

The Approach To Trauma

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Last Update: March 2019

Case Study

“We have a motor vehicle accident 5 minutes out per EMS report.”

47-year-old male unrestrained driver ejected 15 feet from car arrives via EMS. Vital Signs: BP: 100/40, RR: 28, HR: 110. He was initially combative at the scene but now difficult to arouse. He does not open his eyes, withdrawals only to pain, and makes gurgling sounds. EMS placed a c-collar and backboard, but could not start an IV.

What do you do?

Objectives

Upon completion of this self-study module, you should be able to:

- Describe a focused rapid assessment of the trauma patient using an organized primary and secondary survey.
- Discuss the components of the primary survey.
- Discuss possible pathology that can occur in each domain of the primary survey and recommend treatment/stabilization measures.
- Describe how to stabilize a trauma patient and prioritize resuscitative measures.
- Discuss the secondary survey with particular attention to head/central nervous system (CNS), cervical spine, chest, abdominal, and musculoskeletal trauma.
- Discuss appropriate labs and diagnostic testing in caring for a trauma patient.
- Describe appropriate disposition of a trauma patient.

Introduction

Nearly 10% of all deaths in the world are caused by injury. Trauma is the number one cause of death in persons 1-50 years of age and results in significant life years lost. According to the National Trauma Data Bank, falls were the leading cause of trauma followed by motor vehicle collisions (MVCs) and firearm related injuries with an overall

mortality rate of 4.39% in 2016. Trauma patients can consume a significant amount of time and resources due to their acuity and complexity. Having an organized approach to the trauma patient will help reduce errors. In addition to understanding injury patterns, having a high suspicion for certain rare but significant pathology will improve the care you provide to this vulnerable population.

Initial Actions

The trauma patient presents unique challenges to the Emergency Physician. Because these patients are often young and otherwise healthy, they are able to compensate for many of the injuries they sustain and may not manifest signs of shock until they are on the verge of circulatory collapse. These patients may present via EMS from the scene or through triage hours or days after sustaining the injury. Being prepared and organized in your assessment of these patients is critical to not missing injuries. In addition, the patient who is initially stable may decompensate at any point in their care. Trauma patients need frequent reassessments to truly understand the entirety of their condition. In preparation for this patient's arrival, consider life threats and possible interventions that may need to be performed. Ensure the team has appropriate personal protective equipment donned, verify the airway equipment, suction, monitors, vascular access materials and other equipment depending on the level of care that can be provided.

Primary Survey

When evaluating the trauma patient, one should start with airway and progress through the ABCs stopping to stabilize each before moving on to the next. If the patient decompensates, return to airway and progress through the ABCs again until stable.

- A: Airway Maintenance with CERVICAL SPINE protection
- B: Breathing and Ventilation
- C: Circulation with hemorrhage control / shock assessment
- D: Disability: Neurological status
- E: Exposure/Environmental control

Airway

Is the airway patent and protected and will it stay that way?

- **Assessment**
 - Is the airway patent? To do this, have the patient speak to establish patency and to evaluate for voice change and stridor. Look for evidence of pooling secretions, blood, or cyanosis.
 - Look for issues that may affect the airway in the future:
 - Facial injuries causing obstruction or bleeding

- Laryngeal fractures
 - Expanding hematomas
- In addition, is their mental status such that they will be able to maintain and protect their airway for a period of time?
 - GCS equal to 8 or less requires intubation (“Less than 8, Intubate!”)
- **Intervention**
 - Always maintain cervical spine immobilization.
 - Consider performing jaw thrust and chin lift to establish patency of the airway.
 - Consider use of an oropharyngeal airway during bag-valve mask ventilations (BVM). Avoid placing a nasal airway if suspect basilar skull fracture.
 - Identify neck landmarks for cricothyroidotomy.
 - Assess the patient for tracheal deviation which may be a sign of tension pneumothorax.

Breathing

Is the breathing rate and quality sufficient to maintain ventilation and perfusion? A patent airway DOES NOT mean adequate ventilation! Ventilation requires adequately functioning lungs, chest wall, and diaphragm to produce the depth and rate of respiration as well as the appropriate gas exchange.

Assessment: Look, Listen, and Feel

- Inspection:
 - Cyanosis
 - Jugular Venous Distension (JVD) which can be a sign of increased intra-thoracic pressure. This can be seen with **tension pneumothorax** or **cardiac tamponade**.
 - Asymmetric movement of the chest which can be a sign of a **flail chest**.
 - Tracheal deviation which can be a sign of **tension pneumothorax**.
 - Assess for penetrating wounds which may be a clue to an **open pneumothorax**.
 - Take into account the work of breathing and quality of breathing. Accessory muscle usage can be seen with pain, pulmonary contusions, closed head injury, and diaphragmatic injury. This can be an early predictor of respiratory failure. This is usually not sustainable and will often result in respiratory failure.
- Auscultation:
 - Listen for stridor which is a sign of upper airway obstruction. This may be heard in patients with smoke inhalation, blunt, or penetrating neck trauma.

- Listen for presence of breath sounds. Lack of breath sounds can suggest pneumo- or hemothorax. Breath sounds are insensitive for these diagnoses and therefore one should consider CXR or ultrasound for diagnosis.
- If there is a concern for tension pneumothorax, perform needle decompression prior to any imaging.
 - Classically needle decompression is performed with a 14-16G angiocatheter at the 2nd or 3rd intercostal space along the mid-clavicular line. However, more recent literature has shown a higher success rate if performed at the 5th intercostal space along the anterior axillary line.
- Percussion:
 - Hyper-resonance can signify a pneumothorax, while areas of dullness can signify hemothorax.
- Palpation:
 - Subcutaneous emphysema suggests **pneumothorax**.
 - Paradoxical movement suggests **flail segments**.
 - Bruising should increase suspicion for internal trauma and underlying pulmonary contusion.
- **Differential of abnormal findings**
 - **Hemothorax:**
 - Due to systemic/pulmonary vessel disruption. May present with shock with no breath sounds and/or percussion dullness.
 - Massive hemothorax: > 1500 mL blood loss initially or >400 ml per hour for 2 hours.
 - Treatment consists of large bore chest tube; consider operating room (OR) for hemorrhage control for massive hemothorax.



- **Tension Pneumothorax:** Progressive deterioration and worsening of a simple pneumothorax associated with the formation of a one-way valve at the point of a rupture in the lung. Air becomes trapped in the pleural cavity between the chest wall and the lung and builds up, putting pressure on the lung and keeping it from inflating fully.
 - Hypotension due to increased intra-thoracic pressure decreasing preload.
 - Treatment: Decompressive needle thoracostomy.



- **Cardiac Tamponade:** Presents with decreased arterial pressure, distended neck veins, and muffled heart sounds. May be the cause of pulseless electrical activity in the patient who presents with cardiac arrest.
 - Use ultrasound to make diagnosis looking for:
 - Circumferential pericardial effusion
 - Diastolic Collapse of the Right Ventricle
 - Full/Plethoric IVC
 - Treatment: Ultrasound guided **Pericardiocentesis**



- **Ruptured Diaphragm:**
 - More commonly occur on the left
 - May see elevated hemidiaphragm or bowel in the thoracic cavity on X-ray
 - Fairly uncommon
 - Difficult to diagnosis
 - Often missed on CXR and CT scans

- Often discovered on exploratory laparotomy
 - High clinical suspicion
 - Dyspnea without clear cause. Often symptoms improve when patient is upright

Circulation

Is the patient adequately perfusing vital organs and extremities?

- **Assessment:**
 - Palpable Pulses:
 - Carotid and Femoral are most crucial
 - All extremities should have documented pulses. If deformity or fracture is present and pulses are not palpable, reduction/traction should be performed immediately to restore perfusion to that extremity
 - Tachycardia:
 - Concerning for shock although will not see in early phases.
 - Pain
 - Many patients will not mount a tachycardia response to hypovolemic or hemorrhagic shock:
 - Neurogenic shock to sympathetic cord disruption
 - Beta blockade, Calcium channel blockade
 - Elderly
 - Children and young adults
 - Conditioned athletes start with a lower basal level. Doubling their resting heart rate of 45-50 shows a falsely reassuring heart rate of 90-100.

Class of haemorrhagic shock				
	I	II	III	IV
Blood loss (mL)	Up to 750	750–1500	1500–2000	> 2000
Blood loss (% blood volume)	Up to 15	15–30	30–40	> 40
Pulse rate (per minute)	< 100	100–120	120–140	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate (per minute)	14–20	20–30	30–40	> 35
Urine output (mL/hour)	> 30	20–30	5–15	Negligible
Central nervous system/ mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

Table 1. Haemorrhagic shock classification. Taken from <http://lifeinthefastlane.com/2012/03/trauma-tribulation-025/>

Table 1. Hemorrhagic Shock

- Is bleeding controlled?
- If there is any active bleeding, consider tourniquet placement proximal to the bleeding which can be kept in place for up to 4-6 hours.
- If there is concern for pelvic fracture or unstable pelvis palpated, place a pelvic binder to assist with hemorrhage control.
- Does the patient have appropriate access?
 - 2 peripheral IVs 18G or larger
 - IO
 - Cordis
- **Differential of abnormal findings**
 - Shock
 - Hemorrhage: Locations of major blood loss
 - Floor/Scene
 - Scalp Laceration
 - Retroperitoneum
 - Peritoneum
 - Thigh/Femur Fracture
 - Thorax
 - Pelvis
 - Open vs Closed
 - Vascular Injury
 - Open Fracture
 - Dislocations
 - Penetrating Trauma
- **Interventions**
 - Direct pressure on any active bleeding
 - If extremity trauma and no pulses, try to restore anatomic alignment and splint to restore pulses
 - IO
 - IV Access
 - Central Line (Ideally Cordis)
 - Fluid Resuscitation
 - 1-2 L Isotonic Fluids (normal saline or lactated ringer)
 - Consider Blood Products for transient responders and non-responders to IV fluids
 - 2 units of uncrossmatched, O Negative blood
 - If giving more than 2 units of blood and anticipating massive resuscitation, consider 1:1:1 ration of PRBC, FFP and platelets or whole blood.
 - Tranexamic Acid (TXA): TXA is an antifibrinolytic hemostatic adjunct that is used in the management of the severely injured adult trauma patient.

Studies have shown a possible improvement in overall mortality if administered within three hours of injury.

- Consider Escharotomy (burn with no pulses) or Fasciotomy (compartment syndrome)

Disability

What is the patient's mental status? Is it stable or declining? Are there any obvious deficits?

- **Assessment**

- Mental status: **AVPU**
 - **Alert** - A fully awake patient.
 - **Voice** - The patient responds when verbally addressed. Response to voice can be verbal, motor, or with eyes.
 - **Pain** - The patient makes a response on any of the three component measures only when pain stimulus is delivered.
 - **Unresponsive** - If the patient does not give any eye, voice or motor response to voice or painful stimuli.
- Pupils
 - Assess for size, symmetry, and reactivity
 - **Uncal Herniation:** "Blown Pupil"- paralysis of parasympathetic fibers of pupillary constrictors of CN III. You will see a dilated pupil due to unopposed sympathetic activity. The picture below shows a dilated pupil in a head-injured patient.



- Motor/sensory: Gross examination to determine if CNS is intact.
 - Can they follow simple commands with all 4 extremities?

- **Glasgow Coma Score (GCS):**
 - 3 Components
 - Eyes (4 points)
 - Verbal (5 points)
 - Motor (6 points)
 - The best possible score is 15 and the worst score is 3.
 - **YOU CANNOT HAVE A GCS OF ZERO!**

Eye Opening Response	Spontaneous--open with blinking at baseline	4 points
	Opens to verbal command, speech, or shout	3 points
	Opens to pain, not applied to face	2 points
	None	1 point
Verbal Response	Oriented	5 points
	Confused conversation, but able to answer questions	4 points
	Inappropriate responses, words discernible	3 points
	Incomprehensible speech	2 points
	None	1 point
Motor Response	Obeys commands for movement	6 points
	Purposeful movement to painful stimulus	5 points
	Withdraws from pain	4 points
	Abnormal (spastic) flexion, decorticate posture	3 points
	Extensor (rigid) response, decerebrate posture	2 points
	None	1 point

Table 2: GCS score

- **Differential of abnormal findings**
 - Intracranial Hemorrhage (Insert link to page already exists)
 - Seizure
 - Neurovascular Injury
 - Hypoxia
 - Cord Injury
 - Intoxication
- **Interventions for management of increased ICP in trauma:**
 - Elevate head of bed to 30 degrees
 - Mannitol and/or Hypertonic saline (250mL 3% NaCl)
 - Consider if impending herniation

- Hyperventilation to pCO₂ 30-35mm Hg
 - Not generally recommended but can be considered if active herniation as a temporizing measure
- Burr Hole
 - For epidural hematoma

Exposure/Environment

Are there any obvious injuries (holes, bruises, abrasions, deformities)?

- **Assessment**

- Completely disrobe the patient to assess for any hidden injury.
- Keep the patient warm to prevent coagulopathy.
- Visual inspection/palpation for secondary survey.
- In penetrating trauma, make sure to check rectal and gluteal folds and axilla.

- **Interventions**

- Cover the patient in warm blankets to maintain normothermic state.
- Use warm fluids and blood warmer.

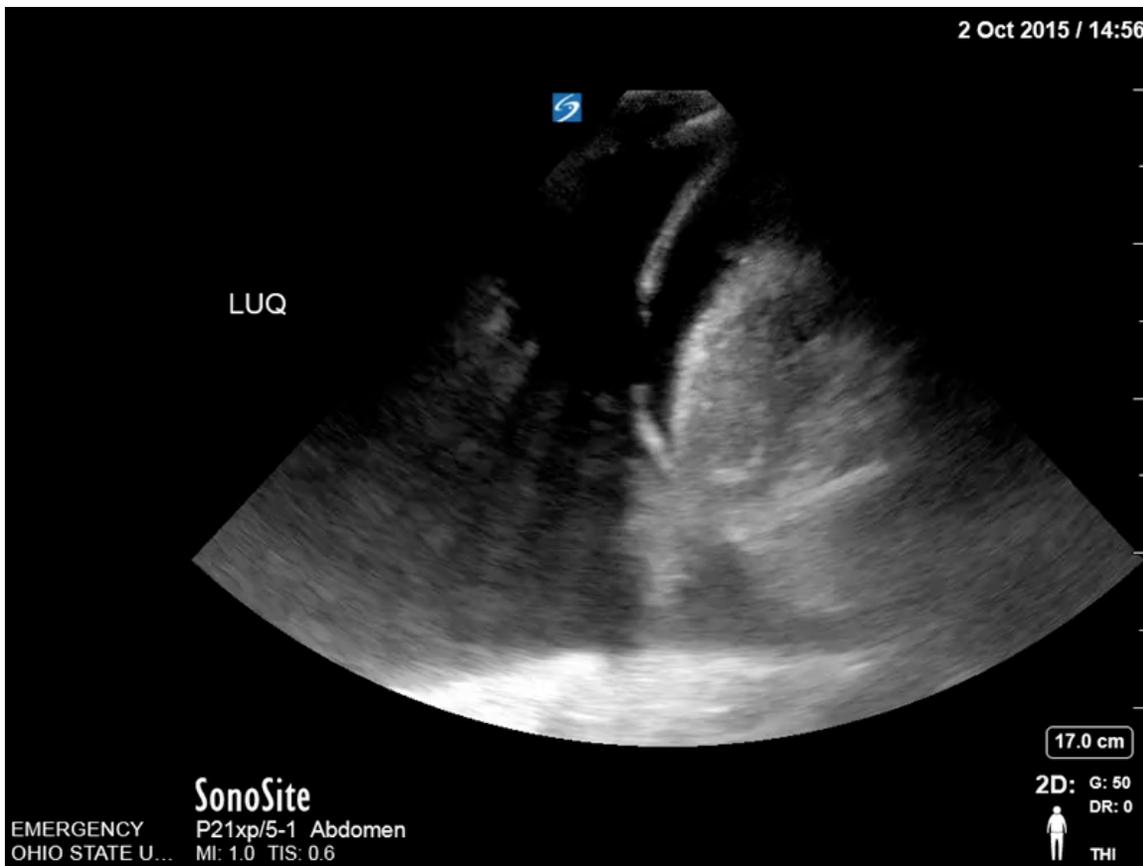
Adjuncts to the Primary Survey

- **Standard Trauma X-rays:**

- AP chest
- AP pelvis

- **FAST Exam:**

- Focused Assessment Sonography in Trauma is rapid, non-invasive, and inexpensive
- FAST scanning has a reported sensitivity of ~90% (range 75-100%) and a specificity of ~95% (range 88-100%) for detecting intraperitoneal free fluid.
- FAST views:
 - Sub-xiphoid cardiac
 - LUQ (splenophrenic and paracolic gutter)
 - Hepato-renal and inferior pole of liver
 - Bladder (pouch of Douglas and posterior cul-de-sac)
- Primarily indicated in hemodynamically unstable blunt trauma patients
- Positive FAST:
 - In the unstable patient, positive FAST should go to the OR and NOT to the CT scanner.



- False Positives
 - Ascites
 - Fat Pads
 - Seminal Vesicles
- Negative FAST:
 - Can miss some significant injuries and DOES NOT exclude injury
 - < 500mL of blood
 - Retroperitoneal Fluid
 - Hollow Viscous Injuries
 - Penetrating trauma
 - Must be negative in all windows.

Secondary Survey

Secondary Survey is not started until all aspects of the primary survey have been addressed and vital signs have been addressed. Sometimes the patient may need emergent surgery, and a secondary survey is not indicated.

- **History: AMPLE**
 - Allergies
 - Medications

- Past illnesses
- Last meal
- Events / Environment / Mechanism
- **“Trauma Frisk”**: **Head to toe assessment**
 - **Head/CNS Trauma**: Looking for skull fractures, axonal injuries, contusion, concussion, or hemorrhage.
 - **Battle’s sign**: Ecchymosis behind ear indicative of basilar skull fracture.



- **Raccoon’s eyes**: Periorbital ecchymosis without edema indicative of basilar skull fracture.
- Motor/Strength Grading:
 - 0: Total paralysis
 - 1: Palpable/visible contraction
 - 2: FROM w/gravity eliminated
 - 3: FROM against gravity
 - 4: FROM, less than normal strength
 - 5: Normal strength
- Sensation
 - Can they feel light touch and pinprick in all 4 extremities?
 - If not, at what level do they lose this sensation?
 - Bilateral or unilateral sensation loss?
 - Upper or lower extremities worse?
- **Facial Trauma:**
 - **Nasal Bone Fractures**: Most common facial fracture (followed by mandible). The diagnosis is clinical.
 - Symptoms and signs:
 - Crepitus
 - Edema

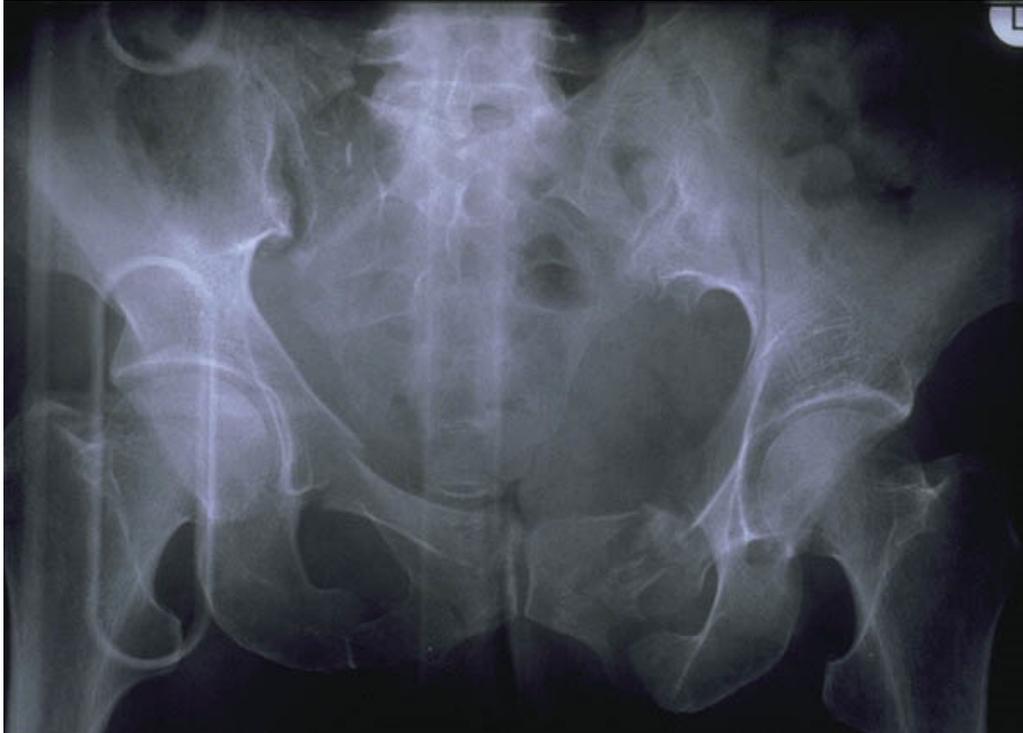
- Periorbital Ecchymosis
 - Tenderness
 - Mobility/ deformity
 - Epistaxis
 - Treatment:
 - Reduction for severe deformity and edema
 - Ice, observation, ENT referral 5-7 days
- **Septal Hematoma:**
 - Signs and symptoms:
 - Purple septal swelling
 - Nasal Congestion
 - Epistaxis
 - Treatment:
 - I&D (topical cocaine), ± drain,
 - Pressure pack.
 - Complications include: infection, necrosis, perforation, saddle-nose deformity and altered phonation
- **Mandible Fractures:** Significantly more force is required to fracture the mandibular symphysis than nose, zygoma, or angle of mandible.
 - **Symptoms and signs**
 - Malocclusion/deformity
 - Oral Bleeding- suggestive of open fracture
 - Pain
 - Swelling and ecchymosis,
 - Diagnosis
 - X-ray/Panorex
 - CT
 - Management - Tetanus, antibiotics, preserve appliances, dentition. Open fractures may need emergent repair.
- **Facial Fractures** (shown in picture below):
 - LeFort I - horizontal; maxilla at the level of the nasal fossa
 - LeFort II - pyramidal; maxilla, nasal bones, medial aspect of orbits
 - LeFort III - craniofacial dysfunction; maxilla, zygoma, nasal bones, ethmoids and all lesser bones of the cranial base.
 - These fractures rarely occur in pure form but rather usually in combination
- **Dental Trauma:**
 - **Avulsed teeth:** *Primary teeth* are never reimplanted as they may ankylose and block eruption of permanent teeth. *Permanent teeth* are reimplanted as soon as possible as chances of successful reimplantation decrease 1% for every one minute out. Transport teeth in saline, Hank's solution or milk. Treatment includes soft diet, tetanus, antibiotics, and stabilization.

- **Fractured teeth:** Typically described by EM physicians using the **Ellis classification** (not always used by OMFS or Dentistry): *Class I:* Fracture of enamel, treatment is to smooth the edge. *Class II:* Fracture of enamel and dentin, treatment is calcium hydroxide covering. *Class III:* Fracture of enamel, dentin, and pulp, treatment includes pulpotomy, pulpectomy, and immediate dental referral.
- **Alveolar fractures:** Diagnostic evaluation: Differentiate from LeFort I. Treatment is to preserve as much tissue as possible, soft diet, and stabilization - a minimum of six weeks.
- **Subluxed teeth:** A tooth loosened in its socket or moved, but not avulsed. Treatment: Dental splint, soft diet, pain control, and dental referral.
- **Cervical Spine/Neck Exam:**
 - Assessment
 - Midline tenderness
 - Swelling
 - Bruising
 - Crepitus
 - Neurologic Deficits
 - Stridor
 - Tracheal Deviation
 - Wounds
 - Facts
 - 5% of brain injuries have associated c-spine injury
 - 55% spinal injuries are cervical
 - 10% of patients with c-spine fractures will have a second noncontiguous vertebral fracture
 - Differential of Abnormal Findings
 - Cervical spine fracture
 - Cord injury
 - Ligamentous injury
 - Tracheal fracture
 - Hematoma
 - Carotid dissection
 - Esophageal injury
 - **Special Situations**
 - Penetrating neck trauma:
 - **Zone III**-Above angle of mandible. Angiography
 - **Zone II**-Angle of mandible → cricoid. Explore, observe, growing role for CTA
 - **Zones 1**-below cricoid cartilage; Angiography, highest mortality, EGD, esophagoscopy
 - **Diagnostics**

- CT scan of cervical spine is the gold standard. Plain films may be considered in thin patients with low pre-test probability of fracture.
 - CT angiography of neck vasculature
 - **Intervention/Treatment**
 - Maintain airway
 - ☐ Consider early intubation if swelling or bleeding of neck
 - Control bleeding with direct pressure
 - Cervical motion restriction: cervical collar
 - ☐ Clearing c-collar
 - NEXUS Criteria- can clear if:
 - ✓ No neurologic deficit
 - ✓ No midline tenderness
 - ✓ No altered mental status
 - ✓ Not intoxicated
 - ✓ No distracting injury
 - Canadian C Spine Rule- can clear clinically if:
 - ✓ Able to range neck >45 degrees left and right
 - ✓ < 65 years-old
 - ✓ No neurologic deficits
 - ✓ Low risk mechanism
 - ✓ Fall < 3 feet
 - ✓ No axial load
 - ✓ Low speed MVC
- **Chest**
 - **Assessment**
 - Crepitus
 - Bruising
 - Symmetric Rise/Fall
 - Auscultate
 - **Facts**
 - <10 % Blunt trauma require surgery
 - Up to 30% penetrating trauma require surgery
 - **Differential (Link chest trauma module)**
 - Cardiac contusion
 - Cardiac tamponade
 - Ventricle rupture
 - Pneumothorax
 - Hemothorax
 - Aortic dissection
 - Pulmonary contusion
 - Pulmonary laceration
 - Rib fracture/flail chest

- 98% sensitive for bleeding
 - Detects bowel injury
 - Invasive, misses retroperitoneal and diaphragm injuries
 - Positive DPL: Any of the following:
 - Gross blood (10 ml)
 - 100,000 RBCs/mm³
 - More than 500 WBCs/mm³
 - Positive Gram stain
 - Food fibers, or bacteria, bile, or feces.
 - **Intervention/Treatment**
 - OR
 - Interventional Radiology
- **Perineum, Rectum, and Genital Exam**
 - **Assessment**
 - Bruising/lacerations
 - Bleeding
 - Vaginal
 - Rectal
 - Urethral meatus
 - Do not place Foley if present
 - Prostate
 - High-riding
 - Rectal tone
 - Cord injury
 - **Differential**
 - Bladder rupture
 - Testicular fracture
 - Urethral injury
 - **Diagnostics**
 - Cystogram
 - Retrograde urethrogram
 - CTAP
 - **Intervention/Treatment**
 - OR
 - Interventional radiology
- **Musculoskeletal**
 - **Assessment**
 - Deformity
 - Bruising
 - Pain
 - Neurovascular status
 - Pulses, motor, sensory
 - Skin tenting

- **Differential**
 - Fracture
 - Hematoma
 - Neurovascular damage
 - Compartment syndrome
 - P's
 - Pain, pallor, paresthesia, polkilohermia, pulseless
 - Crush injury, forearm, and tibial fractures
 - **Diagnostics**
 - Ankle-Brachial index to assess for arterial injury
 - Ankle systolic pressure/brachial systolic Pressure
 - <0.90 indicative of arterial injury
 - XR
 - CT Angiography
 - **Intervention/Treatment**
 - OR
 - Splinting
 - Fasciotomy for compartment syndrome
 - Washout and antibiotics for open fractures
- **Pelvis**
 - **Assessment**
 - Bruising
 - Perineal
 - Scrotal
 - Blood at Meatus
 - Palpate
 - Guarding, tenderness
 - Stability- Only check once if unstable
 - **Facts**
 - Patients can lose up to 5 L of blood.
 - **Differential**
 - Urethral injury
 - Vascular injury
 - Fracture
 - **Diagnostics**
 - XR
 - CTAP
 - **Intervention/Treatment**
 - Pelvic binder
 - Interventional radiology
 - OR



Diagnostic Studies

- Type and cross is most important lab in trauma patient. Fully cross-matched blood is preferable but has about 1-hour processing time.
- Type-specific blood: ABO and Rh only tested and has 10-minute processing time
- Trauma blood: Typically O Negative (males may receive O Positive blood). Advantage: Immediately available.
- Labs
 - CBC (do not depend on Hgb to show bleeding immediately)
 - Chemistry
 - UA (microscopic hematuria common and not reliable for renal injury)
 - Pregnancy test
 - Blood gas
 - Ethanol and drug Screen
 - Coagulation studies
- **Standard Trauma Xrays:**
 - AP chest and AP pelvis x-rays are done as adjuncts to the primary survey.
 - Cervical Spine X-rays: Lateral view only detects 80% of fractures. For films to be adequate, must see level C7-T1. “Swimmer’s View” may help visualization. A full series includes AP, lateral, odontoid, and obliques.

- Due to low sensitivity of plain films, cervical spine CT is the diagnostic test of choice when evaluating for fractures.
- **Other Imaging based on injuries:** (see above)
 - CT scan: Head, face, c-spine, chest (with contrast), abdomen and pelvis (with contrast)
 - FAST (see dedicated section in primary survey)
 - X-rays
 - EKG (especially for fall, blunt chest trauma, drowning, syncope or single car MVA)
 - Retrograde-urethrogram if concern for urethral injury.
 - Diagnostic peritoneal lavage(DPL)

Disposition

- Consider transfer to higher level of care. This process is started as soon as need for transfer is identified.
- Do not delay transfer to obtain imaging.
- Life threatening injuries should be evaluated & addressed prior to transfer.
- Consider securing airway and treating borderline injuries for transfer.

Case Study Conclusion

47-year-old male unrestrained driver ejected 15 feet from car then arrives via EMS. Vital Signs: 100/40, RR 28, HR110. Initially combative at the scene, but now difficult to arouse. He does not open his eyes, withdrawals only to pain, and makes gurgling sounds. EMS placed a c-collar and backboard, but could not start an IV.

As you move the patient over to the gurney, you notice tracheal deviation, paradoxical chest movement, and a large boggy right parietal scalp hematoma. You realize you have to move quickly using what you've learned!

What do you do first?

You scream out "ABC's, IV, O2, Monitor!" as you tend to the patient's primary survey.

- A: Is Airway intact? No, patient needs to be intubated with inline stabilization as he is altered and combative.
- B: Is Breathing intact? No, gurgling breath sounds with increased respiratory rate and tracheal deviation. This patient needs a needle decompression followed by a chest tube.
- C: Are there signs of shock? Yes, tachycardia and hypotension with altered mental status. These resolved when you placed the chest tube.
- D: What is the GCS? Eyes closed (1), withdraws only to pain (4), makes incomprehensible sounds (2) = total of 7. Less than 8, intubate!

- E: Upon exposure you see a cold, blue right foot. You reduce the foot to regain pulses.

Next you perform a Secondary Survey:

- HEENT: large boggy right parietal scalp, the pupils are sluggish and there's hemotympanum on the right side. There is no facial trauma. The trachea is also deviated to the left.
- Chest: Absent breath sounds on right
- Heart: Tachycardic
- Abdomen: Soft, no guarding, no obvious tenderness
- Extremities: Left ankle open, dislocated cold, no pulse
- Neck/Back: normal

Start resuscitation with 2 liters IV normal saline, order type and cross, CBC, chem 7, ua, and coags. Noting the tracheal deviation to the left and decreased breath sounds on the right, you quickly perform a needle decompression and place a chest tube. They come to shoot your chest x-ray and you now note a resolving R sided simple PTX. Pelvis Xray is negative. FAST is negative.

You order antibiotics, tetanus booster and call orthopedic surgery. When the patient is stabilized you move to CT scan where the following scans are obtained: CT of the head, c-spine, chest, abdomen and pelvis.

The rest of his scans reveal the resolved pneumothorax and chest tube you placed, several broken ribs on the right, no visceral injuries and no pelvic trauma. He is taken emergently to the OR for treatment of his epidural hematoma as well as washout of his open ankle fracture/dislocation.

He spends several days in the SICU with an excellent hospital course, is extubated, and has normal neurological function. His chest tube is pulled, and he is discharged home in excellent condition.

Pearls and Pitfalls

- Trauma is a common problem, especially in relatively young patients.
- Trauma has high associated life years lost.
- Have an organized approach to assessing and managing trauma patients.
- Start with ABCDE and return to these anytime patient status changes.
- Perform a comprehensive organized secondary survey to evaluate patient and minimize risk of missing injury.
- Treat life and limb threats as you discover them
- Many traumatic injuries have subtle findings and require a high index of suspicion.
- Blood pressure will remain normal until class 3 hemorrhagic shock; use the whole clinical picture not just the numbers to guide your management.

- Move quickly to administer blood products and active massive transfusion protocols in patients presenting in hemorrhagic shock.
- Stabilize and transfer trauma patients to a trauma center as soon as possible.

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