Approach to Trauma

1. MECHANISM OF TRAUMA

- Important details of accident:
  - Speed
  - Mechanism of collision → head-on, T-bone, rollover
  - Type of vehicle → recreational, bikes
  - Safety restraints → seat belts, airbags, car seats
  - Damage to vehicles → where, how much, intrusion into compartment
  - Other occupants → expelled from vehicle, death on scene

2. PRIMARY SURVEY & RESUSCITATION:

- 1st trauma assessment → must be SEQUENTIAL (don't move forward until issues managed)
- Goal = identify **life-threatening** injuries + appropriate resuscitation
- 5 components:
  - AIRWAY → **Patency** (open vs obstructed)
    - Must be in C-spine collar (immobilized) → don't move neck during airway assessment
    - Causes of **obstruction** → secretions (blood, vomit), distortion of anatomy (fracture, swelling from hematomas), tongue obstruction (from ↓LOC)
    - Assessment = listen + watch
      - If alert & talking = patent
      - If alert & unable to speak/gurgling noises = obstruction
      - If obtunded with resp efforts & noisy breathing = obstruction
      - If obtunded witout resp effort = assume unable to keep airway patent
        - GCS < 8 = airway intervention required
    - **Management**:
      - TEMPORARY:
        - Suction → if d/t blood/vomit
        - Jaw thrust → anterior movement of jaw & tongue
          - NO head tilt (don't move neck)
      - Oral/Nasopharyngeal **airways**
        - Limited as no prevention of blood/secretions into trachea
      - DEFINITIVE = intubation
        - Prevents aspiration into lungs
        - If unable to intubate d/t obstruction → cricothyroidotomy
  - BREATHING → **ventilation & oxygenation**
    - 4 potential problems
      - PTX → separation of parietal & visceral pleura d/t puncture in visceral pleura leading to air into pleural space
        - **Tension PTX** = 1-way valve leading to ++ accumulation of air on affected side → mediastinal shift + heart compression → ↓venous return + ↓CO → ↓BP
          - Px features (leads to Dx)
            - Resp distress = indrawing, ↑RR
            - ↓BS on affected side
            - Contralateral tracheal deviation
            - ↑JVP from poor venous return
            - ↓BP
          - Tx = RELEASE AIR via needle decompression (14G to 2nd ICS MCL) + chest tube (5th ICS Ant. Axillary Line)
        - **Open PTX** = associated wound in skin = communication between pleural space & outside → air enters via wound on inspiration → tension PTX if accumulation of air
          - Main cause = penetrating trauma (stab wounds, gun shot)
          - Px features:
            - Inspect skin for deep, open wounds with air movement
          - Tx = 3-sided occlusive DRESSING over wound to limit further air entry + chest tube

- **Massive hemothorax** = blood in pleural space affecting lung expansion
    - Dx = CXR
    - Tx = CHEST TUBE (5th ICS **Post**. AL) + surgical repair of bleeding structures
        - Amount of blood drained determines hemothorax vs massive hemothorax
- **Flail chest** = ≥2 rib fractures in ≥2 spots within each rib → segment moves <u>independently</u> from rest of thorax
    - On inspiration → segment moves in-draws, remainder of thorax expands
    - On expiration → segment moves out, remainder of thorax retracts inwards
    - Dx = asymmetry of chest wall movement with breathing
    - Tx = early INTUBATION with ventilation control

- CIRCULATION → goal = **control** active hemorrhage + **replace** blood loss
    - Direct pressure for obvious bleeding (surgical clips, staples, manual, tourniquet)
    - Estimate blood loss → 4 classes of hemorrhagic shock:
        - **Class 1**: <15% blood volume
            - ↑BP, normal BP
            - Tx = IV crystalloids (NS, RL)
        - **Class 2**: 15-30% blood volume
            - ↑HR, ↓BP, ↓PP
            - Tx = IV crystalloids (NS, RL)
        - **Class 3**: 30-40% blood volume
            - ↑↑HR, ↓↓BP, ↓LOC (agitated, confused)
            - Tx = IVF + blood
        - **Class 4**: >40%
            - ↑↑HR, ↓↓BP, ↓↓LOC (obtunded)
            - Tx: IVF + blood
- DISABILITY → assessment of NEURO status
    - Global Score:
        - **AVPU scale** → measures best response of patient
            - Awake, responds to Voice, responds to Pain, Unresponsive
        - **GCS** → eyes (/4), verbal (/5), motor (/6)

Score	**Eye Opening**	**Verbal Response**	**Motor Response**
6	-	-	Obeys commands
5	-	Oriented	Localizes to pain
4	Spontaneous	Confused	Withdrawals to pain
3	To voice	Inappropriate words	Flexion posturing
2	To pain	Sounds only	Extension posturing
1	None	None	None

    - Gross motor/sensory → all 4 extremities
        - More detailed exam in secondary survey
    - **Pupils** → size, symmetry, reaction to light
- EXPOSURE → remove <u>all clothing</u> from patient to expose and assess for injuries
    - Ensure patient remains warm when exposed

3. SECONDARY SURVEY:

- Begins once all aspects of primary survey assessed and managed
- Consists of **head to toe** exam with focus on trauma
- Components:
    - H&N:
        - **Face** → ecchymosis around eyes (Raccoon eyes) & behind ears (Battle's sign), tenderness of facial bones/nasal bones/jaw, CSF rhinorrhea
        - **Eyes** → visual acuity, eyelid/globe injuries
        - **Mouth** → tongue laceration & missing teeth
        - **Ears** → hemotympanum, foreign bodies, CSF otorrhea
        - **Scalp** → skull fracture, swelling, lacerations
        - **C-spine** (without moving patient) → palpate for tenderness, swelling
        - **Anterior neck** → swelling, deformities, lacerations

- CHEST:
  - Inspect → swelling, bruising, seat-belt sign
  - Palpate → tenderness, subcutaneous emphysema, clavicles/ribs/sternum
  - Listen → heart, lungs
- ABDO:
  - Inspect → swelling, bruising, deformities
  - Palpate → tenderness
  - Focused abdo US (**FAST**) → look for free-fluid
- PELVIS:
  - Inspect → swelling, bruising, deformities
  - Palpate → tenderness, deformity, asymmetry, **instability**
    - If pelvic fracture/instability present → don't continue to manipulate (will ↑bleeding)
- PERINEUM:
  - Inspect → lacerations, hematoma, blood in urethra (if present then NO catheterization)
- EXTREMITIES:
  - All 4 checked for neurovascular status = pulse, motor, sensation
  - Inspect → any lacerations requiring suturing; joints for swelling & deformities
- BACK → **log roll**
  - Inspect → lacerations, swelling, deformities, bruising
  - Palpation of entire spine → swelling, tenderness, step deformities
  - DRE → high-riding prostate, loss of rectal tone, presence of blood

- Findings indicate what investigations are required

4. INDICATIONS FOR IMAGING IN TRAUMA

Canadian C-Spine Rule:

- Used in patients who have suspicion of cervical spine injury → divides patient into **high/low** risk
- Only applicable to ALERT & STABLE trauma patient
- HIGH risk = **needs** C-spine Xray (any 1 of following)
  - Age **≥65**
  - **Paresthesias** in extremities
  - **Dangerous** mechanism = fall >5steps or >3feet, axial loading (ie. diving), high speed MVA (>100km/h), MVA involving rollover or ejection, bicycle or recreational vehicle (ie. ATVs) involvement
- LOW risk → allow c-spine to be cleared **clinically** (without Xray) if any 1 of following:
  - **Simple** rear ended MVC = no rollover/ejection, not high-speed, no impact by truck/bus
  - **Sitting** position in ED
  - **Ambulatory** any time after injury
  - **Delayed** neck pain
  - **No** midline tenderness
  - If **≥1** low risk factor present → **test** active ROM
    - **≥45** degrees rotation bilaterally → NO xray required = clinically **cleared** c-spine
    - **<45** degrees rotation either side → **needs** C-spine Xray
  - If NO low-risk factor present → needs C-spine Xray
- INTERPRETING C-spine Xray → 3 views (AP, Lat, Odontoid)
  - **Lateral** = most useful → must evaluate:
    - Adequacy of film → must see from C1 to top of T1
    - Alignment (anterior/posterior vertebral lines, spinolaminar line)
      - If lines smooth & no "steps" = good alignment
    - Contour & cortex of bones for deformities/fractures
    - Soft tissue (ST) anterior to vertebra
      - Rule = **<6mm** ST anterior to **C2**, **<20mm** ST anterior to **C6**
        - If > than above values → possible acute injury bleeding into space
  - **Odontoid** → focus on C1-C2 interface & evaluate for:
    - Fracture of Dens (tip, base, with C2 body)
    - Lateral masses of C1 → if extend beyond edge of C2
    - Symmetry of C1 lateral masses and Dens

Canadian CT Head Rule:

- Only applicable to **minor** head injuries with either witness LOC, amnesia, or confusion AND GCS 13-15
- **Exclusions =** Age <16, ↑risk of bleeding (bleeding disorders, anticoagulation)
- HIGH risk (3 categories) = **needs** CT Head if presence of any 1 of following:
    - **Patient**:
        - Age **≥65**
        - ≥2 episodes **vomiting**
        - **Amnesia** before impact ≥30min
    - **Mechanism** of injury
        - Pedestrian vs vehicle
        - Ejection from vehicle
        - Fall >5steps or >3feet
    - **Px**:
        - GCS <13 at presentation or <15 2h post injury
        - Suspected open/depressed skull fracture → step-deformities, boggy hematoma
        - Signs of basal skull fracture → Raccoon eyes, Battle's sign, hemotympanum, CSF otorrhea/rhinorrhea

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