Firefighter Pre-Hospital Care Program
Module 17

Head, Spine & Spinal Cord Emergencies
Firefighter Pre-Hospital Care Program

Module 17

At the end of the lesson and upon completion of the post test quiz, the participant will demonstrate an understanding of:

• how to accurately assess a patient head, spine, and/or spinal cord injury.
• how to determine priorities related to head, spine, or spinal cord injuries
• how to provide emergency patient care in a safe manner, consistent with local standards and Base Hospital direction
• how to evaluate the effectiveness of treatment measures
• how to perform ongoing assessments and interventions in response to the patient’s presentation, changing treatment requirements and environmental variables
Anatomy and Physiology of the Skeletal System

- Skull is divided into cranium and face.
- They are designed to protect the brain and organs of the face (eyes, airway, etc.)
- The spinal column is composed of vertebra (bones) and soft intervertebral disks.
- They are designed to protect the spinal cord while allowing bending and twisting movements.
- Damage to the spinal column can result in paralysis.
Anatomy of the Skull

The skull is made of 22 bones. All of them (except the mandible) become fused together during childhood to form one solid unit.

- Frontal bone
- Maxilla
- Mandible (jawbone)
Anatomy of the Skull (Posterior View)

- Occipital bone
- Mastoid process
The Spinal Column

- Cervical: (7 Vertebrae)
- Thoracic: (12 Vertebrae)
- Lumbar: (5 Vertebrae)
- Sacrum: (5 Vertebrae Fused to 1)
- Coccyx: (4 Vertebrae Fused to 1)
Firefighter Pre-Hospital Care Program
Module 17

Head, Spine & Spinal Cord Injuries
Scalp Lacerations

- Scalp has a rich blood supply. Serious bleeding can result from scalp wounds alone.

- In addition, there may be more serious, deeper injuries.

- Bleeding from the scalp can usually be controlled with bulky pressure dressings. Care must be taken not to apply pressure on brain tissue, eye injuries, or other soft tissues that may have also been injured.
Skull Fracture

- Indicates significant force

- Signs
  - Obvious deformity
  - Visible crack in the skull
  - Raccoon eyes
  - Battle’s sign
  - Cerebrospinal fluid draining from ears or nose (clear fluid, or clear fluid mixed with blood)
  - Brain tissue visible
Concussion

• Brain injury

• Temporary loss or alteration in brain function

• May result in unconsciousness, confusion, or amnesia

• Brain can sustain bruise when skull is struck.

• There may be internal brain bleeding and swelling.

• Bleeding will increase the pressure within the skull and can be life-threatening.
Intracranial Bleeding

• Laceration or rupture of blood vessel in brain
  – Subdural (bleeding from veins on the outside of the brain)
  – Intracerebral (bleeding inside the brain tissue)
  – Epidural (bleeding from a torn artery on the outside of the brain)
Other Brain Injuries

• Brain injuries are not always caused by trauma.

• Medical conditions may cause spontaneous bleeding in the brain.

• Other considerations - Electromotor dysfunction (seizure disorders), brain tumors, ...

• Signs and symptoms of non-traumatic injuries are often the same as those of traumatic injuries.
  – There is no mechanism of injury.
  – History will usually review a sudden onset of headache or alteration of mental status.
  – Often hard to tell the difference between bleeding and stroke until they have a CT scan at the hospital.
  – OPQRST and SAMPLE history should be ascertained.
Signs and Symptoms of a Head Injury

- Lacerations (cuts), contusions (bruises), hematomas (accumulation of blood) to scalp
- Soft areas or depression upon palpation
- Visible skull fractures or deformities
- Ecchymosis (bruising) around eyes and behind the ear
- Cerebral Spinal Fluid leakage
Signs and Symptoms of a Head Injury continued...

• Failure of pupils to respond to light
• Unequal pupils
• Loss of sensation and/or motor function
• Period of unconsciousness
• Amnesia
• Seizures
Signs and Symptoms of a Head Injury continued…

- Numbness or tingling in the extremities
- Irregular respirations
- Dizziness
- Visual complaints
- Combative or abnormal behavior
- Nausea or vomiting
Injuries of the Nose

• Blunt trauma to the nose can result in fractures and soft-tissue injuries.

• In a head-injured patient, cerebrospinal fluid coming from the nose is indicative of a basal skull fracture. This is a rare event, but ominous if you see it.

• Bleeding from soft-tissue injuries of the nose may cause vomiting.
Keep In Mind...

• Injuries to the face can cause an airway obstruction

• Bleeding from the face can be profuse

• Loose teeth may lodge in the throat
Facial Fractures

• A direct blow to the mouth or nose can result in a facial fracture.

• Severe bleeding in the mouth, loose teeth, or movable bone fragments indicate a break.

• Fractures around the face and mouth can produce deformities.

• Severe swelling may obstruct the airway.
Blunt Injuries of the Neck

- A crushing injury of the neck may involve the larynx or trachea.

- A fracture to these structures can lead to subcutaneous emphysema.

- Be aware of complete airway obstruction
Penetrating Injuries of the Neck

- They can cause severe bleeding.
- The airway, esophagus, and spinal cord can be damaged from penetrating injuries.
Spine Injuries

- Compression injuries occur from a fall.

- Motor vehicle crashes or other types of trauma can overextend, flex, or rotate the spine.

- Distraction: When spine is pulled along its length; causes injuries.
  - Hangings are an example.
Significant Mechanisms of Injury

- Any of the following should prompt a high degree of suspicion for dangerous and multiple injuries:
  - Motor vehicle and motorcycle crashes
  - Pedestrian-motor vehicle collisions
  - Falls from greater than 15 feet or 3 times the patient’s height
  - Blunt or penetrating trauma to the head or torso
  - Hangings
  - Diving accidents
Firefighter Pre-Hospital Care Program
Module 17

Treatment for Head, Spine & Spinal Cord Emergencies
Treatment for Head, Spine and Spinal Cord Emergencies

- Complete a full primary assessment
- At the start of the assessment, have one firefighter maintain in-line neck stabilization if head or spinal injury is suspected.
- Administer supplemental oxygen at 10 L/min via non-rebreathing mask.
Treatment for Head, Spine and Spinal Cord Emergencies (continued)

- Be sure to assess CLAPS-D and TICS-D
- Obtain a detailed history including SAMPLE and OPQRST assessments
- Decreased level of consciousness may indicate a head injury
- Look for blood or cerebral spinal fluid (CSF) from the ears, nose or mouth
Patient Assessment

• Look for bruising around eyes (peri-orbital ecchymosis) and behind ears (mastoid bruising)

• Evaluate pupils.

• Do not probe scalp lacerations. Do not remove an impaled object.
Patient Assessment

- Watch for change in level of consciousness
- Use AVPU scale (A=alert, V=responds to verbal, P=responds to pain, U=unresponsive) or Glasgow Coma Scale
- Pain, tenderness, weakness, numbness, and tingling are signs of spinal injury
- May lose sensation or become paralyzed
- May become incontinent (loss of bladder or bowel contents)
# Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Eye Opening</th>
<th>Spontaneous</th>
<th>To Voice</th>
<th>To Pain</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal Response</th>
<th>Oriented</th>
<th>Confused</th>
<th>Inappropriate Words</th>
<th>Incomprehensible Sounds</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor Response</th>
<th>Obeys Command</th>
<th>Localizes Pain</th>
<th>Withdraw (pain)</th>
<th>Flexion (pain)</th>
<th>Extension (pain)</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Baseline Vital Signs/
SAMPLE History

- Complete set of baseline vital signs is essential.
- Assess pupil size and reactivity to light; continue to monitor.
- Gather as much history as possible while preparing for transport.
Patient Care for Head Injuries

• Control bleeding

• Fold torn skin flaps back down onto the skin bed

• Do not apply excessive pressure

• If dressing becomes soaked, place a second dressing over it

• Assess the patient’s baseline level of consciousness
Patient Care for Head Injuries

- Once bleeding has been controlled, secure with a soft self-adhering roller bandage
- Monitor and treat for shock
- Protect airway from vomiting
Care of Soft-Tissue Injuries

- Control bleeding by applying direct pressure.

- Complete spinal immobilization if you suspect a spinal injury.
Care of Facial Injuries

• Assess the ABC’s and care for all life threatening injuries

• Blood draining into the airway may lead to vomiting. Monitor the airway closely

• Take appropriate precautions if you suspect a spinal injury
Injuries of the Nose

- Blunt trauma to the nose can result in fractures and soft-tissue injuries.
- Cerebrospinal fluid coming from the nose is indicative of a basal skull fracture.
- Simple nosebleeds can be controlled by pinching the nostrils.
- External bleeding from soft-tissue injuries of the nose can be controlled with a dressing.
Penetrating Injuries of the Neck

- Apply direct pressure to control bleeding.
- Place an occlusive dressing on a neck wound.
- If there appears to be a sucking neck wound (air bubbling out), use an Asherman Chest Seal or 3 sided dressing.
- Secure the dressing in place with roller gauze, adding more dressing if needed.
- Wrap gauze around and under patient’s shoulder, NOT all the way around the neck.
Patient Care for Spinal Injuries

• Manage the airway. If required consider:
  – Performing a jaw-thrust maneuver to open the airway.
  – Inserting an oropharyngeal airway if the patient is unresponsive
  – Administer oxygen.

• Stabilize the cervical spine.
Stabilization of the Cervical Spine

- Hold head firmly with both hands.
- Support the lower jaw.
- Move to neutral alignment when ready to apply cervical collar (eyes-forward position)
- If you meet with resistance or the patient complains of an increase in pain, **STOP**, and secure in the position found
Stabilization of the Cervical Spine

• Support head while partner places cervical collar.

• Maintain the position until patient is secured to a backboard.
Immobilization Preparation for a Supine Patient

- Maintain in-line stabilization.
- Have the other team members position the cervical collar.
- Log roll patient.
Immobilization Preparation for a Supine Patient

- Secure patient to backboard.
- Reassess pulse, motor, and sensory function in each extremity and continue to do so periodically.
Immobilization Preparation for a Seated Patient

- Maintain manual in-line stabilization.
- Apply a cervical collar.
- Place a short board, such as a KED, behind patient.
- Position device around patient.
Immobilization Preparation for a Seated Patient

• Turn patient and lower to long backboard.

• Secure short and long backboards together.

• Reassess the pulse, motor function, and sensation.
Sizing a Cervical Collar

- One firefighter provides continuous manual in-line support of the head.
- Measure from the top of the patient's shoulder to the bottom of their chin.
- Transfer that measurement to the sizing lines on the cervical collar.
Sizing a Cervical Collar

Once the collar has been adjusted:

- Push in ratchet latches (arrows)

- Engage safety buttons to secure sizing
Applying a Cervical Collar

- One firefighter provides continuous manual in-line support of the head.
- Measure the proper size collar.
- Flip the chin piece from the back of the collar to the front of the collar.
Applying a Cervical Collar

- Place the chin support snuggly under the chin.
- Wrap the collar around the neck.
- Ensure that the collar fits.
Backboards

Short backboards/Kendrick Extrication Device (KED)
  • Used on patients found in a sitting position

Long backboards
  • Provide full-body immobilization
Factors to Consider before Helmet Removal

- Is the airway clear and is the patient breathing adequately?

- Can airway be maintained and ventilations assisted with helmet in place?

- How well does the helmet fit?

- Can the patient move within the helmet?

- Can the spine be immobilized in a neutral position with the helmet on?
Factors to Consider before Helmet Removal

A helmet that fits well prevents the head from moving and should be left on, as long as:

– There are no impending airway or breathing problems.
– It does not interfere with assessment and treatment of the airway.
– You can properly immobilize the spine.
Helmet Removal

- Open the face shield.
- Prevent head movement.
- Partner places hands at back of head and under mandible.
- Gently slip helmet off halfway.
Helmet Removal

• Partner ensures hands are positioned appropriately and the head is secure.

• Completely remove the helmet.

• Second responder controls Cervical Spine on either side of the head in order to facilitate C-Collar application

• Apply cervical collar.

• Pad as needed.
Pediatric Requirements

- Immobilize a child in the car seat, if possible.
Pediatric Requirements

- Children may need extra padding to around them or under their shoulders in order to maintain immobilization.
For All Questions Pertaining to this Module, Contact Your E.M.S. Command Coordinator.

North / West – (416) 338-9429

South / East – (416) 338-8796