



THE NEW MEXICO BUREAU OF MINE SAFETY



About the Bureau of Mine Safety

The Bureau of Mine Safety (BMS) exists to actively promote the safety of miners of New Mexico. BMS will train over 2500 miners during 2011. This includes over 250 miners trained in Spanish language classes. BMS training and initiatives have contributed to a superb safety record in New Mexico.

Directed by the State Mine Inspector, the department is a state and federally funded organization providing services to New Mexico and its miners.



New Mexico Tech

NEW MEXICO BUREAU OF MINE SAFETY

First Aid



Pamphlet

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3. Tie the knots over a pad on the opposite side of the body
4. Support the arm on the injured side in a sling
5. Treat for shock
6. Secure medical treatment



New Mexico Tech

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Consider the possibility of facial injuries when you find the following in your assessment:

- Blood in the airway [nose or mouth]
- Facial deformities
- Swelling and discoloration of the eyelids or discoloration of the tissues below the eyes
- Swelling or discoloration of any part of the face
- Swollen lower jaw, poor function of or inability to close jaw
- Deformity or depression of any part of the face
- Teeth that are loose or have been knocked out, broken dentures
- Any mechanism of injury that indicates a blow to the face.

RIB FRACTURES

Signs and symptoms for rib fractures:

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

First aid treatment for rib fractures:

1. Apply thick padding over injured ribs
2. Apply two medium cravat bandages around the chest firmly enough to afford support centering the cravats on either side of the injury

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BUREAU OF MINE SAFETY



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FIRST AID ANATOMY OF THE HUMAN BODY

To understand first aid procedures and to give effective first aid, it is a must to know something about the anatomy structure and functions of the human body. The body consists of solids bones and tissues and fluids; blood and the various glands, organs and membranes.

The principal regions of the body are the head, neck, chest, abdomen, and the upper and lower extremities. Refer to the upper extremity from one shoulder to the elbow as the upper arm or simply the arm, and the portion from the elbow to the wrist as the forearm; the portion of the lower extremity from the hip to the knee as the thigh and the portion from the knee to the ankle as the leg.

The skeleton is the framework of the human body. It consists of bones of varying sizes and shapes, which together have several important functions:

1. Give shape and form to the body
2. Protect the vital organs
3. Support and carry the soft, internal parts of the body
4. Provide joints for movement with the help of attached muscles and ligaments

There are three major divisions of the skeleton:

1. The head
2. The trunk or main part of the body
3. Upper and lower extremities or limbs

- Loss of consciousness, unresponsiveness, or altered mental states
- Confusion or personality changes
- Unequal or unresponsive pupils
- Paralysis or loss of function, usually to one side of the body and opposite side of the head injury
- Loss of sensation, which may be to one side of the body
- Bilateral weakness or numbness
- Paralysis of facial muscles which may interfere with speech and airway
- Disturbed or impaired vision, hearing, and or sense of balance
- Nausea and or vomiting
- Any changing patterns in respiration that include cycles of rapid, slow, shallow, and stopped breathing, and efforts to breathe with diaphragm but no other chest movement
- Seizures

Facial Injuries

Facial injuries can be very serious because of the potential for airway obstruction. Blood and other fluids, blood clots, bone, and teeth may cause partial or full airway obstruction. The force that caused injury to the face can also be transferred to the base, or floor, of the skull and cause an open head injury. If this has happened, you will see cerebrospinal fluid leaking from the ears and nose.

blood has no opening from which to drain. The blood builds up inside the skull, presses on the brain, and affects or impairs its function or ability to send messages to the body.

Signs and symptoms of head injury:

- Unresponsiveness or unconsciousness.
- Deep cuts or tears to the skin
- Exposed brain tissue
- Penetrating injuries such as impaled objects
- Swelling/goose eggs and discoloration to the skin
- Edges or fragments of bones seen or felt through the skin
- Deformity of the skull, such as depressed or sunken-in areas
- Swelling and discoloration behind the ears
- Swelling or discoloration of the eyelids or tissues under the eyes
- Unequal pupils or both pupils are dilated; one or both eyes appear sunken
- Bleeding from the ears or nose
- Clear or bloody fluid flowing from ears or nose. This fluid called cerebrospinal [ser-e-bro-spinal] fluid surrounds the brain and spinal cord and cannot flow from the ears or nose unless the skull has been fractured
- Weakness or numbness on one side of the body'

Signs and symptoms of brain injury:

- Headache [mild to severe] following the accident
- Any sign of head injury

The head is composed of 22 bones:

1. Eight closely united bones form the skull, a boney case which encloses and protects the brain
2. Fourteen other bones form the face.
3. The only movable joint in the head is the lower jaw

Fifty four bones compose the trunk; a muscular partition known as the diaphragm divides the trunk into two parts. The upper portion of the trunk is the chest, its cavity, and organs. The spinal column or back bone consists of 24 segments, composed of vertebrae. It is joined by strong ligaments and cartilage and forms a flexible column that encloses the spinal cord.

The chest is formed by 24 ribs, 12 on each side, which are attached in the back to the vertebrae. The seven upper pairs of ribs are attached to the breastbone in front by cartilage. The next 3 pairs of ribs are attached in front by a common cartilage to the seventh rib instead of the breastbone. The lower two pairs of ribs, known as the floating ribs, are not attached in front.

The lower part of the trunk is the abdomen, its cavity, and organs; the pelvis is a basin shaped boney structure at the lower portion of the trunk. The pelvis is below the movable vertebrae of the spinal column which it supports and above the lower limbs upon which it rests. Four bones compose the pelvis, the two

bones of the backbone and the wing shaped hip bones on either side. The pelvis forms the floor of the abdominal cavity and provides deep sockets in which the heads of the thigh bones fit.

The upper extremity consists of 32 bones; the collarbone is a long bone. The outer end is attached to the shoulder blade at the shoulder joint. The collarbone lies just in front of and above the first rib. The shoulder blade is a flat triangular bone lies at the upper and outer part of the back of the chest and forms part of the shoulder joint. The arm bone extends from the shoulder to the elbow. The two bones of the fore arm extend from the elbow to the wrist.

There are eight bones in the wrist and five bones in the palm of the hand. There are 14 finger bones, two in the thumb and three in each finger.

The lower extremity consists of 30 bones; the femur [thigh bone] the longest and strongest bone in the body, extends from the hip joint to the knee. The rounded upper end fits into the socket in the pelvis, and its lower end broadens out to help form part of the knee joint. You can feel this flat triangular bone in front of the knee joint. The two bones in the leg extend from the knee joint to the ankle. There are seven bones in the ankle and back part of the foot. The front part of the foot consists of five long bones and 14 toe bones.

Joints and ligaments; Two or more bones coming together form a joint. There are three types of joints. Imovable joints such as the skull, joints with limited motion, such as those of the ribs and lower spine, and

In an open head injury, you may be able to see or feel that the skull is cracked/fractured or depressed/deformed, that there is blood and clear or yellow watery fluid leaking from the ears or nose, and that the eyelids are swollen shut and beginning to discolor or bruise.

The fluids that protect the brain and are normally contained within the skull are leaking out into the tissues through the crack in the skull. The brain may also be injured in open head injuries. Broken bones or foreign objects forced through the skull can cut, tear, or bruise the brain. There may be no evident soft tissue damage in some cases of open head injury.

In a closed head injury, the skull is not damaged or cracked, but the brain can still be injured by the force of something striking the skull. Through the force does not crack the skull, it does cause the brain to bounce off the inside of the skull. The resulting injuries to the brain include concussions or contusions.

Concussion when a blow to the head does not cause an open head injury but does cause damage to the brain. The injury may be so minor it does not cause unconsciousness; or it may be mild, causing headache after brief loss of consciousness; or it may be severe, causing lengthy unconsciousness and abnormal vital signs. Sometimes short term memory is lost. Any signs and symptoms of concussions are an indication of brain injury.

Contusion/bruising when the force of a blow is great enough to rupture blood vessels on the surface or deep within the brain. In a closed head injury, the

8. Cover the victim with blankets and treat for shock
9. Get to a medical facility as soon as possible

** REMEMBER ALWAYS SECURE THE HEAD AREA WITH ANY POSSIBLE SKULL OR SPINAL INJURY*

INJURIES TO THE HEAD

Types of injuries to the head can be caused by a variety of mechanisms that result in pain, swelling, and deformity. In addition, the mechanism of injury may be forceful enough to cause a patient to be unresponsive. Because the skull surrounds or encases the brain, the force of the mechanism of injury can also be transmitted to the brain. Injury to the brain can affect the patient's ability to breathe. Because of this, airway management is always first consideration in the care of any patient who has a head injury. Keep the airway open. In addition to skull and brain injury, there can be cuts to the scalp and other soft tissues.

There are certain signs and symptoms that will help determine if a head injury is an open head injury or a closed head injury.

freely movable joints such as the knee, ankle, elbow, etc.

Freely movable joints are more frequently injured; cartilage covers the ends of bones forming a moveable joint. The bones are held in place by strong white bands called ligaments, extending from one bone to another and entirely around the joint. A smooth membrane that lines the end of the cartilage and the inside of the ligaments secretes a fluid that keeps the joints lubricated.

Muscles and tendons; flesh and muscle tissue which give the body its shape and contour cover the bones, the framework of the body; There are two types of muscles, voluntary muscles are consciously controlled, such as muscles of the arms and legs. Involuntary muscles are not consciously controlled, such as muscles of the heart and those that control digestion and breathing. Strong inelastic fibrous cords called tendons attach the muscles to the bones. The muscles cause the bones to move by flexing or extending.

Skin; the skin is an important organ of the body. It is the protective covering of the body and contains the sweat glands which help regulate body temperature. The skin has two layers; the epidermis the outer layer of skin and the dermis a layer of skin below the epidermis which contains blood vessels, sweat glands, and hair follicles. The layers of fat and soft tissue below the dermis are called subcutaneous. The loss of a large part of the skin will result in death unless it can be replaced. The protective functions of the skin are many. The skin is watertight. It keeps internal fluids in while keeping germs out.

A system of nerves in the skin carries information to the brain. These nerves send information about pain, external pressure, heat, and cold.

Skin provides information to the first aider about the victim's condition. For example, pale, sweaty skin may indicate shock.

PATIENT ASSESSMENT & VITAL SIGNS

If you the first aid person are called to the scene of an injury/illness at the operation. There are ways that you can determine what happened to the injured individual. First, you may be able to talk to the injured person. Second, there may have been other workers in the area when the injury took place that can tell you what happened. Third, you may need to look for signs and symptoms of the injured individual. And fourth, you may have to check for breathing and bleeding if the victim seems to be unconscious. These are the commonly used ways to gather information before you decide what has to be done to help the injured person until more advanced help arrives, if it is necessary to call for help.

There are times when there are no witnesses to the accident/illness and the victim appears to be unconscious or even dead. This is where you, as the first aid person, must spring into action. You will need to quickly look at the accident area for your safety as well as the victim.

Next you must observe the victim for:

3. If the victim is unconscious and you stroke the bottom of their feet or palms of their hand with a pointed object, does their body react

FIRST AID TREATMENT FOR SKULL AND SPINAL INJURIES

When in doubt if a person has head or spinal injury use extreme care and treat for fractures.

The following is an accepted way to treat possible skull and spinal injuries:

1. Stabilize the head until the victim is secured to a splint, stretcher or other hard flat surface
2. Use the modified jaw thrust to keep the airway open
3. Use a blanket, padding, rolled up coats, or other material around the head to prevent movement
4. Control serious bleeding
5. Use enough people to lift the person safely when necessary
6. Lift all at one time with one person taking control of the lift
7. Lift the person only high enough to slide a splint or stretcher underneath
8. Place the person on their back on the stretcher
9. Secure the patient to the stretcher before moving

rolled blankets, tools, newspaper and magazines

7. Victims of these types of injuries should only be moved and transported to medical facilities after all suspected fractures are splinted, unless the victim is in danger at the accident site

SKULL AND SPINAL FRACTURES

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 sign on the skull. A person with a skull fracture may also have an injury to the neck and spine.

Recognize the signs and symptoms of skull fractures:

1. Unconscious after a fall or hit to the skull
2. Deformity of the skull
3. Open wound on the skull
4. Blood or clear water- like fluid coming from nose and ears
5. Pupils unequal in size or impaired vision
6. Partial or complete paralysis

The signs and symptoms for spinal fractures are:

1. Can victim feel your touch to his or her feet
2. Can person wiggle their toes and than raise their feet or legs

#1 breathing and #2 bleeding. Both are life threatening to the victim to say the least

There are ways you can determine the medical condition of the victim. These are called persons vital signs. These are the physical signs which you can observe about the victim to determine his/her condition.

Ordinary vital signs that you can observe without the need of special instruments are:

- pulse,
- temperature,
- respiratory rate
- skin color
- pupils of the eyes
- victims ability to move
- the level of consciousness of the person

By understanding signs and symptoms of the victim you can know what to do much easier.

BREATHING & HEART SHOULD BE CHECKED FIRST

If the victim appears to be unconscious, you must quickly check for breathing and a pulse. A normal breathing rate for an adult lies between twelve to twenty breathes per minute. If a person appears to be taking very short gasping breathes, they may have something in their airway. The coughing up of blood while breathing may indicate some type of lung damage.

MUSCULOSKETAL INJURIES

The usual pulse rate in adults is 60 to 80 beats per minute. If you the first aider were going to take a person's pulse that appeared to be unconscious, you would check in the neck area at the carotid artery. If the victim was conscious you would check on the wrist. The wrist has two places where an artery passes over a bony area close to the skin. To take a conscious victim's pulse you would place your two fingers over the victim's wrist. Give yourself time to find the pulse and check for a minute.

To determine a victim's temperature, you can place the back of your hand on the victim's forehead. Is it cool and clammy? If it is, this may mean the victim is in shock, has lost blood or even heat exhaustion. If the skin is hot and dry the victim may have a fever or suffered sunstroke.

**PARALYSIS TO ONE SIDE OF THE BODY, INCLUDING THE FACE MAY MEAN THE PERSON HAS SUFFERED A STROKE.*

INABILITY TO MOVE BOTH ARMS AND LEGS MAY INDICATE A SPINAL INJURY

OTHER VITAL SIGNS TO CHECK

Skin color of the injured person can tell you a lot. If the skin is the color red, it is possible that the person is suffering from carbon monoxide poisoning. This is dangerous not only to the victim but you as well. Get yourself and the victim to fresh air quickly.

The musculoskeletal system is composed of all the bones, joints, muscles, tendons, ligaments, and cartilages in the body. All kind of injuries can happen to this system on the job. While sprains and strains are the most common type of injury, fractures and dislocations occur also.

All these type of injuries present basically the same type of signs and symptoms. With treatment in mind, all injuries of these types should be treated as possible fractures to bones and joints. The common signs and symptoms are pain, swelling and deformity to the effected areas.

The general treatment for these types of injuries is:

1. Immobilize the suspected fracture
2. Handle as gently as possible one person holds the effected area while a second person applies the splint
3. Do not straighten splint in the position found
4. Splints should be long enough to support joints above and below the suspected fracture
5. Splints should be rigid enough to support the suspected fracture
6. Pad improvised splints to ensure even contact and pressure between the limb and splint. Splinting materials can be of all types; air splints, padded boards, rolled blankets, tools, newspaper and magazines

no pulse begin CPR. Then cover the victim with a blanket to maintain body heat keep the victim's head low and get more advanced medical help. If you are successful in reviving the victim.

CHEMICAL BURNS

Chemical burns require immediate care. You should consider the following steps when treating such a burn. Remove all clothing containing the chemical; Flush the burned area for at least 20 minutes with water; If the chemical is dry, brush away as much of the chemical as possible before applying water; Protect yourself from the chemical by using the correct PPE. If PPE is not available stay clear of splashing water.

Sometimes chemical substances, especially lime, cement, caustics soda, or acids from batteries get in the eyes. The treatment is to immediately flood the eyes with water. Avoid washing the substance back into the eye.

Continue to wash for at least 20 minutes. After washing the eyes, cover both eyes with moist pads. If the victim eyes continue to burn, repeat the flushing of the eyes with additional water and recover. Get the victim to medical help as soon as possible to prevent further damage to the eyes.

** AS WITH ANY EYE INJURY COVER BOTH EYES EVEN IF ONLY ONE EYE HAS BEEN INJURED.*

Other possibilities of a red skin are poisoning and sun-stroke. A pale skin may indicate shock or a heart condition. Blue color can mean poor circulation.

The pupils of the eyes, when normal, generally respond to the light. The pupils get smaller and larger. If you were observing person's eyes and they were not responding to light, several possibilities could exist. Including disease, poisoning, drug overdose, or injury. Enlarged pupils may mean a relaxed or unconscious state and a possible head injury. If the pupils are unequal, this may mean a head injury.

The level of consciousness of a victim is probably the single most reliable sign in determining a person's nervous system. If the victim appears to be losing his/her ability to talk to you and becomes more confused as time goes by, there is an urgent need for more advanced medical help as soon as possible. A rapid loss of consciousness may point to a serious condition.

WHAT'S ARTIFICIAL RESPIRATION ALL ABOUT

Artificial respiration is the process of causing air to flow into and from the lungs when natural breathing has stopped. On the job, incidents may occur for the heart to stop working. These are drowning, suffocation, electrocution, and dangerous gases. When breathing has stopped, the body's blood supply to the brain is cut off. If the brain does not get oxygen in a very short time, brain damage or even death will occur. If artificial respiration is started within a very short time, after the

victim has stopped breathing on their own, the victim has a good chance for survival.

Remember these general steps when doing artificial respirations;

1. Don't waste time start at once
2. Do not take time to move the victim unless the location is unsafe
3. Do not delay ventilations to loosen the victim's clothing or to warm the victim
4. Use the head-tilt/ chin lift method for opening the airway
5. Remove any visible foreign objects in the mouth [gum, tobacco, candy]
6. Keep the victim warm
7. Maintain a steady rhythm while giving artificial respirations
8. Continue until one of the following occurs:
 - a. The victim starts breathing on their own, qualified person relieves you, a doctor pronounces the victim dead or
 - b. You are physically unable to provide artificial respirations any longer.

ELECTRICAL BURNS

The major problem with electrical shock and electrical burns is the victim's heart and breathing may stop. Electrical burns vary in severity depending on how long the body is in contact with the electrical current, the strength of the current, the type of current, and the direction the current takes through the body. Often these burns are deep. There may be more than one area burned. One area may be where the current entered the body and another may be where it left. Electrical burn wounds may look minor on the outside, but could be severe on the inside.

First aid for electrical shock victims:

1. Don't touch them
2. Unplug the source or turn off the power at the control panel lockout if possible
3. If you can't turn off the power, use a piece of wood, like a broom handle, dry rope or dry clothing, to separate the victim from the power source
4. Do not try to move the victim touching a high voltage wire, call for emergency help
5. Keep the victim laying down
6. Unconscious victims should be placed on their side to allow drainage of fluids. Do not move the victim if there is a suspicion of a neck or spine injuries unless absolutely necessary
7. If the victim is not breathing, apply mouth to mouth resuscitation. If the victim has

FIRST AID CARE OF BURNS AND SCALDS

The first aid treatment given to a burn victim largely depends on the cause of the burn and the degree of severity. Emergency first aid for burns or scalds should primarily be:

1. Keep air off the burn
2. Relief of pain that follows the burn
3. Minimizing the onset of shock
4. Prevention of infection

GENERAL CARE OF ALL BURNS ARE

1. Maintain an open airway
2. Keep burn site clean and victim warm
3. If clothing is stuck to the burn, just cut clothing away from around the burn
4. Separate any burned area that may come in contact with each other when bandaging
5. Apply moist dressing to first and second degree burns
6. Apply dry dressing to third degree burns
7. Do not apply ointments, sprays, or butter to burned areas
8. Do not apply ice to any burn [this can cause frost-bite or damage the skin]
9. Do not break blisters
10. Get medical help

9. If you are successful in reviving the victim, keep the victim lying down and treat for shock until medical help arrives

ARTIFICIAL RESPIRATION STEPS

Follow these steps in the proper order:

1. Establish unresponsiveness by tapping the victim on the shoulder and shout "Are you ok / can you hear me."
2. Place the victim on their back
3. Open the air way using the head-tilt/chin-lift method
4. Remove foreign objects from the mouth
5. Kneel near the victim's mouth and nose
6. Use the look, listen, and feel to check for breathing
7. If there is no sign of breathing start artificial respirations
8. Mouth to mouth ventilation is the most common method used:
 - Open the airway using the head-tilt/chin-lift method
 - Kneel at the victim's side near the head area
 - Maintain the head-tilt/chin-lift and seal off the nose with your thumb and fore finger
 - Inhale deeply and give two full breaths

- Remove your mouth between breaths
- Give twelve breaths per minute to the victim

OBSTRUCTED AIRWAY

If someone gets something caught in their throat, it can result in unconsciousness or death. Food, candy, gum, and tobacco products are all common items that can cause a person to choke. When the airway is completely obstructed, the victim is unable to speak, breathe, or cough. They will clutch at their throat. You can help the person by performing the Heimlich maneuver follow these steps.

1. Let the person know you can help them
2. Ask the choking victim these three questions/ can you speak/ can you breathe/ and can you cough up the obstruction on your own
3. If the answer is no, you must stand behind the person and place your arms around their waist.
4. Make a fist with your hand and position the thumb side of your fist against the middle of the victim's stomach just above the navel and below the rib cage
5. Press your fist into the victim's stomach area with a quick upward thrust
6. Continue until the obstruction is cleared bleeding types; Bleeding can be classified as external or internal. Both kinds are based on the type of blood

BURNS AND SCALDS

With the type of work miners do in the mining industry, there is always a concern for burn and scald injuries. Burns are injuries to the skin caused by dry heat such as fire, electricity, friction, or heated objects. Scalds result from contact with wet hot solutions, steam, and chemicals such as acids or strong alkalis. Burns can do more damage than injure the skin. Burns can damage the skin, muscles, bones, nerves, and blood vessels.

The eyes if burned severely can be damaged beyond repair. The lungs and other parts of the respiratory system can be damaged causing life threatening problems such as breathing and even respiratory failure resulting in respiratory arrest.

Burns that involve the skin are classified into three types which are:

- **FIRST DEGREE** {superficial} the outer layer of skin {the epidermis} is reddened and painful, and slight swelling is present. This type of burn will heal on its own
- **SECOND DEGREE** {partial thickness} 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** {full thickness} all layers of the skin are damaged and are charred black or brown or are dry and white. Muscles, tissues, and bone may be damaged. Pain may or may not be severe.

FIRST AID DRESSING AND BANDAGES

First aid materials include open or folded triangle bandages, strips of cloths, bandage compresses, gauze, adhesive bandages, and roller bandages. Your first aid kit should contain an ample supply of these items.

The principles of bandaging include. Cover the entire wound with either a bandage compress or gauze. Bandage snugly, but not too tight. Check the bandage often to make sure circulation is ok. Tie all knots over open wounds except fractures. If bandage becomes soaked with blood, add more, and do not remove original dressing.

Dressing for open wounds can differ depending on the location and extent of the wound. Dressings for open wounds should be covered as follows:

1. Cover head wounds first
2. Cover wounds of the upper extremities
3. Wounds of the trunk
4. Wounds of the lower extremities

A cup can be used along with gauze and bandage material to treat an embedded object in the eye.

vessel involved. External bleeding may be classified by the type of blood vessels which are:

Arterial bleeding – blood is spurting from an artery, often pulsating as the heart beats. The color of the blood is bright red since it contains oxygen. [A great deal of blood can be lost in a short amount of time].

Venous bleeding – blood is flowing steadily from a vein. The color of the blood is dark red, often appearing deep maroon [since it contains little oxygen] however; it may look or become a brighter red when exposed to oxygen. Venous bleeding can also be profuse.

Capillary bleeding – blood is oozing from a bed of capillaries. The color of the blood is red, usually less bright than arterial blood. The flow is slow, as seen in minor scrapes and shallow cuts to the skin.

EVALUATING TYPES OF BLEEDING

Arterial bleeding – of the three types of external bleeding, arterial bleeding is usually the most serious. The action of the heart and the pressure in the arteries prevent blood clot formation because of the rapid, pressurized flow. The muscular nature of walls creates problems in stopping the flow of blood. Sometimes the end of a completely severed artery will collapse and seal off the flow. In small arteries, the pulsation of the muscular wall may slow bleeding. In larger arteries the thickness of the vessel walls prevents this collapse from being complete and the flow remains profuse.

Since arteries are located deep within body structures, capillary and venous bleeding is seen more often than arterial bleeding.

Arteries the heart pumps blood out through one main artery called the dorsal aorta. The main artery then divides and branches out into many smaller arteries so that each region of your body has its own system of arteries supplying it with fresh, oxygen – rich blood. Arteries are tough on the outside and smooth on the inside. An artery actually has three layers; an outer layer of tissue, a muscular middle, and an inner layer of cells. The muscle in the middle is elastic and very strong. The inner layer is very smooth so that the blood can flow easily with no obstacles in its path.

The muscular wall of the artery helps the heart pump the blood. When the heart beats, the artery expands as it fills with blood. When the heart relaxes the artery contracts, exerting a force that is strong enough to push the blood along. This rhythm between the heart and the artery results in an efficient circulation system.

You can actually feel your artery expand and contract. Since the artery keeps pace with the heart, we can measure heart rate by counting the contractions of the artery. That's how we take our pulse.

The arteries deliver the oxygen – rich blood to the capillaries where the actual exchange of oxygen and carbon dioxide occurs. The capillaries then deliver the waste rich blood to the veins for transport back to the lungs and heart.

BLEEDING CLOSED WOUNDS

Closed wounds are injuries that occur without breaking the skin. These injuries may result in internal bleeding from damage to internal organs, muscles, and other tissues. Closed wounds can be placed into two types, bruises and ruptures or hernias.

Bruises usually occur when the victim has been hit by objects or blunt instruments. While a bruise may not show much in the way of damage, perhaps only some swelling or discoloration of the skin, the more serious damage may be internally.

THE BASIC STEPS IN TREATING A BRUISE ARE:

1. Apply cold applications
2. Elevate the wound area
3. Check for other injuries
4. Treat for shock

Ruptures or hernias commonly are a protrusion of the intestines through the wall of the abdomen. The victim may feel a sharp, stinging pain and tenderness. There may be some swelling and the victim may become sick and vomit. The treatment for a hernia is placing the victim on his or her back with the knees drawn up.

Crush Injuries - Most of the time, when people see an accident in which a body part has been crushed, their first thoughts are of fractures. Soft tissues and internal organs are also crushed, often rupturing. Both external and internal bleeding can be profuse

Generally speaking the care for an open wounds are these steps:

1. First concern is to stop the bleeding
2. If unable to see a wound clearly cut away clothing around it
3. Wipe away dirt and foreign particles from the wound. Always wipe particles away from the wound
4. Do not try and remove embedded objects
5. Stabilize an embedded object with a bulky dressing
6. To prevent infection, do not touch the wound with your hands, clothing, or any thing not sterile
7. Cover the entire wound area with sterile materials
8. Place bandage knot over the compress covering the wound, except a compound fracture where the knot would be placed on the side opposite the broken bone
9. Follow shock treatment steps and reassures the victim about their injuries

Venous bleeding – venous bleeding can range from very minor to severe, leading to death within minutes. Some veins are located near the body surface. Many of these are large enough to be seen through the skin. Other veins are deep in the body and can be as large as arteries. Bleeding from a deep vein will produce rapid blood loss. Surface vein bleeding can be profuse, but the blood loss is not as rapid as that seen from arteries and deep veins because of the smaller vessel diameter. Veins have a tendency to collapse as soon as they are cut. This often reduces the severity of venous bleeding.

Veins are similar to arteries but, because they transport blood at a lower pressure, they are not as strong as arteries. Like arteries, veins have three layers; an outer layer of tissue, muscle in the middle, and a smooth inner layer of cells. However the layers are thinner containing less tissue. Veins receive blood from the capillaries after the exchange of oxygen and carbon dioxide has taken place. Therefore the veins transport waste rich blood back to the lungs and heart. It is important that the waste rich blood keeps moving in the proper direction and not be allowed to flow backwards. This is accomplished by valves that are located inside the veins. The valves are like gates that only traffic to move in one direction.

The vein valves are necessary to keep flowing toward the heart, but they are also necessary to allow blood to flow against the force of gravity. For example blood that is returning to the heart from the foot has to be able to flow up the leg. Generally the force of gravity

would discourage that from happening. The vein valves however provide footholds for the blood as it climbs its way up.

Blood that flows to the brain faces the same problem. If blood is having a hard time climbing up you will feel light headed and possibly even faint. Fainting is your brains natural request for more oxygen rich blood. When you faint your head comes down to the same level as your heart making it easy for blood to quickly reach the brain.

Capillary bleeding – most individuals experience little difficulty with capillary bleeding. The blood flow slowly oozes and clotting is very likely to occur within six to eight minutes. The larger the area of the wound, however the more likely is the chance of infection. Capillary bleeding requires care to stop blood flow and reduce contamination.

Unlike the arteries and veins, capillaries are very thin and fragile. The capillaries are actually only one cell thick. They are so thin that blood cells can only pass through them in single file. The exchange of oxygen and carbon dioxide takes place through the thin capillary wall. The red blood cells inside the capillary release their oxygen which passes through the wall and into the surrounding tissue. The tissue releases its waste products, like carbon dioxide which passes through the wall and into the red blood cells.

Arteries and veins run parallel throughout the body with a web like network of capillaries, embedded in tissue connecting them. The arteries pass their oxygen

Jagged cuts are called lacerations. Tissue along the edge of the wound will be torn and a rough edge is produced. Sometimes jagged cuts can be produced from the impact of a blunt object. Usually, they occur when the skin is cut by an object that does not have a very sharp edge.

Avulsions - these wounds most frequently involve the tearing loose or the tearing off of large flaps of skin. A torn ear, an eyeball removed from a socket, and the loss of a tooth are also examples of avulsions.

PUNCTURES & AMPUTATIONS

Punctures - objects such as knives, nails, and ice picks can produce puncture wounds. An object puncturing the body will tear through the skin and usually proceed in a straight line, damaging all the tissues in its path. Puncture wound may be a penetrating wound, ranging from shallow to deep. Another type of puncture wound is a perforating wound. This injury, often seen with gunshot wounds, has an entrance and an exit wound, as the object passes through the body. Puncture wounds are the most likely to become infected. Remember never remove an impaled object from a wound.

Amputations - These wounds involve the cutting or tearing off of the fingers, toes, hands, feet, arms, or legs. Since amputation can be done as a surgical procedure, the injury is often called a traumatic amputation.

BLEEDING OPEN WOUNDS

An open wound is any injury that causes a break in the skin. It may be a simple scraping wound affecting only the outer layers of skin, or a deep and penetrating wound involving arteries, nerves, and muscle tissue.

Open wounds require immediate attention.

The dangers with an open wound are the loss of blood and infection. First aid treatment is aimed directly at these dangers. The proper placing of protective dressings not only helps control bleeding, but is important in screening out bacteria which may cause infection.

Open wounds may be classified as:

Abrasions - which are wounds such as skinned elbows and knees road rash, rug burns, and thorn scratches also called scratches and scrapes.

Cuts - in cases of cuts the skin is fully penetrated, with injury also occurring to tissues lying under the skin.

Cuts may be classified as Smooth or Jagged:

Smooth cuts are called incisions. They are produced by very sharp objects. The edges of a smooth cut appear straight, with no apparent tears or jagged areas. Deep cuts can cause severe tissue damage and life threatening bleeding.

rich blood to the capillaries which allow the exchange of gases within the tissue. The capillaries then pass their waste rich blood to the veins for transport back to the heart.

Capillaries are also involved in the body's release of excess heat. During exercise, for example your body and blood temperature rises. To help release this excess heat, the blood delivers the heat to the capillaries which then rapidly release it to the tissue. The result is that your skin takes on a red flushed appearance. If you hold your hand for example under hot water your hand will quickly turn red for same reason. Your arm however is not likely to change color because it is not feeling an increase in temperature.

**Arterial and large vein bleeding are given priority over small vein and capillary bleeding.*

If bleeding is severe and considered an immediate threat to life, control of bleeding will have to begin while noting signs of breathing.

WAYS TO CONTROL BLEEDING

A person weighing 150 pounds will have approximately 10 to 12 pints of blood. The loss of two pints is a serious matter and the loss of three pints can cause death. For these reasons it is important to understand the steps to control bleeding in an emergency. Minutes count and the proper action at the scene of an accident can save a life at the job site.

The methods of controlling external bleeding are almost always very simple. There are four acceptable methods for controlling external bleeding. These are:

DIRECT PRESSURE - when direct pressure is applied directly to an open wound the normal blood clotting process should occur. It is best to place a sterile pad or the cleanest cloth available over the wound and press firmly with your hand until a cover bandage is applied. Tie the cover bandage knot over the wound in most cases.

ELEVATION - Elevating the bleeding part of the body above the level of the heart will slow the flow of blood and speed clotting. Applying cold packs or cold cloths if available will also aid the clotting process.

PRESSURE POINTS - When bleeding is severe, direct pressure and elevating the wound may not be enough to stop the bleeding. In this case, apply digital pressure at pressure points. Blood vessels are much like soft rubber tubing. If you squeeze shut blood vessels at specific points, blood flow will slow down.

TOURNIQUETS - Use a tourniquet only when the bleeding is so severe that it endangers the victim's life and all other methods are not slowing the blood flow. A tourniquet shuts off all blood flow

** REMEMBER - DIRECT PRESSURE, ELEVATION & COLD PACKS, PRESSURE POINTS, & TOURNIQUETS IN THIS ORDER*

- Slow response to questions

WHAT CAN YOU DO TO TREAT FOR SHOCK

You can do a lot in treating for shock if you recognize the symptoms and jump into action. Remember; take care of breathing problems and control bleeding first. Use this checklist when treating for shock:

1. Position the victim properly. Lay the individual flat if possible. The head should be lower than the rest of the body. The exceptions are in cases of head injury, sunstroke, heart attack, stroke, or shortness of breath
2. Provide plenty of fresh air
3. Loosen tight clothing at the neck, chest, and waist
4. Handle the victim gently and as little as possible
5. Keep the victim warm and dry by using available materials such as blankets and coats. Place blankets or materials under the victim to prevent heat loss
6. Do not give anything by mouth
7. Keep the victim calm by talking to him or her. Do not talk about the extent and seriousness of their injuries.

** FAINING IS A TEMPORARY LOSS OF CONSCIOUSNESS DUE TO AN INADEQUATE SUPPLY OF OXYGEN TO THE BRAIN. IT IS A MILD FORM OF SHOCK.*

- Poisoning, ingested, or inhaled.
- Exposure to extreme heat or cold.
- Emotional stress.
- Substance abuse.

Anytime a victim has lost blood there is a chance of physical shock. Recognize the signs and symptoms of shock and treat.

A VICTIM'S SYMPTOMS OF SHOCK

When you arrive at the scene of an injury or illness you will take care of the immediate needs of the victim; breathing problems and blood loss, etc.. These are the life threatening concerns. Shock can happen soon after an injury or illness or it may take hours. How can you tell if a person has gone into shock or will go into shock? There are physical and emotional symptoms to look for in the victim. These include:

- A dull, chalk like appearance
- Anxious or dull expression
- Closed or partially closed eyelids
- Shallow irregular breathing
- Weak rapid pulse
- Shallow irregular labored breathing
- Eyes dull and lackluster
- Cold moist skin
- Shaking of arms and legs
- Nausea and vomiting
- Thirst
- Skin-lips etc blue or gray
- Partial or total unconsciousness

MORE ABOUT PRESSURE POINTS

There are 26 pressure points, 13 on each side of the body, where pressure on the blood vessel will control the flow of blood. At a pressure point, the blood vessel passes close to the surface of the skin over a bony structure. To reduce the flow of blood using pressure points through the blood vessel follow these steps:

#1. Apply pressure with your fingers

#2. To control bleeding from an artery, select a pressure point between the heart and the wound. Normally, this would be a point above the wound.

#3. When bleeding is from a vein, apply pressure at a point below the wound. On the side of the wound away from the heart.

It is extremely important that the uses of pressure points in the head area are used sparingly. A rule of thumb is never hold pressure more than 30 seconds for the temporal, no more than a minute or two for a facial, and even if you have been trained to use the carotid, this pressure point should only be used for a few seconds without releasing.

** PRESSURE POINTS SHOULD ONLY BE USED IF DIRECT PRESSURE AND/OR ELEVATION DOES NOT CONTROL BLEDDING.*

INTERNAL BLEEDING

Internal bleeding is very difficult to identify. Normally, a victim will have no signs of bleeding on the body. A victim may show very similar signs to someone in shock. Their skin may appear chalked-like, glazed look on their face, half-closed eyes, and an anxious expression.

To determine if a victim has internal bleeding, you can watch for these signs and symptoms. First, does the person have pain or tenderness, swelling, or discoloration particularly in the stomach area? Is the person bleeding from the mouth or other body openings? Do they show signs of shock-dizziness, cold and clammy skin, eyes dull, and pupils enlarged, and rapid breathing, thirst, and a feeling of helplessness?

What you can do at the job site can mean the difference between life and death to a person in this condition. Follow these steps:

1. Keep the airway open and treat for shock.
2. Do not give the victim any thing to eat or drink
3. Get medical help quickly
4. Keep the person lying down on his or her side
5. Transport the victim gently.

PHYSICAL SHOCK

Physical shock follows every serious injury to some extent. Shock may happen immediately after an injury or be delayed for several hours. When physical shock does happen, the heart, the lungs, the digestive system, and other vital organs can be affected. Sometimes the victim goes unconscious. Even if the victim does remain conscious, he or she will to some extent lose the power of reasoning and control of certain body functions.

While shock is a serious condition, it does not pose an immediate threat to life that a stoppage of breathing or uncontrolled bleeding poses. However, it is very dangerous to the victim if physical shock is not treated quickly and correctly. Shock can, in combination with other injuries be fatal. When you give first aid, you should be aware that if the victim has lost blood, or experienced intense pain, he or she is a likely candidate for physical shock. It is important that you treat for shock after every serious injury. The causes of physical shock can include many types of injuries and some prolonged illnesses. Watch for these conditions when considering treating for shock:

- Severe or extensive injuries
- Intense pain
- Loss of blood
- Burns
- Electrical shock
- Certain illness
- Allergic reaction