

## COOK COUNTY HOSPITAL TRAUMA UNIT PROTOCOLS – ADULT

### HEAD – PENETRATING

All gunshot injuries involving the cranium get a CT head regardless of mental status.

### HEAD – BLUNT

Anyone with a period of LOC, seizures, or not neurologically intact should have a non-contrast CT head. History of amnesia or unknown LOC equals LOC and should have a CT head.

Patients with suspected depressed skull fractures (by history or physical exam) should also have a CT head.

**All patients with blunt head trauma on anticoagulation or antiplatelet (ASA, Plavix, etc.) agents should have a CT head regardless of LOC. \*\*\*add protocol for TBI in anticoagulated pts with 1) neg CTH , 2) +CTH- research needed**

**Patients who have had blunt head trauma with LOC and who have a negative head CT, neurologically intact, not intoxicated, not anticoagulated, not on antiplatelet therapy, and have no other injuries which require admission may be discharged home with family and head injury instructions. All others should be admitted for 23 hour observation.**

**LOC that is the result of a syncopal episode should get a CT head, and usually an EKG and a medicine consult for a syncopal workup in addition to the remainder of their symptom based trauma workup.**

### NECK – PENETRATING

Anterior neck is defined as above the clavicles and anterior to the posterior border of the sternocleidomastoid muscle.

The anterior neck is divided into **ZONES I, II and III. Zone I is the thoracic inlet to the cricoid cartilage. Zone II is the cricoid cartilage to the angle of the mandible. Zone III is above the angle of the mandible.**

**All penetrating injuries that do not penetrate the platysma are lacerations and do not require further workup. Patients who have a penetrating injury to the neck and who are UNSTABLE or have HARD SIGNS of vascular injury require surgical or procedural intervention. Otherwise, workup is:**

- 1. Zone I**
  - a. CTA arch and neck**
  - b. Evaluation of esophagus with EGD and esophagram**

- c. Consider evaluation of trachea with bronchoscopy
- 2. Zone II
  - a. CTA neck
  - b. Evaluation of esophagus with EGD and esophagram
  - c. Consider evaluation of trachea with bronchoscopy
- 3. Zone III
  - a. CTA neck and soft tissues
  - b. Visual inspection of oropharynx

\*If metallic foreign body present, consider traditional angiography instead of CTA.

Penetrating injuries to the posterior neck in proximity to the vertebral arteries should have a **CTA neck** to evaluate the vertebral arteries.

#### NECK – BLUNT

Patients with blunt trauma may have their cervical spines cleared clinically if they meet the following criteria:

1. Not clinically intoxicated (able to discriminate 2 point tactile sensation and pain)
2. Awake and alert with a GCS of 15
3. No neck pain or tenderness on exam or motion of neck
4. No neurological findings
5. No distracting pain

**If the above criteria cannot be met, then the C-spine must be cleared with a CT C-spine. If the CT C-spine is negative for fracture, then the C-spine should be clinically reevaluated. If the patient is then clinically sober with a normal GCS and no longer has neck pain or tenderness, the C-spine can be cleared clinically.**

**If the patient continues to have neck pain or tenderness and the patient is clinically sober with a normal GCS, then the ligaments can be cleared with a flexion/extension x-ray. The flexion/extension x-ray must image the area of pain or tenderness and have adequate flexion and extension (15 degrees each direction). If a flexion/extension x-ray is inadequate or cannot be performed, then an MRI of C-spine is the final method for clearing a C-spine in an awake patient.**

**If a C-spine is unable to be cleared in an obtunded patient, then a Miami J collar will remain in place and a CT C-spine can be repeated on hospital day 5 to 7. If this is negative for injury, then the C-collar can be removed.**

**Patients with thoracic or lumbar spine pain or tenderness or neurologic deficits should have a CT Thoracic or Lumbar spine. If the patient is also getting a CT arch or a CT abdomen/pelvis, the spine can be reconstructed from these images.**

## THORAX-PENETRATING

The chest consists of many compartments divided by anatomic boundaries. They are: 1) chest, 2) cardiac box, 3) thoraco-abdomen and 4) posterior box.

Chest: All areas supported within the rib cages, are, by definition, the "chest". All penetrating wounds to the chest that cannot be determined conclusively to be extra thoracic should have an admission CXR. All pneumothoraces or effusions should be treated with a chest tube. If the initial CXR is normal, a repeat inspiration/expiration CXR should be done 6 hours after the first CXR.

Cardiac box: The cardiac box is a rectangle bound by:

1. Superior – the angle of Louis = manubriosternal junction
2. Laterally – mid-clavicular lines
3. Inferior – a line drawn between the costal margin at the level of the mid-clavicular lines which included the upper epigastrium

Penetrating injuries in this area are at risk for injury to the heart. **An ECHO should be done emergently to evaluate for pericardial fluid – cardiology fellow on call immediately consulted.** Any fluid seen on ECHO or a suboptimal study mandates a pericardial window.

Posterior box: Injuries to this area put posterior mediastinal structures (aorta, esophagus and trachea) at risk

1. Superior – scapular spine (top of scapula)
2. Lateral – medial borders of scapulae
3. Inferior – costal margin

Workup:

1. Gunshot injuries
  - a. CXR
  - b. CT arch**
  - c. Esophagram and EGD
  - d. Consider evaluation of trachea with bronchoscopy
2. Stab wounds – less likely than GSW to produce injury due to protective muscles
  - a. CXR
  - b. IF CXR is completely normal, workup is completed except for a repeat CXR in 6 hours
  - c. If PTX or effusion, a chest tube is placed. If no particular matter is recovered, follow patient as indicated
  - d. If mediastinal air, consider esophageal injury
  - e. If mediastinal widening, considering aortic injury

Thoracoabdomen: Wounds originating from the thoracoabdomen are at risk for causing diaphragmatic injuries

1. Superior margin
  - a. Anterior – nipples
  - b. Posterior – tips of scapula
2. Inferior margin – costal margins

Workup includes:

1. CXR
2. DPL
  - a. Positive DPL >10,000 RBC
  - b. **If a DPL cannot be done, consider diagnostic laparoscopy or laparotomy to evaluate for diaphragm injury**

### **Chest tube management**

**Chest tubes are placed for pneumo- and hemothoraces.**

**Once a chest tube is placed, it is connected to a pleuravac and placed to 80mmHg wall suction.**

**The chest tube stays to wall suction until there is no air leak and no pneumothorax on CXR. Once these criteria have been met, regardless of output amount, the chest tube is then placed to water seal and a CXR is done. If the CXR demonstrates a pneumothorax, the chest tube is placed back to wall suction for 48 hours.**

**The chest tube is ready to be removed once:**

1. **It is on water seal**
2. **The previous 24 hour output is less than or equal to 100mL**

### **THORAX-BLUNT**

Blunt chest trauma puts multiple structures at risk. Rib fractures, pulmonary contusion, pneumo/hemothoraces are common. These should be evaluated with a CXR.

Blunt aortic injury risk factors:

1. Accelerating/decelerating injuries > 30MPH, falls >30feet, or sudden compression of chest (ie, car falling off jack)
2. Physical exam findings – abrasions or tenderness of chest wall
3. Abnormalities on CXR

If a patient has an appropriate mechanism (risk factor 1) **PLUS** one of the other factors – imaging or physical exam findings, then the patient should have a CT of the chest with “arch protocol” to evaluate their aorta. The CT arch must be read by the attending radiologist on call. If the CT arch is abnormal, cardiac surgery is consulted.

Blunt cardiac injury: Similar mechanisms of injury as in blunt aortic injury

An initial EKG and troponin I is obtained. If the troponin I level is elevated, or any of the following EKG findings exist, then the patient is admitted to trauma obs for **serial EKGs (total of 4, Q8 hours apart) for 24 hours and telemetry monitoring.**

EKG findings of BCI:

1. Abnormal EKG = ST changes, bundle-branch blocks, changes from previous EKGs
2. Dysrhythmias on monitor
3. Cardiogenic shock

If BOTH initial EKG and troponin I are negative, BCI is ruled out.

#### ABDOMEN-PNETRATING

Indications for operation:

1. Location of bullet pathway
2. Unstable patient
3. Evisceration
4. Retained stabbing implement
5. Gross blood per orifice
6. Peritonitis
7. Pneumoperitoneum
8. Positive DPL
  - a. GSW >10,000 RBC
  - b. Anterior abdomen stab wound >100,000 RBC
  - c. Thoracoabdomen or back/flank stab wounds >10,000 RBC

#### ABDOMEN – GUNSHOT WOUNDS

All gunshot wounds that penetrating the peritoneal cavity require an operation as >98% will have an injury that requires repair. “Tangential” gunshot wounds may have a DPL which is considered positive and requires operative exploration if > 10,000 RBC.

#### ABDOMEN – ANTERIOR STAB WOUNDS

Only 50% penetrate the peritoneal cavity. Of those, only 50% will cause an injury that requires repair. Injury may be diagnosed with a DPL. A positive DPL requiring operative exploration is >100,000 RBC. Local wound explorations are unreliable and prone to complications.

#### ABDOMEN – BLUNT

Patients with blunt trauma to the abdomen should have an evaluation for intra-abdominal injuries. Methods of evaluation are:

1. CT scan of abdomen
  - a. Stable patient

- b. Good for solid organ injury
- 2. FAST
  - a. For use in unstable blunt abdominal patients to identify cavity with hemorrhage
- 3. DPL
  - a. Place foley and NGT
  - b. Avoid with previous abdominal surgery
  - c. RBC > 100,000 is positive
- 4. Serial abdominal examination
  - a. Must be done frequently and by the same examiner
  - b. Only in absolutely stable patients

#### BACK AND FLANK – PENETRATING

Penetrating injuries originating from this region put retroperitoneal structures at risk without necessarily injuring intra-abdominal organs

Back and flank borders:

1. Anterior – mid axillary lines
2. Superior – tip of the scapula
3. Inferior – iliac crests

Workup

1. Triple contrast (oral, rectal and IVF) CT scan
2. DPL >10,000 indicates penetrating into the peritoneal cavity and mandates operative exploration for both GSW and stab wounds
3. If CT scan is entirely negative and shows the entire track of the knife or bullet, then the DPL may be avoided

#### PELVIS – PENETRATING

All penetrating injuries that are trans-pelvic put the abdominal viscera and pelvic outflow tracts at risk.

Workup:

1. Rigid proctosigmoidoscopy
2. Retrograde urethrogram and cystogram
3. Females – vaginal speculum exam
- 4. CTA pelvic vessels**
5. DPL if intra-abdominal penetrating cannot be ruled out
6. Triple contrast CT is retroperitoneal injury is possible

\*If metallic foreign body present, consider traditional angiography instead of CTA.

#### PELVIS – BLUNT

Most of the adverse sequelae of blunt pelvic trauma results from pelvic fractures. The most immediately life-threatening concern is from hemorrhage.

Workup:

1. Rule out intra-abdominal injury
  - a. If need DPL, use open supra-umbilical technique
2. RUG and cystogram for

- a. All fractures of anterior pelvis
- b. Blood at meatus, perineal or scrotal hematoma, or high-riding prostate
- 3. Rigid proctosigmoidoscopy
  - a. If gross rectal blood
- 4. Vaginal speculum exam
  - a. All open pelvic fractures
  - b. Gross vaginal blood

#### VASCULAR INJURIES

##### **Hard signs of vascular injury:**

1. Absent pulse
2. Active hemorrhage
3. Expanding hematoma
4. Bruit or thrill

**Injuries with hard signs generally require operative intervention.**

##### **Soft signs of vascular injury:**

1. Unequal or decreased pulse
2. Nonexpanding hematoma
3. H/o large blood loss at the scene
4. Neurologic deficit

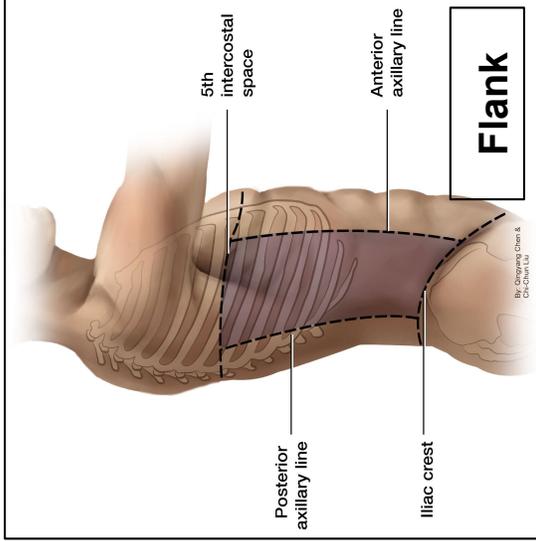
**Penetrating injuries to the extremities IN PROXIMITY TO A MAJOR BLOOD VESSEL PLUS SOFT SIGNS on physical exam should undergo a CTA of that extremity.**

**Consider a formal angiogram in patients with a retained missile or multiple metallic fragments in proximity to the area of concern. Formal angiograms done for proximity alone in a compressible (extremity) vessel can be done in the morning.**

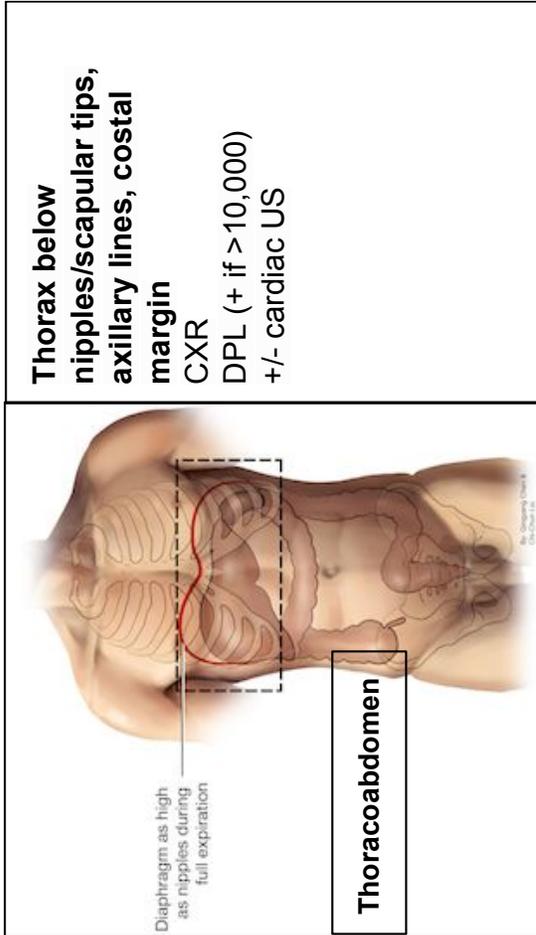
**Penetrating injuries in proximity alone to the subclavian/axillary vessels should undergo CTA imaging or a formal angiogram immediately.**

#### PEDIATRIC TRAUMA

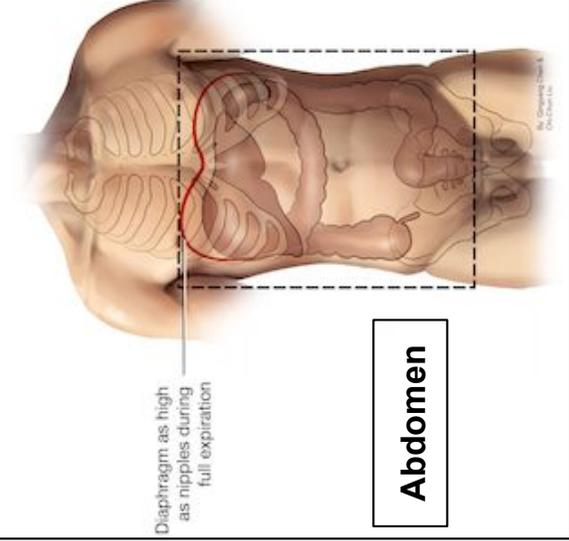
**All patients 14 years old and under that arrive in the trauma bay should be evaluated by the trauma team. The ER chief or surgery chief on call will then page the pediatric surgeon on call and discuss the patient with them to determine a plan. The pediatric trauma protocols can be found in the purple binder in the front room. All pediatric traumas get a social work consult and a pediatric screen should be filled out. If the pediatric screen is positive, then a CPS consult is done. They will determine if DCSF is required. All pediatric burn patients get a social work AND a CPS consult.**



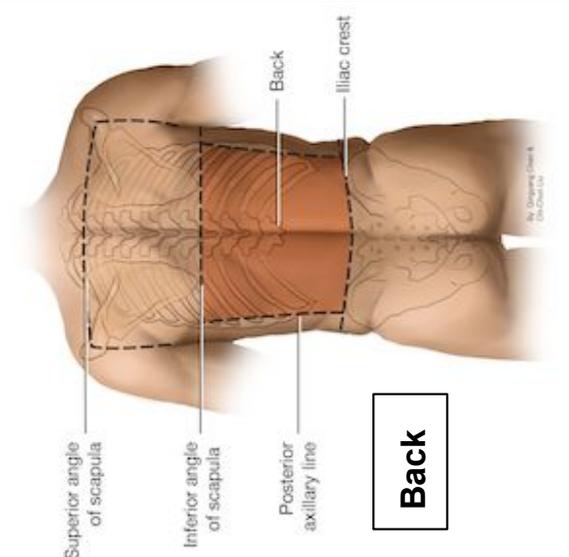
**Midaxillary line, tip of the scapula, iliac crests**  
 CT Abd/ pelvis, triple con  
 DPL (>10,000 positive)  
 \*if CT scan is neg and shows entire wound track, no DPL needed



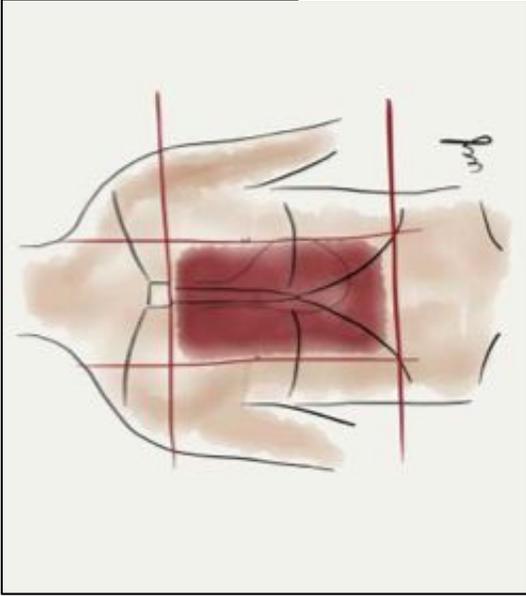
**Thorax below nipples/scapular tips, axillary lines, costal margin**  
 CXR  
 DPL (+ if >10,000)  
 +/- cardiac US



**Axillary lines and inguinal ligaments**  
 DPL, CXR  
 +/- ex lap  
 \*Unstable  
 \*evisceration  
 \*retained sharp implement  
 \*gross blood per orifice  
 \*pneumoperitoneum  
 \*positive DPL (GSW > 10,000, stab >100,000)



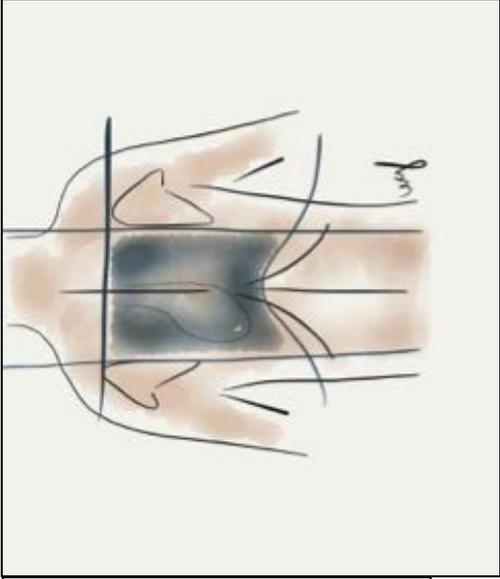
**Inferior angle of scapula, posterior axillary line, iliac crests**  
 CXR  
 CT Abd/ pelvis, triple con  
 DPL (>10,000 positive)  
 \*if CT scan is neg and shows entire wound track, no DPL needed



**Cardiac box**  
 Angel of Lois, midclavicular line, costal margin

Emergent Echo, CXR.  
 Any area supported by the rib cage with penetrating trauma gets a CXR. Repeat CXR 6hrs later if first is normal.

GSW:  
 CXR, CT arch, esophogram, EGD, +/- bronchoscopy.  
 Stab:  
 CXR, if normal, repeat in 6 hrs. If mediastinal air, consider esophageal injury, if mediastinal widening, consider aortic injury



**Posterior cardiac box**  
 Scapular spine, medial borders of scapula, costal margin