Firefighter Pre-Hospital Care Program
Module 20

Burns and Injuries to
Soft Tissues, Face &
Musculoskeletal System
Remember to:

Look for:

C - contusions
L - lacerations
A - abrasions
P - punctures
S - symmetry
D - deformity
Remember to...

Feel for...

T - tenderness
I - instability
C - crepitus
S - symmetry / swelling
D - deformity
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Musculoskeletal Injuries
Anatomy and Physiology of the Musculoskeletal System

• Cardiac Muscle
  – Efficiently conducts the force and stimulus for a contraction but has a limited ability to repair itself

• Skeletal Muscle
  – Are long, slender and responsible for body movement. Partial repairs are possible after injury

• Smooth Muscle
  – Are small, slender and responsible for digestion. They can regenerate after injury
Skeletal System

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How Things Are Connected

- **Ligaments**
  - Attach bone to bone

- **Tendons**
  - Attach muscle to bone

- **Cartilage**
  - Cushions between bones and joints
Types of Musculoskeletal Injuries

• Fracture
  – Broken bone

• Dislocation
  – Disruption of a joint

• Sprain
  – Joint injury with tearing of ligaments

• Strain
  – Stretching or tearing of a muscle
Age Considerations

Minimal force required to cause injury

• Children
  – Due to soft bones, fractures are often incomplete ( e.g. greenstick )

• Elderly
  – Fractures common due to disease pathogens such as Osteoporosis
Mechanism of Injury

- Force may be applied in several ways:
  - Direct blow
  - Indirect force
  - Twisting force
  - High-energy injury
Fractures

• Closed fracture
  – A fracture that does not break the skin

• Open fracture (Compound)
  – External wound associated with fracture

• Non-displaced fracture
  - Simple crack of the bone

• Displaced fracture
  - Fracture in which there is actual deformity
Signs and Symptoms of a Fracture

- Deformity
- Tenderness
- Guarding
- Swelling
- Bruising
Signs and Symptoms of a Fracture cont..

- Crepitus (bone ends grinding)
- False motion (movement where there is not supposed to be)
- Exposed fragments
- Pain
- Locked joint
Signs and Symptoms of a Dislocation

- Marked deformity
- Swelling
- Pain
- Tenderness on palpation
- Virtually complete loss of joint movement
- Numbness or impaired circulation to the limb and digit
Signs and Symptoms of a Sprain

- Tenderness can be elicited over injured ligaments
- Swelling can appear at the point of injury to the ligaments
- Pain
- Instability of the joint is indicated by motion outside the normal range
Minor Injuries

- Minor sprains
- Fractures or dislocations of fingers / toes
Moderate Injuries

- Open fractures of the fingers / toes
- Non-displaced long bone fractures
- Major sprains of a major joint
Serious Injuries

- Displaced long bone fractures
- Multiple hand and foot fractures
- Open long bone fractures
- Pelvic fractures
- Dislocations of major joints
- Multiple finger / toe amputations
- Laceration of major nerves or blood vessels
Severe Life-Threatening Injuries
(Survival Is Threatened)

- Multiple closed fractures
- Limb amputations
- Fractures of two or more long bones (e.g. bilateral femur fractures)
- Spine or skull fractures
- Pelvic fractures
Rapid Physical Exam for Significant Trauma

• Complete a Primary Patient Assessment

• If you find no external signs of injury, ask patient to move each limb carefully, stopping immediately if this causes pain.

• Skip this step if the patient reports neck or back pain. Slight movement could cause permanent damage to spinal cord.
Focused Physical Exam for Minor or Moderate Trauma

• Evaluate circulation, motor function, sensation (neurovascular function)
• If two or more extremities are injured, update EMS.
  – Severe injuries are more likely if two or more bones have been broken
• Recheck neurovascular function before and after splinting
• Impaired circulation can lead to loss of the limb
Assessing Neurovascular Function

- If anything causes pain, do not continue that portion of exam

- Pulse
  - Palpate the pulse distal to (below) the suspected injury
Assessing Neurovascular Function cont..

- Capillary refill
  - Note and record skin colour
  - Press the tip of the fingernail or toenail in the affected limb to make the skin blanch. If normal colour does not return within 2 seconds, you can assume that circulation is impaired.

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Assessing Neurovascular Function cont..

- Sensation
  - Check feeling in the fingers or toes of the affected limb
  - Ask the patient “which finger / toe am I touching” during your assessment

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Assessing Neurovascular Function cont..

- Motor function
  - Evaluate the ability to move the affected limb
  - Ask the patient to open and close his or her fist
  - Ask the patient to wiggle his or her toes
Splinting

• Use splinting to protect known or potential bone & joint injuries
• Flexible or rigid device used to protect extremity
• Injuries should be splinted prior to moving patient, unless the patient is critical
• Splinting helps prevent further injury
• Improvise splinting materials when needed
General Principles of Splinting

- Remove clothing from the area
- Note and record the patient’s neurovascular status
- Cover all open wounds with a dry, sterile dressing
- Do not move the patient before splinting
General Principles of Splinting cont..

- Immobilize the joints above and below the injured joint
- Pad all rigid splints
- Apply cold packs if swelling is present
- Maintain manual immobilization
- Splint the limb as is
Applying a Rigid Splint

• Provide gentle support and in- traction of the limb

• Another firefighter places the rigid splint alongside or under the limb

• Place padding between the limb and splint as needed
Applying a Rigid Splint cont..

- Secure the splint to the limb with bindings
- Assess and record distal neurovascular function
Avoid the Hazards of Improper Splinting

• Injury to tissue, nerves, blood vessels, or muscle
  – Avoid overly tight binding
  – Frequently reassess neurovascular function

• Delay in transport of a patient with a life-threatening condition
  – Critical patients are transported with minimal splinting
Clavicle and Scapula Injuries

- Clavicle is one of the most fractured bones in the body
- Scapula is well protected and rarely fractured
- Splint with a sling and swathe
Dislocation of the Shoulder

- Most commonly dislocated large joint
- Usually dislocates anteriorly
- Is difficult to immobilize
A patient with a dislocated shoulder will guard the shoulder, trying to protect it by holding the arm in a fixed position away from the chest wall.

Allow the patient to select a position of comfort.
Dislocation of the Shoulder cont..

- Splint the joint with a pillow or towel between the arm and the chest wall.
- Apply a sling and a swathe.
Fractures of the Humerus

• Occurs either proximally, in the midshaft, or distally at the elbow

• Splint with sling and swathe, supplemented with a padded board splint

• Always splint as found, as further injury may occur if the limb is repositioned
Elbow Injuries

• Fractures and dislocations often occur around the elbow

• Injuries to nerves and blood vessels common

• Assess neurovascular function carefully
Fractures of the Forearm

- Usually involves both radius and ulna
- Use a padded board, quick or improvised splint
Fractures of the Forearm cont..

- A fracture of the distal radius produces a characteristic silver fork deformity

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Injuries to the Wrist and Hand

- Cover all wounds
- Form hand into the position of function (as shown below)
- Place a roller bandage in palm of hand
- Apply padded board splint
- Secure entire length of splint
- Apply a sling and swathe
Fractures of the Pelvis

• May involve life-threatening internal bleeding
• Assess pelvis for tenderness
• Stable patients can be secured to a long backboard or scoop stretcher to immobilize isolated fractures of the pelvis
Dislocation of the Hip

- Hip dislocation requires significant mechanism of injury
- Splint in position of comfort
Fractures of the Femur

• Presents with very characteristic deformity
• Fractures from trauma injuries best managed with traction splint
• Isolated fracture in geriatric patients can be managed with long backboard
• Muscle spasms can cause deformity of the limb
• Significant amount of internal blood loss will occur
Fractures of the Femur cont..

• A femur fracture may be rotated

• Splint the injured leg to the uninjured leg

• Secure the patient to a scoop stretcher or backboard, as directed by EMS
Injuries of Knee Ligaments

- Knee is very vulnerable to injury
- Patient will complain of pain in the joint and be unable to use the extremity normally
- Splint from hip joint to foot
- Always check distal circulation
Injuries to the Tibia and Fibula

- Usually, both bones fracture at the same time
- Open fracture of tibia common
- Stabilize with a padded rigid long leg splint that extends from the foot to upper thigh
Injuries to the Tibia and Fibula cont..

Because the tibia is so close to the skin, open fractures are quite common.
Ankle Injuries

- Most commonly injured joint
- Dress all open wounds
- Assess distal neurovascular function
- Splint in position found

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Foot Injuries

• Usually occur after a patient falls or jumps
• Immobilize ankle joint and foot
• Leave toes exposed to assess neurovascular function
• Elevate foot 6”
• Also consider possibility of spinal injury from a fall
Foot Stabilization

A pillow splint can provide excellent stabilization of the foot

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Keep In Mind…

Frequently after a fall, the force of the injury is transmitted up the legs to the spine, sometimes resulting in a fracture of the lumbar spine.
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Soft Tissue Injuries
Bleeding

- Soft tissue injuries can be associated with significant blood loss
- Hemorrhage = bleeding
- Body cannot tolerate greater than 20% blood loss
- Blood loss of 1 L can be dangerous in adults; in children, loss of 100-200 mL is serious
Suspect Serious Bleeding When ..

• Significant mechanism of injury
• Poor general appearance of patient
• Assessment reveals signs of shock
• Significant amount of blood loss noted
• Blood loss is rapid
• You cannot control external bleeding
Characteristics of Bleeding

- **Arterial**
  - Blood is bright red and spurts

- **Venous**
  - Blood is dark red and does not spurt

- **Capillary**
  - Blood oozes out and is controlled easily
Characteristics of Bleeding cont..

Capillary Bleed

Venous Bleed

Arterial Bleed

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Blood Clotting

• Bleeding normally stops within 10 minutes
• Some medications interfere with clotting
• Some injuries will be unable to clot
• Patients with hemophilia lack clotting factors
Controlling External Bleeding

• Follow PPE precautions
• Ensure patient has an open airway and adequate breathing
• Provide oxygen if necessary
• There are several methods to control bleeding
Direct Pressure

- Direct pressure is the most common and effective way to control bleeding
- Apply pressure with gloved finger or hand
- Apply a pressure dressing

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Applying a Tourniquet

• Use as a “last resort to control bleeding” only

• Fold a triangular bandage into 4” cravat

• Wrap the bandage

• Use a stick as a handle to twist and secure the stick

• Write “TK” and time and place on patient
Tourniquet Precautions

• Place as close to injury as possible, but not over joint
• Never use narrow material
• Never cover a tourniquet with a bandage
• Do not loosen the tourniquet once applied
Bleeding from the Nose, Ears, and Mouth

Causes:

- Skull fractures
- Facial injuries
- High blood pressure
- Coagulation disorders
Controlling a Nosebleed

• Follow PPE precautions
• Help the patient sit and lean forward
• Apply direct pressure by pinching the patient’s nostrils
Bleeding from Skull Fractures

- Do not attempt to stop the blood flow
- Loosely cover bleeding site with sterile gauze
- If cerebrospinal fluid is present, a target (or halo) sign may be apparent
Care for an Impaled Object

- DO NOT remove the object
- Stabilize object and control any bleeding with a sterile dressing
- Use bulky dressings “log cabin” around object in order to stabilize
- Secure bulky dressings
- Reassess neurovascular function
Internal Bleeding

• Internal bleeding may not be readily apparent

• Assess patient’s:
  – Mechanism of injury
  – Nature of illness
  – Vital Sign’s
Signs and Symptoms of Internal Bleeding

- Bruising
- Bleeding beneath the skin
- Blood in vomit
- Black, tarry stool
Signs and Symptoms of Internal Bleeding cont..

- Coughing up blood
- Pain, tenderness, bruising, guarding, or swelling
- Broken ribs, bruises over the lower chest, or rigid, distended abdomen
Signs of Shock

- Change in mental status
- Tachycardia (fast heart rate)
- Weakness
- Thirst
- Nausea or vomiting
- Cold, moist skin
- Shallow, rapid breathing
- Dilated pupils
- Weak, rapid pulse
- Decreased blood pressure
- Altered level of consciousness
Emergency Medical Care

- Follow PPE precautions
- Maintain airway and administer oxygen
- Control external bleeding and care for any internal bleeding
- Monitor and record vital signs
- Elevate legs and keep patient warm
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Burns

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Extent of Burns / Rule of 9’s

- Used to divide body into areas that represent % of body surface area (BSA)

- Used when estimating extent of large burns

- If burn area is small, estimate by using patient’s palm of hand

- Palm of hand = 1% BSA
Classification of Burns

Superficial

Partial Thickness

Full Thickness

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Superficial Burns  
( First Degree )

- Involve only top skin layer

- Signs and Symptoms include pain and redness
Partial Thickness Burns
( Second Degree )

- Involve epidermis and some portion of dermis
- In addition to the signs of a superficial burn, blistering is evident
Full Thickness Burns
( Third Degree )

- Extend through all layers of skin
## Classification of Burn Severity: Adults

<table>
<thead>
<tr>
<th>Severity</th>
<th>Burn Depth</th>
<th>BSA / Complicating Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Full</td>
<td>&lt; 2% BSA, not involving face, hands, feet, genitalia, or resp. tract</td>
</tr>
<tr>
<td>Minor</td>
<td>Partial</td>
<td>&lt; 15% BSA</td>
</tr>
<tr>
<td>Minor</td>
<td>Superficial</td>
<td>&lt; 50% BSA</td>
</tr>
<tr>
<td>Moderate</td>
<td>Full</td>
<td>2 – 10% BSA, not involving face, hands, feet, genitalia, or resp. tract</td>
</tr>
<tr>
<td>Moderate</td>
<td>Partial</td>
<td>15 – 20% BSA</td>
</tr>
<tr>
<td>Moderate</td>
<td>Superficial</td>
<td>&gt; 50% BSA</td>
</tr>
<tr>
<td>Critical</td>
<td>Partial or Full</td>
<td>Injury to resp. tract, other soft tissue, bone injury</td>
</tr>
<tr>
<td>Critical</td>
<td>Partial or Full</td>
<td>Face, hands, feet, genitalia, resp. tract</td>
</tr>
<tr>
<td>Critical</td>
<td>Full</td>
<td>&gt; 10% BSA</td>
</tr>
<tr>
<td>Critical</td>
<td>Partial</td>
<td>&gt; 30% BSA</td>
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<tr>
<td>Critical</td>
<td>Partial or Full</td>
<td>Musculoskeletal Injury</td>
</tr>
<tr>
<td>Critical</td>
<td>Partial or Full</td>
<td>Involving circumferential burns</td>
</tr>
</tbody>
</table>
Pediatric Needs

- Burns to children are considered more serious than burns to adults
- Children have more surface area relative to body mass than adults
- Burns may result from abuse
- Report all suspect cases of abuse to the authorities
Critical Burns in Infants and Children

- Full-thickness burns covering more than 10% of total body surface area

- Burns involving hands, feet, face, upper airway, genitalia
Moderate Burns in Infants and Children

- Partial-thickness burns covering 10% to 20% of total body surface area
Minor Burns in Infants and Children

• Partial-thickness burns covering less than 10% of total body surface area
Emergency Care for Burns

- Follow proper PPE precautions

- Move patient away from burning area

- Rapidly cool down burn area with cool water or saline solution

- Cover with non-absorbent, dry dressing
Chemical Burns

- Consider HAZMAT notification
- Occur whenever a toxic substance contacts the body
- Eyes are particularly vulnerable
- Fumes can cause burns
- To prevent exposure, wear appropriate gloves and eye protection
Care for Chemical Burns

- Remove the chemical from the patient
- If it is a powder chemical, brush off first
- Remove all contaminated clothing
- Follow MSDS treatment recommendations
Care for Chemical Burns

- Flush burned area with large amounts of water for about 15 to 20 minutes

- Assess the patient for any critical injuries
Chemical Burn to the Eye

• Hold open eyelid while flooding eye with a gentle stream of water

• Continue flushing for 15 minutes
Electrical Burns

- Make sure power is off before touching patient

- There will be two wounds (an entrance and an exit wound) to bandage

- Be prepared to administer CPR
For All Questions Pertaining to this Module,

Contact Your E.M.S. Command Coordinator.

North – (416) 338-9901

South – (416) 338-8796

East – (416) 338-9428

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