

Trauma Service Guidelines

Title: Blunt Abdominal Trauma

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Introduction

In Australia blunt trauma accounts for 90% of admitted trauma cases, 22% of whom sustain a blunt abdominal trauma (BAT) ¹. At the Royal Melbourne Hospital in 2016, BAT accounted for 15% of all major trauma cases, of these 30% required a laparotomy and 18% required angioembolisation ².

The most common mechanisms are:

- motor vehicle crashes (45%)
- motorcycle driver (22%)
- pedestrian (10%),
- fall greater > 1 metre (7%)
- assault (6%)

The organs most commonly injured organs are:

- liver (24%)
- spleen (22%)
- kidney (9%)
- mesentery/omentum (7%)
- colon (6%)

Through better understanding of blunt abdominal trauma and advancements in diagnostics and non-operative management techniques including angioembolisation, more conservative approaches are utilised for treatment of BAT. Therefore, the morbidity associated with laparotomies has reduced.

Diagnosis of an abdominal injury:

Diagnosis of BAT remains a challenge as injuries commonly occur in patients with multisystem injuries and no obvious external signs of trauma. Management should be aimed at identification of injury and determining the best course of treatment.

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Identification of an abdominal injury begins with the initial assessment conducted using EMST principles including adjuncts³:

- Chest and pelvic x-rays: looking for gross abnormalities
- Focused Assessment with Sonography in Trauma (FAST) to identify abdominal free fluid which may indicate intraabdominal haemorrhage.

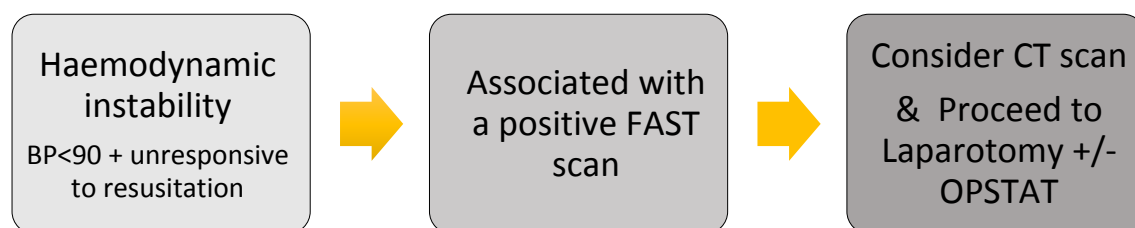
	<p>Physical examination specifically relating to BAT</p> <p>Perform the primary and secondary surveys</p> <p>EMST principles ³:</p> <p>Inspection</p> <p>The anterior and posterior abdomen, as well as the lower chest and perineum for:</p> <ul style="list-style-type: none"> - Abrasions - Contusions from restraint devices (e.g. seat belt sign) - Lacerations - Penetrating wounds - Impaled foreign objects - Evisceration of omentum and small bowel - Pregnant state <p>Percussion</p> <ul style="list-style-type: none"> - Abdominal pain - Signs of peritonism <p><i>Note:</i> If positive for peritonism, further palpation of the abdomen is not necessary</p> <p>Palpation</p> <ul style="list-style-type: none"> - Guarding - Superficial versus deep tenderness - Determine age of pregnancy if appropriate <p>Other</p> <ul style="list-style-type: none"> - Ensure pregnancy test performed in females - Determine pelvic stability (this should only be conducted once; only if PXR is clear) - Urethral, perineal and rectal exam: - Blood at the urethral meatus - Swelling, bruising or laceration of the perineum, vagina, rectum, or buttocks is suggestive of an open pelvic fracture which is associated with a more severe abdominal injury ⁴
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Decision making in BAT:

Management of haemodynamically unstable patients SBP <90mmHg

If the patient is haemodynamically unstable (**BP<90mmhg and not responding to resuscitation**) and has a positive FAST, an urgent trauma laparotomy may be required ³. If the patient is stable enough it is recommended an urgent CT scan is considered.

A negative FAST in haemodynamically unstable patient reliably excludes the abdomen as the source of haemodynamic instability⁵. If FAST results are negative, other causes of haemodynamic instability must be searched during the secondary survey.



Management of haemodynamically stable patients

For haemodynamically stable patients, the key decision is whether the patient requires CT scan, or a period of observation with serial abdominal examinations.

Patients who do not require urgent operative management should then undergo further diagnostic testing if indicated^{3, 6}.

Evidence-based predictive factors, in conjunction with clinical judgement, assist in the identification of patients who may benefit from abdominal CT evaluation, while reducing the number of unnecessary CT scans

Predictors of abdominal injuries post blunt trauma who may require CT: 4, 7-9

- **Traumatic mechanism:** i.e. motorcyclist accident and pedestrian versus vehicle
- **Haemodynamic instability:** defined as SBP<90mmHg
- **Abdominal tenderness** and **clinical evidence** of blunt abdominal trauma
- **Evidence of a head injury ± low or fluctuating GCS:** i.e. evidence of head strike including loss of consciousness, intracranial haemorrhage, skull fractures, CSF leak and/or neurological symptoms.
- **Severe injuries to the pelvis, chest and/or extremities** including severe pelvic, rib and limb fractures.
- **Low haemoglobin:** haematocrit level less than 30%.

All patients with suspected BAT should be followed closely with repeated physical examinations to detect any signs of peritonitis¹⁰. If intraabdominal injury is suspected, a more definitive assessment such as CT scans is required. Equivocal or positive results from FAST or abdominal exam warrant further investigation and management according to the patients clinical and physiological status

Serial Abdominal Examinations

Evaluation of the abdomen includes inspection, looking for external signs of injury such as open wounds, or significant bruising and/or abrasions of the abdominal wall. Palpation of the abdomen is used to assess for tenderness, rigidity, and guarding. Many, although not all, patients with an abdominal injury complain of tenderness, and peritoneal signs may be present if there is injured bowel. Auscultation to assess for presence or absence of bowel sounds.

Imaging

Multi-detector computed tomography (MDCT) scanning with intravenous contrast is the gold standard diagnostic modality for both solid and non-solid organ injury^{8, 11-15}.

Patients with no findings on CT

The negative predictive value for CT for diagnosis of intraabdominal injuries is 99.8%, therefore the majority of haemodynamically stable patients with no findings on CT may be discharged after a period of observation and serial abdominal examination^{16, 17}.

Hollow organ injury is an uncommon event (1-3.2 % of blunt trauma admissions¹⁸). Missed hollow organ injuries account for up to 58% of delayed laparotomy due to blunt trauma¹⁹. The sensitivity of CT in the diagnosis of small intestine injury has been reported by as low as 75% and 64% for bowel or mesenteric injury therefore serial abdominal examination is of high importance^{20 21 22}.

Patients who are not clinically evaluable (GCS<15) with a potential abdominal injury require CT scanning^{23, 24}.

Patients with isolated intraperitoneal fluid found on CT

CT findings of unexplained free fluid in the absence of significant solid organ injuries was present in 93.5% of patients with confirmed hollow organ injury^{25 26}. Isolated intraperitoneal fluid findings raise a high suspicion of hollow organ injury. Management decisions for these patients can be aided by determining the amount of free fluid on CT scans.

In patients with haemoperitoneum, the presence of active extravasation and the rate of bleeding have a more prominent influence on patient care decisions than does the volume of free blood in the abdomen²⁷.

Operative management:

Laparotomy

However trauma laparotomy should be performed if indicated using the damage control approach which has reduced mortality in patients with severe abdominal injuries²⁸.

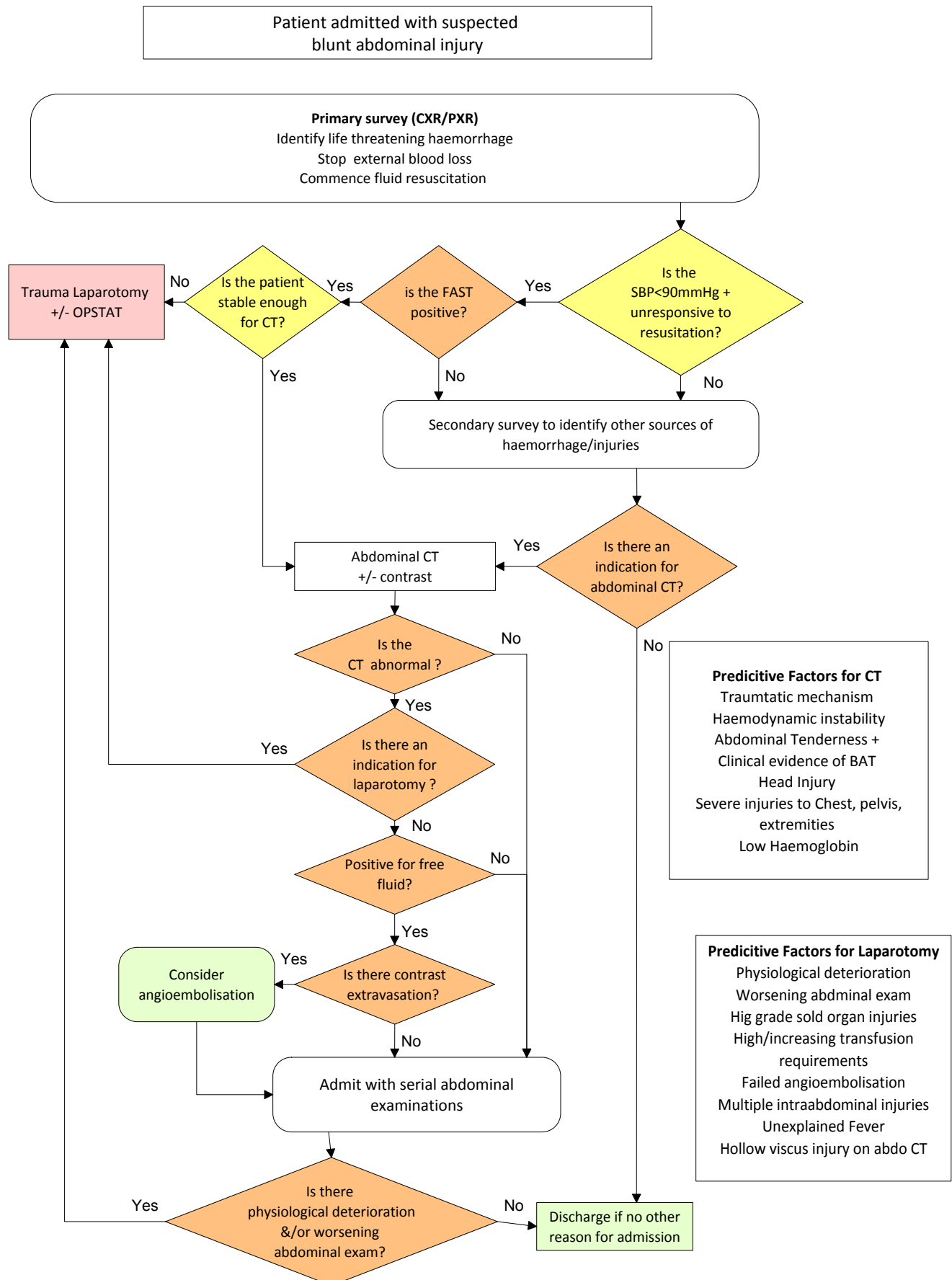
Indications/predictors for laparotomy^{10, 29 30, 31}:

- **Haemodynamic instability**
- **Evidence of Peritonitis** to achieve control of haemorrhage and control of spillage
- **Traumatic diaphragmatic injury** with herniation
- **Severe solid organ injury** (e.g. kidney and spleen)
- **Infarction due to post traumatic occlusion of the blood supply**
- **Mesenteric tear/s**
- **Unexplained Moderate to large amounts of free fluid** (200-≥500mls)
- **Failed non-operative management**

Angioembolisation

Angioembolisation has revolutionised non-operative management in BAT³². In all haemodynamically stable patients with evidence of active extravasation on CT scanning, modern clinical practice guidelines recommend the use of angiography with embolisation if possible³². The complexity of decision making increases when active bleeding is detected on the initial CT scan, but no active bleeding noted on the subsequent angiogram³². Active bleeding and high grade splenic injuries require immediate consultation with Surgeon on call and radiology. Activate radiology ASAP as they require 45 mins out business hours.

BLUNT ABDOMINAL TRAUMA GUIDELINE



PIT FALLS IN BAT

Pancreatic injuries

Pancreatic injuries include transections, contusions or lacerations²⁷. These injuries may not be apparent on initial CT scanning²⁷. Indirect signs of pancreatic injury include fluid in the peri pancreatic fat or in the plane separating the pancreas from the splenic vein and thickening of the left anterior renal fascia⁽³⁰⁾. A repeat CT scan should be obtained after 24-48 hours in patients with a normal pancreatic CT on admission who subsequently developed abdominal signs or symptoms.³³. Increased morbidity and mortality is reported if there is involvement of the pancreatic duct due to complications including infected pseudocyst, abscess, fistulae, or sepsis³³⁻³⁵.

Adrenal gland injuries

Adrenal injuries generally appear as focal hyper attenuating hematomas or as glandular enlargements with haemorrhage confined to or extending outside of the adrenal gland into the retroperitoneal or periadrenal fat on CT scans²⁷. Unilateral adrenal hematomas tend to self-resolve without complications²⁷. Conversely, adrenal insufficiency occasionally develops following bilateral haemorrhage²⁷. Due to the difficulty in differentiating between a pre-existing mass and a traumatic adrenal hematoma, a repeat CT (or MRI) scan may be indicated 8-10 weeks later²⁷.

Diaphragmatic injuries

While the diagnostic accuracy of CT for detecting diaphragmatic trauma has traditionally been considered low, especially in the case of right-sided injuries, improvements in multi-detector technology (higher spatial resolution, improved multi-planar reformations) allow for improved preoperative diagnoses³⁶. CT findings include direct visualisation of diaphragmatic discontinuity, herniation of abdominal viscera into the thorax, and the collar sign, a waist like constriction of herniated abdominal contents through a diaphragmatic rent³⁶. Diaphragmatic injuries are generally managed operatively.

Major Vascular Injuries

Timely diagnosis and immediate therapy are required when there are injuries to the aorta and other major abdominal and pelvic vessels (inferior vena cava, renal vessels, celiac axis, superior mesenteric vessels, lumbar vessels, and iliac vessels) in order to increase the chance of survival due to the potential for rapid fatal exsanguination²⁷. CT Findings include large hematomas, active extravasation of contrast-enhanced blood, pseudoaneurysms, intimal flaps and thrombosis²⁷. Urgent referral to the vascular surgery unit is required.

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