

Unstable Patient with Blunt Trauma

An unstable patient is any patient at high risk for physiologic deterioration. Commonly, though not exclusively, such patients present with:

- Hypotension,
- Hypoxia/respiratory distress, and/or
- Obtundation or impaired consciousness

a) *Bedside Imaging for the Unstable Patient*

Initial assessment of the unstable patient in the ED by the treating team focuses on the methodical completion of primary and secondary surveys to diagnose and treat imminently life-threatening conditions. Bedside imaging plays a key role in this process and should be limited only to studies that will meaningfully advance the care of the patient in an efficient and prioritized manner.

Selected bedside imaging studies targeting the presence of specific life-threatening conditions (e.g. hemorrhage, pneumothorax, hemopericardium) are appropriate prior to definitive imaging (CT) in unstable patients. In general, these studies include:

- Chest XR (supine)
- Extended Focused Assessment with Sonography for Trauma (E-FAST) (See **Appendix F** for E-FAST standards)
- Pelvic XR Targeted plain film X-ray

In selected patients, the following further studies may also be appropriate on an emergent basis in the ED during initial assessment:

- Urethrogram
- Lateral cervical spine plain X-ray
- Targeted plain film X-ray

The plain film imaging of extremity fractures and other studies not urgently required for the determination of imminently life-threatening or limb-threatening conditions should generally be deferred until definitive imaging

Table 1. Bedside Imaging Protocols in Unstable Blunt Trauma

Modality	Recommendations
Chest XR (supine)	<p>Clinical Use to rule out critical diagnoses contributing to hypotension, including major pneumothorax and major hemothorax. If tension pneumothorax is suspected because of hypotension in the setting of absent/diminished breath sounds, respiratory distress, possible tracheal shift and/or hypoxia, then chest decompression should precede CXR.</p> <p>CXR is needed after placement of intrinsic tubes such as endotracheal or chest tubes.</p>

		Other important findings will include stigmata of blunt aortic injury, diaphragm disruption, T-spine injury, major rib fractures.
	Reporting	See Appendix E
Extended Focused Assessment with Sonography for Trauma (E-FAST)	Clinical	Standard E-FAST to visualize free fluid in the pleural, pericardial, perihepatic, perisplenic, and pelvic locations and pneumothorax in the anterior pleura. If CT not readily available, clinicians should consider E-FAST even in stable patients. E-FAST can be used to reserve OR suites, initiate massive transfusion protocol and establish ABC score. It is low cost and clinicians can benefit from maintaining their skill with this modality. If CT is readily available, however, clinicians should forego E-FAST as the latter does not contribute to decision-making. E-FAST is also useful in triage of multiple severely injured patients simultaneously.
E-FAST (cont'd)	Technical	Abdominal visualization uses a 3.5MHz probe. Lung visualization uses a 3.5-7.5 MHz with B-mode imaging of the lung via the 4 th or 5 th intercostal space.
	Reporting	See Appendix E
Pelvic XR	Clinical	If the pelvis is mechanically unstable on initial assessment, or there is concern that occult pelvic injury is present and responsible for occult hemorrhage, then a pelvic binder should be applied prior to bedside pelvic imaging. If CT imaging is anticipated immediately following initial assessment, then plain XR of the pelvis is not indicated on an emergent basis. May also be useful to determine if pelvic binding is needed prior to transfer to CT.
	Reporting	See Appendix E
Urethrogram	Clinical	In the profoundly unstable patient with a clinically unstable pelvic fracture and clinical signs suggestive of urethral disruption (perineal ecchymosis, meatal blood, high-riding prostate), who is not responding to resuscitation efforts (non-responder) and is likely to proceed directly to OR from ED, a single cross-table urethrogram is rarely recommended if a gentle attempt at bladder catheter insertion has been unsuccessful. If no urethral disruption is identified, catheterization may be safely re-attempted. Otherwise urological consultation for urethroscopy/cystoscopy or intraoperative insertion of a percutaneous urinary catheter is required. The unstable polytrauma undergoing emergent surgery requires bladder catheterization to monitor response to intervention and resuscitation during surgery, and this is more difficult to obtain once the patient has left the ED.
	Reporting	See Appendix E
Lateral cervical spine plain X ray	Clinical	In the unstable non-responder with devastating injuries and GCS=3, who shows no evidence of extremity movement and for whom emergent transfer to surgery without CT imaging is being considered, a cross-table lateral c-spine may demonstrate atlanto-occipital dislocation or other severely displaced c-spine fracture, which portends a poor prognosis and thereby facilitates a decision not to proceed to surgery.
	Reporting	See Appendix E

b) Whole Body CT for Trauma – Unstable Patient Responding to Resuscitation (WBCT-R)

Just as for stable trauma patients with a major mechanism, unstable patients responding to appropriate resuscitation should also undergo WBCT in centres able to expedite CT imaging safely

and efficiently. Any centre using WBCT for unstable responders must provide appropriate clinical monitoring and supervision by a physician-led trauma team during imaging. WBCT studies for trauma may be augmented by additional focused CT imaging when clinically indicated by the finding of major extremity trauma on initial assessment. This may include focused CT imaging of joints and fractures with corresponding CT angiography to rule out associated vascular injury.

Expert clinical judgment, as always, is required to determine the suitability of expedited WBCT in unstable responders. The use of CT in unstable responders is well supported by current evidence (see **Appendix A** for discussion of evidence on *Whole Body CT in Hemodynamically Unstable Patients*).

Since CT imaging requires the patient to be removed from a monitored environment, minimizing the time between when the patient leaves the ED to imaging and when he/she returns to ED is essential for patient safety.

The target completion time for WBCT-R is 15 min. door-to-door (from the time the patient departs the ED until he/she returns to ED).

c) Whole Body CT for Trauma – Unstable Patient Transiently Responding to Resuscitation (WBCT-U)

In some cases, initially unstable patients will respond to resuscitation only briefly or transiently (transient responders) indicating that more physiologically active injuries are present. The use of WBCT in these patients is more controversial, but still valuable and feasible if ongoing physiologic support can be maintained during imaging, and scanning can be completed extremely rapidly in a safe setting in direct proximity to the emergency department (see **Appendix A** for discussion of evidence on *Whole Body CT in Hemodynamically Unstable Patients*). In this instance, expedited WBCT is completed more quickly than standard WBCT for trauma and targets the presence of critical injuries that guide the Trauma Team Leader to make an optimally informed and prioritized management plan for the patient in extremis where a suboptimal disposition decision may be fatal.

The key diagnostic information sought in this instance is the presence or absence of:

- intracranial hemorrhage and intracranial hypertension
- cervical spine instability
- major blunt cervical vascular injury
- pneumothoraces
- blunt aortic disruption with contained or free extravasation
- major diaphragmatic tear
- major visceral injury
- unstable thoracolumbar fracture
- pelvic fracture associated with active arterial or venous hemorrhage

Since CT imaging requires the patient to be removed from a monitored environment, minimizing the time between when the patient leaves the ED to imaging and when he/she returns to ED is essential for patient safety.

The target completion time for WBCT-R is 15 min. door-to-door (from the time the patient departs the ED until he/she returns to ED).

Table 2. Whole Body CT Protocols in Stable and Unstable Blunt Trauma

Modality	Recommendations	
WBCT-S Whole Body CT for <i>Stable</i> patients	Clinical	Indicated for trauma patients who have presented physiologically STABLE and remained so. Standard monitoring required. The presence of a physician is not required.
	Technical	No oral contrast IV contrast Optional: Arch-to-COW CT angiography (see Appendix B for indicators) For details of Standard Trauma CT protocols, see Appendix D . Target completion time: 30 min. (door-to-door from ED to imaging and back to ED)
	Reporting	See Appendix E
WBCT-R Whole Body CT for <i>Unstable</i> patients responding to resuscitation (responders)	Clinical	Indicated for trauma patients who have presented physiologically unstable but have RESPONDED to appropriate resuscitation. Standard monitoring required. Monitoring and supervision by a physician-led trauma team including nursing and respiratory therapy is required.
	Technical	No oral contrast IV contrast Optional: Arch-to-COW CT angiography (see Appendix B for indicators) For details of Standard Trauma CT protocols, see Appendix D . Target completion time: 15 min. (door-to-door from ED to imaging and back to ED)
	Reporting	See Appendix E
WBCT-U Expedited Whole Body CT for <i>Unstable</i> Patients responding transiently to resuscitation (transient responders)	Clinical	Indicated for trauma patients who have presented physiologically UNSTABLE and have responded to appropriate resuscitation only transiently. Standard monitoring required. Monitoring and supervision by a physician-led trauma team including nursing and respiratory therapy is required.
	Technical	No oral contrast IV contrast For details of Standard Trauma CT protocols, see Appendix D . Target completion time: 15 min. (door-to-door from ED to imaging and back to ED)
	Reporting	See Appendix E