

JOHNS HOPKINS ALL CHILDREN'S HOSPITAL

Blunt Abdominal & Thoracic Trauma Clinical Pathway

Johns Hopkins All Children's Hospital

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This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient's individualized circumstances and the practitioner's professional judgment.

Blunt Abdominal & Thoracic Trauma Clinical Pathway

Rationale

This clinical pathway was developed by a consensus group of JHACH physicians, advanced practice providers, nurses and pharmacists to standardize the management of children presenting with blunt abdominal & thoracic trauma.

Background

Blunt abdominal trauma is a frequent occurrence after many injury mechanisms and is an important consideration when abdominal trauma is suspected or patient presentation is concerning for abdominal injury. Abdominal trauma is a leading cause of mortality and morbidity and identification can be challenging. Blunt thoracic trauma is less frequent in the pediatric population. However, the mobility of mediastinal structures makes children more susceptible to tension pneumothorax, which is the most common immediately life-threatening injury in children.

Diagnosis

Reliable signs of blunt abdominal trauma include: pain, tenderness, GI hemorrhage, hypovolemia, and evidence of peritoneal irritation. The following physical examination findings may also indicate concern of occult abdominal injury: lap belt marks, steering wheel shaped contusions, flank umbilicus ecchymosis, abdominal distention, auscultation of bowel sounds in the thorax, abdominal bruit, local or generalized tenderness, guarding, rigidity, or rebound tenderness, fullness or doughy consistency on palpation, crepitation or instability of the lower thoracic cage, or referred shoulder pain.

Lab tests: CBC, CMP, T&S, PT/PTT, amylase, lipase, AST, ALT, UA

Radiologic studies: chest and pelvis x-rays, CT abdomen/pelvis

Clinical Management

Determining stability of the patient on presentation is necessary to determine the immediate interventions necessary and to determine diagnostic and disposition options for treatment. Assessment and intervention should be coordinated with a trauma team activation and care driven by ATLS protocol.

This pathway focuses on **blunt abdominal trauma** (see algorithm next page). For **blunt thoracic trauma**, guidance focuses on the following clinical scenarios:

- Hemo/pneumothorax (HPTX): Place size-appropriate chest tube. If suspected tension pneumothorax, perform immediate needle decompression with 16-gauge angiocath or finger thoracostomy. If massive (>15 mL/kg initially) or persistent (>3 -4 mL/kg/hr) bleeding, consider thoracotomy. If persistent high-grade air leak or worsening subcutaneous air, consider flexible bronchoscopy to rule out tracheobronchial injury. Small (asymptomatic & and not appreciable on CXR) HPTX may be selectively observed at TTL discretion.
- Sternal fracture/concern for blunt cardiac injury: start with 12-lead EKG. Consider troponin and transthoracic echocardiogram if EKG abnormal and/or hemodynamic concerns.

Emergency Center Management

Patients presenting with blunt abdominal trauma and concern for occult injury should have a trauma team activation and ATLS protocols followed for initial assessment, correction of life-threatening injuries, rapid secondary assessment, and disposition decision.

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Blunt abdominal trauma (BAT)

- ATLS Primary/Secondary Survey + adjuncts: CXR, PXR, labs
- Determine hemodynamic stability
- Assess for immediate indications for OR (diffuse peritonitis, free air, evisceration)
- Consider FAST exam

Stable, no indication for immediate OR

Unstable

Immediate indication for OR

Indication for CT scan?

- Abnormal or unreliable exam
- Abd wall contusion (e.g. seat belt sign)
- Multiple rib fractures or pelvic fracture
- AST/ALT >125, lipase >3x normal, UA RBC>20
- Positive FAST
- High energy mechanism (trauma team leader discretion)

No indication for CT

Yes, indication for CT

Further workup and disposition per Trauma Team Leader (TTL)

Normal

Solid organ injury

Free fluid without solid organ injury

Pelvic fractures

Free air, intraperitoneal bladder injury, diaphragm injury

Disposition per TTL
(23h obs for seatbelt sign)

ICU vs. floor per criteria below and TTL (see APSA 2023 guideline)

Admit, serial abdominal exams (consider BIPS prediction model)

Consider CT cystogram

OR

- 20 mL/kg bolus warm isotonic crystalloid
- Consider PRBC/MTP

Vital signs stabilize

Vital signs remain unstable

- Transfuse PRBCs
- Activate MTP
- Consider FAST
- Assess response

Vital signs stabilize

Vital signs remain unstable

OR

CT abdomen/pelvis with IV contrast

Admission & Inpatient management

Possible admission criteria include continued abdominal pain, failed PO challenge, positive abdominal CT (see solid organ injury guidelines below), continued concern for occult injury with need for medical team serial examinations, and trauma team discretion.

All patients with known or suspected injury will be admitted to a surgical service under the direction of a trauma attending.

Transfusion guidelines:

- Begin transfusion after 20 mL/kg bolus of crystalloid if unstable hemodynamics, activate MTP at this time.
- Transfuse if Hgb <7 if hemodynamically stable and ongoing clinical concern for bleeding.
- Transfuse Hgb 5-7 if no longer clinical concern for ongoing bleeding.

Solid Organ Injury: Presence of ANY grade solid organ injury gets admitted to hospital with following criteria for ICU vs floor admission:

- ICU Admission:
 - o abnormal vitals after 20 mL/kg bolus of crystalloid
 - o q 6 hour CBC
 - o NPO
 - o Bedrest until vitals normalize and stable Hgb
- Floor Admission
 - o If vital signs normal, no more CBC necessary
 - o No bed rest
 - o May have diet as tolerated

Concern for blunt hollow viscus injury:

- Consider the Bowel Injury Prediction Score (BIPS)
- BIPS is calculated by assigning one point for each of the following: (1) WBC $\geq$ 17,000, (2) abdominal tenderness, and (3) intestinal injury grade $\geq$ 4 (mesenteric contusion or hematoma with bowel wall thickening or adjacent interloop fluid collection) on CT scan.
- BIPS of $\geq$ 2 has 67% positive predictive value and 82% negative predictive value for predicting surgical intervention (see Wandling et al.).

References

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Eastern Association for the Surgery of Trauma - Management Guidelines
<https://www.east.org/education/practice-management-guidelines>

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Christiano et al. Clinical significance of isolated intraperitoneal fluid on computed tomography in pediatric blunt abdominal trauma. Journal of Pediatric Surgery (2009) 44, 1242–1248.

McNutt et al. Early surgical intervention for blunt bowel injury: the Bowel Injury Prediction Score (BIPS). J Trauma Acute Care Surg. 2015 Jan;78(1):105-11. doi: 10.1097/TA.0000000000000471. PMID: 25539210.

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American College of Surgeons, Advanced Trauma Life Support Student Course Manual, 10th Ed., 2018

Outcome Measures:

- Spleen removal
- Delayed presentation of injury with delayed operative management from time of initial injury
- Unexpected mortality or morbidity

Clinical Pathway Team
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Disclaimer

Clinical Pathways are intended to assist physicians, physician assistants, nurse practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. The ultimate judgment regarding care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.

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