.

As in all cases of fracture, treat the victim for shock, and obtain medical care as soon as possible.

### FRACTURE OF THE UPPER ARM

The signs of fracture in the upper arm include pain, tenderness, swelling, and a wobbly motion at the point of fracture. When the fracture is near the elbow, the arm is likely to be straight, with no bend at the elbow.

**TREATMENT.** When the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture. Treatment of the fracture depends partly upon the location of the break; that is, whether the

fracture is in the upper part of the arm, in the middle of the upper arm, or near the elbow.

When the fracture is in the upper part of the arm, near the shoulder, place a pad or folded towel in the armpit, bandage the arm securely to the body, and support the forearm in a narrow sling.

When the fracture is in the middle of the upper arm, you may use one well-padded splint on the outside of the arm. The splint should extend from the shoulder to the elbow. Fasten the splinted arm firmly to the body, and support the forearm in a narrow sling, as shown in figure 10-50.

Another method of treating a fracture in the middle of the upper arm is to fasten two wide splints, or four narrow ones, around the arm, and support the forearm in a narrow sling. If you use a splint between the arm and the body, ensure it does not extend too far up into the armpit. A splint in this position can cause a dangerous compression of the blood vessels and nerves and may be extremely painful to the victim.

When the fracture is at or near the elbow, the arm may be either bent or straight. No matter what position you find the arm in, **DO NOT ATTEMPT TO STRAIGHTEN IT OR MOVE IT IN ANY WAY.** As carefully as possible, splint the arm in the position in which you find it.

Treat the victim for shock and obtain medical care as soon as possible.

### FRACTURE OF THE THIGH

The thighbone is the long bone in the upper part of the leg, between the kneecap and the pelvis. When the thighbone is fractured, any attempt to move the limb results in a spasm of the muscles and causes excruciating pain. The leg has a wobbly motion, and there is complete loss of control below the fracture. The limb usually assumes an unnatural position, with the toes pointing outward. The fractured leg is shorter than the uninjured one, by actual measurement, because of the pull of the powerful thigh muscles. Serious damage to the blood vessels and nerves often results from a fracture of the thighbone. Shock is likely to be severe.

**TREATMENT.** When the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture itself. Serious bleeding is a special danger in this type of injury, since the broken bone may tear or cut the large artery in the thigh.

Carefully straighten the leg. Apply two splints: one on the outside of the injured leg and one on the inside.

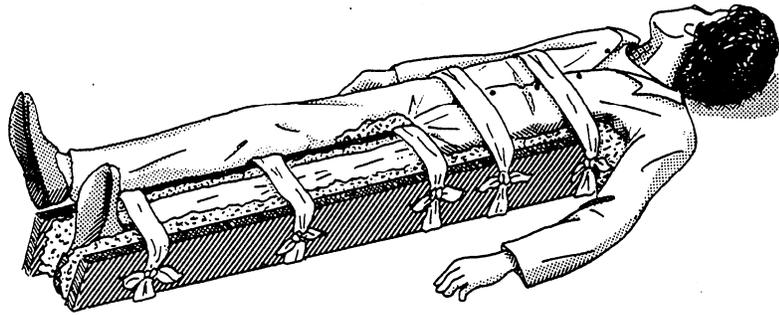


Figure 10-51.—Boards used as emergency splints for fractured thigh.

The outside splint should reach from the armpit to the foot. Make sure the inside splint reaches from the crotch to the foot. The splints should be fastened in five places: (1) around the ankle, (2) over the knee, (3) just below the hip, (4) around the pelvis, and (5) just below the armpit. Both legs should be tied together to support the injured leg as firmly as possible.

It is essential that a fractured thigh be splinted before the victim is moved. Ready-made splints are best, but improvised splints may be used. Figure 10-51 shows how boards may be used as an emergency splint for a fractured thigh. Remember, **DO NOT MOVE THE VICTIM UNTIL THE INJURED LEG HAS BEEN IMMOBILIZED.**

Treat the victim for shock and obtain medical care as soon as possible.

### FRACTURE OF THE LOWER LEG

When both bones of the lower leg are broken, the usual signs of fracture are likely to be present. When only one bone is broken, the other one acts as a splint and, thus to some extent, prevents deformity of the leg; however, tenderness, swelling, and pain at the point of fracture are usually present. A fracture just above the ankle is often mistaken for a sprain. When both bones of the lower leg are broken, an open fracture is likely to result.

**TREATMENT.** When the fracture is open, stop the bleeding and treat the wound.

Carefully straighten the injured leg. Apply three splints: one on each side of the leg and one underneath. Ensure the splints are well padded, especially under the knee and at the bones on each side of the ankle.

A pillow and two side splints work well for treatment of a fractured lower leg. Place the pillow beside the injured leg; then carefully lift the leg and place it in the middle of the pillow. Bring the edges of

the pillow around to the front of the leg and pin them together. Then place one splint on each side of the leg, over the pillow, and fasten them in place with strips of bandage or adhesive tape.

Treat the victim for shock and obtain medical care as soon as possible.

### FRACTURE OF THE KNEECAP

**TREATMENT.** The first-aid treatment for a fractured kneecap is as follows:

Carefully straighten the injured limb. Immobilize the fracture by placing a padded board under the injured limb. The board should be at least 4 inches wide and should reach from the buttock to the heel. Place extra padding under the knee and just above the heel, as shown in figure 10-52. Use strips of bandage to fasten the leg to the board in four places: (1) just below the knee, (2) just above the knee, (3) at the ankle, and (4) at the thigh. **DO NOT COVER THE KNEE ITSELF.** Swelling is likely to occur rapidly, and any bandage or tie fastened over the knee would quickly become too tight.

Treat the victim for shock, and obtain medical care as soon as possible.

### FRACTURE OF THE COLLARBONE

A person with a fractured collarbone usually shows definitive symptoms. When the victim stands, the

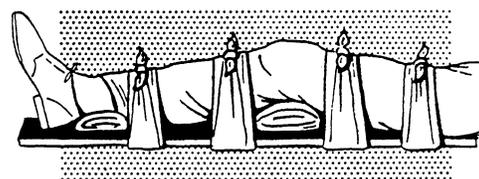


Figure 10-52.—Immobilization of fractured kneecap.

injured shoulder is lower than the uninjured one. Usually the victim is unable to raise his arm above the level of his shoulder. The injured person may attempt to support the injured shoulder by holding the elbow of that side in his other hand; that is, in fact, a characteristic position assumed by a person with a broken collarbone. Since the collarbone lies near the surface of the skin, you may be able to detect the point of fracture by the deformity and localized pain and tenderness.

**TREATMENT.** When the fracture is open, stop the flow of blood and treat the wound before attempting to treat the fracture. You must bend the victim's arm on his injured side and place his forearm across the chest. The palm of his hand should be turned in, with the thumb pointing up. His hand should be raised about 4 inches above the level of his elbow. Support his forearm in this position by means of a wide sling.

Next, use a wide roller bandage (or any wide strip of cloth) to fasten the victim's arm to his body. Wrap the bandage several times around his body, and ensure it goes down over the hand so the arm is held close against his body.

Treat the victim for shock and obtain medical care as soon as possible.

### **FRACTURE OF THE RIB**

When the ribs are broken, the victim should be kept comfortable and quiet so the greatest danger—the possibility of further damage to the lungs, heart, or chest wall by the broken ends—is minimized.

The common finding in all victims with fractured ribs is pain localized at the fracture site. By asking the patient to point out the exact area of pain, you can often determine the location of the injury. There may not be a rib deformity or chest wall contusion or laceration of the area. Deep breathing, coughing, or movement is usually painful. The patient generally wishes to remain still and may often lean toward the injured side, with one hand over the fractured area to immobilize the chest and to ease his pain.

**TREATMENT.** In general, rib fractures are not bound, strapped, or taped when the victim is reasonably comfortable; however, they may be splinted by the use of external support. If the patient is considerably more comfortable with his chest immobilized, the best method is to use a swathe bandage (fig. 10-53) in which the arm on his injured side is strapped to his chest with the palm flat, the thumb up, and with the forearm raised to a 45-degree angle. Immobilize his chest, using wide



**Figure 10-53.—Swathe bandaging of fractured rib victim.**

strips of bandage to secure the arm to his chest. Wide strips of adhesive plaster applied directly to the skin of his chest for immobilization should not be used, since the adhesive tends to limit the ability of his chest to expand and thus interferes with proper breathing.

Treat the victim for shock, and obtain medical care as soon as possible.

### **FRACTURE OF THE NOSE**

A fracture of the nose usually causes localized pain and swelling, a noticeable deformity of the nose, and extensive nosebleed.

**TREATMENT.** First, stop the nosebleed. Have the victim sit quietly, with his head tipped slightly backward. Instruct the patient to breathe through his mouth, not his nose. If the bleeding does not stop within a few minutes, apply a cold compressor ice bag over his nose.

Treat the victim for shock and obtain medical care as soon as possible. A permanent deformity of the nose may result if the fracture is not treated promptly.

### **FRACTURE OF THE JAW**

A person with a fractured jaw may suffer serious interference with breathing. The victim is likely to have great difficulty in talking, chewing, or swallowing. Any movement of the jaw causes pain. The teeth may be out of line, and there may be bleeding from the gums. Considerable swelling may develop.

**TREATMENT.** One of the most important phases of emergency care is to clear the upper respiratory

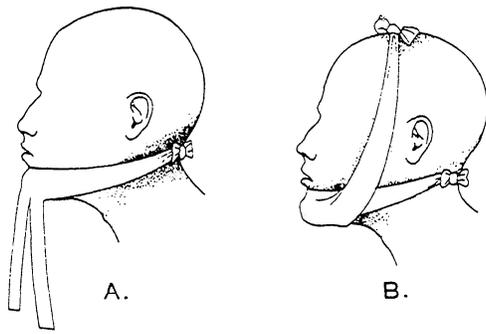


Figure 10-54.—Four-tailed bandage for a fractured jaw.

passage of any obstruction. When the fractured jaw interferes with breathing, pull his lower jaw and tongue FORWARD and keep them in that position.

Apply a four-tailed bandage, as shown in figure 10-54. Be sure the bandage pulls the lower jaw FORWARD. Never apply a bandage that forces the jaw backward, since this could seriously interfere with breathing. The bandage must be firm to support the jaw properly, but it must not press against the victim's throat. Ensure the victim has scissors or a knife to cut the bandage in case of vomiting.

Treat the victim for shock and obtain medical care as soon as possible.

## FRACTURE OF THE SKULL

When a person suffers a head injury, the greatest danger is that his brain may be severely damaged. Whether or not the skull is fractured is a matter of secondary importance. In some cases, injuries that fracture the skull do not cause serious brain damage. But brain damage can, and frequently does, result from apparently slight injuries that do not cause damage to the skull itself.

It is often difficult to determine whether an injury has affected the brain because symptoms of brain damage vary greatly. Any person who has suffered a head injury of any kind must be handled carefully and given immediate medical attention.

Some of the symptoms that may indicate brain damage are listed below; however, you must remember that these symptoms are not always present in any one case and the symptoms that do occur may be greatly delayed.

1. Bruises or wounds of the scalp may indicate that the victim has sustained a blow to the head. Sometimes the skull is actually depressed at the point of

impact. When the fracture is open, you may find bullets, glass, shrapnel, or other objects that have penetrated the skull.

2. The victim maybe conscious or unconscious. When conscious, the victim may feel dizzy and weak, as though he were going to faint.

3. Severe headache sometimes (but not always) accompanies head injuries.

4. The pupils of the eyes maybe unequal in size and may not react normally to light.

5. There maybe bleeding from the ears, nose, or mouth.

6. The victim may vomit.

7. The victim may be restless and perhaps confused and disoriented.

8. The arms, legs, face, or other parts of the body may be partially paralyzed.

9. The victim's face maybe very pale, or it may be unusually flushed.

10. The victim is likely to be suffering from shock, but the symptoms of shock maybe disguised by other symptoms.

It is not necessary to determine whether or not the skull is actually fractured when you are giving first aid to a person who has suffered ahead injury. The treatment is the same in either case, and the primary intent is to prevent further damage to the brain.

**TREATMENT.** Keep the injured person lying down. When facial flushing is apparent, raise the victim's head and shoulders slightly. When facial pallor is present, position the victim so the head is level with or slightly lower than the body. Watch carefully for vomiting. If the victim begins to vomit, position the head so choking on the vomitus does not occur.

When there is serious bleeding from wounds, try to control it by applying direct pressure, using caution to avoid further injury to the skull or brain.

You must exercise care when moving or handling the victim. Transport the person only when necessary. If you must transport the victim, keep him lying down.

Be sure the victim is kept comfortably warm but do not overheat him. Do NOT provide the victim with anything to eat or drink. DO NOT GIVE ANY MEDICATION.

Finally, obtain medical care for the victim as soon as possible.

## FRACTURE OF THE SPINE

The spinal cord, which contains nerve fibers in direct connection with the brain, is enclosed and protected by a bony structure known as the SPINAL COLUMN, or BACKBONE. The spinal column is made up of a number of small bones called the VERTEBRAE.

If the spine is fractured at any point, the spinal cord may be crushed, cut, or otherwise damaged so severely that death or paralysis can result. However, when the fracture occurs in such a way that the spinal cord is not seriously damaged, there is a good chance of complete recovery—PROVIDED THE VICTIM IS PROPERLY CARED FOR. Any twisting or bending of the neck or back whether due to the original injury or caused by careless handling later, is likely to cause irreparable damage to the spinal cord.

The primary symptoms of a fractured spine are pain, shock and paralysis. PAIN is likely to be acute at the point of fracture. It may radiate to other parts of the body. SHOCK is usually severe, but (as in all injuries) the symptoms may be delayed for sometime. PARALYSIS occurs when the spinal cord is seriously damaged. When the victim is unable to move his legs, feet, or toes, the fracture is most probably in his back. When he cannot move his fingers, his neck is probably broken. Remember, however, that a spinal fracture does not always injure the spinal cord, so the victim is not always paralyzed. Any person who has acute pain in the back or neck following an injury, should be treated as though a fracture of the spine has occurred. This remains true even though no other symptoms are present.

**TREATMENT.** First aid for all spinal fractures, whether of the neck or bath has two primary purposes: (1) to minimize shock and (2) to prevent further injury to the spinal cord.

You must keep the victim comfortably warm. Do NOT attempt to place the victim in the position normally used to treat shock. Any unnecessary movement may cause further injury to the spinal cord. Keep the victim lying flat. Do NOT attempt to lower the victim's head.

To avoid further damage to the spinal cord, DO NOT MOVE THE VICTIM UNLESS IT IS ABSOLUTELY ESSENTIAL. But if you must transport the victim, DO NOT BEND OR TWIST HIS BODY; DO NOT MOVE HIS HEAD FORWARD, BACKWARD, OR SIDEWAYS; AND DO NOT, UNDER ANY CIRCUMSTANCES, ALLOW HIM TO SIT UP.

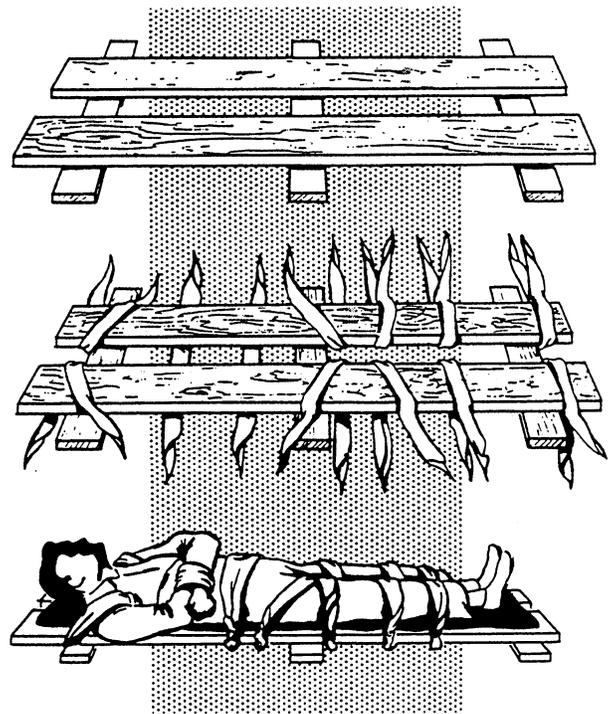


Figure 10-55.—Improvised frame for transporting victim with fractured spine.

When it is necessary to transport a person who has suffered a fracture of the spine, follow these general rules:

1. If the spine is broken at the NECK, the victim must be transported lying flat on his back with his face up. Place pillows or sandbags beside his head so it cannot be turned to either side. DO NOT PUT PILLOWS OR PADDING UNDER HIS NECK OR HEAD.
2. When you suspect the spine is fractured but do not know the location of the break treat the injury as though the victim has a broken neck. In other words, the victim should be lying on his back with his face up. When both the neck and back are broken, treat the victim in the same manner; that is, keep the victim on his back with his face up.
3. No matter where the spine is broken, USE A FIRM SUPPORT IN TRANSPORTING THE VICTIM. Use a rigid stretcher, or use a door, shutter, wide board, or a frame similar to that shown in figure 10-55. Pad the support carefully, and put blankets both under and over the victim. Use cravat bandages or strips of cloth to fasten the victim firmly to the support.
4. Hold the injured person by his clothing; then slide or pull the victim onto the support. DO NOT ATTEMPT TO LIFT THE VICTIM UNLESS YOU

HAVE ADEQUATE ASSISTANCE. Remember, any bending or twisting of the body is almost certain to cause serious damage to the spinal cord. When there are at least four (preferably six) people present to help lift the victim, they can probably accomplish the job without much movement of the victim's body. But a smaller number of people should NEVER attempt to lift the victim.

5. GET MEDICAL HELP AT ONCE.

## **FRACTURE OF THE PELVIS**

The large pelvic bones (sometimes called hipbones) and the lower bone of the spinal column together make up the bony structure known as the PELVIS. The joint between the thighbone (the long bone of the upper part of the leg) and the pelvic bone is call the HIP JOINT.

Fractures in the pelvic region often result from falls, heavy blows, and accidents that involve crushing. The greatest danger in any pelvic fracture is that the organs enclosed and protected by the pelvis may be seriously damaged when the bony structure is fractured. In particular, there is danger that the bladder is ruptured. There is also danger of severe internal bleeding, because the large blood vessels in the pelvic region maybe tom or cut by fragments of the broken bone.

The primary symptoms of a fractured pelvis are severe pain, shock, and loss of ability to use the lower part of the body. The victim is unable to sit or stand. If conscious, the victim may feel as though his body is "coming apart." When the bladder is injured, the victim's urine may be bloody.

**TREATMENT.** Do not move the victim unless ABSOLUTELY necessary.

Treat the victim for shock Keep him comfortably warm. Do not attempt to place the victim in the shock position, as this may produce futher damage internally.

When you must transport the victim to another place, handle him with the utmost care. Use a rigid stretcher, a padded door, or a wide board. Keep the victim lying on his back with his faceup. In some cases, the victim will be more comfortable when his legs are straight. In other cases, the victim will be more comfortable with his knees bent and his legs drawn up. After you have placed the victim in the most comfortable position, immobilize him by placing bandages around his legs at the knees and ankles. Then place a pillow beside each hip and fasten each pillow securely with bandages or pieces of cloth. Finally, fasten

the victim securely to the stretcher or improvised support, and obtain medical help immediately.

## **FIELD SANITATION**

In the field, devices necessary for maintaining personal hygiene and field sanitation must be improvised. Some of the devices for field sanitation that have been tried and used in the field successfully are described next.

### **LATRINES**

When you are on bivouac or at a new location, it is unlikely that you will find a waterborne sewage system available for your use. The usual alternative is digging a hole (cat hole) about 1 foot deep and covering the feces completely with dirt or using a latrine.

**NOTE:** Latrines must be 100 yards from water supplies and messing facilities.

Straddle trench latrines are commonly used. Dig straddle trenches as soon as you arrive at a position. Use the 1:2:3 ratio (trenches 1 foot wide, 2 feet deep, and 3 feet long). No seats are provided, and the men stand along the sides. Add another foot of depth for each day you anticipate using the trench. Keep a pile of dirt and a shovel adjacent to the trench so each man may use some of the dirt to cover his waste materials. Boards may be placed around the sides to help keep steady footing.

When the latrine is filled to within 1 foot of the ground level or is to be abandoned, the following steps should be initiated:

1. Using an approved residual insecticide or diesel fuel, spray the pit contents, the sidewalls, and the ground surface extending 2 feet from the sidewalls.

2. Fill the pit to ground level with successive 3-inch layers of earth, packing each layer down before adding the next one; then mound the pit over with at least 1 foot of dirt and spray again with insecticide or diesel fuel. This prevents flies that hatch in the closed latrine from getting out.

When there is a possibility that others may come into the area, it is better to mark the closed latrine so the site will not be used again. A sign "closed latrine" with the date of closing should be placed firmly in the earth over the spot.

As soon as possible, regular pit latrines should be dug. These latrines may be 20 to 30 feet deep if the ground permits. The sides must be straight and have no ledges that could catch feces. Latrine boxes, usually of

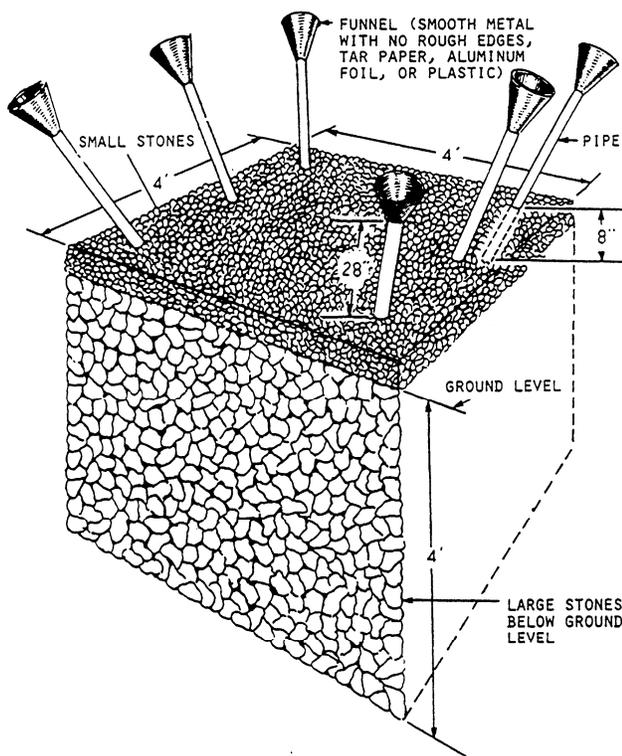


Figure 10-56.—Urinal pipes and soakage pit.

four or eight holes, and accessories, such as tent, urinals, tar paper, and screen wire, are finished ready for installation.

When the box is installed, it is lined with tar paper from the top to the bottom. The boxes also need a metal or tar paper urine deflector. This deflector is converted into a trough under the front of the seat so it drains toward one end. From this end, a pipe carries the urine to an outside soakage pit. This helps prevent a disagreeable odor from the urine. In some cases where the soil is rather porous, the urine drains into the latrine pit itself.

It is necessary to cover all cracks in the box to help make it flyproof. You do this by nailing strips of wood or tin over them. When the box is placed over the pit, it must be done carefully. If any cracks are showing, seal them by packing some dirt tightly around the edges.

A separate urine soakage pit is built when the latrine pit is in soil that absorbs liquids poorly (fig. 10-56). This pit is about 4 feet square and 4 feet deep. It is filled with pieces of broken rock brick large stone or lava rock to within 1 foot from the top. Then oiled burlap is placed over the rocks and covered with sand or earth. Vents, inserted to reduce odor, are covered at the top with fine mesh screen.

Urinals may be made of 1-inch or large-sized pipe and placed at each corner of the pit and along the sides.

The pipes should reach at least 8 inches below the ground surface. In the upper end of each pipe, place a funnel of sheet metal, tar paper, or similar material. These funnels are covered at the opening with wire mesh. This is to keep out flies, cigarette butts, or other items that would clog up the pipes.

In other cases, pail latrines maybe used in buildings where no adequate plumbing facilities are available or where it is not practical to build deep pit latrines. Usually a standard latrine box is adapted for use as a pail latrine. The pails are removed at least once daily and replaced by clean pails. Each pail should have about 1 inch of a 2-percent cresol solution or some slaked lime in it.

Pails of excreta are removed from the latines by hand, cart, wagon, or truck. The contents maybe burned, buried, or placed in flyproof concrete tanks where it decomposes.

A trough urinal is usually built as part of a latrine. The trough may be made of tin, galvanized iron, or wood. When it is made of wood, it should usually be lined with tar paper.

The trough slopes toward one end and empties into a drain pipe. The drain pipe, fitted with a fine mesh fly screen, extends into the latrine or urine soakage pit. Sometimes the pipe is omitted and the trough extends into the pit.

## GARBAGE DISPOSAL

Garbage is the waste from the kitchen and mess hall. It is usually divided into two categories: WET and DRY. Both have to be removed from the mess area before they cause offensive odors or attract flies and rats.

Cans should be used for storing garbage until the garbage can be removed for disposal. The cans should be kept outside of the kitchen. Covers must be kept on the cans at all times. Cans should not be filled higher than 4 inches from the top. Regular washing of the cans is necessary to help ensure proper sanitation. When steam is available, it can be used to remove accumulated grease.

The common method of disposal is burial. Trenches or pits are dug and the garbage is deposited. Sometimes a continuous trench is used. The garbage for each day is then covered by the excavation made for the following day. The length, width, and depth of the holes vary according to the need; however, you should not pile the garbage higher than 2 feet from the top before covering it with earth.

**NOTE:** Garbage pits are usually not more than 30 yards from mess areas and not less than 100 yards from water supplies.

Some installations may have facilities to load the garbage on barges. The barges are taken out to sea and the garbage dumped. Where available, movable platforms accomplish this without the need of handling the garbage again.

A few installations burn dry garbage. This method of disposal should be used whenever possible because it is quick and inexpensive.

## **LOW-TEMPERATURE CLIMATES**

In low-temperature areas, such as the Arctic, the problem of sewage and garbage disposal is more difficult than in temperate areas. The difficulty is due to the effect of the low temperature on the physical state of fluids, soils, and other materials involved in garbage and sewage disposal.

The biological and chemical reduction of organic material is a slow process in areas with low-temperature conditions. The soil will not assimilate wastes as readily as under temperate conditions, and permafrost (permanently frozen ground) often does not permit proper drainage of the soil. In addition, most solids, as well as liquids, show a decline in solubility with a decline in temperature. These and other factors have an important bearing on the type of sewage and garbage disposal methods used in the Arctic or other low-temperature areas. Let us consider briefly a few temporary methods suitable for use in such areas.

In severely cold weather, feces deposited by troops freezes quickly, and, when pulverized by wind and snow, can soon contaminate a whole area. Sometimes, on a march, a SNOW HOLE may be used, but it should be placed near a rock or terrain feature that will ensure against other troops bivouacking on the same spot at a later date.

DISPOSAL BAGS offer a good means of preventing the spread of contaminated material and should be used whenever possible. These bags are collected and stacked under rock piles, then disposed of later by dumping them on the ice of adjacent bodies of water. The bags present no problem while frozen, and they cannot be scattered until the thaw begins.

In forward bivouacs, you can expect to find a very simple facility, such as a SLIT TRENCH in the snow, protected by a windbreak. The slit trench should be located in close proximity to the group. Marking

prevents other troops from bivouacking on the same spot at a later date.

In a more permanent type of camp, a heated shelter will probably be provided. This may be a tent or prefabricated unit in which there is a portable folding box latrine. All forms of latrines should be marked with the dates they are closed.

## **WATER TREATMENT**

Safe water in sufficient amounts is essential to field troops. Water not properly treated can give you diseases, such as typhoid fever, dysentery, cholera, and common diarrhea. In certain areas of the world, water may also transmit infectious hepatitis and amebic dysentery. The latter diseases are caused by organisms that are highly resistant to the water disinfection methods normally used.

The quantity of water required for troops varies with the season of the year, the geographical area, and the tactical situation. Dehydration may be the problem in both extremely hot and cold climates. In extremely hot climates, large quantities of drinking water are required to replace body fluid losses. In extremely cold climates, body fluid losses are not as great as in hot climates; however, water is needed in the reconstitution of dehydrated foods. Additional water is also required for maintenance of personal hygiene in both hot and cold climates. A guide for planning to meet the water requirements in a temperate zone is 5 gallons per man per day for drinking and cooking and at least 15 gallons per man per day when showering facilities are to be made available.

You may not be able to obtain water from water points set up by the Utilitiesman. If this should occur, you must obtain and treat your own water. The possible sources of water are surface water (lakes, rivers, streams, and ponds), groundwater (wells and springs), rain collected from roofs or other catchment surfaces, melted blue ice or snow, and distilled water. The cleanest source of water available should be selected. Water taken from any of these sources must be properly treated before being used, because all sources are presumed to be contaminated.

To treat water for drinking, you can use either a plastic or aluminum canteen with the water purification compounds available in tablet form (iodine) or in ampule form (calcium hypochlorite).

Before using iodine tablets, check them for physical change, as they lose their disinfecting ability with age.

If the tablets are stuck together, crumbled, or have a color other than steel gray, do not use them. When treating water in your canteen with iodine tablets, fill the canteen with the cleanest, clearest water available. Add one iodine tablet to a 1-quart canteen of clear water; add two tablets when the water is cloudy. Double these amounts for a 2-quart canteen. Place the cap on the canteen loosely; wait 5 minutes; then shake the canteen well, allowing leakage to rinse the threads around the neck of the canteen. Tighten the cap and wait an additional 20 minutes before using the water for any purpose.

To purify water in a 1-quart canteen with calcium hypochlorite ampules, fill the canteen with the cleanest, clearest water available, leaving an air space of an inch or more below the neck of the canteen. Take your canteen cup and fill it half full of water. Add the calcium hypochlorite from one ampule, and stir the water with a clean stick until the powder has dissolved. Fill the cap of a plastic canteen half full of the solution from the canteen cup and add it to the water in the canteen, then place the cap on the canteen and shake it thoroughly.

**NOTE:** If you have a 1-quart aluminum canteen, add at least 3 capfuls of the solution to the canteen, as its cap is much smaller than the one on the plastic canteen.

Loosen the cap slightly and invert the canteen, letting the treated water leak onto the threads around the neck of the canteen. Tighten the cap on the canteen and wait at least 30 minutes before using the water for any purpose.

You could save the remaining solution to use later if additional treated water may be needed, or you can discard it.

When you do not have disinfecting compounds, boiling the water is another method for killing disease-producing organisms; however, it has several disadvantages: (1) fuel is needed, (2) it takes along time to bring the water to a boil, and then allowing it to cool, and (3) there is no guaranteed protection against recontamination. Water must be held at a rolling boil for at least 15 to 20 seconds to make it safe for drinking.

Hand-washing devices that are easy to operate are usually provided at appropriate places in the bivouac area: outside the latrine enclosures, near the mess area, and at other locations as needed. A soakage pit is provided under each device to prevent water from collecting. The water containers for these devices are usually checked by a Utilitiesman to ensure the containers and the surrounding area are kept clean.

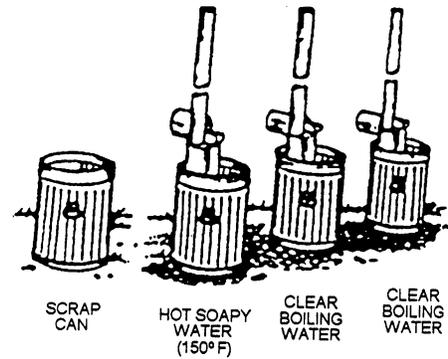


Figure 10-57.—Immersion heaters for mess kit washing setup.

In the field you must care for your own mess kit. Proper washing is important; otherwise, food particles remain and become breeding places for disease germs.

The galley maintenance personnel usually set up four corrugated cans or other similar containers, placed in a row, for washing your mess kit. The first can is used to scrape the food particles from your mess kit into. The second contains hot water with soap or detergent, and the third and fourth cans contain clear water which is kept boiling throughout the washing period (fig. 10-57). Along-handled brush is furnished so you can wash your mess kit.

To clean your mess kit properly, follow the steps given below:

1. Scrape the food particles from your mess kit into the scrap can.
2. Wash your mess kit in the first container of hot soapy water, using the long-handled brush.
3. Rinse your mess kit in the second can of boiling water by dipping it up and down several times.
4. Disinfect your mess kit by immersing it in the third container of boiling water for several seconds.
5. Shake your mess kit to remove excess water and allow it to dry in the air; then close it to keep out dust and vermin.

If your mess kit becomes soiled or contaminated between meals, it should be washed again before use.

When desirable to preheat utensils before a meal, a corrugated can with clear boiling water is placed near the start of the serving line. It is important that such water be maintained at a rolling boil throughout the meal service period.

