| **Networks** |
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| **Midlands Critical Care & Trauma Networks** |
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## 1. Introduction

Abdominal trauma is relatively uncommon in the trauma population of the Midlands.
Only 4% of our TARN submissions have a serious or worse abdominal injury (AIS3+). The presentation of abdominal pathology may be insidious, taking several hours to develop, especially in the presence of haemodynamic stability.

Through better understanding of blunt abdominal trauma (BAT) and advancements in diagnostics and non-operative management, for example angioembolisation, more conservative treatments can now be utilised for BAT. As a consequence, the morbidity associated with laparotomies has decreased.

## 2. Standards

a) All patients with suspected abdominal trauma should ideally be admitted to an MTC or TU* with a clear plan for repeated clinical assessment and an expectation that a proportion of patients will require late intervention
b) Patients requiring emergency laparotomy should have care delivered as per current best practice recommendations (ie NELA)
c) For unstable patients or those with multiple injuries a damage control approach should be followed focusing on haemorrhage control, decontamination of the abdominal cavity,

and temporary abdominal closure pending a second look procedure once the patient is more stable.

*some may not trigger stage 1- 3 or be applied with the triage tool.

**3. Blunt Abdominal Trauma**

a) Initial haemodynamic status and early response to resuscitation will determine the subsequent investigation and management.

b) Patients requiring ongoing resuscitation should be considered for emergent surgery however a major trauma CT scan should be performed to identify the source of bleeding, as long as it does not add a lengthy delay.

c) Exceptions to performing emergency surgery are:
    i. futility due to brain injury
    ii. pelvic hemorrhage that may be more amenable to immediate angioembolisation (if not available in a timely way pre-peritoneal pelvic packing may be considered).

d) Damage Control Resuscitation principles should guide the ongoing resuscitative efforts with an expectation of the primary surgery being completed within a 60-90-minute time frame and where necessary temporary abdominal closure being utilised.

e) The blunt abdominal trauma patient with lesser degrees of haemodynamic instability should have a CT scan with iv contrast either as part of whole body CT scan or if clinically appropriate as an isolated chest, abdomen and pelvis scan. Free intra-abdominal fluid in the absence of identifiable solid organ injury should raise a concern for hollow viscus injury.

f) Suspected or confirmed solid organ injuries (splenic, hepatic, renal, pancreatic injuries) should have management that includes discussion with specialised urology and or hepatobiliary teams as required.

g) Patients with active contrast extravasation on abdominal CT should be promptly referred for angioembolisation or surgery. A Damage Control Surgical approach (including therapeutic packing) should be considered dependent on patient physiological dynamics (haemodynamics, pH, lactate, temperature, clotting).

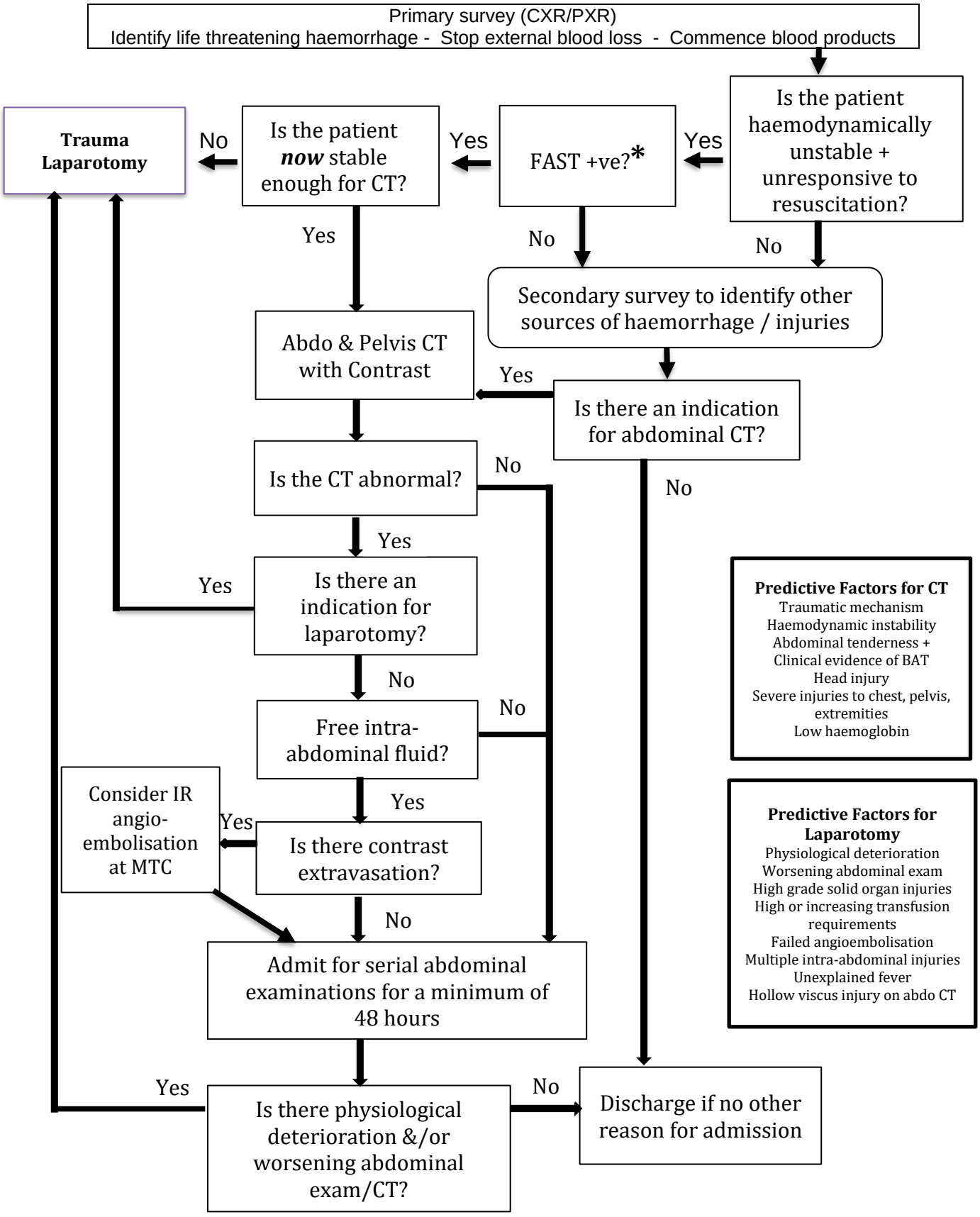
h) Gross haematuria in a trauma patient mandates a further investigation of the genitourinary system (e.g. retrograde urethrography, and CT cystoscopy) and urgent referral to Urological Surgeon. Bladder perforation from pelvic fractures must be considered.

i) Limitations of serial abdominal physical examination in the assessment of a blunt abdominal trauma due to distracting injuries or obtunded responses due to drugs or alcohol must be recognised and may change thresholds for investigation and management. Consider repeat CT scanning.

j) Changes on serial abdominal physical examination, rising lactate, decreasing haemoglobin, fever, persisting or worsening acidosis should prompt re-evaluation and further imaging or surgical exploration to find missed injuries (e.g. mesenteric tear and bowel ischaemia).

## 4. Blunt Abdominal Trauma Flowchart

### Patient admitted to hospital with suspected blunt abdominal injury



***NICE Guidance**

**Haemorrhage Imaging in hospital settings**

a) Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.
b) Limit diagnostic imaging (such as chest and pelvis X-rays or FAST [focused assessment with sonography for trauma]) to the minimum needed to direct intervention in patients with suspected haemorrhage and haemodynamic instability who are not responding to volume resuscitation.
c) Be aware that a negative FAST does not exclude intraperitoneal or retroperitoneal haemorrhage.
d) Consider immediate CT for patients with suspected haemorrhage if they are responding to resuscitation or if their haemodynamic status is normal.
e) Do not use FAST or other diagnostic imaging before immediate CT in patients with major trauma.
f) Do not use FAST as a screening modality to determine the need for CT in patients with major trauma.

## 5. Specific Injuries in Blunt Abdominal Trauma

a) **Pancreatic injuries**

Pancreatic injuries include transections, contusions or lacerations. These injuries may not be apparent on initial CT scanning, although with modern multi-planar scans acquired in the arterial and venous phase, it is unusual to miss a pancreatic injury. 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. Amylase levels should also be monitored, and if doubt remains about pancreatic injury, a repeat CT scan should be obtained after 24-48 hours. Increased morbidity and mortality are reported if there is involvement of the pancreatic duct due to complications including infected pseudocyst, abscess, fistulae, or sepsis.

b) **Adrenal gland injuries**

Adrenal injuries generally appear as focal hyper attenuating haematomas or as glandular enlargements with haemorrhage confined to or extending outside of the adrenal gland into the retroperitoneal or periadrenal fat on CT scans. Unilateral adrenal haematomas tend to self-resolve without complications. Conversely, adrenal insufficiency occasionally develops following bilateral haemorrhage. Due to the difficulty in differentiating between a pre-existing mass and a traumatic adrenal haematoma, a repeat CT without IV contrast may be indicated 8-10 weeks later.

c) **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 diagnoses. 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 rent. Diaphragmatic injuries due to blunt trauma are generally managed conservatively however, patient should

be managed and reviewed regularly by a general surgeon, with cardiothoracic input if required.

d) **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, caeliac axis, superior mesenteric vessels, lumbar vessels, and iliac vessels) in order to increase the chance of survival due to the potential for rapid fatal exsanguination. A biphasic CT will allow detection of large haematomas, active extravasation of contrast-enhanced blood, pseudoaneurysms, intimal flaps and thrombosis. Urgent referral to Vascular Surgery and IR if available is required.

## 6. Penetrating Abdominal Trauma

a) Any penetrating wound to the abdomen should be considered to have crossed the diaphragm and to have entered the mediastinum or thoracic cavity. It is vital to ensure the chest is appropriately examined and imaged as part of the assessment of the abdominal trauma.

b) Haemodynamically unstable patients (or those who have diffuse abdominal tenderness after penetrating abdominal trauma) should be taken emergently for laparotomy, ideally following a Whole-Body CT scan or CT Chest, Abdomen and Pelvis as indicated as long as the delay is felt to be clinically significant.

c) Some patients may be selected for initial non-operative management. In these patients:

   i. A contrast CT should be strongly considered as a diagnostic tool to facilitate initial management decisions as this test can accurately predict the need for laparotomy
   ii. Serial examinations should be performed, as physical examination is reliable in detecting significant injuries after penetrating trauma to the abdomen Patients requiring delayed laparotomy will develop abdominal signs
   iii. If signs of peritonitis develop, laparotomy should be performed
   iv. If there is an unexplained drop in blood pressure or haematocrit, further investigation is warranted.

d) Most patients with penetrating abdominal trauma managed non-operatively may be considered for discharge after 24-48 hours of observation if a reliable abdominal examination is possible and minimal or no abdominal tenderness elicited.

   i. Penetrating injury to the right upper quadrant of the abdomen with injury to the right lung, right diaphragm, or liver may be safely observed after CT scan, in the presence of stable haemodynamics, and with a reliable clinical examination and minimal abdominal tenderness
   ii. Exploration for all penetrating renal trauma is not necessary and may be undertaken selectively dependent on the renal injury sustained.

e) Laparoscopy may have utility in assessment of abdominal stab injury. Main indications for laparoscopy are:

   i. Haemodynamically stable patients
   ii. Thoraco-abdominal stab wounds
   iii. Anterior or flank stab wounds without obvious indications for laparotomy
   iv. Abdominal stab wounds with omental herniation

v. The limitations of laparoscopy are diagnosing hollow viscus and retroperitoneal injuries. If laparoscopy demonstrates peritoneal penetration, then there should be a low threshold to convert to laparotomy to facilitate full exploration of the abdominal cavity

vi. A negative laparoscopy in isolated stabbing cannot definitively exclude injury and so should be looked at in the context of the clinical status of the patient. If the patient remains clinically well with no adverse symptoms or signs, then a negative laparoscopy could justify enhanced recovery and early discharge.

## 7. Non MTC Laparotomy for Trauma

Patients presenting to a non MTC who have sustained blunt or penetrating abdominal trauma and who have gross haemodynamic instability should undergo laparotomy with appropriate surgical intervention at that hospital. It will often be appropriate to perform damage control and temporary abdominal closure although as in any case if definitive management is possible and safe, this may be carried out.

After a damage control laparotomy there should be a carefully considered discussion about whether transfer to the Major Trauma Centre is warranted.
Considerations for transfer include:

- Non abdominal injuries that necessitate MTC care
- Need for interventional radiology not available in the TU or LEH
- Need for specialist hepatobiliary input.

If definitive management of the abdominal trauma has been performed there is no need to transfer the patient.