Trauma Care

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SCENE SIZE UP

Pre-game: Analyze information from dispatch. Form index of suspicion

- Age, setting, number of patients, timing
- However, these are just speculations. Don't let them cloud your judgement!!!

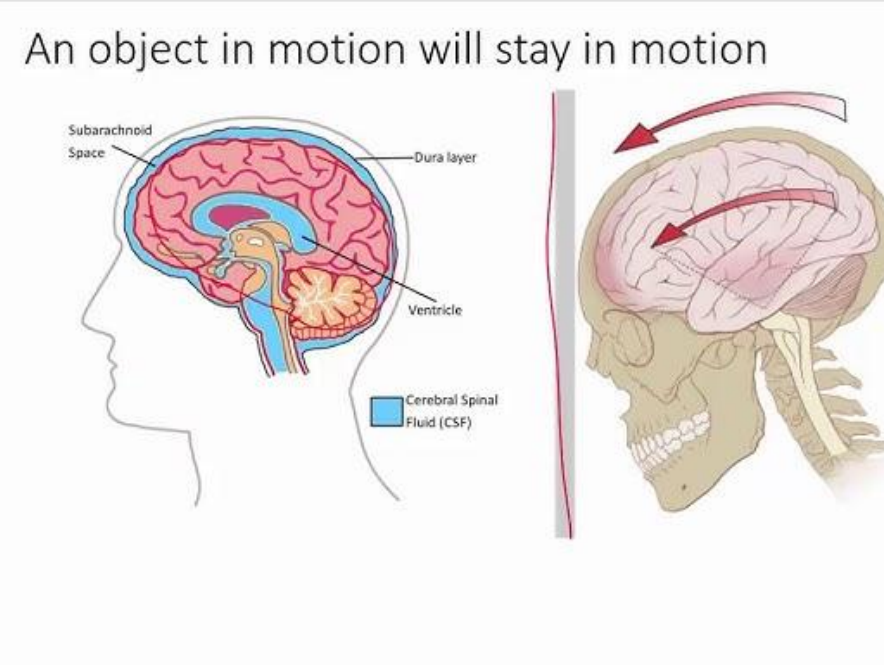
Scene Safety: You can't help anyone if you become a patient!!!

- Recognize threats (environmental, human)

SCENE SIZE UP (cont.)

Mechanisms of injury: determines severity and appropriate actions

- How?
- What force?
- Where on the body?
- KE=1/2mv^2
- Minor (small lacerations, simple fracture), moderate (long bone fractures, severe bleeding), or severe (immediate life threat)



Three Collisions: Car stops, body stops, organs stops

MECHANISMS OF INJURY

Penetrating Trauma: pierces skin
- Slow velocity (i.e. knives)
- High velocity (i.e. gunshots)
- Pain, hemorrhage, puncture, infection, organ damage

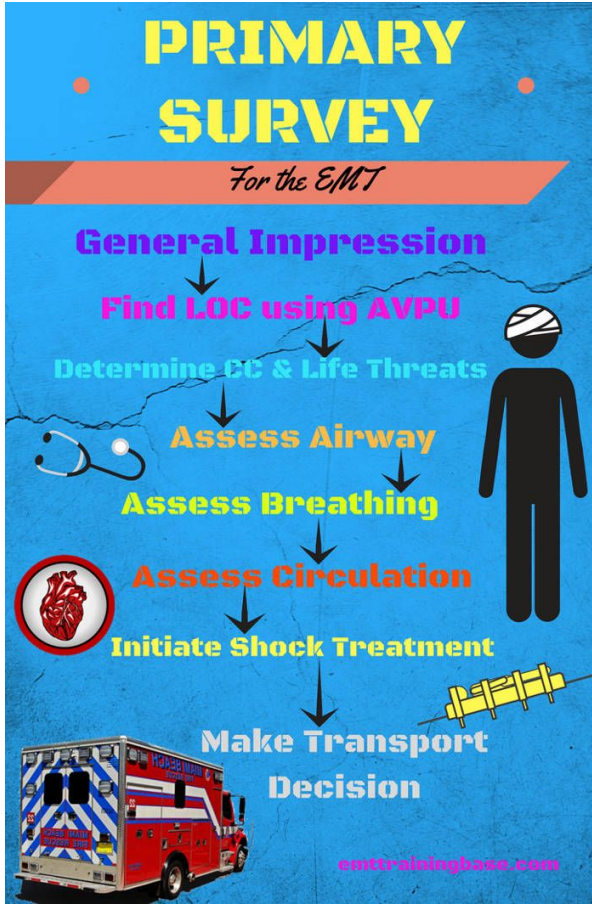
Blunt Trauma: dull strike

- Collisions
- Falls
- Pain, bruising, swelling, deformity, internal bleeding

Axial Loading:
- When patient falls on their feet, energy is transmitted to spine **= spinal injury** + injury to legs and pelvis
- Falling more than 20 ft (6 m) is SIGNIFICANT

PRIMARY ASSESSMENT

- XABCD
- X - eXsanguinating bleeding. Control life threats (i.e. severe bleeding)
- A - Airway
- B - Breathing
- C - blood flow/shock
- D - Disability; neurological status (AVPU)
- “Load and go”/“stay and play”



RAPID HEAD TO TOE ASSESSMENT

Purpose: DCAP-BTLS

Head

- Scalp/Skull
- Eyes (orbits, raccoon eyes)
- Facial bones
- Inside ears, nostrils, mouth
- Behind ears (CSF, battle signs)

Neck

- Midline trachea
- Jugular vein distention
- Cervical spine

Chest

- Clavicles
- AC joint
- Sternum
- Barrel chest (intercostals)
- Lung sounds

Abdomen/Pelvis

- Palpate quadrants
- Pelvis
- Genitalia/perineum

Lower Extremities

- Femur
- Patella + knee flex
- Tibula/fibula
- Calcaneus
- Tarsals/metatarsals/phalanges
- CSM (circulation, sensory, motor)

Upper Extremities

- Humerus
- Olecranon + elbow flexion
- Radius/ulna
- Carpals/metacarpals/phalanges
- CSM

Posterior thorax, lumbar, & buttocks

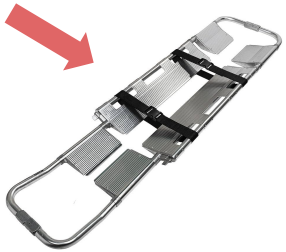
- Back of head
- Posterior thorax
- Spine
- Lung sounds
- Ischium
- Buttocks

BACKBOARD USAGE

Long backboards: full body immobilization; immobilizes patients in any position

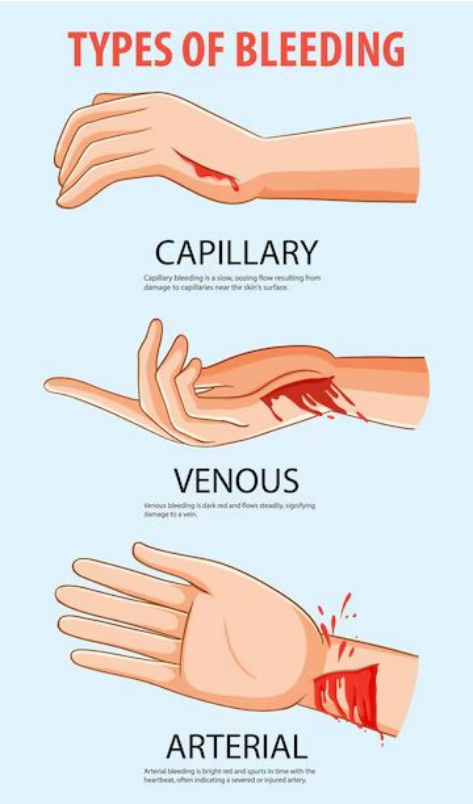
- Commonly used for PTs found supine
- Suspected spinal injury
- Must move PT out of awkward places (e.g. crashed vehicle)
- Altered or unconscious PTs

If you can't log roll patient due to pelvic fracture, use a **SCOOP STRETCHER!



BLEEDING MANAGEMENT

Types of Bleeds



- Slow and oozing
- Easily controlled
- Stops spontaneously

- Steady flow
- Easier to control
- Low pressure system

- Rapid and profuse
- Spurting in rhythm with heartbeat
- Most difficult to control
- High pressure system

How to Stop the Bleed!

1. Apply direct pressure with gloved hand on bleeding site
2. CONTROLLED? => If yes, apply pressure dressings.

5. TREAT FOR SHOCK - POWT (or POWR)

STILL BLEEDING? 🤯

3. Apply tourniquet
4a. Pack wound with gauze if bleeding is still uncontrolled

4b. Use occlusive dressing

Hemostatic Gauze

- Hemostatic dressing contains a chemical compound within it that slows or stops bleeding by promoting clot formation.
- Contraindications:
  - Non-compressible wounds: chest, abdomen, open skull wounds
  - Intravascular use
  - Necrotic tissue
  - Exposed vital structures: nerves, organs, vasculature

***typically not advised by any EMS protocols

SOFT TISSUE INJURIES

OPEN INJURIES

D - Deformities

C - Contusions

A - Abrasions & Avulsions

P - Penetrations/Punctures

B - Burns

T - Tenderness

L - Lacerations

S - Swelling

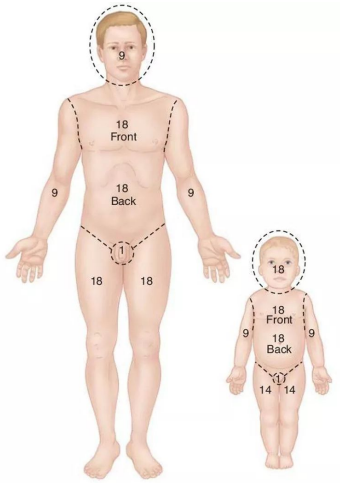
Abrasions vs Avulsions

- An **abrasion** is a wound on the superficial layer of the skin
- Rubbing or scraping body part across a rough/hard surface causes **friction**

- An **avulsion** separates the layers of soft tissue
- Skin can be completely detached or left hanging as a flap

Burns

- Occurs when body receives more radiant energy than it can absorb
- Patients with chronic illnesses are more likely to experience **shock** from burn injuries
- **Rule of ninths**: adult vs pediatric; helps determine severity of burn
- Make sure to:
  - Perform a full physical exam; DCAP-BTLS
  - Estimation of Rule of Ninths based on affected portion
  - Classify burn
  - Severity of burn
  - Transport

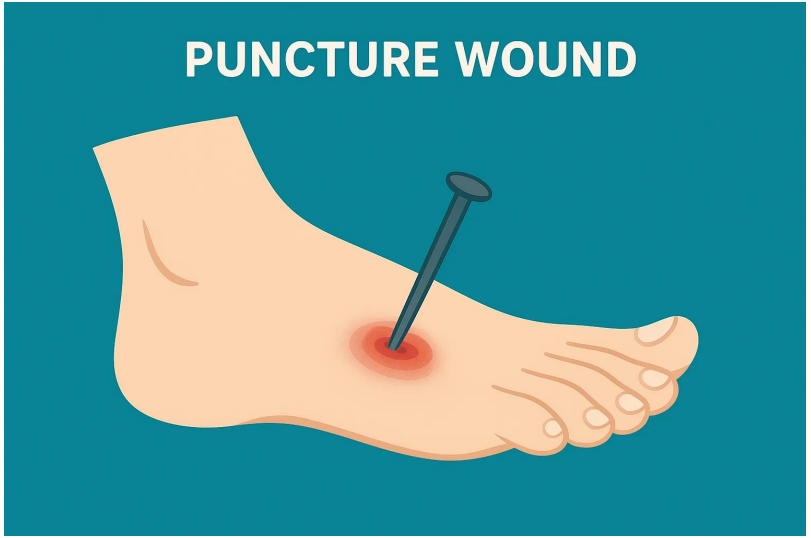


Penetrating Wounds

- Injury results from a piercing object
- Stabbings and shootings can result in multiple penetrating injuries
- Tips:
  - Assess PT carefully and identify all wounds
  - Count the numbers of penetrating wounds
  - Determine type of gun or weapon used if possible

Punctures

- Caused by impalement of object
- Remove object only when:
  - It’s in the cheek or mouth
  - Object obstructs airway
  - Object interferes with CPR



Lacerations

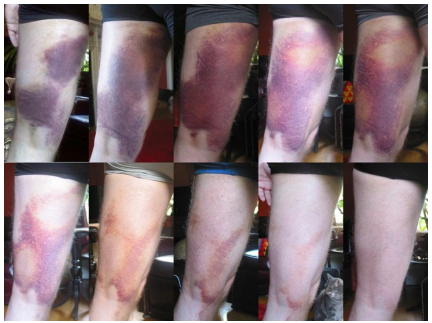
- Lacerations = JAGGED cut
- Incision = sharp, smooth cut (e.g. with scalpel)
- Vary in depth
- Abdominal wounds
  - **Evisceration**: when organs protrude through open wound
  - **Apply moist sterile dressing and occlusive dressing**
- Neck wounds
  - Use **occlusive dressing**
  - **Compress and put pressure**; avoid both carotid arteries

CLOSED INJURIES

1. Bleeding-Related
2. Crush Syndrome
3. Compartment Syndrome

Bleeding-Related

Contusion: bleeding beneath the skin; skin does not break; bruise/ecchymosis



Hematoma: blood collected within damaged tissue or in a body cavity; swelling of blood clots

Treat closed soft injuries with **RICES (Rest, Ice, Compression, Elevation, Splinting)

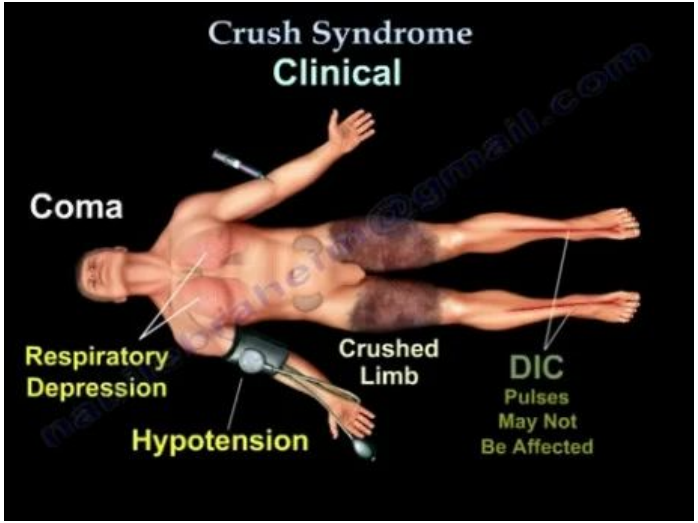
**No special emergency care for small contusions

Look out for **hypovolemic shock for extensive injuries

****Transport and reassess**!

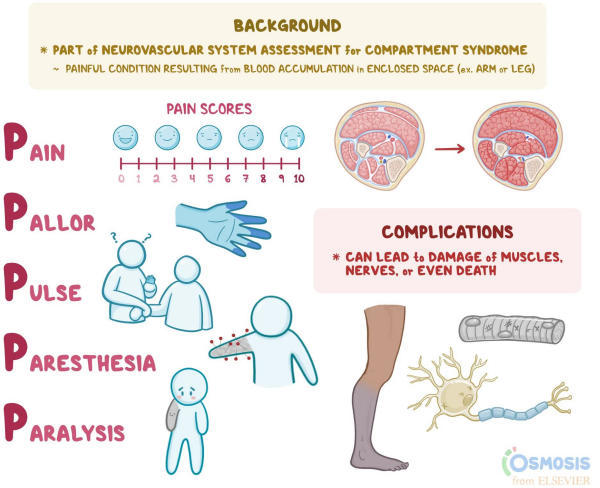
Crush Syndrome

- Occurs when a large amount of force is applied to the body
- Crush syndrome usually occurs when body is trapped for longer than 4 hours
- When tissues are crushed beyond repair, muscle cells die and release harmful substances into surrounding tissues



Compartment Syndrome

- Results in swelling that occurs whenever tissues are injured; **compressed nerves and vessels**
- Often occurs in children with a fractured **tibia** or **forearm**
- Typically develops within **6-12 hours** after injury due to excessive bleeding, severely crushed extremity or rapid return of blood to an ischemic limb
- S/s (aka **5 P's**):
  - Pain that is out of proportion to injury
  - Pain on passive stretching of muscles within the compartment; any tingling?
  - Pallor (paleness)
  - Decreased sensation and power

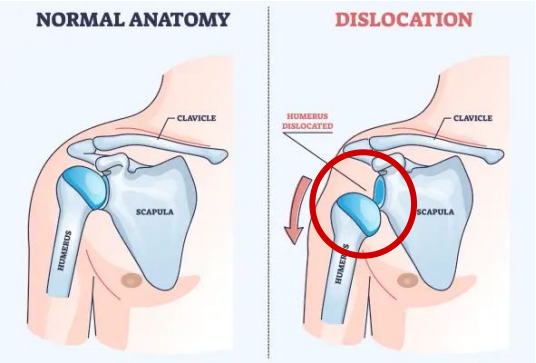


TREATMENT:
**Splint affected limb, keeping it at heart-level
Rapid **transport
Reassess neurovascular status frequently during transport

ORTHOPEDIC INJURIES

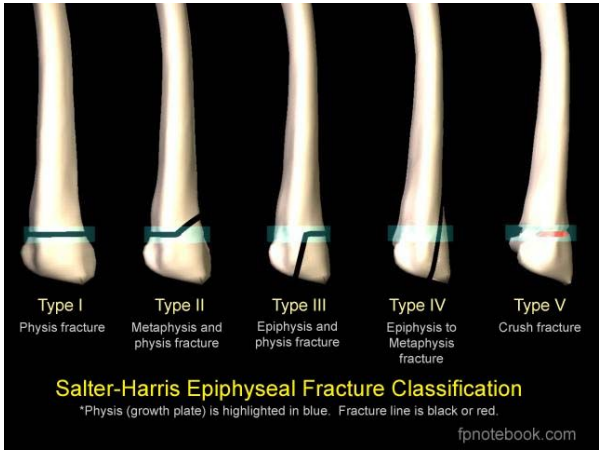
Fractures

- Fractures and dislocations require significant force in order to occur (e.g. direct blows, indirect forces, twisting forces, or high-energy forces)
- Causes a break in the continuity of the bone; can be closed or opened fractures
- **Fractures** can be nondisplaced (just a crack) or displaced (major deformities)
- **Dislocations**: disruption of a joint where bone ends are no longer in contact
- Always take precautions of fractures when elderly patients experience a fall



Types of Fractures

1. **Comminuted**: bone is broken into 2+ fragments
2. **Epiphyseal**: fracture occurs in the growth segment of a child's bone
3. **Greenstick**: incomplete fracture that breaks only part-way through the shaft of a bone
4. **Incomplete**: fracture does not run completely through bone
5. **Oblique**: bone is broken at an angle

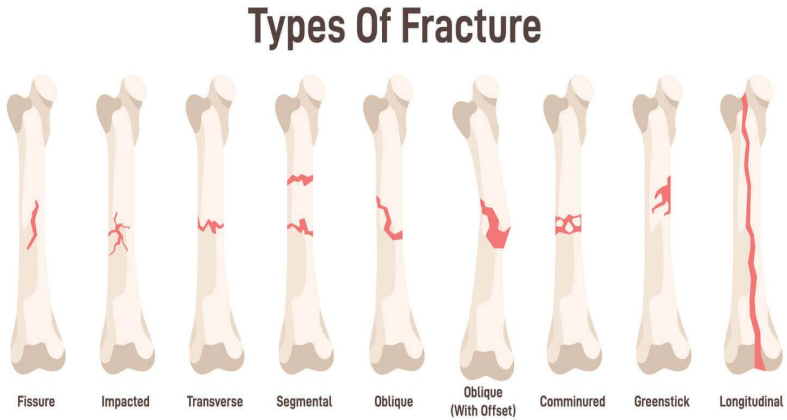


Types of Fractures cont.

6. **Pathologic**: bone is weakened or diseased

7. **Spiral**: caused by twisting force leading to oblique fracture around and through bone

8. **Transverse**: fracture occurs straight across bone



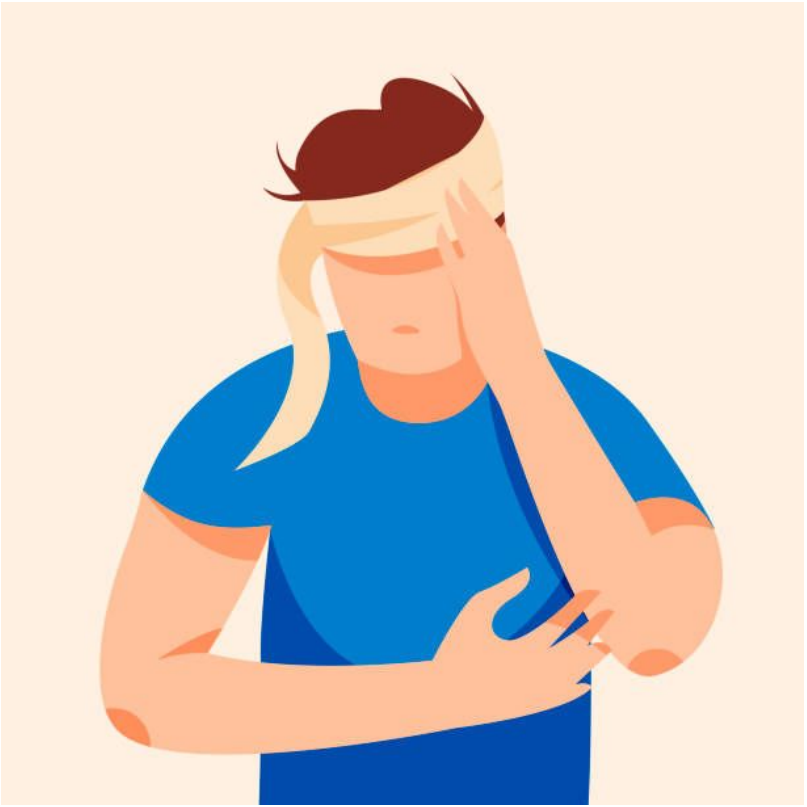
S/s of Fractures

1. Deformities (shortening, rotation, angulation, etc.)
2. Tenderness
3. Guarding
4. Swelling (may mask deformity of limb)
5. Bone bruising
6. Crepitus
7. False motion
8. Exposed fragments
9. Pain
10. Locked joint

SPLINT & STABILIZE

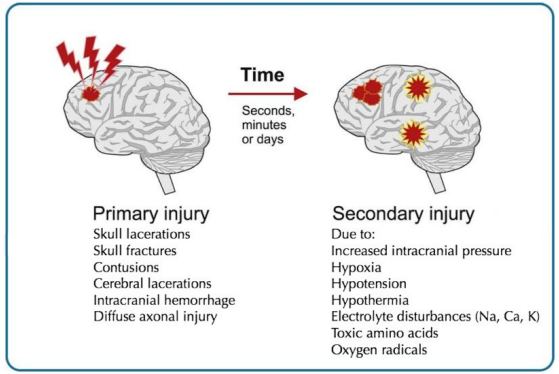
NEUROLOGICAL TRAUMA

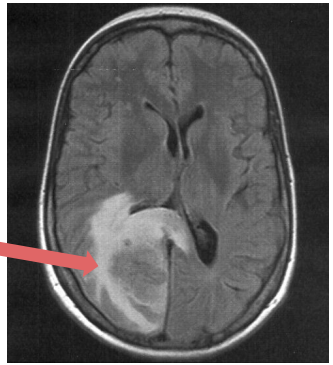
1. TBI & Coup-Contrecoup
2. Concussion vs Contusion



Traumatic Brain Injury (TBI)

- Super serious brain damage due to external forces
- Categorized into primary injury or secondary injury
- Primary brain injury: DIRECT impact to the head
- Secondary brain injury: increases severity of the primary injury; INDIRECT
    - Caused by hypoxia, hypotension, cerebral edema, intracranial hemorrhage, increased intracranial pressure, cerebral ischemia, infection…
    - Monitor the PT for any **seizure activity** as low blood oxygen levels can aggravate cerebral edema



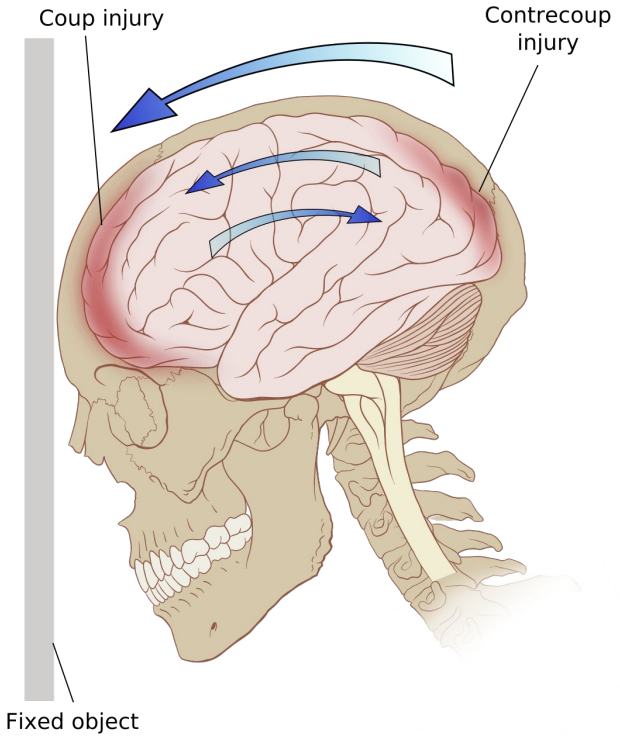


TBI: Coup-contrecoup

Coup: the initial damage to the brain's surface via brain hitting object or vice versa

Contrecoup: Head's sudden acceleration or deceleration causes brain to move and hit the opposite side of the initial site of damage

Example: Head hits windshield due to sudden stop of vehicle, brain accelerates forward hitting inside of skull (frontal lobe) = **coup**; head slams back into seat where brain hits other side of skull (occipital lobe)= **contrecoup**



Concussions vs Contusions

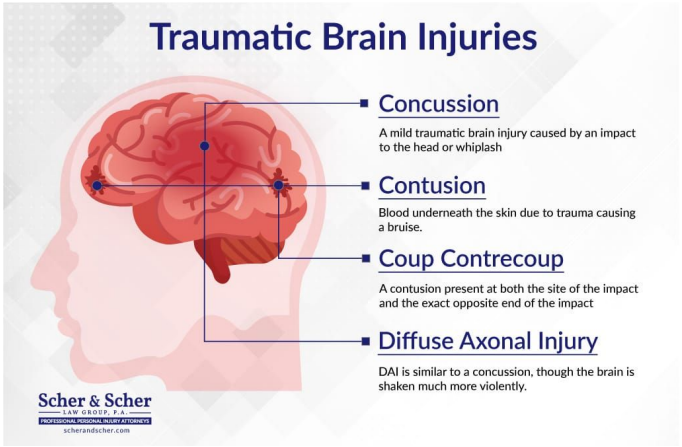
Concussion: a mild TBI by impact to the head or whiplash

S/s: dizziness, weakness, visual changes, nausea/vomiting, ringing in ears, inability to focus

Contusion:

- More serious than a concussion
- May involve physical injury to brain (bruising and swelling); long-lasting or even permanent damage
- May exhibit any or all signs of brain injury above and more (e.g. slurred speech, numbness, tingling, memory impairment…)
- Be aware of blood clots, hemorrhages, high BP (aneurysm), ischemic/hemorrhagic stroke, ALOC, CSF leakage

- **DON’T GIVE ASPIRIN!!!**



ALCO PROTOCOL

TRAUMA PATIENT CRITERIA

1. **INTRODUCTION:** The goal of the Alameda County trauma system is to transport confirmed patients meeting the various criteria below to a designated trauma center in a timely manner, bypassing non-trauma centers

2. **RED CRITERIA TRAUMA PATIENTS (High Risk for Serious Injury):**

   2.1 A patient is identified as at high risk for serious injury when any of the following injury patterns or mental status/vitals signs listed below are present. These patients should be transported to a designated Trauma Center rapidly.

Injury Patterns	Mental Status & Vitals Signs
• Penetrating injuries to head, neck, torso,and proximal extremities • Skull deformity, suspected skull fracture • Suspected spinal injury with new motor or sensory loss • Chest wall instability, deformity, or suspected flail chest • Suspected pelvic fracture • Suspected fracture of two or more proximal long bones • Crushed, degloved, mangled, or pulseless extremity • Amputation proximal to wrist or ankle • Active bleeding requiring a tourniquet or wound packing with continuous pressure	**All Patients** • Total Glasgow Coma Scale ≤ 13 or: Motor GCS < 6 (Unable to follow commands) • RR < 10 or > 29 breaths/min • Respiratory distress or need for respiratory support • Room-air pulse oximetry < 90% **Age 0–9 years** • SBP < 70mm Hg + (2 x age in years) **Age 10–64 years** • SBP < 90 mmHg or • HR > SBP **Age ≥ 65 years** • SBP < 110 mmHg or • HR > SBP

3. **YELLOW CRITERIA TRAUMA PATIENTS (Moderate Risk for Serious Injury):**

   3.1 In addition to above criteria, the following mechanisms of injury and EMS provider judgment of risk factors can be utilized to preferentially triage a patient to a trauma center. In general, these patients are transported code 2, however, differing field circumstances and/or patient condition may require a code 3 transport

Mechanism of Injury	EMS Judgment
• High-Risk Auto Crash – Partial or complete ejection – Significant intrusion (including roof) • >12 inches occupant site OR • >18 inches any site OR • Need for extrication for entrapped patient – Death in passenger compartment – Child (age 0–9 years) unrestrained or in unsecured child safety seat – Vehicle telemetry data consistent with severe injury • Rider separated from transport vehicle with significant impact (eg, motorcycle, ATV, horse, etc.) • Pedestrian/bicycle rider thrown, run over, or with significant impact • Fall from height > 10 feet (all ages)	**Consider risk factors, including:** • Low-level falls in young children (age ≤ 5 years) or older adult (age ≥ 65 years) with significant head impact • Anticoagulant use • Suspicion of child abuse • Special, high-resource healthcare needs • Pregnancy > 20 weeks • Burns in conjunction with trauma • Children should be triaged preferentially to pediatric capable centers • EMS Provider judgment - If concerned, take to a trauma center

4. **TRANSPORT:** Patients that meet Red or Yellow trauma criteria in the prior sections will be transported to **the closest, most appropriate, designated Trauma Center**

   4.1 **Adult trauma patients are defined as being 15 years of age or older**

   4.2 **Pediatric trauma patients are defined as being 14 years of age or younger**

5. **Exceptions:** The patient is identified as meeting Red or Yellow trauma criteria, but presents with one of the following:

PATIENT PRESENTATION	ACTION	
UNMANAGEABLE AIRWAY: *The patient requires advanced airway management, and the paramedic is unable to manage the patient's airway through basic or advanced interventions.*	**Closest Basic E.D.**	
ADULT TRAUMATIC ARREST:	Proceed to **Adult Cardiac Arrest - Traumatic** protocol or **Determination of Death in the Field** protocol	
PEDIATRIC TRAUMATIC ARREST	Proceed to **Pediatric - Cardiac Arrest - Traumatic** protocol or **Determination of Death in the Field** protocol	
	→ ETA to the Pediatric Trauma Center ≤ 20 minutes	Pediatric Trauma Center
	→ ETA to the Pediatric Trauma Center ≥ 20 minutes	Closest Adult Trauma Center

6. **PATIENT TURNOVER REPORTING FORMAT:** EMS Clinicians should use the following **DMIST** format when turning over patient care to the Trauma Center medical team:

   → **D**emographics

   → **M**echanism

   → **I**njuries

   → **S**igns - Vital signs

   → **T**reatments

7. **BASE HOSPITAL CONTACT:** Varying field circumstances make rigid application of any set of rules impractical. These criteria should serve as guidelines. Clinical circumstances may dictate that transport be undertaken immediately with Base Hospital contact made during transport

   7.1 **Contact the Base Hospital Physician if:**

   ► The patient meets the criteria listed in the "Yellow Criteria" but the provider is requesting transport to a basic ED

   ► The patient requires medical treatment not covered in the **Trauma Patient Care** protocol

   ► The patient would benefit from consultation with the Base Hospital Physician

8. **OUT-OF-COUNTY TRANSPORT**

   8.1 Patients who meet Trauma Patient Criteria may be transported directly to an out of county Trauma Center if it is the closest, most appropriate destination for the patient

   8.2 Prior to transporting to an out-of-county Trauma Center, the transporting provider must:

   ► Contact the out-of-county Trauma Center by land line to determine if they can accept the patient

   ► Give a brief report including E.T.A. (See Reporting Format Protocol)

   ► Contact the Alameda County Base Hospital if medical consultation is required (see #5 above)

   8.3 **Out-of-County Trauma Centers:**

TRAUMA CENTER	PEDIATRIC CAPABLE	LOCATION	PHONE #
STANFORD UNIVERSITY MEDICAL CENTER	X	PALO ALTO	(650) 723-7337
SAN FRANCISCO GENERAL HOSPITAL		SAN FRANCISCO	(415) 206-8111
SANTA CLARA VALLEY MEDICAL CENTER	X	SAN JOSE	(408) 885-6912
JOHN MUIR MEDICAL CENTER		WALNUT CREEK	(925) 947-4444
SAN JOAQUIN GENERAL		FRENCH CAMP	(209) 982-1975

TRAUMA PATIENT CRITERIA - *HIGH RISK*

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TRAUMA PATIENT CRITERIA - *MODERATE RISK*

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TRAUMA PATIENT CRITERIA - *More Info*

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CRITICAL/TIME SENSITIVE INTERVENTIONS:

- ► Control major external hemorrhage (see **page 122**)
- ► Control the Airway - Consider **endotracheal intubation or supraglottic airway device if indicated** (See below for patients with closed head trauma)
- ► Keep patient warm
- ► Determine patient severity (see "Trauma Patient Criteria" - see **page 26**):


Kahoot!