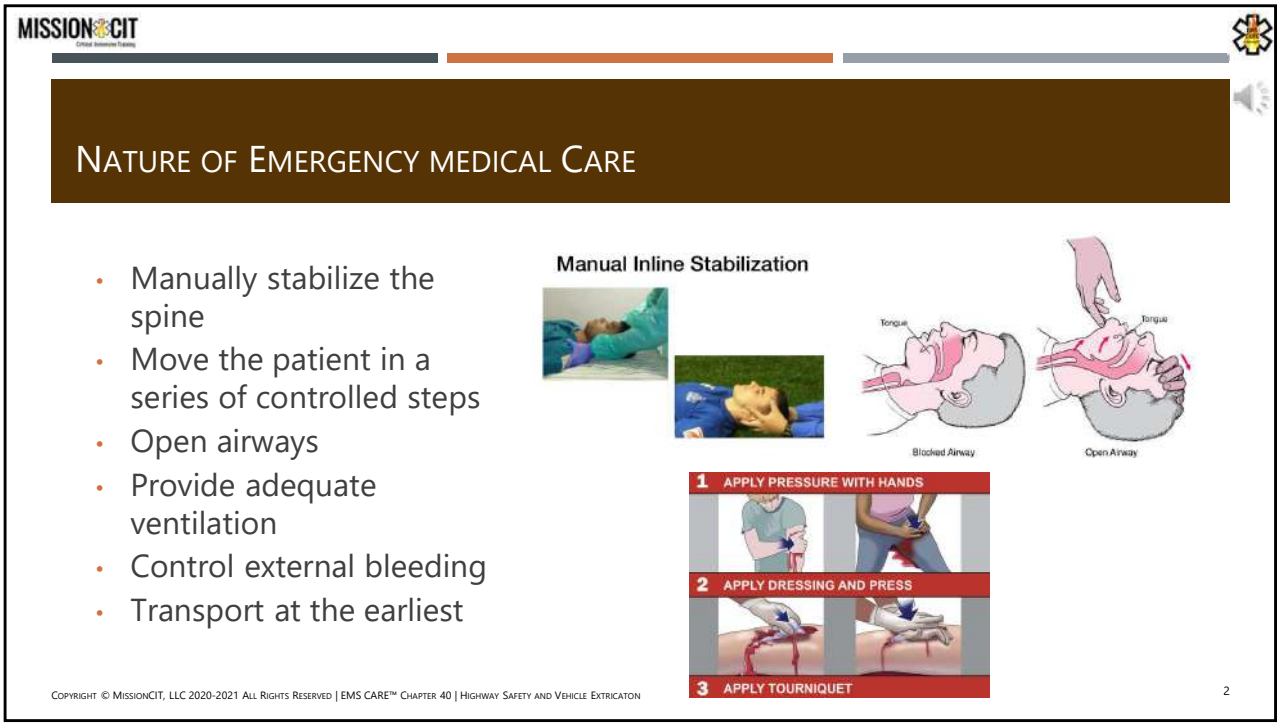




PROVIDING EMERGENCY MEDICAL CARE

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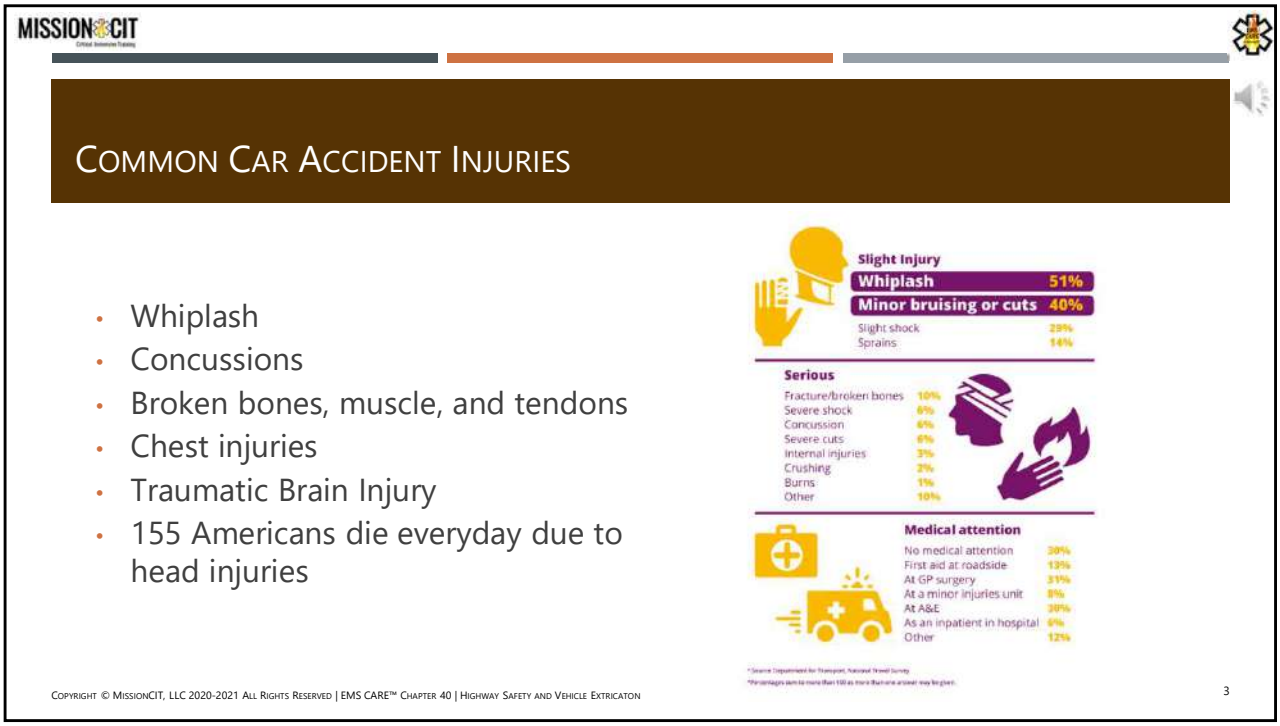
In this last lesson, we'll talk about providing emergency medical care to patients. The timely emergency pre-hospital care and subsequent transportation of accident victims to the health facility may help reduce the accident and injury outcomes. Available evidence suggests that Road traffic accidents victims stand a greater chance of survival if attended to and cared for in a timely manner.



One of your primary roles would be to provide emergency medical care to the patients involved in the accident. Some of the things you can do are:

- Manually stabilize the spine.
- If you're involved in the extrication, move the patient in a series of controlled steps.
- Open the airway and ensure that the patient is breathing.
- Provide adequate ventilation.
- Take steps to control external bleeding.
- Look for external hemorrhage and transport the

patient at the earliest.



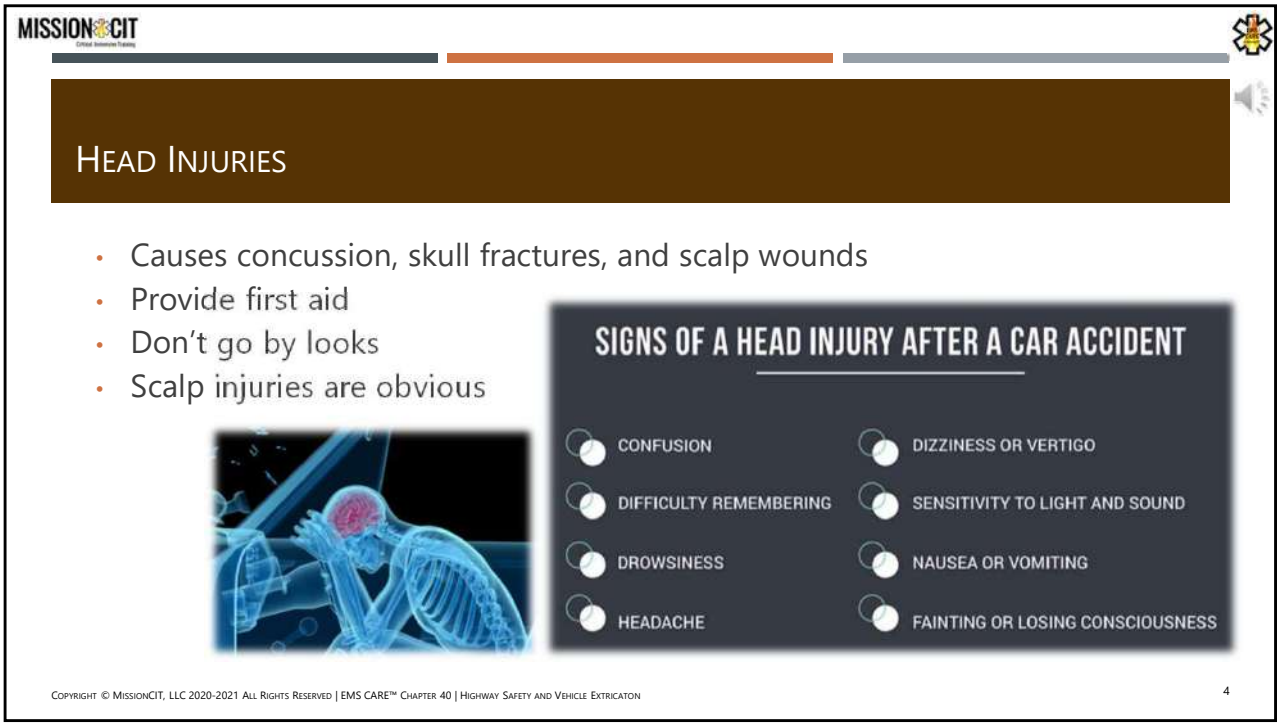
Some of the common car accident injuries that you'll see are:

- When the car stops or turns suddenly, it causes your neck to whip back and forth rapidly, and this can cause pain or injury to your neck muscles and tendons.
- When a passenger's head is thrown back and forth, it can cause a serious injury called a concussion, even if the head doesn't make physical contact with any object. A patient may have symptoms such as headache, dizziness, and even temporary loss of

consciousness.

- Broken bones are extremely common due to the blunt force of the car or the compression due to the crash.
- Chest injuries occur when the steering wheel or dashboard presses against the seat belt. It is characterized by a sharp pain in the chest, shock, bruising, and even trouble breathing.
- When the brain is violently moved, it results in a traumatic brain injury. Headaches, seizures, memory loss, loss of balance, poor concentration, and nausea are some of the symptoms of these injuries.

Out of these, trauma and damage to the head are a common cause of fatal injuries. The CDC estimates that each day an average of 155 Americans die from these injuries. So, let’s talk in detail about how you can handle them.



As mentioned earlier, head injury is an injury to your brain, skull, or scalp that causes concussions, skull fractures, and scalp wounds. You have to provide first aid based on the nature of the injury.

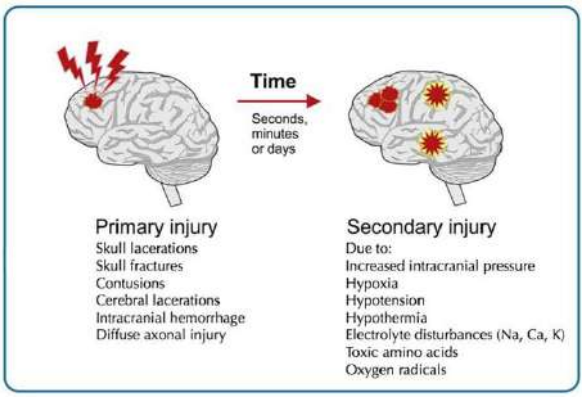
A word of caution here. Don't go by just looks when it comes to head injury because many major injuries don't bleed at all.

Let's start with the scalp injuries as they are probably the

most obvious, because you'll notice profuse bleeding due to the presence of many blood vessels in this area. In such situations, provide the necessary first aid to control bleeding and transport the person right away.

Primary and Secondary Head Injuries

- Primary injury is initial impact
- Secondary injury is chemical or perfusion changes
- Secondary injuries can be reduced with trauma care



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Moving on to head injuries, primary and secondary brain injuries are the processes that occur when a patient suffers head trauma. The primary injury occurs during the initial impact, as many physical structures of the brain tend to get displaced due to the impact. The secondary brain damage, on the other hand, happens a few minutes to hours later due to chemical or perfusion changes that occur due to the injury.

The good news is many of the secondary brain injuries and their intensity can be reduced with proper first aid and trauma care.

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MECHANISMS OF INJURY

- Being aware:
  - ✓ Deformity of the vehicle
  - ✓ Deformity of interior structures
  - ✓ Deformity or injury patterns of the patient
- Three-collision concept:
  - ✓ Machine collision
  - ✓ Body collision
  - ✓ Organ collision

MVC-related Mechanisms of Injury

Pathway	Potential Injuries
Unrestrained—"up and over"	Head, face, and neck injuries from impact with windshield or sunroof Chest injuries—steering wheel impact Abdominal injuries—steering wheel impact (dependent upon body habitus) Airbag injury to face, neck, chest Lower extremity injury if tangled under dash/gas-brake pedals
Unrestrained—"down and under"	Lower extremity injuries—crush mechanism; entrapped in pedals, knee fracture/dislocation, hip fracture/dislocation Pelvis injury impact Abdominal injury—crush, impalement, body habitus affects Possible chest injury, neck injury



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Depending upon the choice of restraint, the individual has several potential injuries while in the vehicle. The unrestrained occupant has a greater chance of ejection from the seat through the “up and over” mechanism or entrapment under the dashboard via the “down and under” path.

Be aware of the following clues in the mechanism of injury:

- Deformity of the vehicle (indication of forces involved

– energy exchange)

- Deformity of interior structures (indication of where the patient impacted – energy exchange)
- Deformity or injury patterns of the patient (indication of what parts of the body may have been impacted)

Utilizing the three-collision concept, check for the presence of the following:

- Machine collision: Look for front-end deformity of the vehicle
- Body collision: Check the steering wheel for ring fracture and deformity and the column for any displacement
- Organ collision: Look for traumatic tattooing of patient's skin

Head-on Collision

- Direct trauma signs:
  - ✓ Lacerations of mouth and chin
  - ✓ Contusion/bruises of the anterior neck
  - ✓ Traumatic tattoos of the chest wall
  - ✓ Bruising of the abdomen
- Organs susceptible to shearing injuries:
  - ✓ Aortic arch, liver, spleen, kidneys and bowel
- Compression injuries common for:
  - ✓ Lungs, heart, diaphragm and urinary bladder



Steering wheel injuries.

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The head-on collision is entirely dependent on the area of the body that impacts with the steering wheel, dashboard, or other portion of the vehicle's interior. Signs may be readily visible, with direct trauma such as lacerations of mouth and chin, contusion/bruises of the anterior neck, traumatic tattoos of the chest wall, and bruising of the abdomen.

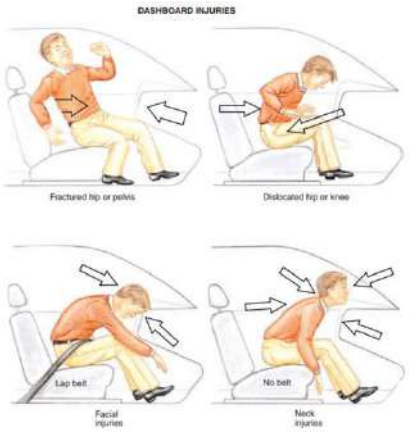
Deeper structures and organs may harbor occult injuries due to shearing forces, compression forces, and displacement of kinetic energy.

Organs that are susceptible to shearing injuries due to

their ligamentous attachments are the aortic arch, liver, spleen, kidneys, and bowel. With the exception of small-bowel tears, those injuries are sources for occult bleeds and hemorrhagic shock. Compression injuries are common for the lungs, heart, diaphragm, and urinary bladder.

Dashboard Injuries

- Knee trauma:
  - ✓ Simple contusion
  - ✓ Severe compound fracture of patella
  - ✓ Frank dislocation of knees
  - ✓ Fracture of proximal tibia
  - ✓ Fracture of the femur or fractured hip
- Other injuries:
  - ✓ Acetabulum and pelvic fractures
  - ✓ Hemorrhage leading to shock



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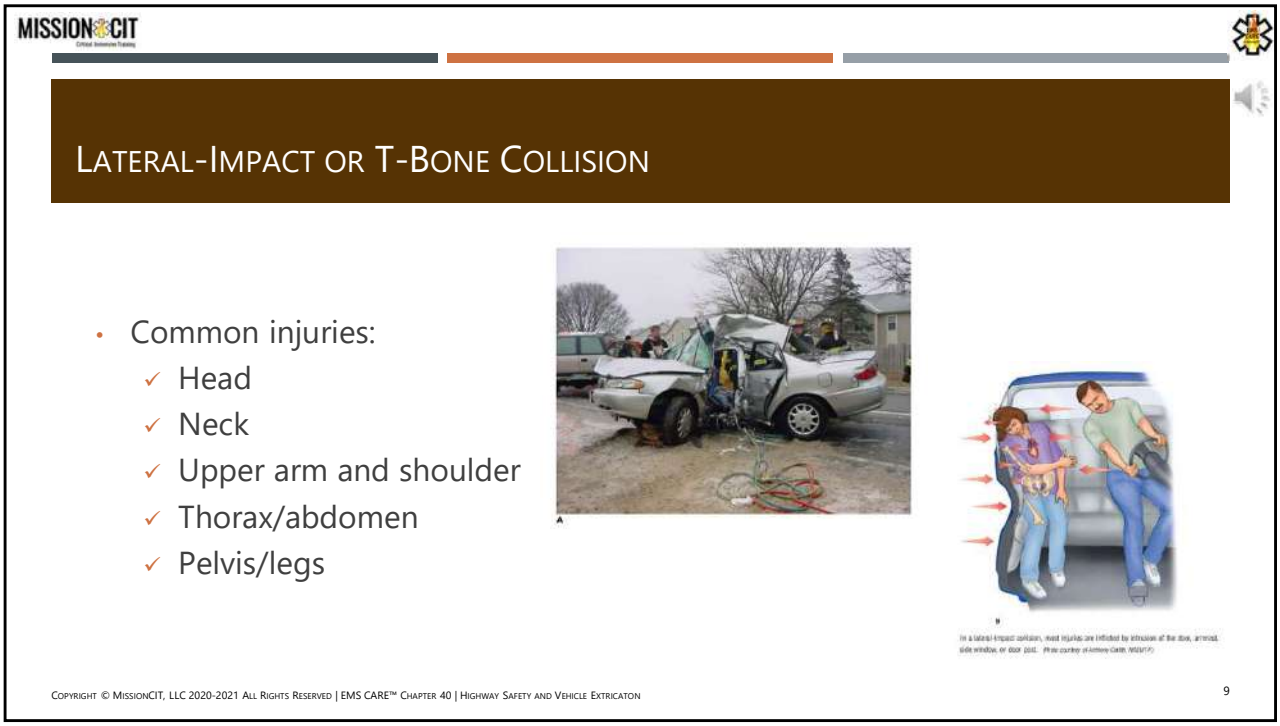
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Dashboard injuries occur most often to an unrestrained passenger. The dashboard has the capability of producing a variety of injuries, depending on the area of the body that strikes the dashboard. Most frequently, injuries involve the face and knees.

Facial, brain, and cervical-spine injuries have already been mentioned. These are more likely if the crash forces send the victim up over the dash into the windshield. Knees commonly impact with the dashboard, especially if the patient is thrown down

under it. Knee trauma may range from a simple contusion to a severe compound fracture of the patella. Frank dislocation of the knees also can occur, along with fractures of the proximal tibia. In addition, kinetic energy may be transmitted proximally and result in fracture of the femur or fractured/dislocated hip. On occasion, the pelvis can impact with the dash, resulting in acetabulum and pelvic fractures. Such pelvic injuries are often associated with hemorrhage that may lead to shock. Maintain a high index of suspicion, and always palpate the femurs, gently squeeze the pelvis, and palpate the symphysis pubis.

Deceleration collisions are most commonly associated with secondary collisions with people or loose objects in the vehicle, which can become missiles causing deadly injuries.



The mechanism of the lateral-impact collision is similar to that of the frontal impact collision, with the addition of lateral energy displacement.

Look for the following common injuries:

- Head. Coup/contracoup is due to lateral displacement.
- Neck. Lateral displacement injuries range from cervical muscle strain to fracture or subluxation with neurologic deficit.

- Upper arm and shoulder. Injuries appear on the side of the impact and are common, as are injuries to the lower extremities.
- Thorax/abdomen. Injury is due to direct force either from inward bowing of the door on the side of the impact or from an unrestrained passenger being propelled across the seat. Injuries vary from soft-tissue injuries to flail chest, lung contusion, pneumothorax, hemothorax, or possible traumatic aortic dissection. Abdominal injuries include those to solid and hollow organs.
- Pelvis/legs. Occupants on the side of the impact are likely to have pelvic, hip, or femur fractures. Pelvic injuries may also include dislocation, bladder rupture, and urethral injuries.

Rear-Impact Collision

- Common injuries:
  - ✓ Posterior displacement
  - ✓ Possible hyperextension of cervical spine
  - ✓ Lumbar-spine injury
  - ✓ Cervical-spine injuries
  - ✓ Associated deceleration



A Victim moves ahead while head remains stationary. Head rotates backward. Neck extends.

B Head snaps forward. Head rotates forward. Neck flexes.

Mechanism of cervical-spine injury in a rear-impact collision.

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In the most common form of rear-impact collision, a stationary car is struck from the rear by a moving vehicle. Or a slower-moving car may be impacted from the rear by a faster-moving car.

The sudden increase in acceleration produces a posterior displacement of the occupants, and possible hyperextension of the cervical spine if the headrest is not properly adjusted. If the seatback breaks and falls backward into the rear seat, there is a greater chance of lumbar-spine injury. Rapid forward deceleration may also occur if the car suddenly strikes something in the

front, or if the driver applies the brakes suddenly. The potential for cervical-spine injuries is great. Be alert for associated deceleration injuries as well.

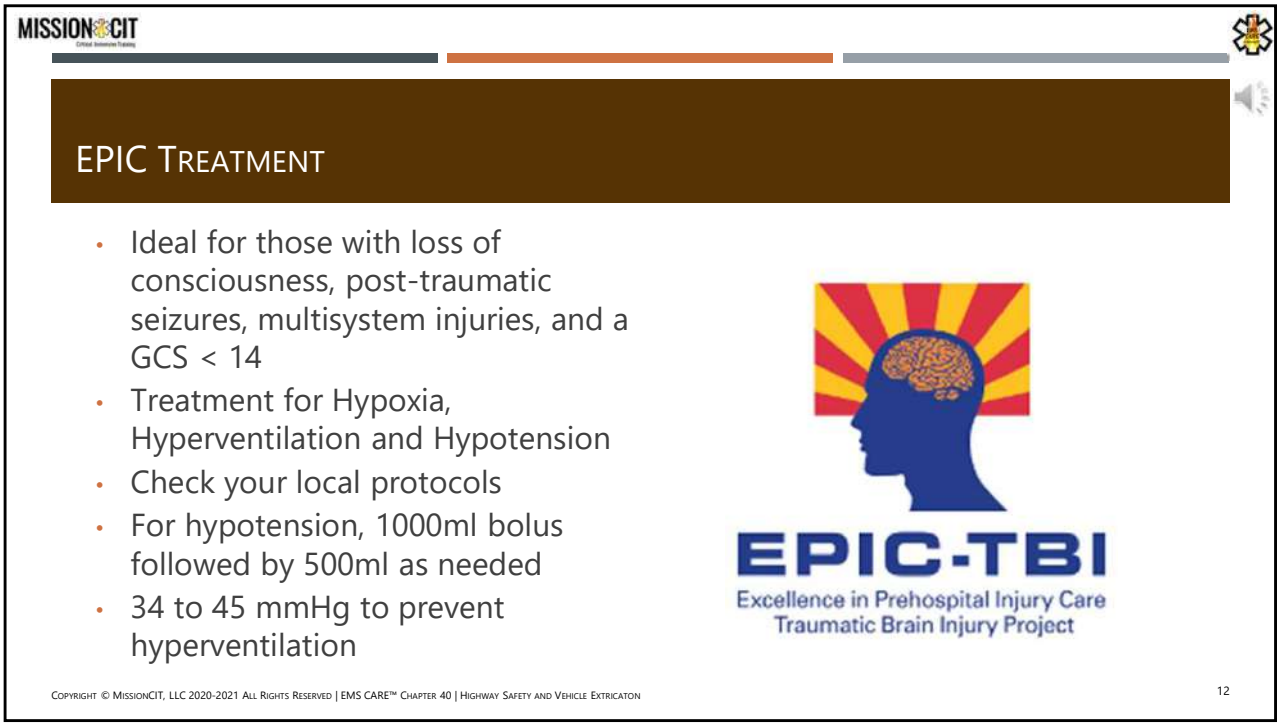


Pre-hospital emergency medical service (PHEMS) is a vital part of the health system and emergency safety net which provides care and transports injured patients from the scene of the accident to the appropriate hospital. NAEMT's Pre-hospital Trauma Life Support (PHTLS) concept aims to improve pre-hospital care for patients with major trauma.

The program is based on a pre-hospital trauma care philosophy, stressing the treatment of the multi-system trauma patient as a unique entity with specific needs. This may require an approach to the trauma patient that

varies from traditional treatment modalities. PHTLS promotes critical thinking as the foundation for providing quality care. It is based on the belief that, given a good fund of knowledge and key principles, EMS practitioners are capable of making reasoned decisions regarding patient care.

The timely and adequate management including quick referral of the trauma patient into a designated trauma center may limit secondary injury and may thus improve outcomes already during the pre-hospital phase of care. The professional treatment of multiple injured trauma patients begins at the scene in the context of a well-structured pre-hospital emergency medical system. The “Primary Survey” is performed by the emergency physician at the scene according to the PHTLS-concept. The overall aim is to rapidly assess and treat life-threatening conditions even in the absence of patient history and diagnosis (“treat-first-what-kills-first”). If no immediate treatment is necessary, a “Secondary Survey” follows with careful and structured body examination and detailed assessment of the trauma mechanism.



Since proper treatment can prevent secondary brain injuries, a team at Arizona University developed an EMS-centric brain injury project called EPIC that standards for Excellence in Pre-hospital Injury Care. This treatment is not under implementation in the State of Connecticut yet but surely provides some interesting insights.

This treatment is deemed to be ideal for those who experience one or more of the following:

- Loss of consciousness.
- Post-traumatic seizures.
- Multisystem injuries or trauma that requires

intubation.

- A Glasgow Coma Score less than 14.

Typically, the EPIC treatment centers around treatment for Hypoxia, Hyperventilation, and Hypotension.

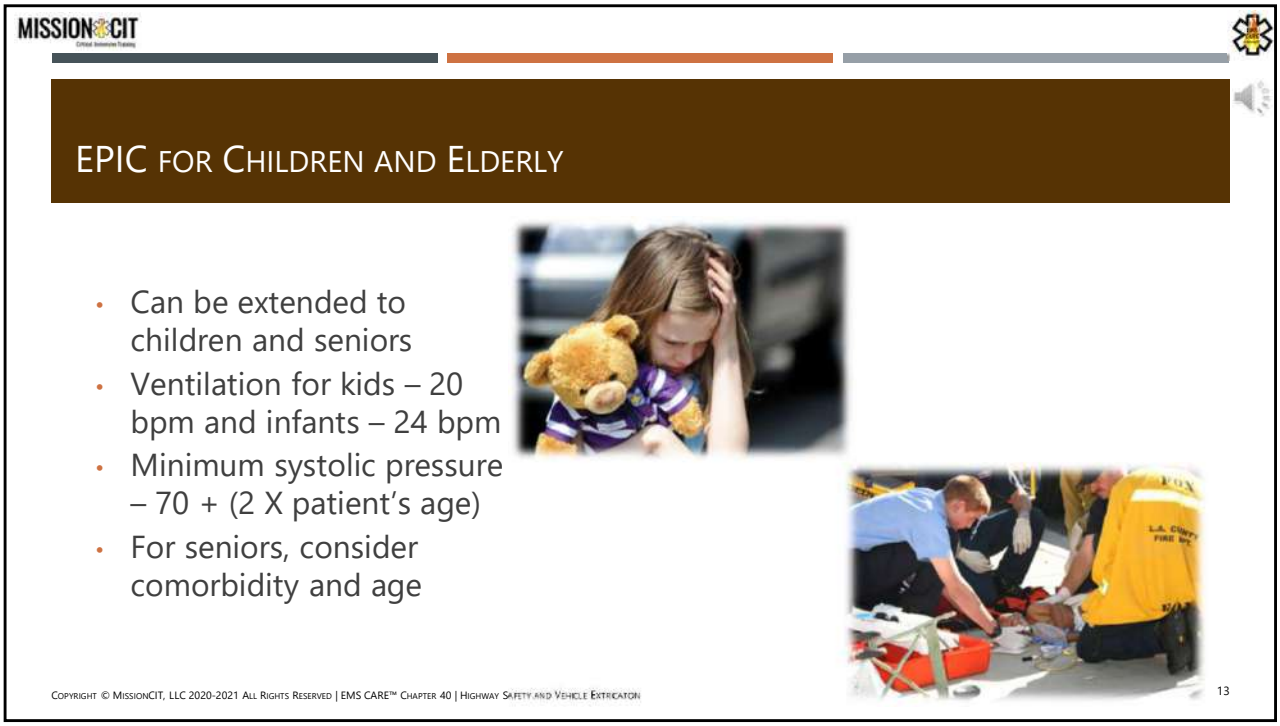
Hypotension and Hypoxia are known to double the chances for mortality in injured patients, while hyperventilation can happen inadvertently while caring for a patient, and that's why EPIC focuses on these three conditions specifically.

Though EMTs may not be eligible to provide EPIC, it still helps to know what needs to be done to increase the chances of survival.

For patients suffering from hypoxia, provide oxygen as early as possible, even if the SpO2 is above 90 percent. As for hypotension, EPIC recommends an initial 1000ml bolus followed by 500ml as needed.

When it comes to hyperventilation, EPIC recommends that too much carbon dioxide can cause vasoconstriction, hence 34 to 45 mmHg is considered

ideal.



EPIC treatment can be done to children and seniors as well, though the exact value will change. Kids also benefit from the high levels of oxygen, so go ahead and start it early, provided your local protocols allow it. The ventilation rates must be around 24 bpm for infants and 20bpm for children. The minimum systolic pressure you must maintain is 70 + (2 X patient's age).

For seniors, consider their co-morbidities and age. Also, many of them are likely to take blood thinners, so watch out for those as well.



Spinal injuries are also a common occurrence, so spinal immobilization is a common kind of treatment you have to provide, subject to local protocols. In general, consider spinal immobilization if you think the patient is suffering from a head or spinal injury. Altered mental status and neurological deficits may also warrant spinal immobilization. It can also be used when a patient has,

- Low GCS or evidence of drug or alcohol intoxication
- Midline tenderness at the back of the cervical spine
- Any spinal deformity
- Presence of similar injuries

At the same time, it merits to note that there is a growing body of evidence that spinal immobilization is overused, even where it’s not needed. So, avoid immobilization if it causes discomfort or distress for the patient, likely to delay prehospital care, restrict respiration, and if the patient has Ankylosing spondylitis or any other pre-existing spinal deformity.



Some of the different ways to immobilize a patient with spinal injuries are as follows:

- The hard collar is being used since the mid-1960s to stabilize the cervical spine though there is little evidence to support its positive impact. However, the American Association of Neurological Surgeons continues to suggest these hard collars as a way to stabilize a spinal cord in a pre-hospital setting.
- A hardboard is a long spinal board that is often used with hard collars to safely transport a patient. As with other strategies, there is some skepticism on its

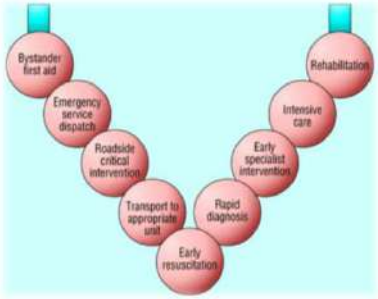
positive outcome and some EMS organizations also advocate for a soft vacuum mattress instead.

- Blocks are a part of the inline mobilization strategy that is known to be effective when strapping the patient on a spinal board. It is also used with hard collars.

Many researchers are advocating for alternate methods and some even contend that spinal immobilization increase discomfort and pain for the patients. So, it is up to you to use your clinical acumen to decide what is best for the patient in the given scenario.

Continuum of Care

- Bystander first aid
- Emergency service dispatch
- Roadside critical intervention
- Transport to the appropriate unit
- Early resuscitation
- Rapid diagnosis
- Early specialist intervention
- Intensive care
- Rehabilitation





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Pre-hospital system care can be a lifesaver in many road accidents. A continuum of care has been developed over the years and it is believed that if every link in this continuum is well-executed, then the patient has the highest chances of recovery.

The continuum consists of:

- Bystander first aid
- Emergency service dispatch
- Roadside critical intervention
- Transport to the appropriate unit
- Early resuscitation

- Rapid diagnosis
- Early specialist intervention
- Intensive care, and
- Rehabilitation

With this, we come to the end of this lesson and in the next one, Justin will take you through the chapter review.