Hollow Viscus Injury
Clinical Care Algorithm

Approved by TMD: 2/23/2024
Approved by EBM: 5/15/2024

Blunt abdominal trauma with any of the following[1]:

• GCS ≤ 13	• Abnormal FAST
• Abdominal bruising	• Abnormal chest or pelvic x-ray
• Abdominal Seatbelt Sign	• ALT >125 U/L; AST>200 U/L
• Abdominal distention	• Decreased Hemoglobin (less than 7g/dl)
• Abdominal pain/tenderness	• Elevated Lipase
• Vomiting	• Hematuria (UA >50 rbc/hpf)

Exclusion criteria: Blunt Abdominal Trauma with peritonitis and penetrating abdominal trauma

NO → Manage other injuries

YES

Circulatory Status
(recent/ongoing bleeding suspected?)

Unstable

Fluid Resuscitation
20 ml/kg NS or LR

Sustained response to bolus?

YES → **CT abd/pelvis with IV contrast**

NO

Resuscitation with PRBCs 10-20ml/kg

Recurrent hypotension or persistent shock[2ab]

NO → **CT abd/pelvis with IV contrast**

YES

Failure of NOM

- Angiography & Embolization[3]
- Surgery[3]
- NOM at Surgeon's discretion

Stable

CT abd/pelvis with IV contrast

Negative
- No evidence of Hollow or solid organ injury
- If intraperitoneal free fluid:
  - Small volume isolated intraperitoneal free fluid with ≤25 HU[4]

Discharge Home from ED if:
1. Vitals normal
2. Tolerating diet
3. Minimal abdominal pain
4. No blood product administration in ED
4. Access to care: transportation & phone

(admit to non-ICU for observation if all the above conditions are not met)

At discharge:
1. Provide discharge instructions & return precautions.

- Suspected Hollow organ injury
- >25 HU [4] intraperitoneal free fluid
- Free air
- Soft tissue seatbelt sign
- Bowel wall thickening
- Mesenteric hematoma or stranding
- Abdominal Wall hernia

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Significant intra-abdominal blood or contrast extravasation
OR
Solid organ injury

See Blunt Pediatric Liver/Spleen Injury

Other → Manage per surgeon discretion

1-Based on PECARN & PedSRC prediction rule
2a- Consider other causes (head injury, tension pneumothorax, tamponade, pelvic hemorrhage
2b-Activate Massive Transfusion protocol (see MTP guideline)
3- must be available within 30 minutes of notification
4 – Hounsfield Units

Guideline adapted from the ATOMAC Blunt Pediatric Liver/Spleen Injury Guideline v12.

Hollow Viscus Injury Clinical Care Algorithm

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CT abd/pelvis with IV contrast with concern for or evidence of Hollow Viscus Injury

HVI SCORE

- Score 1-5 Low Risk
- Score 6-9 Moderate Risk
- Score 10-17 High Risk

Score 1-5 Low Risk → Admit for observation & Serial Abdominal Exams (time?) + CBC and Lactate **(evaluate every 6 hours x4)**

Score 6-9 Moderate Risk → **Per Physician discretion**: Laparoscopy Vs Admit for observation and serial abdominal exams

Proceeding with diagnostic laparoscopy?

- NO → Admit for observation & Serial Abdominal Exams (time?) + CBC and Lactate
- YES → **Diagnostic Laparoscopy**

Any of the following present?
Increasing WBC
Increasing Lactate
Change in abdominal exam or change in vital signs

- YES → **Diagnostic Laparoscopy**
- NO → **Discharge Home if:**
  1. Vitals normal
  2. Tolerating diet
  3. Minimal abdominal pain
  4. Access to care: transportation & phone

  At discharge:
  1. Provide discharge instructions & return precautions.

Score 10-17 High Risk → **Diagnostic Laparoscopy**

Diagnostic Laparoscopy → Inpatient management based on intra-operative findings

HVI SCORE AND RISK CATEGORIES

Variable	Points
Clinical	
Guarding	1
Tenderness to palpation	2
Initial systolic BP <110 *	2
Radiographic	
Bowel wall thickening	1
Mesenteric hematoma	1
Mesenteric stranding	2
Soft tissue SBS	2
Free air	4
Free fluid	4

AUROC = 0.94

Score 1-5: Low Risk (0-5% risk of HVI) Observation

Score 6-9: Moderate Risk (10-44% risk of HVI) Consider diagnostic laparoscopy

Score 10-17: High Risk (58-99% risk of HVI) Recommend diagnostic laparoscopy

JACS Journal of the American College of Surgeons

***For Pediatric Patients Refer to Age-specific hypotension according to the following:**

- 1 to <12 months: SBP <70 mmHg
- 1-10 years: SBP <2 times of age added to 70 mmHg (SBP <70 mmHg + [age in years ×2]),
- >10-years: SBP <90 mmHg
- ≥ 15 years BP<110

Patient and Family Education
Lexicomp Patient Education: Blunt Abdominal Trauma

Clinical Care Guideline

Name: Hollow Viscus Injury
Emergency Department, Inpatient and ICU

• **Inclusion Criteria**	• Patients ages 0-17 years presenting to CHOC Emergency Department with blunt abdominal trauma.
• **Exclusion Criteria**	• Major multiple trauma when the blunt abdominal trauma does not direct the patient's plan of care. • Specific findings/Injuries: o Peritonitis o Pancreatic injuries o Penetrating abdominal injury • Significant medical comorbidities
• **Assessment and evaluation**	• Review of history, physical exam, labs, and imaging. • Refer to Hollow Viscus Injury Clinical Care algorithm (attached) for recommendations on when to obtain CT abdomen/pelvis imaging and considerations for diagnostic laparoscopy.
• **Interventions (utilizing GRADE whenever possible)**	• 1A Management of the awake and oriented blunt abdominal trauma patient starts with the primary survey, E-FAST, physical examination and the secondary survey, blood chemistry, vital signs followed by contrast-enhanced abdominal CT. • 1A CT is recommended for the evaluation of hemodynamically stable patients with equivocal findings on physical examination, associated neurologic injury, or multiple extra-abdominal injuries. Under these circumstances, patients with a negative CT should be admitted for observation. • 1A CT is the diagnostic modality of choice for nonoperative management of solid visceral injuries. • 2C Patients with high-risk mechanisms (i.e., handlebar, seatbelt sign) and non-specific CT findings should be admitted for observation including serial clinical examination. • Level 3A: Objective diagnostic testing (i.e. CT) is indicated for patient with abnormal mentation, equivocal findings on physical examination, multiple injuries, concomitant chest injury or hematuria.
• **Recommendations and considerations (utilizing GRADE whenever possible)**	**Considerations related to diagnosis and management:** • 1A In the context of blunt abdominal trauma with or without solid organ injury, bowel injuries are often missed. A high index of suspicion is required. • 2B Delay in the diagnosis of bowel injury is linked to increased morbidity and mortality.

	• 3: Patients with seat belt sign should be admitted for observation and serial physical examination. The presence of intraperitoneal fluid on FAST or CT scan in a patient with seat belt sign suggests the presence of an intra-abdominal injury that may require surgery. • 3: Elevated amylase/Lipase levels are suggestive but not diagnostic of pancreatic injury **Considerations related to imaging:** • 1A Management of the awake and oriented blunt abdominal trauma patient starts with the primary survey, E-FAST, physical examination and the secondary survey, blood chemistry, vital signs followed by contrast-enhanced abdominal CT. • 2: CT scanning is the diagnostic modality of choice for nonoperative management of solid visceral injuries. • 1A CT is recommended for the evaluation of hemodynamically stable patients with equivocal findings on physical examination, associated neurologic injury, or multiple extra-abdominal injuries. Under these circumstances, patients with a negative CT should be admitted for observation. • 1A The presence of a seatbelt sign should prompt a CT scan and a high index of suspicion for bowel injury. • 2C Pediatric patients with Hounsfield units (HU) of 25 or less isolated intraperitoneal free fluid (IIFF) and a nonperitonitic physical examination do not require operative exploration or further workup for intraabdominal injury. In the absence of other injuries, it is safe to discharge these patients without further workup. • Level 3A: Haemodynamically stable children with blunt trauma should undergo radiographic evaluation if they have gross haematuria or >50 red blood cells/high-power field on microscopic urine analysis. • Level 3: In the patient at high risk for intra-abdominal injury (e.g., multiple orthopedic injuries, severe chest wall trauma, neurologic impairment), a follow-up CT scan should be considered after a negative FAST. **Considerations related to hemoglobin monitoring, ongoing bleeding and transfusion:** • 2C Clinical determination of recent or ongoing bleeding in children requires integration of multiple factors to determine the relative importance of SOI bleeding. Important factors to consider are listed on the algorithm instructions to assist in the determination recent bleeding significant enough to suggest shock. • 2C Consider use of 1:1:1 transfusion ratios early in resuscitation. • 2C Consideration for TEG-directed therapy may be given based on adult data. • 2C Limiting crystalloid volume and early use of transfusion in children with significant bleeding should be considered based on the adult literature.

	• 2D Transfusion of red blood cells in response to shock is recommended. • 2C A pediatric practice management guideline may be used for all children under 18 years of age, but a caution about the use of the algorithm for children 9-16 years of age may be appropriate. **Considerations related to Operative Management** • 1A The presence of highly specific CT findings such as extraluminal air, extraluminal oral contrast, or bowel-wall defects warrants prompt surgical exploration. • Grade: Moderate - The presence of highly sensitive CT fndings such as free fuid in the absence of solid organ injury, abnormal enhancement of bowel wall, and mesenteric stranding can be used as an adjunct to the clinical picture but should not solely determine management. • Grade: Moderate - Scoring systems that include radiologic, biochemical, and clinical signs can guide management in diffcult scenarios. **Considerations related to Non-operative Management (NOM)** • 1A NOM in the face of peritonitis should be excluded from this guideline and managed per physician discretion. • 1A Failure to stabilize as noted by persistent or recurrent hypotension cannot have NOM dictated by algorithm alone without taking into account local resources and other injuries. These patients should be considered for surgery, urgent embolization, or continued NOM, depending on other injuries. • 1B Patients at risk for missed injury, need for operation, or recurrent bleeding are those with multiple identified abdominal injuries (especially pancreas), those with a contrast blush on CT scan, and those with bicycle handlebar injuries, and may not be candidates for early discharge. Since delayed bleeds have occurred (often outside of the APSA guideline period), standardized education remains an important component of the discharge. • 2A The presence of highly sensitive CT findings such as free fluid in the absence of solid organ injury, abnormal enhancement of bowel wall, and mesenteric stranding can be used as an adjunct to the clinical picture but should not solely determine management. **Considerations related to discharge and follow-up:** • 2D Children may return to school when comfortable and able. • 2D Parents and patients are instructed to return to the emergency department for increasing pain, pallor, dizziness, difficulty breathing, vomiting, worsening shoulder pain, jaundice, gastrointestinal bleeding, or black tarry stools. • 3C Long-term follow-up of patients with blunt abdominal trauma is required to identify the sequelae of mesenteric injuries.

Patient Family Education (PFE)	Lexicomp patient education: • Blunt Abdominal Trauma (Appendix B)
Discharge criteria	For all patients, they may be discharged when all of the below criteria are met: 1. Vital signs are normal for age 2. Adequate oral intake 3. Minimal abdominal pain and/or pain controlled with oral medication 4. Access to care: transportation & phone
Discharge instructions:	1. Return to school: As tolerated 2. Follow-up: As needed 3. Return to the Emergency Department for increasing pain, pallor, dizziness, difficulty breathing, vomiting, worsening shoulder pain, jaundice, gastrointestinal bleeding, or black tarry stools.
References (leveled)	**Level II:** Linnaus ME, Notrica DM, Langlais CS, St Peter SD, Leys CM, Ostlie DJ, Maxson RT, Ponsky T, Tuggle DW, Eubanks JW 3rd, Bhatia A, Alder AC, Greenwell C, Garcia NM, Lawson KA, Motghare P, Letton RW. Prospective validation of the shock index pediatric-adjusted (SIPA) in blunt liver and spleen trauma: An ATOMAC+ study. J Pediatr Surg. 2017 Feb;52(2):340-344. doi: 10.1016/j.jpedsurg.2016.09.060. Epub 2016 Sep 23. PMID: 27717564. **Level III** Adelgais, Kathleen M et al. “Accuracy of the abdominal examination for identifying children with blunt intra-abdominal injuries.” *The Journal of pediatrics* vol. 165,6 (2014): 1230-1235.e5. doi:10.1016/j.jpeds.2014.08.014 Borgialli, Dominic A et al. “Association between the seat belt sign and intra-abdominal injuries in children with blunt torso trauma in motor vehicle collisions.” *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine* vol. 21,11 (2014): 1240-8. doi:10.1111/acem.12506 Gaffley, Michaela et al. “Evaluation of an evidence-based guideline to reduce CT use in the assessment of blunt pediatric abdominal trauma.” *Journal of pediatric surgery* vol. 56,2 (2021): 297-301. doi:10.1016/j.jpedsurg.2020.07.002

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	Level V Adelgais, Kathleen M et al. “Accuracy of the abdominal examination for identifying children with blunt intra-abdominal injuries.” *The Journal of pediatrics* vol. 165,6 (2014): 1230-1235.e5. doi:10.1016/j.jpeds.2014.08.014 Harmston C, Ward JBM, Patel A. Clinical outcomes and effect of delayed intervention in patients with hollow viscus injury due to blunt abdominal trauma: a systematic review. Eur J Trauma Emerg Surg. 2018 Jun;44(3):369-376. doi: 10.1007/s00068-018-0902-2. Epub 2018 Jan 4. PMID: 29302699. Perea, Lindsey L et al. “Low-density Isolated Intraperitoneal Free Fluid in Pediatric Blunt Trauma Is Not Associated with Abdominal Injury.” *Pediatric emergency care* vol. 38,1 (2022): e143-e146. doi:10.1097/PEC.0000000000002189 **Expert Opinion:** Hoff, W., Holevar, M., Nagy, K., Patterson, L., Young, J., Arrillaga, A., Valenziano, C. (n.d.). Practice Management Guidelines for the Evaluation of Blunt Abdominal Trauma: The EAST Practice Management Guide Santucci, R A et al. “Evaluation and management of renal injuries: consensus statement of the renal trauma subcommittee.” *BJU international* vol. 93,7 (2004): 937-54. doi:10.1111/j.1464-4096.2004.04820.x Smyth, L., Bendinelli, C., Lee, N. *et al.* WSES guidelines on blunt and penetrating bowel injury: diagnosis, investigations, and treatment. *World J Emerg Surg* **17**, 13 (2022). https://doi.org/10.1186/s13017-022-00418-y
Education and communication dissemination plans (provider, nursing, and other departments/ services as needed).	**Guideline to be reviewed and distributed at the following:** 1. Trauma M&M and IOP 2. Trauma Nurse staff meetings 3. Critical Care Committee 4. ED Physician meetings
Pertinent policies and/or procedures	1. Massive Blood Transfusion (F747)

Blunt Abdominal Trauma Discharge Instructions

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You must carefully read the "Consumer Information Use and Disclaimer" below in order to understand and correctly use this information

About this topic

Trauma is an injury caused by some force or energy from the environment. Abdominal trauma can be very serious. Trauma calls for special doctors to care for you to help your chances of healing.

With abdominal trauma, you may have a mild injury like bruises. Other times you may have more serious problems if there is damage to any of your internal organs. You may need to have surgery right away. Trauma can lead to bleeding inside of your body, shock, or even death.

Most often, you will need care right away after a trauma. You may need emergency care where the accident happened. Staff will work to make sure you are breathing. They will control bleeding and protect you from any more harm. Then, you may be taken to the emergency room.

At the hospital, you will be given urgent medical care. The goal is to find and treat your injuries and to help you heal fully. How quickly you heal from a trauma may vary from person to person. Healing is based on how:

- Serious the injury and disability are
- Quickly treatment is given
- You respond to treatment

What care is needed at home?

- Ask your doctor what you need to do when you go home. Make sure you ask questions if you do not understand what the doctor says.
- Get lots of rest. You may have a problem sleeping or changes in sleep patterns. Be sure to take time to rest even if you cannot sleep. Take naps during the day.
- You may still have pain, even after fully healing. Talk with the doctor about your pain and how to control it.
- You may have emotional problems, worry, anxiety, or low mood. This could be caused by the trauma. The doctor may suggest counseling or other therapies.
- Talk to your doctor about how to care for your injuries. Ask your doctor about:
    - When you should change your bandages
    - When you may take a bath or shower
    - If you need to limit your activity or be on bedrest
    - If you need to be careful with lifting things over 10 pounds (4.5 kg)
    - When you may go back to your normal activities like work, driving, or sex
- Be sure to wash your hands before touching your wound or dressing.

What follow-up care is needed?

- Your condition needs close monitoring.
- Your doctor may ask you to make visits to the office to check on your progress. Be sure to keep these visits.

What drugs may be needed?

The doctor may order drugs to:

- Help with pain and swelling
- Prevent or fight an infection
- Prevent constipation

Will physical activity be limited?

You may need to rest for a while. You should not do physical activity that makes your health problem worse. If you run, work out, or play sports, you may not be able to do those things until your health problem gets better.

What problems could happen?

- Infection

- Bleeding
- Need for surgery

What can be done to prevent this health problem?

There are no specific ways to prevent general trauma. But, you can help prevent traumatic events by:

- Always wear a seat belt with a shoulder strap.
- Drive safely. Obey speed limits.
- Do not drink and drive. Do not text or talk on the phone when you drive.
- Do not use illegal drugs.
- Stay active and work out to keep your muscles and joints strong and flexible.
- Follow special precautions when in high-risk situations, like:
  - Avoid activities that may cause falls.
  - Wear protective gear when participating in sports.
- Talk to your doctor if you are worried about domestic abuse and be sure you have resources for your safety.

When do I need to call the doctor?

- Signs of infection. These include a fever of 100.4°F (38°C) or higher; chills, and redness near the site of injuries.
- Throwing up blood or passing blood with your stool
- Upset stomach and throwing up
- New blood in your urine or stool
- Increasing size of your belly
- Dizziness

Teach Back: Helping You Understand

The Teach Back Method helps you understand the information we are giving you. After you talk with the staff, tell them in your own words what you learned. This helps to make sure the staff has described each thing clearly. It also helps to explain things that may have been confusing. Before going home, make sure you are able to do these:

- I can tell you about my condition.
- I can tell you what changes I need to make with my activities.
- I can tell you what I will do if I have fever, throw up blood, or have an upset stomach.

Last Reviewed Date

2021-03-29