**Blunt Chest Injuries Guidelines**

**ORIGINATION DATE**: 03/04/2013

**LAST UPDATE:** 10/6/2025

**PURPOSE:** To establish guidelines for the management of trauma patients with blunt injury to the chest. To define an optimal diagnosis strategy and appropriate treatment plans for suspected injuries.

**DEFINITIONS:**

Blunt Injury: Any mechanism creating a force to cause injury to the chest cavity.

Chest: The thorax area bound superiorly by the lower neck and inferiorly by the lower costal margin.

Signs of Life: Presence of blood pressure, palpable pulse, organized cardiac activity, or respiratory effect.

**POLICY:**

Any blunt force to the chest has the potential to cause internal organ damage, which may involve the:

- Heart
- Lungs
- Tracheobronchial tree
- Esophagus
- Great vessels
- Diaphragm
- Spine/Spinal Cord

**PROCEDURE:**

- In all patients, assess ATLS ABC's, and if necessary, obtain an airway as quickly as possible.
- Patients who present without a palpable pulse will be managed per the traumatic arrest and trauma resuscitation guidelines.
- In the non-arrest patient, evaluate the patient through a primary and secondary survey and manage injuries according to the appropriate divisional and hospital guidelines.

**Primary Survey and Adjuncts**

**Airway** – Immediate endotracheal intubation (or surgical airway if appropriate) should be secured in those patients with an unstable airway. Patients presenting with suspected tension pneumothorax should have their chest rapidly decompressed (needle, finger, or tube thoracostomy) prior to obtaining an advanced airway. Failure to perform this may result in further hemodynamic collapse and patient demise.

**Breathing** – Any patient with significant hypoxemia or hemodynamic compromise and physical exam findings consistent with a **pneumothorax** should have their chest decompressed (either 28f chest tube, or pigtail catheter) prior to obtaining imaging. If hypoxemia is mild, treatment can be delayed until imaging is performed. Severe hypoxemia may also be related to a significant **tracheobronchial tree injury**. This should be suspected in the setting of persistent hypoxemia (despite chest tube placement) and a large air leak. The use of single lung ventilation by advancing the ETT into the right mainstem or

utilizing an endobronchial blocking device are potentially life-saving maneuvers in those patients who cannot otherwise be oxygenated.

**Circulation** – All hemodynamically unstable patients should, at a minimum, have an extended FAST (eFAST) and Chest XR performed. Further adjuncts to evaluate for hemorrhage should also be considered (Pelvic XR, Foley catheter, etc…)

**Hemothorax** should be treated with placement of a 28f chest tube however consideration for a pigtail catheter can be made for stable patients. Evacuation of a massive hemothorax may necessitate rapid transit to the operating room for thoracotomy. While immediate drainage of 1500cc of blood has been considered an indication for a thoracotomy this is not an absolute indication. Instead, the decision to operate on the patient should be made based on their hemodynamics, need for blood products, and amount of ongoing chest drainage. Patients with normal hemodynamics (or who regain normal hemodynamics) following chest tube placement should have their chest irrigated with 1L warm normal saline to reduce the incidence of retained hemothorax.

**Severe Pulmonary Contusion** may also result in hypotension secondary to right heart strain. Once it has been determined there is no significant source of bleeding, fluid and blood products should be limited. These patients may be candidates for extracorporeal life support depending on the severity of their contusions and hypoxemia.

**Blunt Cardiac Injury** may result in life threatening arrhythmias and/or structural damage to the heart resulting in hemodynamic compromise. An EKG should be performed on any patients suspected of having a BCI. Those with new EKG changes (arrhythmia, ST changes, ischemia, and heart block) should be admitted for continuous telemetry monitoring. A normal EKG and negative troponin effectively rule out BCI. Patients with normal EKG but elevated troponin should be admitted for monitoring. A formal echocardiogram should only be obtained in those with persistent hypotension or a new-onset arrhythmia. (ref EAST GUIDELINES)

**Disability** – Patients with exam findings consistent with a thoracic spinal cord injury may present in neurogenic shock. The presence of hemorrhagic shock must be ruled out prior to attributing hemodynamic abnormalities to a spinal cord injury. Patients with vertebral fractures or spinal cord injuries should have appropriate imaging of their entire spine and the spine team should be consulted. Additionally, these patients should be offered appropriate analgesia and have their bladder decompressed with a foley catheter.

**Secondary Survey** – Specific Injuries

**Occult Hemo/Pneumothorax** – These are defined by pneumo- or hemothoraces not visible on plain radiography but present on axial imaging. For patients with asymptomatic occult pneumothoraces with a lung collapse less than 35mm measured radially on axial imaging of largest air pocket, no thoracic intervention should be performed. These patients should have a follow-up CXR within 24h to evaluate the stability of the pneumothorax. If a patient becomes symptomatic, they should have imaging repeated or a chest tube placed depending on the severity of symptoms. Occult hemothoraces with estimated volumes < 300cc (estimated by using the formula - d2 * L where d = greatest AP distance from chest wall to mediastinum of the largest collection of blood on axial imaging in cm, L = height of the fluid column (number of slices on axial imaging of the fluid collection * thickness of slices in cm)) can be

managed expectantly. Follow up imaging at 24h and 72h at a minimum should be obtained. If patients are discharged prior to 72h, they should have short term follow-up in clinic with a preclinic CXR

**Rib Fractures** - Patients with fractured ribs should be placed on the Chest Trauma Monitoring pathway and have their vital capacity and tidal volumes monitored. The Acute Pain guideline should be used to assess and treat pain in a multimodal fashion. Geriatric patients should be followed especially closely and should be admitted to the ICU if they have >3 ribs fractured, or if their vital capacity is < 40% of predicted in the Emergency Department. Please refer to the Geriatric Trauma Patient Guideline for guidance on this population.

Patients with fractured ribs should be considered for operative repair if any of the following are present:

- Flail chest (three or more ribs fractured in 2 or more areas) or
- Three or more ribs with bicortical displacement

-AND-

- Severe pain despite maximal medical management, persistent Vc < 40%, or progressive lung collapse seen on serial imaging studies.

Patients on Extracorporeal Membrane Oxygenation (ECMO) therapy should not routinely undergo rib fixation as a means to wean this therapy. These patients present an especially high risk of bleeding complications and should only undergo fixation if deemed appropriate or necessary be the trauma faculty AND anticoagulation can be held for an extended perioperative interval.

**Sternal Fracture** - repair should be considered for patients with severe displacement, or significant ongoing pain despite maximal medical management.

**Great Vessel Injury** – Patients with CXR findings indicative of mediastinal hematoma (widened mediastinum, loss of AP window, widened parasternal stripe, indistinct aortic contour etc…) should have a CT angiogram of the chest. Refer to the multidisciplinary Aortic Injury Guideline for patients diagnosed with aortic injuries.

**Esophageal Injury** – Blunt esophageal injury is rare. Although unexplained mediastinal air should raise suspicion for an esophageal injury this finding in isolation is not specific for this injury and does not warrant further workup. Patients with high suspicion for injury based on clinical presentation or radiographic findings should have a full aerodigestive workup (endoscopy, bronchoscopy, and contrast esophogram).

**Imaging**:

*Initial Assessment*:

- With rare exception, all blunt trauma patients should have a portable CXR in during their initial assessment
- Patients transferred from a referring hospital should have a repeat CXR on arrival
- Stable patients may be sat upright for their CXR to improve the diagnostic quality

*Disease specific*:

- Patients admitted with rib fractures should have at a minimum 1 additional CXR during their admission.
- Patients with significant rib fractures and ongoing pain or oxygen requirement should have follow-up imaging periodically throughout their admission
    - Strong consideration for ordering pre-clinic CXR at time of discharge.
- Patient with hemothoraces (without chest tube) should have imaging at 72h from admission to evaluate for delay progression of their HTX (this is a minimum standard, more films may be required.)

*Patient with Chest Tubes*:

- Changes to chest tube status (water seal, suction etc…) require a follow up chest x-ray between 6-24h after.
    - Applies primarily to patient with tubes which may be removed in the next 24-48h.
    - For tubes that are unlikely to be removed (air leak or ongoing drainage) this is less important, and decisions can be based on the clinical situation.

- Chest tubes removed with ongoing lung pathology (small/stable PTx or effusion) will have post-pull CXR within 24h.
    - Strong consideration for ordering pre-clinic CXR at time of discharge

Clinical examples:

- Chest tube has minimal output and no air leak; changed from suction to waterseal – early follow up to expedite removal that day
- Chest tube has moderate output (perhaps down trending and may make our threshold within a day) and no air leak – follow up imaging next day

**REFERENCES:**


1. ATLS 10th ed
2. Screening for Blunt Cardiac Injury. J Trauma. 73(5): S301-S306, November 2012
3. Figueroa JF, Karam BS, Gomez J, et al. The 35-mm rule to guide pneumothorax management: Increases appropriate observation and decreases unnecessary chest tubes. J Trauma Acute Care Surg. 2022 Jun 1;92(6):951-957.


**APPROVAL:**

Author: David Milia, Trauma Medical Director

Reviewer: David Milia, Trauma Medical Director, Jacob Peschman, Associate Professor of Surgery

Approval: Trauma Quality and Operations Committee