

# **Soft Tissue Injuries**

**EMS Continuing Education  
Technician through Technician-Advanced Paramedic**

**Consistent with the  
National Occupational Competency Profiles  
as developed by  
Paramedic Association of Canada  
and  
“An Alternate Route to Maintenance of Licensure”  
as developed by Manitoba Health**

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## **Disclaimer**

These documents were developed for improved accessibility to “An Alternative Route to Maintenance of Licensure” for all paramedics in Manitoba. Regional implementation of Alternate Route is at the discretion of the local EMS Director.

This is a supportive document to the National Occupational Competency Profiles and “An Alternative Route to Maintenance of Licensure.” It is not the intent that this package be used as a stand-alone teaching tool. It is understood that the user has prior learning in this subject area, and that this document is strictly for supplemental continuing medical education. To this end, the Paramedic Association of Manitoba assumes no responsibility for the completeness of information contained within this package.

It is neither the intent of this package to supercede local or provincial protocols, nor to assume responsibility for patient care issues pertaining to the information found herein. Always follow local or provincial guidelines in the care and treatment of any patient.

This package is to be used in conjunction with accepted models for education delivery and assessment, as outlined in “An Alternative Route to Maintenance of Licensure”.

This document was designed to encompass all licensed training levels in the province Technician, Technician-Paramedic, Technician-Advanced Paramedic. Paramedics are encouraged to read beyond their training levels. However, the written test will only be administered at the paramedic’s current level of practice.

All packages have been reviewed by the Paramedic Association of Manitoba’s Educational Subcommittee and physician(s) for medical content.

As the industry of EMS is as dynamic as individual patient care, the profession is constantly evolving to deliver enhanced patient care through education and standards. The Paramedic Association of Manitoba would like to thank those practitioners instrumental in the creation, distribution, and maintenance of these packages. Through your efforts, our patient care improves.

This document will be amended in as timely a manner as possible to reflect changes to the National Occupational Competency Profiles, provincial protocols/Emergency Treatment Guidelines, or the Cognitive Elements outlined in the Alternate Route document.

Any comments, suggestions, errors, omissions, or questions regarding this document may be referred to [info@paramedicsofmanitoba.ca](mailto:info@paramedicsofmanitoba.ca) , attention Director of Education and Standards.

## **Soft Tissue Injuries**

This package has been written to encompass all current training levels in the province. However, paramedics will only be required to take the test that best defines their current licensed level.

This package is to be used in conjunction with accepted models for education delivery and assessment, as outlined in the “Alternate Route to Maintenance of Licensure”, Manitoba Health Emergency Services.

### Conventions Used in this Manual

The cognitive elements contained in this training module apply to all EMS licensure levels. Therefore no conventions have been used to differentiate between Technician, Technician-Paramedic and Technician-Advanced Paramedic

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## **Introduction**

This module deals with Soft Tissue Injuries. Components of this document include:

- Anatomy and physiology of the skin.
- Principles of aseptic technique
- Description and management of open and closed wounds.
- Procedure and considerations for assessing and managing each of the following soft tissue injuries:
  - gunshot wound
  - impaled object
  - evisceration
  - amputation
  - avulsion
  - crush
  - abrasion
  - laceration
  - puncture
- Procedure / considerations for assessing and managing injuries to the following:
  - eye
  - neck
  - face
  - nose
- Functions and principles of dressings and bandages.
- Definition, characteristics and management for the following classification of burns:
  - superficial – 1<sup>st</sup> degree
  - partial thickness – 2<sup>nd</sup> degree
  - full thickness – 3<sup>rd</sup> degree
- Considerations for management of burn patients
  - rule of nines
  - identification of burn patient requiring specialized care
- Signs and symptoms and management of the following:
  - inhalation burns
  - general chemical burns
  - burns to the eye
  - electrical burns

## **Soft Tissue Injuries**

### ***Anatomy and Physiology of the Skin***

The skin is one of the largest, most important organs of the human body. Covering the entire body, it protects us from fluid loss and bacterial invasion. It also provides a massive surface for sensation and natural radiator to dissipate excess body heat. Known collectively as the integumentary system, the skin is the first tissue of the human body to experience the effects of trauma.

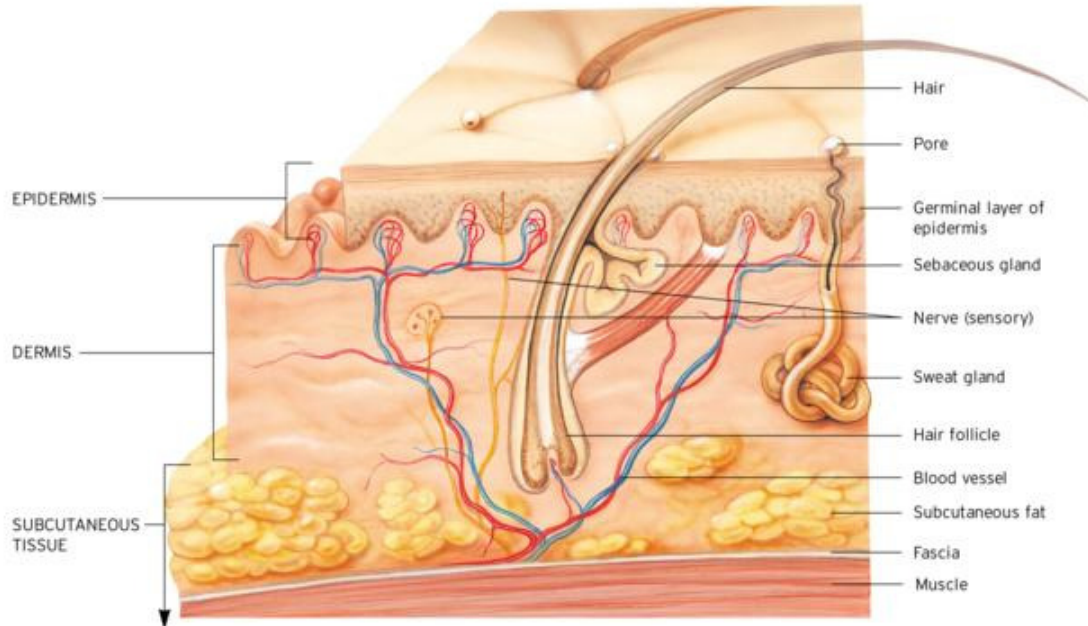


Figure 1 The skin is composed of a tough external layer called the epidermis and a vascular inner layer called the dermis

### Layers of the skin:

**Epidermis:** The first and outermost layer is the epidermis. It is a layer of dying and dead cells being pushed outward by new cells growing from beneath. As these cells reach the surface, they abrade away with everyday activity. The constant movement outward provides a barrier that is difficult for bacteria and other pathogens to penetrate. Glands beneath the epidermis secrete oil called sebum. This oil lubricates the epidermis and assists in making it watertight. It also coats the outer layers and makes the epidermis pliable. In addition, sebum provides a barrier to the flow of water or other fluids either in or out of the skin. It also contains cells that give the skin its color.

**Dermis:** Directly below the epidermis is the tissue layer called the dermis. It consists of many different structures, including blood vessels, glands, and nerve endings. It is here that sebaceous glands produce sebum and secrete it into hair follicles. Sudoriferous glands in the dermis also secrete sweat to the surface of the skin. As the water in sweat evaporates, passing air carries the vapor and associated heat energy away with it. This process allows us to maintain a normal body temperature. Located in this layer are hair follicles and sensory nerves.

Subcutaneous Tissue: Additional regulation of body temperature occurs as warm blood from the body's core travels through the peripheral circulation. Vessels direct blood either to the dermal surface or beneath the subcutaneous tissue. Subcutaneous tissue, which is composed of adipose (fat) and connective tissues, serve as an insulation layer in various thicknesses. For example, it is extremely thin in the eyelids but thick over the buttocks.

Blood Vessels: Blood is an important medium traveling through the skin. It is a fluid consisting of water, electrolytes, proteins, and cells. Blood travels through arteries, arterioles, veins, venules, and capillaries. Any soft-tissue wound or burn can affect the flow of blood through these vessels.

### **Functions of the Skin**

The skin is extremely flexible and ordinarily regenerates itself. This durable, thin organ provides a number of valuable functions.

- The skin protects the human body from many dangers found in the environment, such as pathogens.
- The skin functions as an organ of sensation, perceiving temperature, pressure (touch), and pain.
- The skin contains vital fluids and aids in temperature regulation through secretion of sweat and shunting of blood.
- The skin provides a barrier against infection and insulation from trauma.

### ***Aseptic Techniques:***

For many years, guidelines have required EMS personnel to take steps to protect themselves against diseases transmitted through blood. This is known as taking universal precautions. Today, Health Canada and the Laboratory Centre for Disease Control have published guidelines that set a new standard. That standard says, assume that all blood and body fluids are infectious. It requires EMS personnel to practice a strict form of infection control with all patients. It is called body substance isolation (BSI). With BSI precautions, it is possible to take care of all patients safely, even those with infectious diseases. BSI precautions include hand washing, proper cleaning, disinfection, or sterilization of equipment, and use of personal protective equipment (PPE).

## ***Open or Closed Wounds***

Soft tissues are often injured because they are exposed to the environment. There are three types of soft-tissue injuries:

**Closed Wounds:** Soft tissues beneath the skin are damaged. The skin itself is not broken. There are three general types of closed wounds. They are a ***contusion*** (bruise which results from blunt force striking the body. The epidermis remains intact, but cells within the dermis are damaged, and small blood vessels are usually torn. The depth of the injury varies, depending on the amount of energy absorbed. As fluid and blood leak into the damaged area, the patient may have swelling and pain.) Small contusions generally do not need treatment. Cold packs help relieve pain and reduce swelling in larger contusions. A ***clamping injury*** (usually involving a finger or limb stuck in an area smaller than itself. The body part can swell rapidly, making the condition worse. Another type of clamping injury occurs when an object, such as a ring, strangles a body part that was previously injured.) In a clamping injury a lubricant such as soap may help free the body part. If not, then it may need to be freed at the hospital. Apply a cold pack to help reduce swelling. Since circulation to the body part may be reduced, do not cool it for longer than 15 to 30 minutes at a time. Elevate the injured part above the level of the heart. A ***crushing injury*** (Blunt trauma is caused by a sudden blow or force that has a crushing impact. A crushing injury may be open or closed. Blunt trauma can cause serious internal injuries, including organ rupture, with few external signs.) If the mechanism of injury suggests a crushing injury caused by blunt trauma, treat the patient for internal bleeding. Be sure to assess carefully for broken bones, especially when swelling or deformity is present.

NOTE: Always take BSI precautions when there is any possibility that you will come in contact with a patient's blood or other body fluids.

**Open Wounds:** Where there is a break in the surface of the skin or the mucous membrane, exposing deeper tissue to potential contamination. An open injury may also be the first indicator of a deeper, more serious injury, such as a fracture. Examples of open wounds are: ***Abrasions*** (an open wound caused by scrapping, rubbing, or shearing away of the epidermis), ***Lacerations*** (a break of varying depth in the skin. Lacerations are caused by forceful impact with a sharp object. Bleeding may be severe, especially if an artery is involved.) And ***Penetration/Puncture wounds*** (a wound usually the result of a sharp, pointed object being pushed or driven into the soft tissues. This type of injury may have both an entry wound and an exit wound.)

**Burns:** A burn occurs when the soft tissue receives more energy than it can absorb without injury. The sources of this energy can be thermal heat, frictional heat, toxic chemicals, electricity, or nuclear radiation.

NOTE: It is likely that you will be exposed to your patient's blood and other body fluids, so take all appropriate BSI precautions. Wear PPE as necessary. After patient care, wash you hands, even if you wore gloves.

***Management of all soft tissue wounds includes the following:***

- PPE should be utilized as appropriate
- BSI techniques and equipment should be utilized as appropriate
- consider C-spine precautions-maintenance of an open airway and ensuring adequate respirations has priority over all other treatments, including control of the c-spine
- primary survey
  - expose wound sites by removing or cutting clothing around the wound
  - control any major bleeding
  - record vital signs
- provide O<sub>2</sub> based on patient's presenting condition and vital signs
- consider load and go situations
- secondary survey-consider underlying injuries
- if conscious, place patient in a position of comfort whenever possible and injuries permit
- obtain a pertinent history
  - injuries identified by the patient
  - time of injury
  - mechanism of injury
  - past medical history
  - medications
  - allergies
  - last meal
- treat for shock, if indicated
- treat all wounds
- distal circulatory and neurological status must be assessed prior to applying dressing and bandages, and reassessed after applying dressings and bandages
- monitor distal circulatory and neurological status en route (be prepared to adjust the bandages and dressings if status is compromised by the dressings or bandages)
- do not allow the patient to exert him/herself
- initiate transport
- document all actions including the decision to initiate load and go
- report all findings to the receiving facility staff, and document on the patient care report
  
- There are, however, some special considerations that need to be applied to certain soft tissue injuries. These injuries include:

**Gunshot wounds:**

- scene assessment is very important
- ensure the scene is safe prior to entering
- police may be required

- ensure safety for all EMS personnel and bystanders
- continuously monitor the scene and be prepared to leave immediately
- if possible, identify the type of weapon and the caliber
- load and go should be initiated immediately
- assess the patient carefully for entrance and exit wounds
- expose all wounds sites
- treat injuries as per the appropriate guidelines
- if clothing must be removed or cut from the patient, EMS personnel should avoid damaging or cutting through entrance and exit holes in the clothing
- clothing should be transported with the patient and be delivered to the receiving facility staff
- clear wounds of loose foreign material
- apply dressings and bandages to all wounds
- control bleeding (direct pressure and elevation first. If bleeding still is not controlled, then use a pressure point)
- consider internal bleeding, fractures, and injuries to underlying organs and structures
- any additional surveys and treatment should be conducted en route
- be prepared to manage cardiorespiratory distress or arrest

### **Impaled Objects:**

The object should never be removed in the field unless it is through the patient's cheek or interferes with airway management or CPR. To provide emergency care to a patient with an impaled object, follow these guidelines:

- stabilize the object
- expose the wound area. Remove clothing from around it, but remember to take care not to move the object at all.
- control the bleeding. Apply direct pressure to the edges of the wound. Avoid putting pressure directly on the impaled object.
- use a bulky dressing to help stabilize the object. Surround the entire object with dressings. Pack them around the object and tape it securely in place. A ring or doughnut pad may be used to stabilize it.
- if the object impedes transport then careful shortening (cut) of the object may be required (object impaled in chest)
- immobilize object securely during shortening effort

When an object is impaled in a patient's cheek, bleeding can interfere with breathing. If this is the case, then remove the object as follows:

- while maintaining an open airway, feel inside the patient's mouth with gloved fingers. Find out if the object has penetrated completely.
- remove the object in the direction in which it entered.
- control the bleeding from the outside the cheek. Then, dress the wound.
- if the object penetrated the cheek completely, pack sterile gauze between the cheek wall and the teeth
- continue to monitor the airway. Suction, when necessary.

**Evisceration:**

Cover exposed organs with a sterile saline soaked dressing. Then cover with bulky dressing. Secure with tape on all four sides.

An evisceration occurs when internal organs protrude through an open wound. This most commonly occurs with abdominal wounds. When you care for a patient with an evisceration, never try to reposition the protruding organs and never touch them. You could cause further damage and contaminate both the organs and the cavity from which they protrude. Cover the evisceration with sterile, saline soaked dressings. Cover the dressings with a bulky dressing. Support the evisceration with additional dressings.

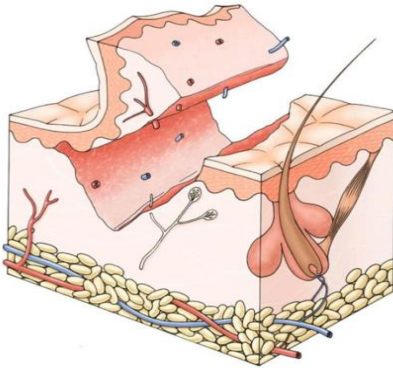
**Amputation:**

In an amputation, a body part has been completely severed from the body. This is the result of ripping or tearing forces, often from an industrial accident or MVA. Massive bleeding is usually present. In some cases, however, the elasticity of the blood vessels helps them contract, and bleeding is minimal. Care for an amputation in the same way you care for all open injuries. With amputations, you must also care for the amputated part. First provide emergency care to the patient. If possible, have other EMS personnel locate all of the severed parts. Rinse the part(s) gently with sterile saline to remove loose debris and gross contamination. Do not scrub. Wrap the severed part(s) in sterile, dry dressings. Place the wrapped part(s) into waterproof plastic bag(s). Seal the bag with tape. Do not pour fluid into the bag. Label the bag with patient name, date, and time. Place the plastic bag into a container filled with ice and water. Label the container with the name, date, and time. Record the time of the incident and the approximate elapsed time before the part was protected by ice and water. Transport the patient, with the severed part if possible. If EMS personnel are unable to immediately locate and retrieve the severed part, transport the patient to the nearest appropriate health care facility without delay.

Note that if the amputation is partial, you should never complete it. Monitor distal circulatory and neurological status en route. Be prepared to adjust bandages and dressings if status is compromised by the dressings or bandages.

### **Avulsion:**

An avulsion is a torn flap of skin or soft tissue that has been torn loose or pulled off completely. Clean the wound surface. Fold the skin flap back to its normal state. Control bleeding with direct pressure.



Avulsions are injuries characterized by either complete separation of tissue or tissue hanging as a flap. Significant bleeding is common.

### **Crush:**

A crushing injury occurs when a great amount of force is applied to the body for a period of time. The extent of the damage depends on just how long that period was. In addition to causing some direct soft-tissue damage, continued compression of the soft tissues will cut off their circulation, producing further tissue destruction. For example, if a patient's legs are trapped under a collapsed pile of rocks, damage to the leg tissues will continue until the rocks are removed.

Another form of compression can result from swelling that occurs whenever tissues are injured. The cells that are injured leak watery fluid into the spaces between the cells. If swelling is excessive or occurs in a confined space such as the skull, the tissue pressure will increase to dangerous levels. The pressure of the fluid may become great enough to compress the tissue and cause further damage. This is especially true if the blood vessels become compressed, cutting off blood flow to the tissue. This condition is called compartment syndrome. Excessive swelling often follows injury of the brain, the spinal cord, and the extremities.

Severe closed injuries can also damage internal organs. The greater the amount of energy absorbed from the blunt force, the greater the risk of injury to deeper structures. Therefore, you must assess all patients with closed injuries for more serious hidden injuries. Remain alert for signs of shock or internal bleeding, and begin treatment of these conditions if necessary.

Small contusions require no special emergency medical care. More extensive closed injuries may involve significant swelling and bleeding beneath the skin, which could lead to hypovolemic shock. Before treating a closed injury, make sure to follow BSI techniques. Soft-tissue injuries may look rather dramatic. However, you must still focus

on airway and breathing first. Provide O<sub>2</sub> and maintain the airway in patients who need it. Treat a closed soft-tissue injury by applying the acronym ICES:

**ICE**-(or cold pack) slows bleeding by causing blood vessels to constrict and also reduces pain.

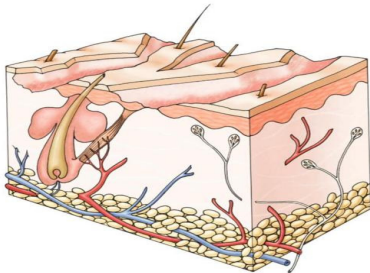
**COMPRESSION**-over the injury site slows bleeding by compressing the blood vessels.

**ELEVATION**-of the injured part just above the level of the patient's heart decreases swelling.

**SPLINTING**-decreases bleeding and also reduces pain by immobilizing a soft-tissue injury or an injured extremity.

In addition to using these measures to control bleeding and swelling, you should also be alert for signs of developing shock, including low blood pressure, increased heart rate, and cool or clammy skin. If the patient appears to be in shock, you should elevate his or her legs, give O<sub>2</sub> and transport to nearest facility.

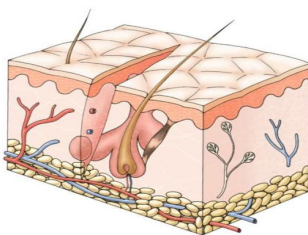
### **Abrasion:**



Abrasions usually do not penetrate completely through the dermis, but blood may ooze from the capillaries.

An abrasion is an open wound caused by scraping, rubbing, or shearing away of the epidermis. An abrasion usually does not penetrate completely through the dermis, but blood may ooze from the injured capillaries in the dermis. Known by a variety of names, including road rash, road burn, strawberry, and mat burn, abrasions can be extremely painful. Small abrasions usually are not life threatening. Large ones, however, may be cause for concern. Bleeding in such a case may not be serious, but contamination, infection, and the potential for underlying injuries may be.

### **Laceration:**

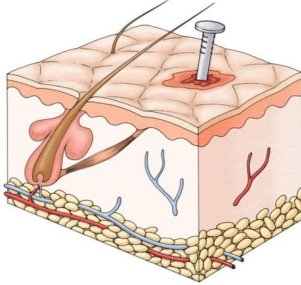


Lacerations vary in depth and can extend through the skin and subcutaneous tissue to the underlying muscles, nerves, and blood vessels. These wounds can be smooth or jagged as a result of a cut by a sharp object or a blunt force that tears the tissue.

A laceration is a break of varying depth in the skin. It may occur in isolation. It also may occur with other types of soft tissue injuries. Lacerations are caused by forceful impact with a sharp object. Bleeding may be severe, especially if an artery is involved. The edges of a laceration may be regular or irregular. Regular lacerations are usually caused by a knife or razor. They may heal better because their edges are smoother. Irregular

lacerations are commonly caused by a blunt object, serrated knife, or broken bottle. The edges of the wound are jagged, and healing is usually prolonged.

### **Puncture:**



Puncture wounds often have very little external bleeding but can damage structures deep within the body.

A puncture wound is usually the result of a sharp, pointed object being pushed or driven into the soft tissues. This type of injury may have both an entry wound and an exit wound. The entry wound may be small, and there may be little or no external bleeding. However, such injuries may be deep and damaging and cause severe internal bleeding. The overall severity of a puncture wound depends on the following factors:

- the location of the injury
- the size of the penetrating object
- the forces involved in creating the injury

It can be difficult to determine the extent of these injuries only on the basis of external signs. So, treat puncture wounds with great caution.

Management of the above open wounds consists of:

Assessment of Airway, Breathing, Circulation, maintain a patent airway and ensure adequate ventilations. Expose the entire injury site. Clear wounds of loose foreign material to prevent further contamination. Apply dressings and bandages to all wounds. Control bleeding. Begin with direct pressure and elevation. If bleeding still is not controlled, then use a pressure point.

### ***Procedure and considerations for assessing and managing injuries to the following:***

#### **Eyes:**

When you assess a patient with an eye injury, find out when the injury occurred, whether or not both eyes were affected, and what symptoms the patient first noticed. Then carefully examine the eyes separately and together with a small penlight. Proceed as follows:

- **Orbits**-Check for bruising, swelling, lacerations, tenderness, depression, and deformity.
- **Eyelids**-Check for bruising, swelling, and laceration.

- **Mucous membranes**-Check for redness, pus, and foreign objects.
- **Globes**-Check for abnormal coloring, laceration, and foreign objects.
- **Pupils**-Check for size, shape, equality. Also check for reaction to light.
- **Eye Movement**-Check to see that the eyes can move in all directions. Check for abnormal gaze or pain upon movement.

### **Special Considerations:**

If the patient is unconscious, close the eye lids if not contraindicated by injuries

#### Foreign Object

- reassure patient
- locate object visually
- if mobile and readily identified, attempt to remove object with the edge of a sterile dressing
- avoid pressing object into the eye
- roll eyelid up to visualize upper eye, if necessary
- do not attempt to remove the foreign body if it is adherent or imbedded in the lid or the globe
- if unable to remove foreign object or the object is adherent or imbedded to any structure
- place dressing over injured eye
- advise patient to limit movement of injured eye
- do not attempt to place a dressing over an injured eye if there is a foreign body in the lid or globe

#### Injured Orbit

- treat any open wounds (see Soft Tissue Injuries/Wounds, External and Internal Bleeding Guidelines)

#### Lid Injury

- treat any open wounds (see Soft Tissue Injuries/Wounds, External and Internal Bleeding Guidelines)
- protect underlying structures

#### Injured Globe (Eyeball)

- treat any open wounds (see Soft Tissue Injuries/Wounds, External and Internal Bleeding Guidelines)
- protect the eye using a cone or cup over the injured eye and bulky sterile dressings positioned to prevent any pressure being applied directly to the globe
- do not apply any pressure directly to the globe

#### Impaled Object

- do not remove the impaled object
- immobilize the impaled object (see Soft Tissue Injuries/Wounds, External and Internal Bleeding Guidelines)

- secure the object using a cone or cup over the impaled object and bulky sterile dressings positioned to stabilize the object and prevent movement of the object
- immobilize the patient, if required

#### Avulsed Eye

- do not attempt to put the eye back in the socket
- cover the avulsed eye with moist, sterile, saline soaked dressings
- secure the eye using a cone or cup over the avulsed eye and bulky sterile dressings positioned to stabilize the eye and prevent movement of the eye

In general, the uninjured eye should not be covered with dressings and bandages. If movement of the uninjured eye results in increased pain to the injured eye due to collateral movement the uninjured eye should be covered.

If this is done, care must be taken to monitor the patient's movements closely.

Emotional support should be provided as even the short term loss of vision may be an anxiety inducing episode.

#### **Neck:**

Common causes of neck injury include hanging (attempted suicide), impact with a steering wheel or running into a stretched wire or clothesline. Large wounds may involve injuries to the major vessels in the neck, which can produce massive, even fatal, bleeding. If a wound to the neck is left uncovered, air may be sucked into the vessels causing an obstruction (air embolism).

The signs and symptoms include the following:

- obvious lacerations or other wounds
- deformities or depressions
- obvious swelling, which sometimes occurs in the face and chest
- difficulty speaking, loss of the voice
- airway obstruction
- crackling sensations under the skin due to air leaking into the soft tissues (subcutaneous emphysema)
- increased venous congestion to head

Special Considerations regarding Throat Injuries:

- refer to Soft Tissue Injuries/Wounds, External and Internal Bleeding, Burns, and Poisoning Guidelines for management of soft tissue injuries to the throat
- in the event of venous hemorrhage, apply occlusive dressings to prevent an air embolus
- maintain a high level of suspicion for a cervical spine injury
- continuously monitor the patient for airway compromise due to swelling
- ensure that any direct pressure applied to control hemorrhage does not compromise the airway

- consider load and go with any throat injury
- monitor the patient closely for changes in status
- if external bleeding from the neck cannot be controlled with direct pressure
- control bleeding by using the carotid pressure point
- pressure should not be applied to both carotid arteries at the same time
- load and go should be initiated immediately

### **Face:**

Whenever there are significant soft tissue injuries to the face, there may also be underlying fractures. The signs and symptoms include the following:

- distortion of facial features
- numbness or pain
- bruising and swelling
- bleeding from the nose or mouth
- limited jaw motion
- teeth that do not meet normally; teeth that are missing
- double vision (with fracture of bones around the eyes)
- asymmetry of bones in the face (before swelling)

Secondary survey should include a complete head-to-toe survey with a minimum of patient movement.

Specific to the face:

- compare one side to the other
- orbits
  - swelling, bruising, lacerations, tenderness
- lids
  - swelling, bruising, lacerations
  - conjunctivae (mucous membrane investing the anterior surface of the eyeball and posterior surface of the lids)
  - redness, pus, foreign bodies, jaundice, lacerations
- globe
  - redness, abnormal coloring, lacerations, rupture, artificial eye
- pupils
  - shape, size, symmetry, reaction to light
- eye movement
  - spontaneous movement, dysconjugate movement, abnormal gaze, pain on movement, blurred or altered vision

## **Nose:**

Care for soft tissue injuries to the nose in the same way you would care for other such injuries. Take special care to maintain an open airway. Position the patient to prevent blood from draining into the throat.

The nose is the most commonly broken bone in the face. When it is broken, it will swell and appear to be deformed. To treat it, apply cold packs to reduce swelling. Arrange for patient transportation.

Foreign objects in the nose are usually a problem among small children. Reassure the child and parents, and arrange for transport to a hospital. Do not probe or try to remove the object because special lighting and instruments are required.

### Epistaxis (Nosebleed)

- establish ABCs
- control bleeding by applying dressing(s) below the nostrils and squeezing the nostrils together firmly with the fingers
- maintain the direct pressure
- apply cold packs to the nose
- be prepared for the patient to vomit
- do not allow patient to blow nose
- position the patient sitting upright and leaning forward
- supine (or other) position may be required if signs and symptoms of shock are present
- if the patient must be placed supine, turn the patient to side and monitor the airway
- treat for shock if required
- instruct patient to avoid swallowing
- have the patient attempt to spit out any blood into a basin
- bleeding from the nose or the escape of clear fluid may be due to head injury (see Central Nervous System Injuries Guideline)
- in cases of epistaxis associated with head injury in the unconscious patient, maintenance of a patent airway is the first priority
- suction may be required to keep the airway clear
- place dressings below the nostrils for bleeding control

### Foreign Body in the Nose

- do not attempt to remove the object
- establish ABCs
- control bleeding, if present, by applying dressing below the nostrils
- apply cold packs to the nose, if required
- obtain a history

Secondary survey should include a complete head-to-toe survey with a minimum of patient movement, specific to the nose look for:

- discharge, fluid, or blood
- swelling or deformity
- nasal flaring

- foreign body
- obstruction

### ***Functions and principles of dressings and bandages:***

In general, dressings and bandages have three primary functions:

- to control bleeding
- to protect the wound from further damage
- to prevent further contamination and infection

A dressing is a covering for a wound. It should be sterile. It should also be absorbent and large enough to protect the entire wound from contamination. Types of dressings include the following:

**Gauze pads**-these are usually individually wrapped and sealed to prevent contamination. Take care not to touch the portion of the gauze that is to make contact with the wound.

**Trauma dressing**-large and absorbent, this type of dressing is used on larger injuries and when maximum absorbency is needed.

**Bandage compress**-this is a gauze pad that is attached to the middle of a strip of bandaging material. The pad can be applied directly to an open wound with virtually no exposure to the air or your fingers.

**Occlusive dressing**-made of plastic wrap, aluminum foil, petroleum gauze, or other material, this dressing is used to form an airtight, moisture proof seal over a wound.

**Petroleum gauze**-this is a sterile gauze saturated with petroleum jelly to prevent it from sticking to a wound.

Large, thick, layered, bulky pads are also available. They come in several sizes for quick application to an extremity or to a large area of the trunk.

A bandage does not make contact with a wound. It is used to hold a dressing in place, create pressure to help control the bleeding, or provide support for an injured body part. Bandages should be applied firmly and fastened securely. They should not be so loose as to let the dressings slip. If a bandage becomes unfastened, the wound could bleed or become infected.

Before bandaging, remove the patient's jewellery and other potentially restricting materials such as tape. In case of swelling, these items can restrict circulation. Loosen bandages if the skin around them becomes pale or cyanotic, if pain develops, or if the

skin is cold, tingly, or numb distal to the bandage. Please note that improper bandaging can be defined in a court of law as negligence.

The types of bandages include the following:

**Triangular bandage**-this is used to support injured limbs, secure splints; form slings, and make improvised tourniquets. It can also be used to bandage the forehead or scalp.

**Cravat**-this is a triangular bandage that has been folded.

**Roller Bandage**-the self-adhering, form fitting, non-elastic roller bandage is the most popular and easy to use. Overlapping wraps cling together and can be cut and tied or taped in place.

### ***Principles of Application***

There are no hard and fast rules for dressing and bandaging wounds. In dressing and bandaging, use materials you have on hand and meet the general condition listed below:

- The material used for dressings should be sterile.
- Make sure that the dressing is opened carefully. Avoid contaminating it before it reaches the wound surface.
- The dressing should adequately cover the entire wound.
- Do not bandage a dressing in place until the bleeding has stopped. The exception is a pressure dressing, which is meant to stop the bleeding.
- All the edges of a dressing should be covered by the bandage. There should also be no loose ends of cloth or tape.
- Do not bandage a wound too loosely. Bandages should not slip or shift or allow the dressings beneath to slip or shift.
- Bandage wounds snugly but not too tightly. Be sure to ask the patient how the bandage feels. Be careful not to interfere with circulation.
- If you are bandaging a small wound on an extremity, cover a larger area with the bandage. This will help avoid creating a pressure point and will distribute pressure more evenly.
- Always place the body part to be bandaged in the position in which it is to remain. You can bandage across a joint but do not try bending a joint after the bandage has been applied to it.
- Tape bandages in place or tie them by using a square knot.
- Leave the fingers and toes exposed when the arms and legs are bandaged so that you can check for problems with circulation.
- Keep the bandage neat in appearance. You will be perceived as being more professional, which can result in easier patient management.

## ***Burns***

### ***Depth of Burn Characteristics, Definitions and Management***

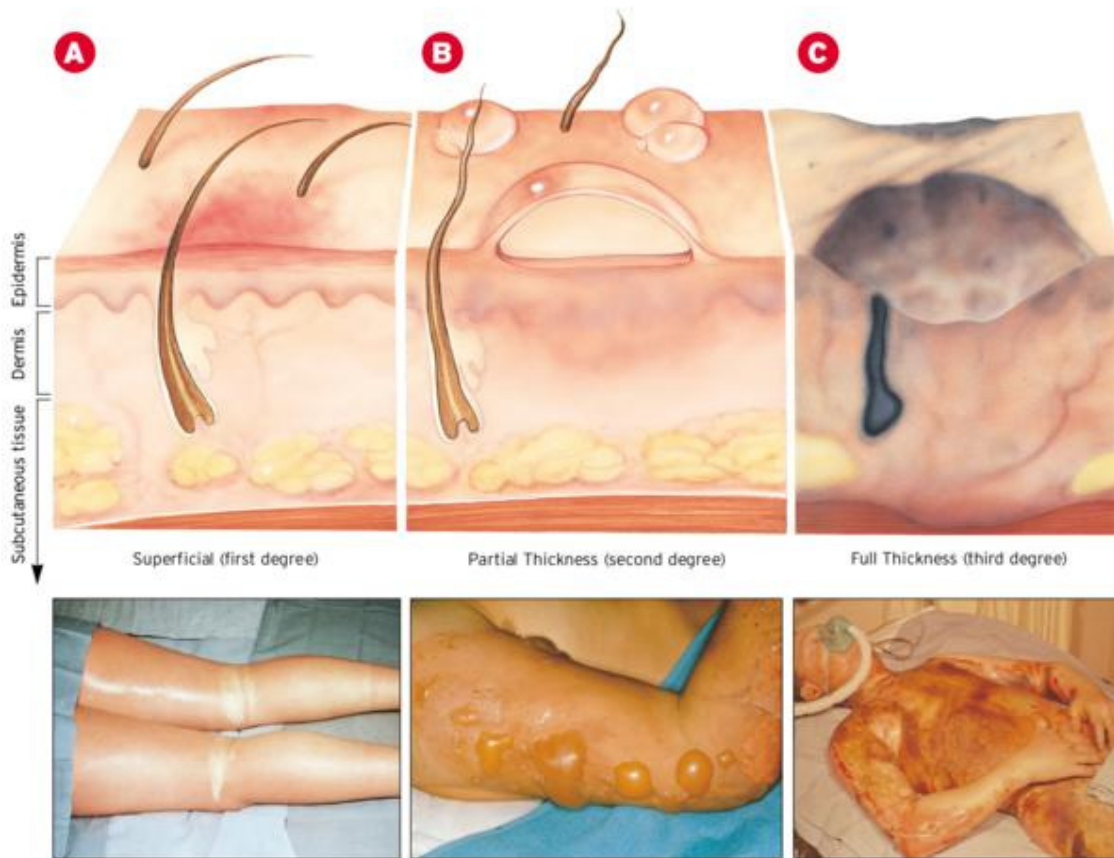
**First-Degree (Superficial) Burns:** Involve only the top layer of skin, the epidermis. A sunburn is a good example. Characterized by reddened skin, pain, and the absence of blisters.

**Second-Degree (Partial-Thickness) Burns:** Involve the epidermis and some portion of the dermis. These burns do not destroy the entire thickness of the skin, nor is the subcutaneous tissue injured. Characterized by a red or mottled appearance with associated swelling and blister formation. The surface may have a weeping, wet appearance and is painfully hypersensitive, even to air currents.

**Third-Degree (Full-Thickness) Burns:** Extend through all skin layers and may involve subcutaneous layers, muscle, bone, or internal organs. Usually appear dark and leathery. The skin also may appear translucent, mottled, or waxy white. The surface may be red and does not blanch with pressure. The surface is painless and generally dry. If the nerve endings have been destroyed, a severely burned area may have no feeling. However, the surrounding, less severely burned areas may be extremely painful.

The depth of burn is important in evaluating the severity of the burn, planning for wound care, and predicting complications.

EMS personnel must focus initial care for the burn patient on stopping the burn process and establishing and maintaining the ABCs.



### ***General Management of burn patients:***

- ensure personal safety and safety of bystanders
- personal protective equipment should be utilized as appropriate
- body substance isolation techniques and equipment should be utilized as appropriate
- remove the patient from the burn or radiation source
- specially trained personnel may be required to access the patient and transport them to a safe environment
- stop the burning process
- consider cervical spine precautions
- maintenance of an open airway and ensuring adequate respirations has priority over all other treatments including control of the cervical spine
- calm and reassure the patient

### **Primary survey**

- establish ABCs
- consider an inhalation injury with potential airway compromise if any or all of the following clinical indicators are present
- history of altered mental status

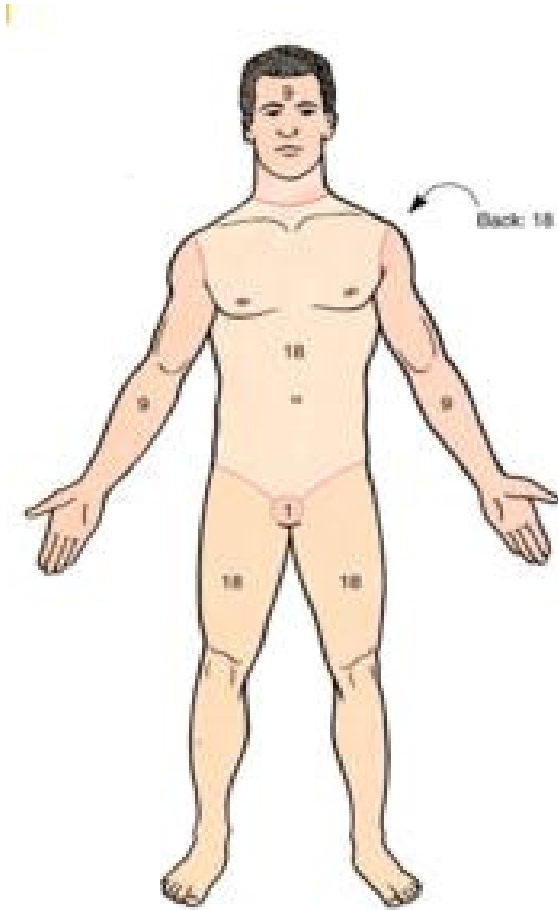
- history of confinement in a burning environment (e.g. trapped in a closed fire environment)
- burns to the head, face, nose, mouth, neck, or torso
- singed eyebrows and nasal hair
- carbon deposits in the nose or mouth
- acute inflammatory changes in the oropharynx
- carbonaceous sputum
- stridor
- explosion with burns to head and torso
- presence of any of these findings suggests acute inhalation injury
- these injuries require immediate and definitive care and close monitoring for changes in the patient's respiratory status
- load and go should be considered if any of these are present
- administer 100% oxygen and support respirations as required
- repeat and record vital signs at regular intervals (5-15 mins.) or when there is a change in the patient's status

### **Secondary survey**

- estimate percentage of body surface area injured by using the Rule of Nines
- estimate depth of burn
- assess for other injuries
- initial treatment of injuries should be based on the patient's signs and symptoms
- pay particular attention to the presence of the following injuries, because they are associated with particular complications
- direct thermal injury
- upper airway edema or obstruction
- inhalation of products of incomplete combustion (carbon particles) and toxic fumes
- tracheal and bronchial inflammation, edema, and pneumonia
- carbon monoxide (CO) poisoning
- respiratory distress, chest pain, altered mental status, seizures, coma
- remove jewelry from any extremity that has been burned if possible, without further injuring the patient
- jewelry may need to be cut off in order to remove it
- document the disposition of jewelry removed
- treat burns
- do not apply any ointment to a burn
- do not break blisters
- treat for shock, if indicated
- treat other injuries if the patient's condition permits
- cold compresses should not be used for pain control
- do not continue to apply cool saline or water to the burns once the burning process has been stopped
- ongoing application of cold solutions may cause hypothermia
- maintain high concentration oxygen delivery to the patient
- assist ventilations if required

- do not allow the patient to exert him/herself - e.g. walking, standing unassisted to transfer to the stretcher, etc.
- load and go should be initiated if a significant burn is recognized, or there are potentially life-threatening complications due to the burn
- on scene times should be kept to a minimum
- treat other life-threatening conditions en route
- transport the patient to the nearest appropriate health care facility
- notify the receiving health care facility of the patient's status as soon as possible
- monitor and treat the patient en route
- additional surveys and treatments should be conducted en route
- document all actions including the decision to initiate load and go
- report all findings to the receiving facility staff, and document on the patient care report

## Rule of Nines for Estimation of Body Surface Area Affected by Burn



### ADULT

head & neck 9%

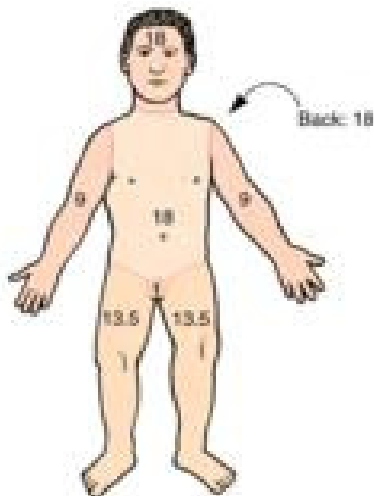
anterior trunk 18%

posterior trunk 18%

each upper extremity 9%

external genitalia 1%

each lower extremity 18%



### Child (1-8yrs) and Infant

head 18%

posterior trunk 18%

anterior trunk 18%

each upper extremity 9%

each lower extremity 14%

- as a general guide, the area of the patient's palm is approximately one per cent (1%) of the patient's body surface area
- this can be used as a tool to estimate the total area burned
- body surface area distribution in a young child or infant differs considerably from the body surface area distribution for an adult
- the infant or young child's head represents a larger portion of the surface area, and the lower extremities a lesser portion, when compared to an adult
- the percentage of total body surface of the small child and infant's head is twice that of the normal adult

### **Burn Transport Classifications:**

#### **Severe Burns** – initiate load and go

Includes all burns complicated with airway or respiratory problems, major or multiple fractures, or major wounds.

- 1st degree burns over more than 70% of the body
- 2nd degree burns over more than 30% of the body
- 3rd degree burns over more than 10% of the body
- 3rd degree burns involving critical areas – face, hands, feet, genitalia or perineum, or areas overlying major joints
- any burn on an infant
- significant electrical burns
- significant chemical burns
- burn injury in patients with a serious preexisting medical condition (e.g. diabetes, cardiac, respiratory, drug therapy, etc.)
- burn injury complicated by trauma or cardiopulmonary arrest
- burn injury with inhalation injury or airway compromise

#### **Moderate Burns** – consider initiating load and go

- 1st degree burns that cover 50% - 70% of the body
- 2nd degree burns involving 15% - 30% of the body
- 3rd degree burns involving less than 10% of the body, excluding the face, hands, or feet

#### **Minor Burns** – consider initiating load and go based on underlying or complicating factors

- 1st degree burns that involve less than 50% of the body
- 2nd degree burns that involve less than 15% of the body
- 3rd degree burns that involve less than 2% of the body, excluding the face, hands, or feet

## **Specialized Care:**

A burn is an injury that results from contact with heat, chemical agents, electricity or radiation. Soft tissue burns occur secondary to thermal (heat), electrical, chemical or radiation insult to the body. Complications often found in patients with burns include:

- airway or respiratory difficulties
- shock (due to loss of intravascular volume)
- pain
- swelling
- infection post injury
- fractures
- entrance/exit wounds
- when responding to a scene involving fire, chemical spills, electrocution, or radiation hazard, the first priority must be for the EMS personnel's safety - see Poisoning Guideline
- thermal injury patients frequently develop hypothermia or shock
- maintain a high level of suspicion for complications in patients with smoke inhalation
- maintain a high level of suspicion for airway problems in patients with burns involving the face, head, neck, chest, or patients who were confined in a fire environment
- pulse oximeter readings are often inaccurate and misleading in patients who have been in an enclosed fire where carbon monoxide was present
- fractures and muscle injuries are common complications in incidents of electrical shock
- elevate burned limb(s) if possible, and position patient according to injury
- transportation of burn patients should not be delayed
- transport should be to the nearest appropriate health care facility
- EMS personnel trained and certified in the use of morphine or fentanyl may do so to manage pain associated with the burns, as outlined in the Burn Management Protocol
- EMS personnel trained and certified in the use of nitrous oxide – oxygen mixture may do so to manage pain associated with the burns, as outlined in the Nitrous Oxide – Oxygen (50:50 mixture) Protocol

## **Inhalation Burns:**

Greater than half of all fire-related deaths are caused by smoke inhalation. About 80% of those who die in residential fires do so only because they have inhaled heated air or smoke and other toxic gases. Smoke inhalation is the leading cause of death and a major cause of disability among firefighters. Suspect inhalation injury in any patient who was burned in a fire, especially if the patient was confined in an enclosed space. The severity of an inhalation injury is determined by the following factors:

- singed nasal hairs
- burns to the face
- burned specks of carbon in the sputum

- sooty or smoky smell on the breath
- respiratory distress
- noisy breathing
- hoarseness, cough, difficulty speaking
- restricted chest movement
- cyanosis

If any of these signs and symptoms is present, administer humidified oxygen, if it is available. Note that this type of injury may appear to be mild at first and then become more severe. Closely monitor the patient's airway and breathing. Be prepared to assist ventilations, if necessary.

### **Chemical Burns:**

It is very difficult in the field to assess the severity of chemical burns. The general guideline is to treat all chemical burns as critical. Speed is essential. The faster you stop the burning process and initiate care, the less severe the burn will be.

### **Management:**

- attempt to identify the contaminant before treating; water may intensify the reaction.
- inform the receiving health care facility of the nature of the patient's exposure to the hazardous materials so decontamination procedures (if not done at the scene) and treatment preparations can be initiated
- do this as early as possible to permit adequate preparation time at the receiving facility
- an additional ambulance(s) and additional EMS staff may be required to transport the patient if the initial EMS personnel or their ambulance become contaminated
- remove contaminant - see Poisoning Guideline
- flush the contaminated areas on the patient with saline or water if appropriate
- extensive flushing of the patient's skin or eyes may be required (often 20 minutes)
- load and go should be immediately initiated only once the contaminant is removed
- attempting to remove the contaminant while en route can result in significant chemical exposure to the crew and contamination of the ambulance
- transport should be initiated immediately only if criteria for load and go are met and there is an immediate threat to life
- avoid contamination of other areas of the patient or EMS personnel

#### **On the skin:**

- remove contaminated clothing and flush the skin with saline or water for twenty minutes
- if contaminant is dry powder, brush off thoroughly before flushing the skin

#### **In the eye:**

- flood the eye with lukewarm saline or water for twenty minutes

- position the patient so runoff from the eye does not contaminate the other eye or other areas of the patient
- have the patient blink frequently during irrigation
- cover burned eye with moist dressings, then cover moist dressings with dry dressings

### **Electrical Burns:**

Electrical burns may be the result of contact with high or low-voltage electricity. Your safety is of particular importance when you are called to the scene of an emergency involving electricity. You must never attempt to remove someone from an electrical source unless you are specially trained to do so. There is always a burn injury where the electricity entered the body (an entrance wound) and another where it exited (an exit wound). The entrance wound may be quite small, but the exit wound can be extensive and deep. There are two dangers specifically associated with electrical burns. First, there may be a large amount of deep tissue injury. Electrical burns are always more severe than the external signs indicate. Second, the patient may go into cardiac arrest from the electric shock.

### **Management:**

- eliminate the electrical contact or shut off the power
- monitor the patient for possible cardiac arrhythmias.
- if the patient is in cardiac arrest, initiate CPR and defibrillate as per Defibrillation Protocol
- consider load and go
- treat as thermal burns
- consider cervical spine injuries
- initiate cervical spine control in primary survey
- immobilize if required
- consider other possible injuries (fractures, dislocations)
- immobilize if required
- treat for shock, if indicated

### **Corneal Burns:**

- often found as a complication to flash burns to the face
- assess for airway burns
- rinse the eyes with saline or water
- cover both eyes with moist, sterile dressings

### **Thermal Burns:**

Moderate to Severe

- maintain high concentration oxygen delivery to the patient
- assist ventilations if required
- assess the patient for airway and respiratory complications

- if there is evidence of an impending airway obstruction or severe respiratory compromise, and advanced life support (ALS) is available, EMS personnel should request early response of these personnel to the scene or consider an ALS intercept while en route
- initiation of transport should not be delayed for ALS arrival
- cover burned area with moist dressings, then cover moist dressings with dry dressings
- initiate early load and go
- monitor the patient's status closely
- initiate load and go at any point during assessments if dictated by the patient's condition

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