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 Center Medical Director	**Last Reviewed: 06/2017**

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. A modified hemodynamic instability scoring system cited in the Western Trauma Association Splenic Trauma Algorithm Guidelines provides a useful framework for classifying a trauma patient's hemodynamic status, with blunt abdominal trauma patients exhibiting Grade 4 and 5 hemodynamic instability generally requiring immediate laparotomy.

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. A Johns Hopkins retrospective study of radiographic imaging in patients aged 14 years old and below found that 91% of the total radiation dose was from CT imaging, while constituting only 32% of studies performed in their population of 719 patients. (Brown et al, J trauma 2010). To limit the use of potentially harmful radiation exposure to children, guidelines for abdominal CT imaging in pediatric trauma are often more restrictive in recommending imaging than comparable guidelines for adults.

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, with reported sensitivities and

specificities of 73 - 88% and 89 – 100% respectively. A positive study usually indicates the presence of a minimum of ~ 200 - 300ml 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 *de facto* "gold standard" imaging modality in the evaluation of a blunt abdominal trauma patient, with a reported sensitivity of 92 – 97.6% and specificity of 98.7%. 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.

The trauma physician must remain aware of the fact that overly liberal use of x-ray and CT scan imaging exposes patients to long term risks of radiation exposure. For this reason, predictive factors for intra-abdominal injuries have been proposed to guide the clinician's decision-making for or against CT scanning. In patients for whom the merits of CT imaging are not immediately clear, the trauma physician may choose to review these predictive factors.

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 (i.e. Grade 4 or 5 instability) 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 patients with Grades 4 and 5 instability 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 protocols.

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

* Some authors have suggested a modest elevation in AST/ALT to < 200 should not warrant CT imaging. Some authors have suggested microscopic hematuria >100 RBC/hpf to be an indication for CT imaging.
16.

Related References:

Hoff, William S., et al. **"Practice management guidelines for the evaluation of blunt abdominal trauma: the EAST practice management guidelines work group."** Journal of Trauma and Acute Care Surgery 53.3 (2002): 602-615.

American College of Emergency Physicians. **"Clinical policy: critical issues in the evaluation of adult patients presenting to the emergency department with acute blunt abdominal trauma."** Ann Emerg Med.2004;43(2):278-290.

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Sudakoff GS, Rosen MP, Rybicki FJ, Blake MA, Cash BD, Desjardins B, Greene FL, Hindman NM, Oliva IB, Weiss C, Yaghmai V, Expert Panels on Vascular Imaging and Gastrointestinal Imaging. **ACR Appropriateness Criteria® blunt abdominal trauma.** [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p.

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

Holmes JF, Mao A, Awasthi S, McGahan JP, Wisner DH, Kuppermann N." Validation of a prediction rule for the identification of children with intra-abdominal injuries after blunt torso trauma."Ann Emerg Med. 2009 Oct;54(4):528-33

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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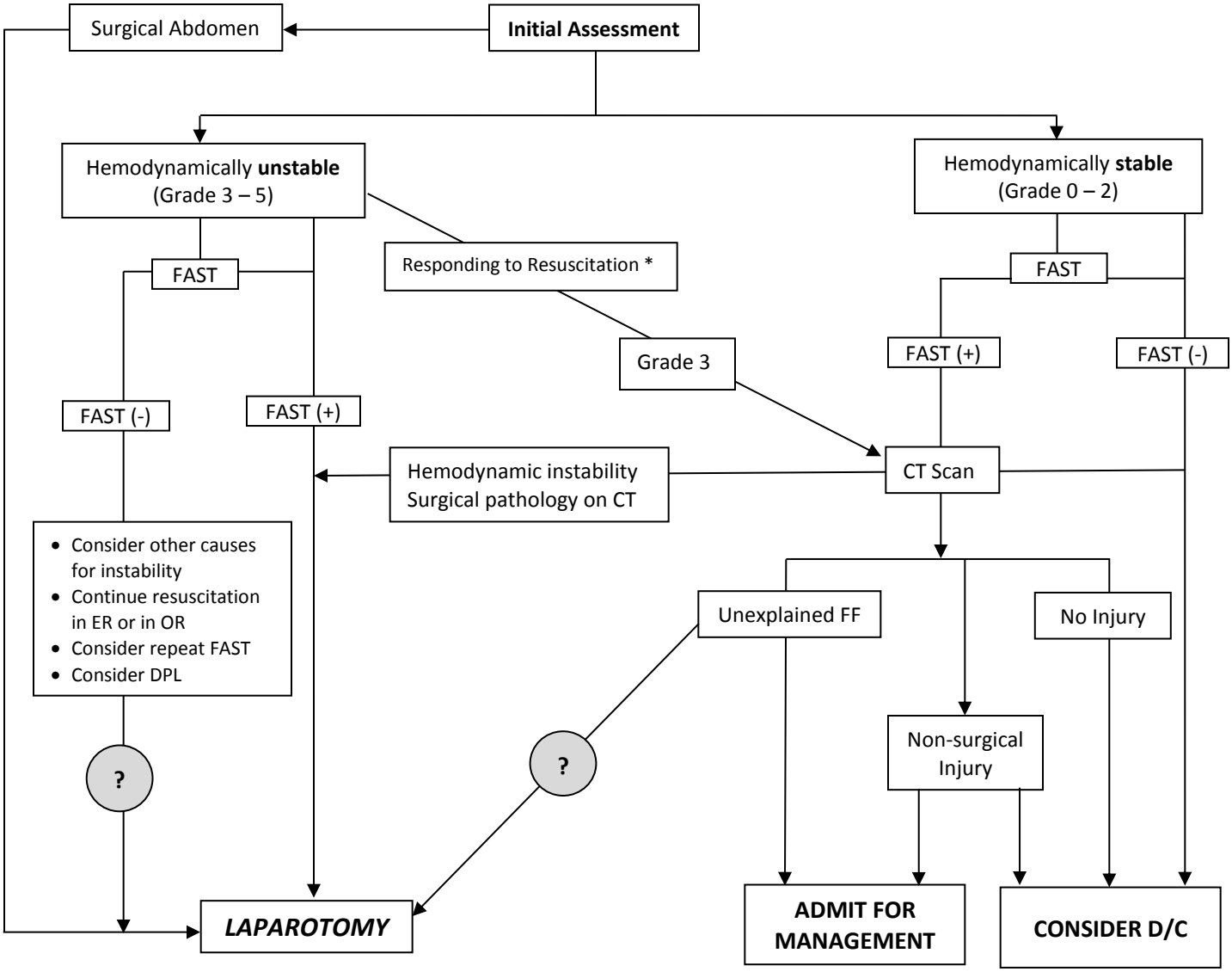

*** Pediatric Volume Resuscitation:**
Crystalloid bolus – 20 ml/kg LR or NS
1 "unit" PRBC bolus – 10 ml/kg
FFP dosing is 10-15 ml/kg
Platelet dosing is 5-10 ml/kg
Cryoprecipitate dosing is 1-2 bags/5-10 mg body weight

**** 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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ADULT **Practice Management Guideline**	**Effective: 06/2017**
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