First Aid

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PREFACE

This is one of a series of manuals prepared by the technical staff of the Mine Safety and Health Administration (MSHA) to acquaint the reader with a subject of interest to miners. In the event of an accident, this manual provides an explanation of first aid techniques to be used before medical help arrives. This safety manual is presented in correct sequence of events for performing first aid. The index is in alphabetical order for quick reference. A list of references (Bibliography) is included for those interested in additional information on first aid and emergency care.

Other manuals available in this series are listed on the inside back cover. Multiple copies may be ordered for $2.00 each. Single copies of safety manuals may be obtained free of charge from:

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INTRODUCTION

What should you do if a coworker or family member is suddenly injured or becomes ill? Right after an illness or accident occurs and before medical help arrives, there is a critical period in which a person skilled in first aid techniques can mean the difference between life and death for the patient.

People should be trained to care properly for injuries to themselves and others at home, at work, or in the community. This first aid knowledge should impress employees of the need for personal safety. Since even trivial injuries are potentially serious, everyone should know the proper steps to prevent complications.

There is a particular need for first aid training in the mineral industries because medical treatment is often not immediately available at mining sites. In certain cases only a person who is nearby and has first aid training can prevent a fatality.

During the first few minutes following an injury, the injured worker has a better chance of receiving proper care if there are a number of employees trained in first aid. All employees should be able to give effective assistance until the injured person receives professional medical care.

Experience has shown that first aid training is an essential means of promoting safety and reducing accidents, as well as saving lives. First aiders must be able to take charge of a situation, keep calm while working under pressure, and organize others to do likewise. By demonstrating competence and using well-selected words of encouragement, first aiders should win the confidence of others and do everything possible to reassure the apprehensive patient.

Personnel trained in first aid, where workers, supervisors, and officials meet and learn on a common basis, develop a spirit of mutual protection and regard for everyone's well-being. An individual trained in first aid is someone special to fellow workers.

INFECTION CONTROL

In addition to rendering first aid treatment, you must be concerned with preventing the spread of communicable diseases. As a first aider, you may come into close contact with people who may be carrying infectious or communicable diseases. You need to be concerned about preventing the spread of these diseases to yourself and others.

Barriers to infectious diseases are the chief methods of infection control. Intact skin is an effective barrier, but pathogens (infectious organisms) will pass through mucus membranes and cuts.

Blood and all body fluids of all persons should be regarded as potentially infectious. The primary methods for guarding against infection are:

- Using protective equipment and clothing, such as
  - Latex gloves
  - Masks
  - Eye protection – goggles or face shields
  - Gowns
- Properly disposing of contaminated sharp objects
- Using a pocket face mask with a one-way valve or bag-valve-mask unit to deliver artificial ventilation
- Handwashing

- Proper decontamination of surfaces, equipment, and clothing

Remember to care for yourself. Remove and place your clothing in a plastic bag. Launder this clothing separately as soon as possible using a disinfecting soap. Be certain to clean your fingernails and wash your hair.

BASIC PROCEDURES FOR FIRST AID

When you arrive on the scene to care for an injured or ill person, you must make several decisions regarding not only the patient, but also the surrounding area. They are:

- Scene Size-Up
  - Scene Safety – As you approach the scene, begin to observe the scene to ensure personal, patient, and bystander safety. Do not move the injured person unless absolutely necessary – you and/or the patient are exposed to further danger at the accident site.
  - Body Substance Isolation Precautions (BSI) – Determine and don the appropriate personal protective equipment that will be needed prior to patient contact.
  - Mechanism of Injury – If possible, determine what forces caused the injury or the evidence of a medical problem. Consider what witnesses tell about the accident, what you observe about the patient, and what the patient (if conscious) can tell you.
  - Determine the Number of Patients – Call or have someone else call for assistance.

- ➔ Stabilization of Spine – During the initial assessment, avoid unnecessary movement or rough handling of the patient because it might aggravate undetected fractures or spinal injuries.

- Initial Assessment
  - ➔ Form a general impression
    - ✓ Look at and listen to the patient
- Assess mental status
  - ➔ Determine if patient is alert and responsive or nonresponsive.
- Assess airway
  - ➔ Ensure the airway is open, the patient is breathing, and that breathing is adequate. (If patient is talking or crying, you know the airway is open.)
- Assess circulation
  - ➔ Check carotid pulse. If absent, a trained person starts cardiopulmonary resuscitation (CPR); if a pulse is present, control serious bleeding by using BSI.
- Determine the priority of patients (if more than one) and transport as soon as possible.

Once life-threatening conditions are under control and obvious injuries have been treated, continue with the head-to-toe (detailed) examination. Look for any type of abnormalities such as swelling, discoloration, lumps, and tenderness that might indicate a hidden injury. Also check for medical identification devices which are usually necklaces or wrist or ankle bracelets. The detailed examination should include the:

- Head
- Neck
- Chest
- Abdomen
- Pelvis
- Arms
- Legs
- Back surfaces

FIRST AID PROCEDURES FOR LIFE-THREATENING CONDITIONS

The most important concern is immediate recognition and correction of life-threatening conditions and taking action to prevent death or further injury, to relieve pain, and to counteract shock.

Treat life-threatening conditions in the following order:

- Restore breathing.
- Restore circulation - Cardiopulmonary Resuscitation (if necessary).
- Control bleeding.
- Treat for shock.

Respiratory Arrest

If you determine that the patient is not breathing or breathing efforts are minimal, you must provide artificial ventilation by mouth-to-mask, mouth-to-mouth, or mouth-to-nose.

When giving artificial ventilation, always use a barrier, such as a pocket face mask when possible. The pocket face mask is made of soft, collapsible material and is small enough to be carried in a pocket or purse. It has a chimney with a one-way valve that allows your ventilations to enter but prevents the patient's exhaled air from coming back through the valve and into contact with you.

A patient not breathing is a life-threatening condition, and artificial ventilation must begin at once.

Causes

- Suffocation
- Gas poisoning
- Electrical shock
- Drowning
- Heart failure

Signs/Symptoms

- The chest or abdomen does not rise and fall.
- Air cannot be felt coming from the nose or mouth.
- Skin color is blue or gray.

Mouth-to-Mask

- Establish if the patient is unresponsive (tap the shoulder and ask, "Are you OK?").
- If the adult patient is unresponsive and you are alone, immediately call 911 (if a telephone is reasonably close).

- Determine that breathing is absent or inadequate.
- Position patient on back. If necessary, roll patient as a single unit, keeping the back and neck straight avoiding the aggravation of any possible spinal injury.
- Position yourself at the patient's head and open the airway using the head-tilt/chin-lift maneuver (if no spinal injury is suspected) or the jaw-thrust maneuver (if spinal injury is suspected).
- Take 3-5 seconds to listen and feel for air exchange and look for chest movements.
- If no breathing is present, position the mask on the patient's face so that the apex (top of the triangle) is over the bridge of the nose and the base is between the lower lip and prominence of the chin.
- For modified jaw-thrust maneuver (Figure 1), hold the mask firmly in place while maintaining the proper head tilt by placing:
  - ➔ Both thumbs on the sides of the mask.
  - ➔ Index, third and fourth fingers of each hand grasping the lower jaw on each side between the angle of the jaw and the ear lobe to lift the jaw forward.
  - ➔ Take a deep breath and exhale two times into the one-way valve at the top of the mask port. Each ventilation should be delivered over 1½ to 2 seconds in adults and 1 to 1½ seconds in children and infants. Watch for the patient's chest to rise.

- ➔ Remove your mouth from the port and allow for passive exhalation.
- ➔ If the attempt to ventilate is unsuccessful, reposition the patient's head and try again.
- ➔ If the patient does not begin spontaneous breathing after these initial breaths, begin Cardiopulmonary Resuscitation (CPR) if you have been trained.

If you have not been trained in CPR, continue with rescue breathing.

- Repeat breathing 10 to 12 times per minute for an adult, 15 times per minute for a child, and 20 times per minute for an infant.
- Use deep breaths for an adult, less for a child, and gentle puffs for infants.
- Break contact with the mask after each breath to allow air to escape.
- Air should be passively released from the patient's lungs while you watch the patient's chest fall and listen and feel for return of air.
- Take another deep breath and begin the cycle again.
- As the patient begins to breathe, maintain an open airway.

Figure 1 - Mouth-to-Mask (Modified Jaw-Thrust Maneuver)

Mouth-to-Mouth (Nose)

- Establish if the patient is unresponsive (tap the shoulder and ask, "Are you OK?").
- If the adult patient is unresponsive and you are alone, immediately call 911 (if a telephone is reasonably close).
- Determine that breathing is absent or inadequate.
- Position patient on back. If necessary, roll patient as a single unit, keeping the back and neck straight avoiding the aggravation of any possible spinal injury.
- Open airway by using head-tilt/chin-lift method (Figure 2-A) if no spinal injuries are present, or use modified jaw-thrust maneuver (Figure 3) if a spinal injury is suspected.
- Take 3-5 seconds to listen and feel for air exchange and look for chest movements.
- If no breathing is present, pinch the nose closed with your fingers, form an airtight seal by placing your mouth over the patient's mouth, and breathe into the patient's mouth two times (Figure 2-B). (If using the mouth-to-nose method, seal the patient's mouth with your hand and breathe into his/her nose. Use a mask if one is available.)
  - ➔ Each ventilation should be delivered over 1½ to 2 seconds in adults and 1 to 1½ seconds in children and infants.
  - ➔ If the attempt to ventilate is unsuccessful, reposition the patient's head and try again.

→ If the patient does not begin spontaneous breathing after two initial breaths, begin Cardiopulmonary Resuscitation (CPR) if you have been trained.

If you have not been trained in CPR, continue with rescue breathing:

- Repeat breathing 10 to 12 times per minute for an adult, 15 times per minute for a child, and 20 times per minute for an infant.
- Use deep breaths for an adult, less for a child, and gentle puffs for infants.
- Break contact with either the mouth or the nose after each breath to allow air to escape (Figure 2-C).
- Air should be passively released from the patient's lungs while you watch the patient's chest fall and listen and feel for return of air.
- Take another deep breath and begin the cycle again.
- As the patient begins to breathe, maintain an open airway.

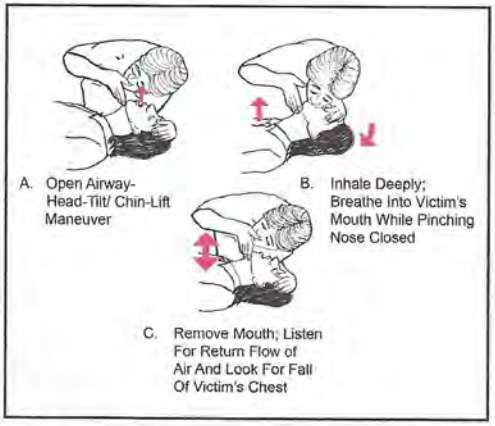

Figure 2 - Mouth-to-Mouth Ventilation

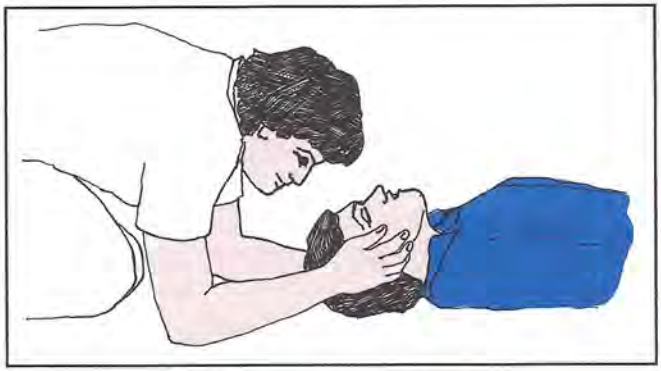

Figure 3 - Modified Jaw-Thrust Maneuver

DO NOT STOP! Continue artificial ventilation until patient is revived, a doctor pronounces the patient dead, another person relieves you, or you are physically unable to continue. If patient must be moved, continue artificial ventilation.

Foreign Objects in the Throat (Conscious Patient – Heimlich Maneuver) (Figure 4)

Signs/Symptoms

- Gasps for breath
- Has violent fits of coughing
- Quickly turns pale then blue
- Cannot talk or breath

Figure 4 - Universal Distress Signal for Choking

First Aid Treatment

- Determine if airway obstruction is partial or complete.
- If obstruction is partial (air exchange) **encourage patient to cough**.
- If there is no air exchange, stand behind the patient and place your arms around the patient's waist (Figure 5).
- Grasp one fist in your other hand and position the thumb side of your fist against the middle of the patient's abdomen between the lower tip (xiphoid process) of the sternum and the navel.
- Press your fist into the patient's abdomen with a quick upward thrust.
- Repeat the procedure if necessary ensuring that each new thrust is a separate and distinct movement.
- Repeat thrusts until the foreign body is expelled or the patient becomes unconscious.

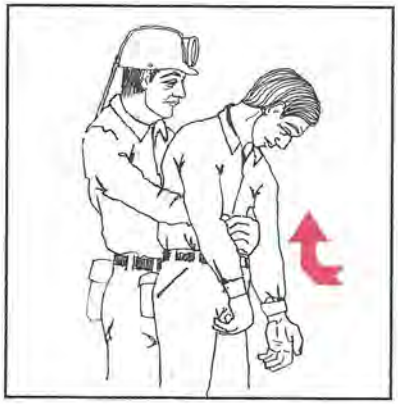

Figure 5 - Abdominal Thrust with Victim Standing (Heimlich Maneuver)

Foreign Objects in the Throat (Unconscious Patient)

First Aid Treatment

- Position patient on back.
- Straddle the patient's hips.
- Place the heel of one hand against the middle of the patient's abdomen between the lower tip (xiphoid process) of the sternum and navel with fingers pointing toward the patient's chest.
- Place your other hand on top of the first.
- Press into the patient's abdominal area with a quick upward thrust.
- Open patient's mouth and grasp dislodged foreign object with fingers to remove obstruction.
- Repeat procedures if necessary ensuring that each new thrust is a separate and distinct movement.
- Repeat thrusts until the foreign body is expelled.

CARDIOPULMONARY RESUSCITATION

Cardiopulmonary Resuscitation (CPR) must be learned through training and supervised practice. Courses are available through the American Heart Association.

CONTROL OF BLEEDING

Hemorrhaging or bleeding is a flow of blood from an artery, vein, or capillary. The best all around method of controlling bleeding is applying pressure directly to the wound.

Signs/Symptoms

- Artery – spurting blood, bright red in color
- Vein – continuous flow of blood, dark red in color
- Capillary – blood oozing from a wound

First Aid Treatment

Direct Pressure – Cover wound with a clean cloth or your gloved hand and apply direct pressure on the wound. Most bleeding can be stopped with direct pressure (Figure 6).

Elevation – If the wound is on an arm or leg and there is no fracture, elevate extremity above heart level as you apply pressure.

Digital Pressure – Use digital pressure at a pressure point, when necessary, to control arterial bleeding from a wound (bright red spurting blood). Place your fingers on the appropriate pressure point between the heart and the wound. Hold pressure point tightly until bleeding is controlled. Since digital pressure shuts off the supply of oxygenated blood to the brain, use the pressure points in the head and neck for only brief periods.

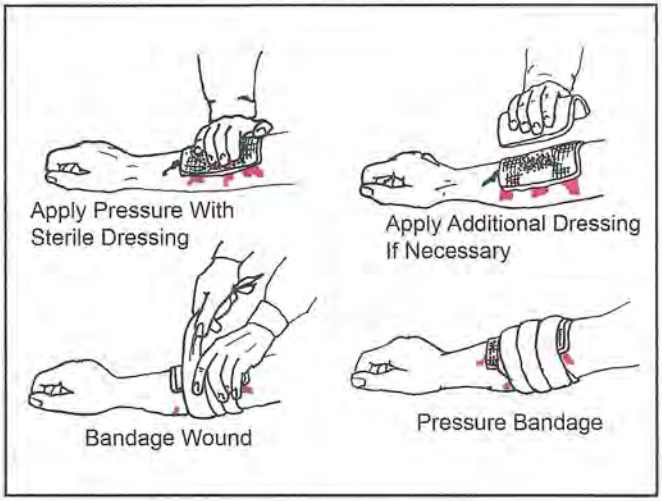

Figure 6 – Direct Pressure

Tourniquets

A tourniquet is a device that restricts all blood flow to and from an extremity. It is to be used **ONLY AS A LAST RESORT**, when all other methods fail, since the use of the tourniquet often results in the loss of the limb. Apply a tourniquet between the wound and the heart as close to the wound as possible, but never over a joint. Tighten the tourniquet to the point where bleeding is controlled.

For an improvised tourniquet, wrap the material around the extremity and tie it in a half knot. Place a stick or similar object on the half knot and tie a full knot. Twist the stick to tighten the tourniquet only until the bleeding is controlled. Secure the stick in place with the loose ends of the tourniquet, another strip of cloth, or other improvised material (Figure 7).

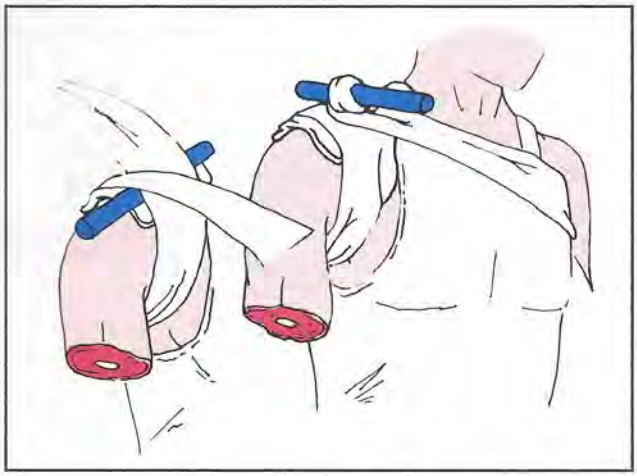

Figure 7 - Improvised Tourniquet

Once the tourniquet is in place, **DO NOT LOOSEN**. Make note of time applied, mark a "T" or "TK" on the patient's forehead, and get him/her to a medical facility as soon as possible.

NOTE: Improvise a tourniquet from a strap, belt, handkerchief, necktie, cravat bandage, etc. (Never use wire, cord or anything that will cut into the flesh.)

Internal Bleeding

Internal bleeding occurs within the body and cannot be seen. It can be minor or life threatening.

Signs/Symptoms

- Pale, cool and clammy skin
- Profuse sweating
- Rapid shallow breathing

- Weak and rapid pulse
- Dull eyes and enlarged pupils
- Possible thirst
- Nausea and vomiting
- Pain in affected area

First Aid Treatment

- Treat patient for shock.
- Anticipate that patient may vomit; give nothing by mouth.
- Get the patient to professional medical help as quickly as possible.

TREATMENT FOR SHOCK

Shock may accompany any serious injury: Blood loss, breathing impairment, heart failure, burns, etc.

Shock can kill; therefore, treat as soon as possible and continue until medical aid is available.

Signs/Symptoms

- Shallow breathing
- Rapid and weak pulse
- Nausea, collapse, vomiting
- Shivering
- Pale, moist skin
- Mental confusion
- Drooping eyelids, dilated pupils

First Aid Treatment

- Establish and maintain an open airway.
- Control bleeding.
- Keep patient lying down.
- Elevate foot of stretcher unless an injury will be aggravated by this position such as head and chest injuries, heart attack, stroke, and sun stroke. If there is no spinal injury, patient may be more comfortable and breathe better in a semireclining position. If in doubt, keep the patient lying flat.
- Place blankets under and over patient.
- Do not give anything by mouth.

BANDAGES AND DRESSINGS

Never tie a tight bandage around the neck as it may cause strangulation.

A bandage should be tight enough to prevent slipping, but not so tight as to cut off circulation.

Leave uninjured fingers and toes exposed and watch for swelling or changes of color and coldness which signal poor circulation.

Loosen bandages immediately if patient complains of numbness or a tingling sensation.

Once a dressing is in place do not remove it. If blood saturates the dressing, put another on top of it.

WOUNDS

An open wound is any break in the skin (Figure 8). A first aider caring for an open wound must stop or control the bleeding and prevent germs from entering the wound.

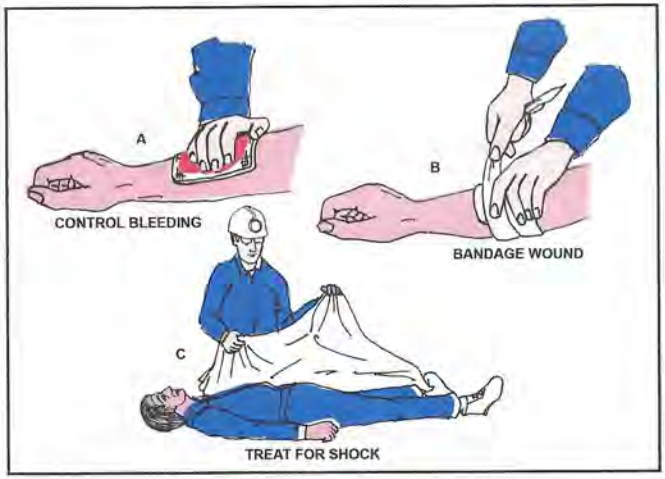

Figure 8 - First Aid for Open Wounds

First Aid Treatment

- Expose the wound. Carefully cut or tear the clothing so the injury may be seen.
- Wipe loose foreign particles away from wound.
- Control bleeding.
- Tie bandage compress or gauze over wound.
- Embedded objects:
  - ➔ Do not remove embedded objects.
  - ➔ Cut clothing away from injury site.
  - ➔ Stabilize objects with bulky dressing.
  - ➔ If large object, cut off only enough to allow for transportation of patient.
- Cover all compresses or gauze dressings with outer bandage, except dressings for wounds of the eyes, nose, chin, one finger, and one toe, or

compound fractures of the hand and foot when splinted. When eyes have been burned by chemicals, wash the eyes freely with clean water, cover both eyes with moistened sterile gauze pads and secure in place.

Sucking Chest Wounds

First Aid Treatment

If air is being sucked into the lungs through a wound in the chest:

- Cover wound with airtight material (plastic wrap or waxed paper) after the patient has exhaled. If no airtight material is available, use your gloved hand.
- Place the patient on the injured side to allow expansion room for the uninjured lung if there is no spinal injury.
- Get the patient to the hospital as soon as possible.

Protruding Intestines

First Aid Treatment

- Treat for shock and ensure an open airway.
- Do not try to re-place intestines.
- Flex uninjured legs at hips and knees to reduce tension of abdominal muscles.
- Apply sterile dressing that has been soaked in saline solution.
- Seal the edges of the dressing to prevent the loss of moisture from the internal organs.
- Cover with a thick dressing to help prevent heat loss. Hold dressings in place with cravats.

Foreign Particles in the Eyes

Foreign particles frequently enter the eye and lodge there. If not removed, they can cause discomfort, inflammation and possibly infection.

First Aid Treatment

- Never rub eyes.
- Try to flush out with clean water.
- If particle is on upper lid, lift eyelid and remove particle with sterile gauze (Figure 9).
- If foreign particle is on the eye and cannot be washed out, cover eye and take patient to a doctor.

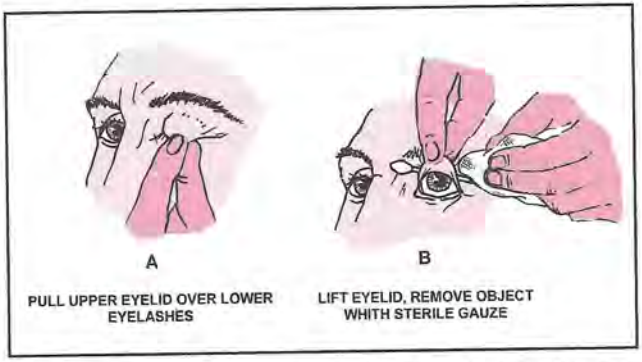

Figure 9 - Removing Foreign Particle From Inside of Eyelid

Embedded Objects in the Eyes

First Aid Treatment

- Leave object in eye; only a physician should remove it.
- Place sterile gauze around eye; apply no pressure.

- Cover with paper cup or cardboard cone to prevent object from being further driven into eye.
- Cover both eyes and explain to patient why both eyes are covered—one eye cannot move without the other eye moving.
- Reassure the patient. He/she may panic with both eyes covered.

BURNS

A burn is an injury that results from contact with heat, chemicals, electricity, and radiation. Burns vary in depth, size, and degree of severity (Figure 10).

Problems, in addition to skin injuries, associated with burns are:

- Airway or respiratory difficulties
- Injuries that involve structures below the skin including muscles, bones, nerves, and blood vessels
- Loss of body fluids contributing to shock
- Pain contributing to shock
- Anxiety contributing to shock
- Swelling
- Infection due to destruction of skin tissue

Burns that involve the skin are classified as:

- First Degree (minor) - The outer layer of skin (epidermis) is reddened and painful, and slight swelling is present. This type of burn will heal of its own accord.
- Second Degree (moderate) - The epidermis and the dermis (the second layer of skin) are damaged. The burned area is painful. Blisters may form. The area may have a wet, shiny appearance because of exposed tissue.
- Third Degree (critical) - All the layers of the skin are damaged and are charred black or brown or are dry and white. Muscle, tissue, and bone may be damaged. Pain may or may not be severe due to nerves being destroyed.

Thermal Burns

Thermal burns are caused by scalding liquids, steam, contact with hot objects, flames, flaming liquids and gases, and the sun.

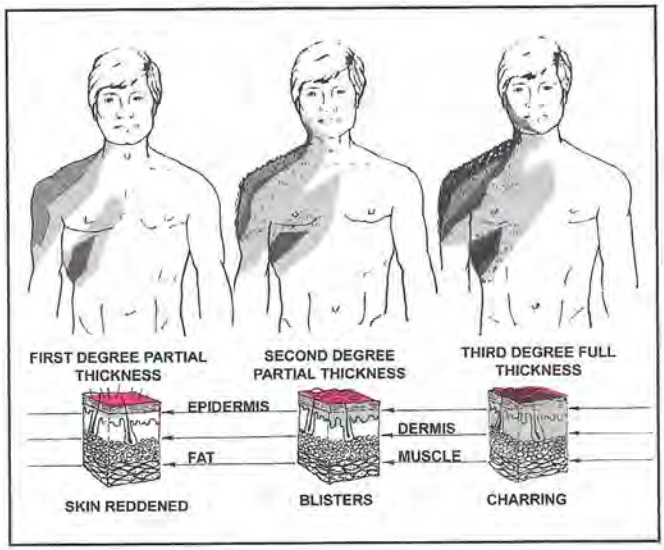

Figure 10 - Burns

Chemical Burns

Chemical burns require immediate care. After ensuring the scene is safe, remove all clothing containing the chemical. Irrigate the burns with water for at least 20 minutes. Avoid harsh sprays that may further damage burned tissues. If the chemical is dry, brush away as much of the chemical as possible and then flush the skin with water. Protect yourself during the washing process. Wear vinyl or latex gloves and protective eyewear and avoid splashing the chemical.

Frequently, chemical substances, especially lime, cement, caustic soda, or acids or alkalis from storage batteries, get into the eyes. The treatment is to immediately flood the eyes with water. Avoid washing chemicals back into the eye or into an unaffected eye. Continue to wash the eyes for at least 20 minutes. After washing the eyes, cover both eyes with moistened pads. If burning continues, repeat washing the affected eye or eyes.

Electrical Burns

Electrical current and lightning can cause severe damage to the body. Even though the patient of an electrical accident may have burns where the energy entered and exited the body, the major problem caused by electrical shock is respiratory and cardiac arrest.

Ensure that the power is off before rescue attempts are made.

Radiation Burns

Radiation presents a hazard to the rescuer as well as the patient. A rescuer who must enter a radioactive area should stay for as short a time as possible. Radiation is undetectable by the human senses, and the rescuer, while attempting to aid the patient, may receive a fatal dose of radiation without realizing it. Notify experts immediately of possible radioactive materials contamination.

General Care for All Burns

- Maintain an open airway.
- Keep the burn site clean and keep the patient warm.
- Separate any burned areas that might come in contact with each other when bandaging (fingers, toes, ear and head, arm and side of body, armpit, crotch, etc.).
- Apply moist dressings to first and second degree burns and dry dressings to third degree burns.
- Do not use ointments, sprays, or butter on burned areas. This causes the heat to be trapped against the burn site, causing more pain.
- Do not apply ice to any burn because it can cause tissue damage.
- Do not break blisters.
- Get medical attention as soon as possible.

MUSCULOSKELETAL INJURIES

The musculoskeletal system is composed of all the bones, joints, muscles, tendons, ligaments, and cartilages in the body. The musculoskeletal system is subject to injury from sprains, strains, fractures, and dislocations. Since these injuries present basically

the same signs and symptoms, treat all injuries to the bones and joints as fractures.

The usual sign of a strain, sprain, fracture or dislocation will be pain; therefore, you should keep the patient at rest, not moving any part of the body. Even though a strain, sprain and dislocation may appear obvious, you cannot rule out a fracture.

Musculoskeletal injuries (Figure 11) are classifed as either closed, painful, swollen, deformed extremities (skin is not broken) or open, painful, swollen, deformed extremities (skin is broken).

Signs/Symptoms

- Pain
- Swelling
- Deformity

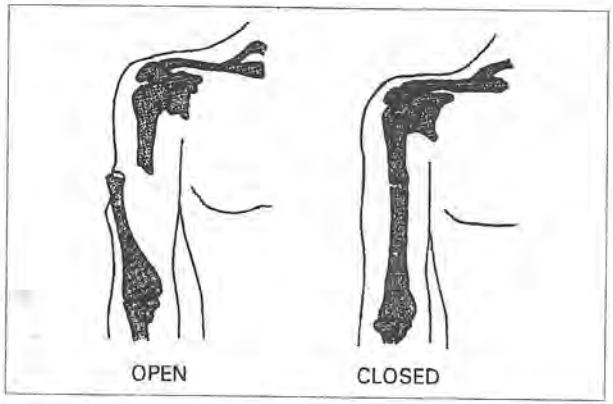

Figure 11 - Open, painful, swollen, deformed extremity and closed, painful, swollen, deformed extremity

First Aid Treatment

- Immobilize suspected fracture.
- Handle as gently as possible—one person to immobilize the limb and one to apply the splint.
- Do not attempt to straighten any painful, swollen, deformed extremity. Splint in the position found. Move injured extremities as little as possible to avoid damage to exposed nerves, blood vessels, and surrounding tissue.
- Splints:
  - ➔ Splints should be long enough to support joints above and below suspected fracture.
  - ➔ Splints should be rigid enough to support the suspected fracture.
  - ➔ Pad improvised splints to ensure even contact and pressure between the limb and the splint, and to protect all bony prominences.
  - ➔ Types of splints: Air splint, padded boards, rolled blanket, tools, newspapers, magazines.
- Applying improvised splints:
  - ➔ Handle the affected limb as gently as possible.
  - ➔ Place the padded splint under, above, or alongside the limb.
  - ➔ Tie the limb and splint together with bandaging materials so the two are held firmly together. Make sure the bandaging material is not so tight that it impairs circulation. Leave uninjured fingers and toes exposed, so the circulation can be checked constantly.

- Applying inflatable splints:
  - → Use inflatable splints to immobilize fractures of the lower leg or forearm.
  - → To apply an air splint, gather splint on your own arm so the bottom edge is above your wrist.
  - → Help support the patient's limb–or have someone else hold it.
  - → Hold injured limb and slide the splint from your forearm over the patient's injured limb.
  - → Inflate by mouth only to the desired pressure. Inflate it to the point where your thumb makes a slight indentation.
  - → If it is a zipper type air splint, lay the patient's limb in the unzipped splint, zip it and inflate. Traction cannot be maintained when applying this type of splint.
  - → Change in temperature can affect this type of splint–going from cold to warm and warm to cold areas can cause the splint to expand or deflate. It may be necessary to check the splint for proper pressure.
  - → Transport only after all fractures are immobilized unless the patient and first aider are in immediate danger at the accident site.

Skull Fracture

Consider a skull fracture serious because of possible injury to the brain. Injuries to the back of the head are particularly dangerous because the skull may be fractured without a visible wound on the scalp. Consider all serious injuries to the head as possible fractures of the skull. A person with a skull fracture may also have an injury to the neck and spine.

Signs/Symptoms for Skull Fractures

- Unconsciousness
- Deformity of the skull
- Open wound
- Blood or clear water-like fluid coming from ears and/or nose
- Pupils may be unequal in size; impaired vision
- Partial or complete paralysis

Spinal Fracture

A spinal fracture is difficult to detect when a patient is unconscious. Treat all injuries to the spinal column, even without signs of paralysis, as a fracture of the spinal column.

Signs/Symptoms for Spinal Fractures (Conscious Patient - Figure 12)

- Ask if patient can feel your touch to his/her feet.
- Ask if patient can wiggle toes.
- Ask if patient can press against your hand with feet.

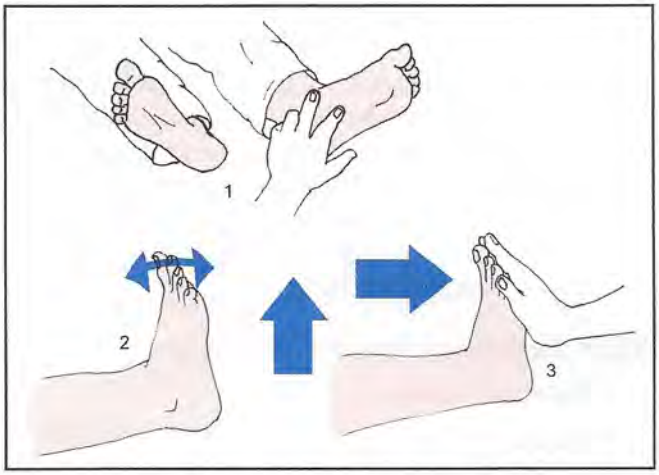

Figure 12 - Survey for Conscious Patient

Signs and Symptoms for Spinal Fracture (Unconscious Patient - Figure 13)

- Stroke the soles of the feet with a pointed object; if the spinal cord is undamaged, the feet will react.
- Stroke the palms of the hands with a pointed object; if the spinal cord is undamaged, the hands will react.

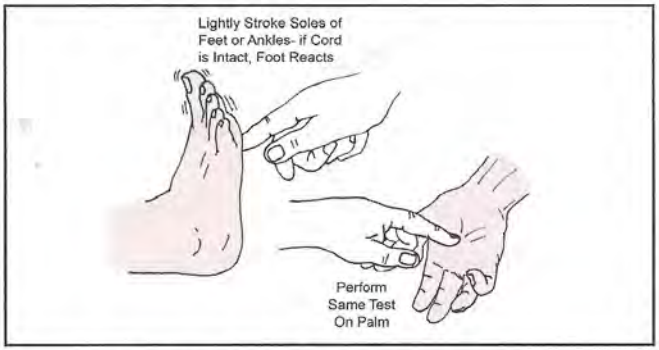

Figure 13 - Survey for Unconscious Patient

First Aid Treatment for Skull and/or Spinal Fractures

- Stabilize the head (Figure 14) until the patient is secured to a splint, stretcher, or other hard, flat surface.
- Use the modified jaw-thrust to maintain an open airway.
- Use a blanket, padding, rolled up coats, or other material around the head and neck to prevent movement.
- Control serious bleeding.
- Use enough people to lift the patient safely in unison.
- Lift patient only high enough to slide the splint or stretcher underneath.
- Place the patient on his/her back on the splint or stretcher.
- Secure the patient to the splint or stretcher to immobilize the entire body.
- Cover with a blanket and treat for shock.
- Transport to a medical facility.

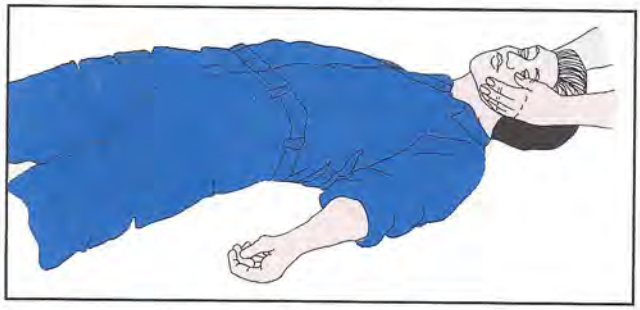

Figure 14 - Stabilize the Head

Rib Fracture

Signs/Symptoms

- Severe pain with each breath
- Tenderness over the fracture
- Deformity at site of fracture
- Inability to take a deep breath

First Aid Treatment

- Apply thick padding over injured ribs.
- Apply two medium cravat bandages around the chest firmly enough to afford support, centering the cravats on either side of the injury.
- Tie the knots over a pad on the opposite side of the body (Figure 15).
- Support the arm on the injured side in a sling.
- Treat for shock.
- Secure medical treatment.

NOTE: Ensure that the binding is not too tight, as a fractured rib can puncture a lung. If a lung is punctured, frothy blood may come from the patient's mouth.

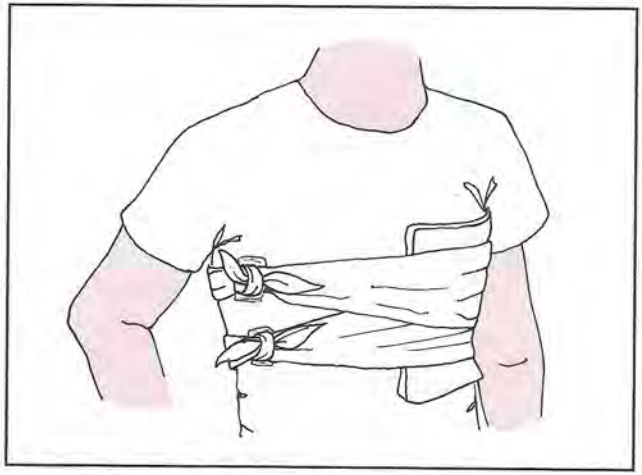

Figure 15 - Bandage for Fractured Rib

TRANSPORTATION

After receiving first aid, an injured person often requires transportation to a medical facility. Under special circumstances like those in mining accidents, the patient must be transported to a place accessible to ambulance personnel. It is the responsibility of the first aider to see that the patient is transported in such a manner as to prevent further injury, pain, or discomfort. Improper handling and careless transportation often add to the original injuries, increase shock, and endanger life.

Under normal circumstances, do not move an injured person until a thorough examination has been made and first aid has been given. Move a seriously injured person in a position that is least likely to aggravate injuries. Various methods for carrying a patient can be used in emergencies, but the stretcher is the preferred method of transportation. When a

stretcher is not available or impractical, employ other means of transportation.

When the life of a person is in danger and the person must be pulled or dragged to safety, pull the body by the shoulders, not sideways. Avoid bending or twisting the neck or trunk. Carry in the arms, over the back, or use the two-person carry when you know that no injury will be aggravated by such handling of the patient.

Two-Person Seat Carry

The two-person seat carry (Figure 16) is a technique for transporting the patient in a seat fashioned from the rescuers' arms. Use this carry when moving the patient through narrow passageways. Do not use this carry when injury to the spinal column is suspected.

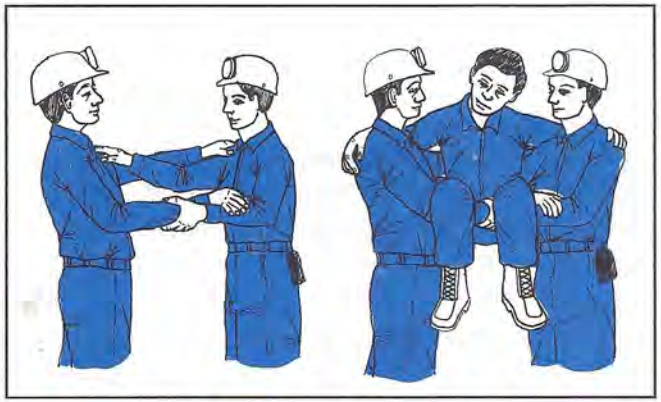

Figure 16 - Two-Person Seat Carry

Three-Person Lift and Carry

Use the three-person lift and carry (Figure 17) to move an injured person a short distance, through a narrow passageway, or when a stretcher is not available. Also use this carry when an injured person is placed on or removed from a stretcher.

Three persons are required for this lift and a fourth is desirable. (A fourth person to hold the head is necessary if a spinal injury is suspected.) Proper lifting must be done by commands of a leader, usually the bearer at the patient's head.

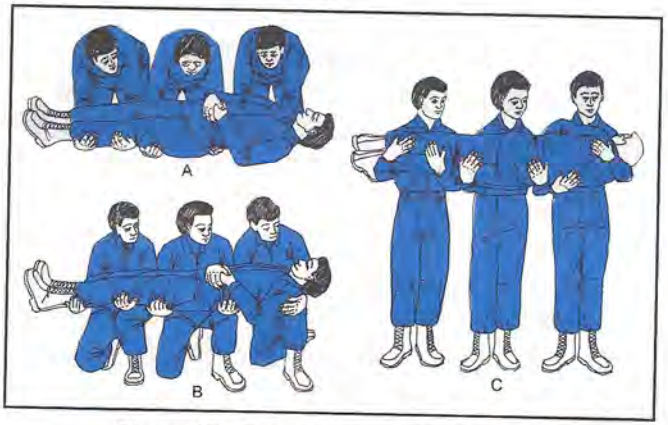

Figure 17 - Three-Person Lift and Carry

- Each of the three bearers kneel on the knee nearest the patient's feet and on the least injured side, if possible.
- One bearer, opposite the patient's shoulders, supports the patient's neck and shoulders.
- Another bearer, opposite the patient's hips, supports patient's thighs and small of back.

- The third bearer, opposite the patient's knees, supports the patient's knees and ankles.
- On command, the bearers slowly lift the patient to rest on their knees.
- On command, the bearers slowly turn the patient on his/her side so the patient rests in the bend of their elbows close to their chests.
- On command, all bearers rise in unison.
- The bearers can then, when commanded, move the patient.

Four-Person Log Roll

This technique for moving a patient with spinal injuries requires four persons, one who acts as captain. To perform the four-person log roll, proceed as follows:

- One rescuer (who acts as captain) stabilizes the neck and head as he/she opens the airway by using the modified jaw-thrust maneuver. One rescuer places spine board parallel to the patient.
- Three rescuers (one rescuer at shoulder, one at waist, one at knee) kneel at the patient's side opposite spine board, leaving room to roll patient toward them while the captain keeps the neck and head stabilized.
- The captain commands the shoulder level rescuer to extend patient's arm over the head on the side on which the patient will be rolled.
- The rescuer at the shoulder places one hand under patient's shoulder and the other hand under patient's upper arm.

- The rescuer at the waist places one hand on the patient's waist and the other hand under patient's buttocks.
- The rescuer at the knees places one hand under the patient's knees and the other hand under the mid-calf.
- On command, roll patient in unison on side toward the rescuers.
- On command, waist level rescuer or bystander pulls spine board into position against patient.
- Roll patient as a unit onto board, on command.
- Place rolled blankets beside head and neck for additional protection and secure head to board with cravat bandages.
- Secure patient to the splint or stretcher so the entire body is immobilized (Figure 18).

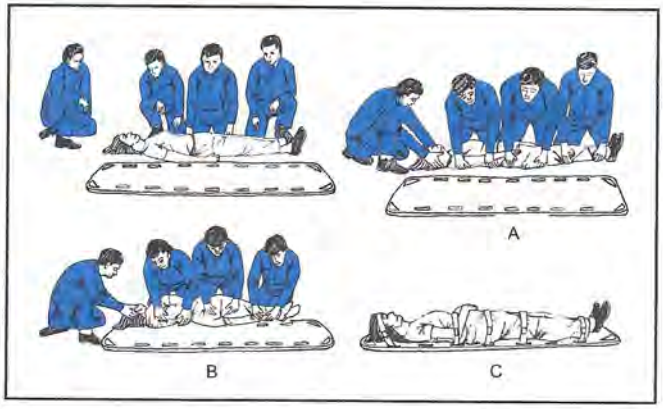

Figure 18 - Four-Person Log Roll

Straddle Slide

Another technique for moving a patient with a spinal injury onto a long board is the straddle slide. Three persons handle the patient and the fourth person slides the board into place. To perform the straddle slide, proceed as follows:

- One rescuer maintains an open airway with the modified jaw-thrust and applies traction.
- The second rescuer faces and straddles the patient. Bending at the waist, the rescuer grips the patient's arms, just below the shoulders.
- A third rescuer also faces and straddles the patient. Bending at the waist, the rescuer places his/her hands on the sides of the patient's waist. (The long board must pass between the legs of the three rescuers).
- The fourth rescuer positions the board at the patient's head in line with the patient's body.
- On signal from the commanding rescuer, the rescuers lift the patient just high enough to allow the fourth rescuer to slide the board under the patient.
- On command, the rescuers gently lower the patient onto the board. Support is maintained until patient is secured (Figure 19).

Figure 19 - Straddle Slide

Stretcher

Test the stretcher before placing the patient on it. Use a person of about equal weight as the patient. That person should be face down on the stretcher so, if the stretcher breaks or tears when it is picked up, the person can catch himself/herself.

ENVIRONMENTAL EMERGENCIES

Exposure to cold and hot temperatures can cause life-threatening problems. Understanding how the body regulates its own temperature can help you give effective first aid when a person is simply too hot or too cold.

Cold Emergencies

When the environment is too cold, body heat is lost faster than it can be generated. This may result in damage to exposed tissue and body functions may be greatly reduced or stopped.

Generalized Hypothermia

Hypothermia is a general cooling of the entire body, even in temperatures well above freezing. When the inner core of the body is chilled, the body cannot generate enough heat to stay warm. The injured or ill patient and the young or old are most susceptible to hypothermia. With time, the body is unable to maintain its proper internal temperature and can lead to death.

Signs/Symptoms

- Shivering
- Numbness
- Drowsiness and/or muscular weakness
- Rapid breathing and rapid pulse
- Decreased level of consciousness
- Reddened skin in early stages. In prolonged cases, skin is pale to bluish and some body parts are stiff and hard (frozen).

First Aid Treatment

- Get patient into a warm area.
- Remove all wet clothing.
- Wrap the patient in blankets. Maintain patient's body heat by placing blankets under as well as over the patient or place another rescuer in the blankets with the patient. (Do not warm too quickly.)
- Warm trunk of body first.
- Handle the patient gently and get him/her to a medical facility as soon as possible.

Localized Hypothermia

Cold-related emergencies are those affecting particular parts of the body being exposed to intensely cold air or liquid. Most commonly affected are the nose, cheeks, ears, toes, and fingers. Localized cold injuries are classified as early or superficial, and late or deep.

Signs/Symptoms - Early or Superficial Cold Injury

- In early or superficial cold injury, light skin first reddens; dark skin lightens. Both then blanch (whiten).
- Superficial cold injury feels numb to the patient.

Signs/Symptoms - Late or Deep Cold Injury

- In late or deep cold injury, the skin appears white and waxy and later turns from mottled or blotchy to grayish yellow and finally grayish blue.
- Deep cold injury feels frozen on the surface.

First Aid Treatment - Early or Superficial Cold Injury

- Get patient out of the cold environment.
- Warm the affected area.
- Splint affected extremity. Do not rub or massage and do not re-expose to the cold.

First Aid Treatment - Late or Deep Cold Injury

- Get patient out of the cold environment.

- Handle frostbite or frozen area by using a covering such as loose, soft, sterile dressing, and handling it as gently as possible.
- Do not re-expose patient to the cold.
- Transport to a medical facility as soon as possible.
- In cases of extreme hypothermia, assess the carotid pulse for 30-45 seconds. If there is no pulse, start CPR immediately, if you have been trained. Transport immediately.

Heat Emergencies

Exposure to excessive heat can create heat that is not needed for temperature mainenance.

Generalized Hyperthermia

Hyperthermia is an abnormally high body temperature caused by the body not being able to rid itself of excessive heat. Exposure to excessive heat and high humidity are often associated with hyperthermia.

Signs/Symptoms - Moist, Pale, Normal-to-Cool Skin

- Muscular cramps - usually in the legs and abdomen
- Weakness or exhaustion, dizziness or faintness
- Rapid, shallow breathing
- Weak pulse
- Moist pale skin which may feel normal to cool
- Heavy sweating
- Possible loss of consciousness

First Aid Treatment - Moist, Pale, Normal-to-Cool Skin

- Remove patient from the hot environment and place in a cool environment.
- Loosen or remove clothing and cool patient by fanning. Watch for shivering; do not chill.
- Keep patient lying down with foot-end of stretcher elevated.
- If the patient is responsive and not nauseated, give water to drink; otherwise, give nothing by mouth.
- Apply moist applications over cramping muscles.

Signs/Symptoms - Hot, Dry, or Moist Skin

- Rapid, shallow breathing
- Full and rapid pulse
- Weak
- Hot, dry or possibly moist skin
- Little or no perspiration
- Loss of consciousness or altered mental state
- Dilated pupils
- Patient may experience seizures, but no muscle cramps

First Aid Treatment - Hot, Dry, or Moist Skin

- Remove patient from the hot environment and place in a cool environment.
- Loosen or remove clothing and apply cool packs to neck, goin, and armpits. Keep skin wet by applying water by sponge or wet towels. Fan patient.

- If immediate transport is delayed, immerse patient up to the neck in a tub of cool water.

MEDICAL EMERGENCIES

Hyperventilation

Hyperventilation is a temporary condition of rapid and deep breathing which reduces the carbon dioxide level in the blood.

Signs/Symptoms

- Chest pains
- Tingling sensation in the upper extremities
- Cramping in the fingers

First Aid Treatment

- Have patient breathe into a paper (not plastic) bag.
- If this does not control hyperventilation, transport patient to a medical facility.

Diabetic Emergencies

Diabetic Coma

Signs/Symptoms

- Warm and dry skin
- Extreme thirst
- Rapid and weak pulse
- Rapid and labored breathing
- Sickly sweet odor of acetone on breath
- Confused

First Aid Treatment

- Maintain an open airway.
- In case of vomiting, turn the head to one side.
- Treat patient for shock.
- Transport patient to a medical facility as quickly as possible.

Insulin Shock

Signs/Symptoms

- Cold clammy skin
- Profuse perspiration
- Rapid, weak pulse
- Respiration normal or shallow
- Dizziness
- Convulsions or total unconsciousness

First Aid Treatment

- Give sugar (sugar, candy, or orange juice) to conscious patient.
- If unconscious, put a "sprinkle" of granulated sugar under the tongue.
- Transport patient to a medical facility as soon as possible.

If you cannot distinguish between a patient of insulin shock and a patient progressing into diabetic coma, give sugar to the patient. Giving sugar to a patient with too much blood sugar doesn't make any significant difference to patient outcome, but giving sugar to a patient in insulin shock can save a life.

Seizure Disorders

A seizure is not a disease, but rather a sign of an underlying defect, injury, or disease. Epilepsy is probably the best known condition that results in seizures. As a first aider, you should not try to diagnose the cause of a seizure, but rather treat the person during and after the seizure.

Signs/Symptoms

- Possible loss of consciousness
- Convulsions
- Severe spasms of the jaw muscles (may bite tongue)
- Vomiting
- Pale face before the seizure and bluish during seizure
- Loud and labored breathing with a peculiar hissing sound
- Seizure usually lasts only a few minutes, but it may be followed by another.

First Aid Treatment

- Keep patient calm.
- Do not restrain the patient.
- Protect the patient from injury but do not try to hold him/her.
- Do not place anything in the patient's mouth during the seizure.
- Ensure an open airway after convulsions have ended and provide artificial ventilation if needed.

- Position patient on side if there is no possibility of spinal injuries.
- Protect patient from stress or embarrassment.
- Transport to a medical facility.

Stroke

A stroke occurs when an artery in the brain becomes blocked or ruptures. This prevents oxygenated blood from reaching the areas supplied by the artery.

Signs/Symptoms

- Confused or unconscious
- Dizziness
- Impaired speech
- Numbness or paralysis (usually on one side of the body with sagging muscles or loss of expression in the face)
- Unequal pupils
- Impaired vision
- Rapid full pulse
- Difficult respirations
- Nausea or vomiting
- Seizures
- Loss of bowel or bladder control

First Aid Treatment

- Conscious patient - Ensure an open airway. Try to reassure and keep patient calm. Transport in a semireclining position.

- Unconscious patient - Maintain an open airway. Transport lying on side.

Drug Abuse

Drug abuse or drug overdose signs and symptoms can vary from one patient to another, even for the same drug. When questioning the patient and bystanders, ask if the patient has been taking any medication rather than using the word "drugs."

First Aid Treatment

- Call for help. Ask bystanders to call for an ambulance and/or a physician.
- Monitor breathing and be alert for respiratory arrest.
- Talk to the patient to gain his/her confidence and to maintain consciousness.
- Protect the patient from further harm.
- Treat for shock.
- Reassure the patient throughout all phases of care.

Always be alert and ready to protect yourself. Some drug abusers appear calm at first and become violent as time passes.

Poisons

Poisons are substances which have harmful effects on the normal body processes. They enter the body through ingestion (eating or drinking), inhalation (breathing), injection (body tissues or blood stream), and/or absorption (through the skin).

First Aid Treatment

- Try to determine the poison involved and when it occurred.
- Call the poison control center or a physician, immediately.

Animal Bites

Any warm-blooded animal may suffer from rabies. If a person is bitten by an animal, always suspect the animal to be rabid.

First Aid Treatment

- Control bleeding.
- Wash the wound with soap and water and rinse with alcohol.
- Dress and bandage the wound.
- Splint if bite is on an extremity.
- Get patient to a medical facility as soon as possible.

Snakebites

Coral snakes, copperheads, rattlesnakes, and water moccasins are the four types of poisonous snakes in the United States. Persons who frequent regions infested with poisonous snakes should carry a snakebite kit.

Signs/Symptoms

- Bite marks with sharp, stinging pain
- Severe burning, pain and swelling in bitten area
- Nausea and vomiting

- Rapid pulse and labored breathing
- Progressive general weakness
- Shock
- Vision problems
- Seizures
- Drowsiness or unconsiousness

First Aid Treatment

- Treat for shock and conserve body heat.
- Locate mark of fang(s) and clean site with soap and water.
- In case of swelling, remove jewelry from extremity.
- Immobilize bitten extremity and keep at the level of the heart or below the level of the heart.
- If a physician can be contacted, it may be ordered to apply a tight constricting band above and below the bitten area. The band should be tight, but not tight enough to stop arterial circulation.
- Transport to a medical facility, carefully monitoring breathing.

Insect Bites and Stings

Many insects bite or sting, but few can cause serious symptoms unless the person is allergic to them. Occasionally, insects have been feeding on or have been in contact with a poisonous substance transmitted at the time of the sting or bite.

Signs/Symptoms

- Altered state of awareness
- Local irritation, burning, pain, or itching and possibly noticeable stings, bites, or puncture marks
- Blotchy skin
- Redness, swelling or blistering
- Headache and dizziness/weakness or collapse
- Difficult breathing and abnormal pulse rate
- Chills and fever, excessive saliva formation, profuse sweating
- Nausea and vomiting
- Muscle cramps, chest tightening, joint pains

First Aid Treatment

- Treat for shock.
- If stinger remains, remove stinger by carefully scraping the site using a blade or a card. Do not use tweezers or forceps.
- Remove jewelry in case the limb swells.
- Keep the limb immobilized and the patient quiet.
- Look for medical identification device to determine if patient is allergic.
- Get patient to a medical facility as soon as possible.

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