

Trauma Center Practice Management Guideline

Blank Children's Hospital — Des Moines

Blunt Abdominal Trauma Evaluation and Management Guideline

PEDIATRIC
Practice Management Guideline

Effective: 06/2014

Contact: Trauma Medical Director

Last Reviewed: 01/2020

PURPOSE

To address the evaluation of pediatric patients presenting acutely after blunt abdominal trauma.

BACKGROUND

Abdominal trauma is a leading cause of morbidity and mortality in children.

A carefully performed physical exam, while being cognizant of the limitations imposed by individual patient factors such as diminished mental status, remains central to decision making in the trauma bay. A clinician evaluating a pediatric trauma patients should be aware of the fact that their injury patterns and physiologic responses can be distinctly different from those observed in adults. As with adults, appropriately selected adjunct diagnostic studies are used to minimize the risk of missed injury. A patient's hemodynamic stability or instability will often dictate the diagnostic options available for use.

Pediatric patients have certain anatomic features that alter their susceptibility to intra-abdominal injury when compared to adults. A pediatric patient's abdominal wall typically has thinner musculature and less fat, providing less protection to underlying intra-abdominal organs. Ribs protecting the thoracic abdomen have an increased flexibility compared to adult ribs and, while this protects the ribs from damage, it more easily allows the ribs to injure the abdominal organs. Additionally, solid organs within the pediatric abdomen have a larger surface area relative to adult organs, and thus a greater area is exposed to potential injury. The organ attachments are also more elastic, which increases the chance of tearing and shearing injuries. In the pediatric patient, the bladder also extends to the umbilicus, increasing its chance for injury.

In the evaluation of the pediatric trauma patient, the risks of radiation exposure from planned imaging studies must be weighed against the anticipated benefits to the patient. The ALARA (as low as reasonably achievable) philosophy of pediatric radiation dose management evolved to address concerns about increasing radiation exposure from medical diagnostic testing. To limit the use of potentially harmful radiation exposure to children, we created guidelines for imaging in pediatric trauma.

Focused Abdominal Sonography for Trauma (FAST) has come to occupy a dominant role as the initial imaging study of choice in evaluating a blunt abdominal trauma patient. A positive study usually indicates the presence of a minimum of ~ 200 – 300 ml of free fluid. The sensitivity and specificity of FAST imaging improves with user experience, and physician trauma providers at IMMC are encouraged to make use of FAST a routine part of their evaluation of trauma patients. If FAST results are equivocal, alternative diagnostic options should be pursued. CT scan imaging has become the "gold standard" imaging modality in the evaluation of a blunt abdominal trauma patient. In spite of significant improvements in CT scan imaging technology, a notable weakness of CT imaging is in detection of hollow organ injury. Although rare in the blunt trauma patient, delays in diagnosis can result in significant patient morbidity and mortality. To be weighed against the risk of missed injury is the morbidity associated with non-therapeutic laparotomies. In patients in whom the diagnosis of blunt

intestinal injury is in question, there is evidence to suggest observation with serial abdominal exams, rather than repeated CT or urgent laparotomy, may be performed with no significant effect on outcomes in patients that ultimately require laparotomy. (Letton et al, J Ped Surg 2010 Jan;45(1):161-5)

PROCEDURE STATEMENTS

1. ATLS precepts will guide the initial evaluation and management of trauma patients at IMMC.
2. Patients who are hemodynamically unstable or who have diffuse peritonitis after blunt abdominal trauma should be taken urgently for laparotomy.
3. A patient's initial hemodynamic status and early response to resuscitation will dictate/determine the parameters within which the trauma team must act in planning the patient's subsequent workup and injury management.
4. A FAST (+) patient who requires aggressive ongoing resuscitation should be triaged to the OR. Extremely rare exceptions to this guideline may exist (e.g. assessing for futility due to brain injury, assessing for pelvic hemorrhage that may be more amenable to angioembolization).
5. A negative FAST in a hemodynamically unstable patient reliably rules out the abdomen as the source of hemodynamic instability, although FAST may need to be repeated during the patient's resuscitation before this conclusion can be arrived at with appropriate certainty.
6. In unstable patients in whom there is reason to doubt intra-abdominal hemorrhage as the source for the instability, the trauma team should consider continuing resuscitation in the OR while further evaluation of refractory shock is continued.
7. In the blunt abdominal trauma patient in whom intra-abdominal injury is suspected, FAST exam cannot reliably rule out injury and more definitive imaging by CT scan with contrast is recommended. CT of the abdomen and pelvis in blunt trauma does not require the use of oral contrast.
8. Suspected or confirmed splenic and hepatic injuries should be managed according to their respective management guidelines.
9. Contrast extravasation on abdominal CT in hemodynamically stable children is not an absolute indication for angioembolization.
10. Free intra-abdominal fluid in the absence of identifiable solid organ injury should raise a concern for hollow viscus injury. Younger children may have small amount of physiologic free fluid in the abdomen.
11. Gross hematuria in a trauma patient mandates a further workup of the patient's genitourinary system for injury, with bladder perforation from pelvic fractures being of particular concern. Microscopic hematuria, on the other hand, does not necessarily mandate performance of CT imaging. Hemorrhage at the urethral meatus, or abnormalities on digital rectal exam, will establish the need for imaging modalities such as pelvic x-ray, retrograde urethrography and CT cystoscopy.
12. The role and limitations of serial abdominal examination in the assessment of a blunt abdominal trauma patient needs to be determined on a case-by-case basis.
13. Factors that may warrant laparotomy for a patient undergoing serial abdominal examination for blunt abdominal trauma, include worsening abdominal exam, increasing WBC, decreasing hemoglobin, fever, persisting acidosis, or worsening imaging findings.

14. A patient's global suspected and/or confirmed injury burden may necessitate deviations from the customary management of specific injuries. For instance, in a patient with severe pulmonary contusions on initial imaging, a decision for early surgical intervention may be a prudent course of action since the patient may develop surgically prohibitive ventilator requirements.
15. There is good evidence that a normal-appearing CT may negate the need to admit a patient to the hospital for observation. In a select group of patients who sustain trivial trauma and in whom the physician has a low index of suspicion for injury, a negative ultrasound may be adequate basis to consider discharging a patient from the ER.

"High-risk" clinical variables for intra-abdominal injury that should suggest need for CT scan:

- Abnormal abdominal exam (e.g. tenderness, distension, contusion)
 - Hypotension
 - Gross hematuria
 - Abnormal LFTs or Amylase/Lipase
 - Altered level of consciousness
 - Femur fracture
 - Abnormal CXR
 - Pelvic Fracture
 - Abnormal FAST
-
- Modest elevation in AST/ALT to < 200 should not warrant CT imaging
 - Consider CT imaging if microscopic hematuria >100 RBC/hpf

Related References:

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J Wayne Meredith et al, **Nonoperative Management of Blunt Hepatic Trauma: The exception or the rule?** J of Trauma 1994; 36 (4): 529 – 535

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Holmes et al, "Identifying Children at very low risk of clinically important blunt abdominal injuries" Ann Emerg medicine 2013 Aug; 62(2): 107 – 116

Potoka et al, "Blunt Abdominal Trauma in the Pediatric Patient", Clinical Pediatric Emergency Medicine 2005 6:23-31

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Flood RG, Mooney DP. “Rate and prediction of traumatic injuries detected by abdominal computed tomography scan in intubated children.”J Trauma. 2006 Aug;61(2):340-5

Letton RW, Worrell V; APSA Committee on Trauma Blunt Intestinal Injury Study Group. “Delay in diagnosis and treatment of blunt intestinal injury does not adversely affect prognosis in the pediatric trauma patient.”J Pediatr Surg. 2010 Jan;45(1):161-5

National Cancer Institute; Radiation Risks and Pediatric Computed Tomography (CT): A Guide for Health Care Providers

<http://www.cancer.gov/cancertopics/causes/radiation/radiation-risks-pediatric-CT>

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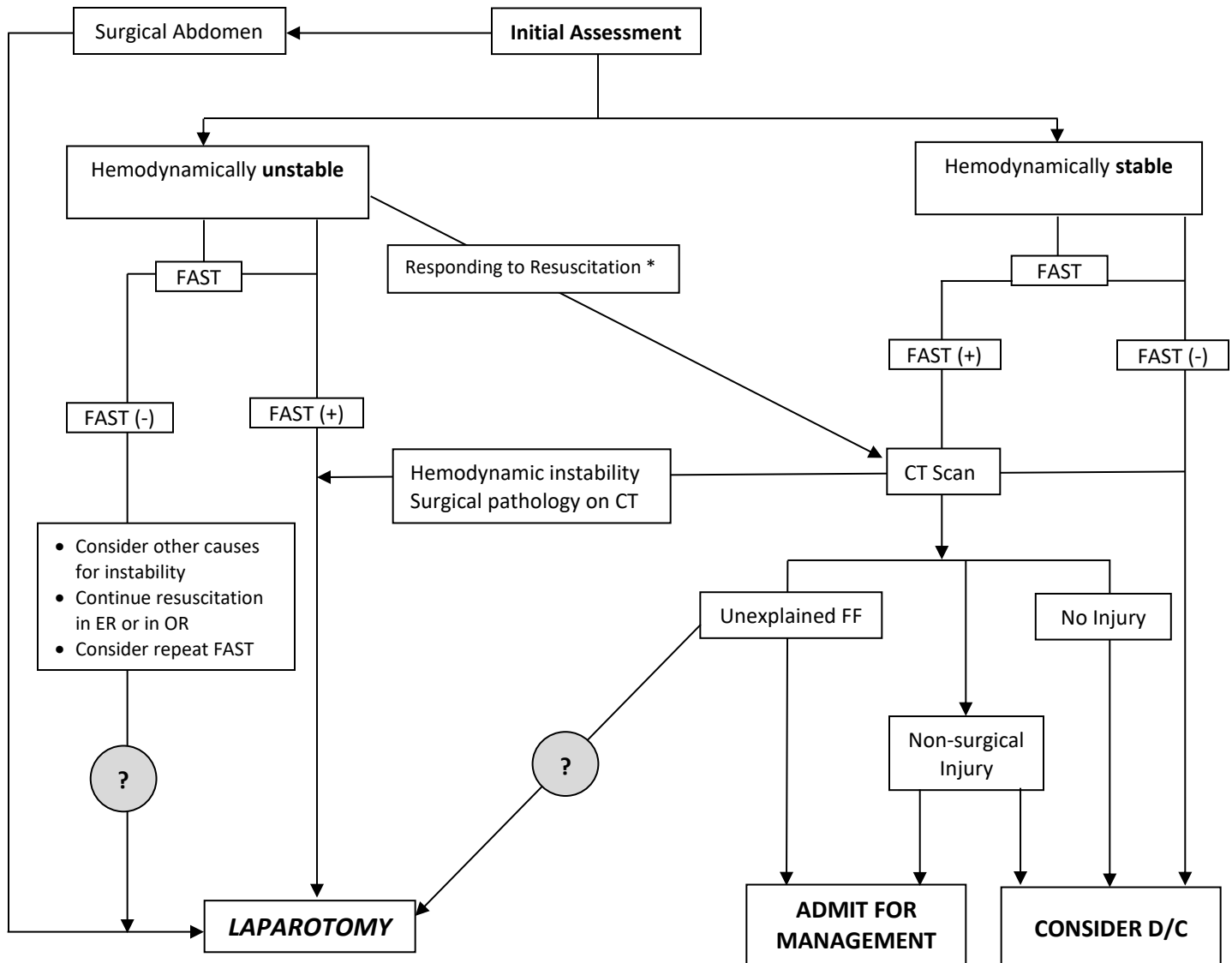
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* Pediatric Volume Resuscitation:

Crystalloid bolus – 20 ml/kg LR or NS

1 “unit” PRBC bolus – 10 ml/kg

FFP dosing is 10-15 ml/kg

Platelet dosing is 5-10 ml/kg

Cryoprecipitate dosing is 1-2 bags/5-10 mg body weight

** If Liver or Spleen injury identified,

Refer to attached management guidelines

Hemodynamic Instability Score

- Grade 0 Never hypotensive or tachycardic
- Grade 1 Resolved pre-arrival hypotension or tachycardia
- Grade 2 Hypotension or tachycardia responded to < 2L initial volume loading, no ongoing volume requirement
- Grade 3 Modest ongoing volume requirement
- Grade 4 Large initial volume requirement, vigorous ongoing volume requirement
- Grade 5 Hypotension and tachycardia unresponsive to volume

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