1. Key Messages

The Victorian State Trauma System provides support and retrieval services for critically injured patients requiring definitive care, transfer and management. This abdominal trauma guideline provides evidence based advice on the initial management and transfer of major trauma patients who present to Victorian health services with severe abdominal injuries.

This abdominal trauma guideline is developed for all clinical staff involved in the care of trauma patients in Victoria. It is intended for use by frontline clinical staff that provide early care for major trauma patients; those working outside a Major Trauma Service (MTS) and those working directly at a Major Trauma Service (MTS).

The guideline has been assessed utilising the AGREEII methodology for guideline development and is under the auspice of the Victorian State Trauma Committee (VSTC).¹

**Clinical Emphasis Points:**

- Management of abdominal trauma largely depends upon the haemodynamic stability of the patient.
- Blunt and penetrating abdominal trauma have different care pathways.
- Widespread availability of CT scanning has seen a shift in the management of haemodynamically stable blunt abdominal trauma patients towards non-operative management.
- Delay in diagnosis and treatment of hollow viscus injury leads to early peritonitis, haemodynamic instability and increased mortality and morbidity.
- Consultation with ARV for advice and transfer to a MTS should be initiated for all penetrating abdominal trauma and in significant blunt trauma.
Abdominal Trauma

Make early contact with ARV for advice from the major trauma services and to initiate retrieval.

**Early Activation**
- Gather vital information
- Activate Trauma Team
- Designate roles
- Set up to receive patient
- Ensure safety using PPE

**Primary Survey**

**AIRWAY / C-SPINE**
- Assess airway stability & protect as needed
- Be prepared for intubation
- Maintain full spinal precautions if suspected injury

**BREATHING**
- Identify & treat life threats
- Assess RR, work of breathing, SpO2, & symmetry
- Oxygen therapy to maintain SpO2 between 94-98%
- ETCO2, monitoring if intubated, maintain btw 35-45mmHg

**CIRCULATION**
- Insert x 2 large bore IV canulæ
- IO access if required
- Assess HR / BP / Cap refill
- Initial management of hypovolaemia: crystalloid fluids, 20ml/kg, then consider blood products

**DISABILITY**
- Assess conscious level - AVPU
- Check pupils
- Test BSL

**EXPOSURE / ENVIRONMENT**
- Fully expose and inspect patient
- Prevent heat loss
- Log roll

**ADJUNCTS**
- FAST scan
- Analgesia
- X-ray Chest, Pelvis
- Bloods – FBE, X-match, U&E, Lactate, ABG
- 12 lead ECG
- Oesophageal tube if intubated
- Urinary Catheter
- AMPLE mnemonic

**Key Points**
- Consult ARV early regarding management
  - Abdominal trauma with significant distracting injury
  - Positive FAST
  - Free air under the diaphragm
  - Significant gastrointestinal hemorrhage

**Management Considerations**

Indications for emergency laparotomy
- FAST + hypotension (SBP <90) not responding to resuscitation.
- Penetrating abdominal trauma + hypotension (SBP <90) not responding to resuscitation.
- Peritonism (significant abdominal tenderness on palpation, involuntary guarding, percussion tenderness).
- Free air under the diaphragm.
- GSW traversing peritoneum or retro peritoneum.

**Imaging**
- FAST
  - Sensitivity approximating 96% in detecting >300mls blood.
  - Positive results from a FAST scan warrant further investigation and management in accordance with the patient’s clinical status.
- CT abdomen / pelvis
  - Allows haemopneumothorax to be identified and injuries graded.
3. Introduction

Abdominal trauma accounts for 22% of body regions injured in major trauma and can be difficult to diagnose and manage. A high index of suspicion should be maintained for any multi-trauma patient, particularly where the mechanism of injury may suggest significant abdominal injury. Understanding the types of injuries is important for the planning and organisation of trauma services. Penetrating injuries are frequently isolated injuries, but may cause severe organ or vessel disruption and rapid bleeding. Securing breathing and control of bleeding are often the priorities with this type of injury.

The vast majority (over 90%) of major trauma in Australia is caused by blunt injury mechanisms, such as those caused by motor vehicle collisions (MVC), falls, and being forcefully struck. Blunt injuries less often present with rapid exsanguination, but are more often associated with multiple organ failure, combinations of airway, breathing, circulatory, neurological and musculoskeletal deficiencies, and permanent physical and cognitive disabilities among survivors.

Missed abdominal injuries are a major cause of avoidable death in trauma patients. The principles of initial management focus on the detection of any injury and determining the need for urgent intervention. Investigations such as the Focused Assessment of Sonography in Trauma (FAST) and Computerised Tomography (CT) scanning can determine the presence of injuries in combination with assessment.

**Blunt abdominal trauma**

Blunt abdominal injuries may be initially difficult to detect if the patient has no signs of external trauma and alteration to their vital signs. Significant blood loss can occur without any dramatic change in appearance of the abdomen. A direct blow from blunt trauma can lead to solid organ rupture and visceral damage causing haemorrhage, contamination with the visceral contents, peritonitis and associated pelvic injuries. The most common organs injured are the spleen, liver and small bowel. Shearing injuries caused by improperly worn seatbelts are a form of crush injury that can display an identifiable seatbelt pattern of bruising.

Physical examinations signs following blunt abdominal trauma should raise suspicion of a severe injury when the following are present: seatbelt injury, rebound tenderness, hypotension BP<90, abdominal distension, abdominal guarding and concomitant femur fracture.

**Operative management**

**Indications for emergency laparotomy – blunt trauma**

- Peritonism.
- Free air under the diaphragm.
- Significant gastrointestinal hemorrhage.
- Hypotension with positive FAST scan or positive DPL.
- Increasing abdominal pain.
• High grade solid organ injuries if embolisation not available.
• Physiological deterioration.

Angioembolisation
The non-operative management of splenic injuries in blunt abdominal trauma has been markedly improved by angioembolisation. In all haemodynamically stable patients with evidence of active splenic extravasation on CT scanning, angioembolisation is advised if available. In patients with a manageable degree of instability, urgent transfer to a major trauma service for embolisation may be advised after active risk assessment and consultation. Active bleeding with high grade splenic injuries require immediate consultation with a surgeon. Patient selection for non-operative management of traumatic splenic injuries can be supported through joint assessment and planning with Major Trauma Services, Adult Retrieval Victoria (ARV), or the Paediatric Infant Perinatal Emergency Retrieval Service (PIPER).

Traumatic Spleen Injuries.
Recent developments in trauma surgery favour a conservative approach to preserve the spleen following injury whenever clinically appropriate and possible. Splenectomy can be life-saving if injuries are time critical or life threatening. Haemodynamically stable blunt solid organ injuries should be managed in trauma services where facilities exist to closely monitor for clinical deterioration.

The goal of all management of traumatic spleen injuries is preservation of the spleen if possible and non-operative management should always be considered in all patients with a confirmed splenic injury. The increased use of CT has allowed for the transition to non-operative management without increasing mortality, morbidity and hospital stays.

Removal of the spleen is associated with a number of complications including bacterial infections, deep vein thrombosis, pulmonary embolism and coronary artery disease. Prolonged recovery is also seen in operative management.

The decision for splenectomy should be made once a joint assessment of the clinical scenario with ARV/PIPER has determined that the patient is too critically unwell for transfer. Early communication with the Major trauma Service surgical team is an essential part of this decision making.

Splenectomy can be life-saving if injuries are time critical or life threatening.

Haemodynamically stable blunt solid organ injuries should be managed in trauma services where facilities exist to closely monitor for clinical deterioration.

Penetrating abdominal trauma
Penetrating injuries tend to be obvious and dramatic. The most commonly injured intra-abdominal organs are the small intestine, liver and colon. Of these only one third will penetrate the peritoneum & only 50% of these will require surgical intervention. In contrast, 85% of abdominal gun-shot wounds (GSW) penetrate the peritoneum & 95% of these require a surgical intervention.

Where a penetrating object impales the patient, it should not be removed as the object potentially acts as a tamponade and any removal may lead to catastrophic haemorrhage. Removal should only take place in a controlled surgical environment with appropriate resources for intervention and resuscitation.
Indications for emergency laparotomy – penetrating trauma:

- Penetrating abdominal trauma + hypotension.
- Peritonism.
- Free Air.
- Evisceration.
- GSW traversing peritoneum.

Solid organ versus hollow viscus injury:

There are many different mechanisms of injury that leads to the compressive and shear forces that damage abdominal organs. Significant deceleration or compression forces occur in MVC’s or falls from height. Significant injuries can also occur from mechanisms such as assaults or sporting activities leading to splitting of the structure and in a hollow organ may cause rupture.  

Shearing forces created by sudden deceleration can cause lacerations of both solid and hollow organs at their points of attachment to the peritoneum. They may also create tears or cause stretch injuries to the arteries, resulting in infarction of the distal organ. Fractured ribs or pelvic bones can lacerate intra-abdominal tissue. Diaphragmatic & pancreatic injuries are frequently missed on initial CT scanning. Delay in diagnosis and treatment of hollow viscus injury leads to an increase in mortality and morbidity.

4. Early activation

Emergency medical services should notify the receiving hospital that a trauma patient with suspected abdominal injuries is en-route. This information may be crucial to how a severely injured patient is managed and can allow for communication to vital members of the response team as well as time to prepare the department for the patient’s arrival.

The following sequence of actions should take place upon initial notification:

1. Gather vital information from the notifier using the MIST mnemonic:
   - M Mechanism of injury
   - I Injuries found or suspected
   - S Signs: respiratory rate, pulse, blood pressure, SpO2, GCS or AVPU
   - T Treatment given

2. Ensure all staff involved in patient care are wearing gloves, aprons and eye protection. Personal protective equipment is vital in the care of trauma patients.

3. Activate the trauma team and available support departments (medical imaging, pathology). In small health service settings this may only consist of a clinician and a nurse. Additional staff may be gathered from wards or on call. It may be necessary to utilise the skills of all available resources including emergency response personnel in the initial trauma management.

4. Set up the trauma bay to receive the patient, including equipment checks, documentation, medications and resuscitation equipment.
5. Designate roles and specific tasks to staff and maintain an approach based on teamwork. Ensure good communication between all parties involved in managing the trauma. Use closed-loop communication, which ensures accuracy in information shared between response staff. Repeat instructions, make eye contact and provide feedback. Misinterpreted information may lead to adverse events.

If there is no prior notification of the patient, then rapid activation of the trauma team request must take place and any additional resources notified. If it is anticipated that transfer to an MTS will be required, early retrieval activation is essential (phone ARV on 1300 368 661).

Early retrieval activation ensures access to critical care advice and a more effective retrieval response. Early activation and timely critical care transfer improves clinical outcomes for the patient. Even if you are unsure, call the ARV coordinator, who can provide expert guidance and advice over the phone or via tele- or videoconference, and link to an MTS as required.

5. Primary Survey

Use a systematic approach based on ABCDE to assess and treat an acutely injured patient. Unless there are associated injuries, most patients with abdominal trauma generally present with a patent airway. Alterations found in breathing, circulation and disability assessments generally correspond to the degree of shock. The goal is to manage any immediate threats to life and identify any emergent concerns that may require activation of retrieval services and early transfer to a MTS.

**Airway with cervical spine protection**

*Assess for airway stability*

Attempt to elicit a response from the patient.

Look for signs of airway obstruction (use of accessory muscles, paradoxical chest movements, see-saw respirations).

Listen for any upper-airway noises, breath sounds. Are they absent, diminished or noisy? Noisy ventilations indicate a partial airway obstruction by either the tongue or foreign material.

*Assess for soiled airway*

Haemorrhage and vomiting are common causes of airway obstruction in trauma patients. These should be removed with suction.

*Attempt simple airway maneuvers if required*

- Open the airway using a chin lift and jaw thrust.
- Suction the airway if excessive secretions are noted or if the patient is unable to clear their airway independently.
- Insert an oropharyngeal airway (OPA) if required.

If the airway is obstructed, simple airway-opening maneuvers should be performed as described above. Care should be taken to not extend the cervical spine.
Caution: NPA should not be inserted in patients with a head injury in whom a base of skull fracture has not been excluded.  

Secure the airway if necessary (treat airway obstruction as a medical emergency)
Consider intubation early if there are any signs of:
- A decreased level of consciousness GCS <9, unprotected airway, uncooperative/combatve patient leading to distress and further risk of injury
- Hypoventilation, hypoxia or a pending airway obstruction: stridor, hoarse voice.
- Assist ventilation with a bag and mask while the provider is setting up for intubation.

Maintain full spinal precautions if indicated
Suspect spinal injuries in polytrauma patients, especially where there is an altered level of consciousness. Ensure cervical collar, head blocks or in-line immobilisation is maintained throughout patient care.

Breathing and ventilation
Patients with early, compensated shock may have a mild increase in their respiratory rate, however those with more severe hypovolemic shock will display marked tachypnea.

Assess the chest
Count the patient’s respiration rate and note the depth and adequacy of their breathing. Auscultate the chest for breath sounds and assess for any wheeze, stridor or decreased air entry. Be mindful that in the setting of abdominal trauma, potential thoracic injuries may have occurred also. Rupture of the hemi diaphragm often leads to compromise of respiratory function and bowel sounds may be heard over the thorax when breath sounds are auscultated.

Record the oxygen saturation (SpO2)
Adequate oxygenation to the brain is an essential element in avoiding secondary brain injury. Monitor the SpO2 and maintain it above 95%. Failure to keep saturations above this rate is associated with poorer outcomes.
Ensure high-flow oxygen is administered to maintain saturations above 95%.

Circulation with haemorrhage control

Assess circulation and perfusion
Check:
- Heart rate.
- Blood pressure.
- Peripheral circulation and skin (pale, cool, clammy).

Shock from intra-abdominal haemorrhage may range from mild tachycardia with few other findings to severe tachycardia, marked hypotension and pale, cool, clammy skin. The most reliable indicator of intra-abdominal haemorrhage is the presence of hypovolemic shock from an unexplained source.
In immediate trauma care aim for a blood pressure greater than 90 mmHg systolic or a shock index less than 1 (HR/SBP).

Insert x 2 large bore peripheral IV cannulas. If access is difficult, consider a central or intraosseous insertion if the equipment / skills are available.

Commence fluid resuscitation as indicated.
Initial treatment of hypovolaemia with crystalloid fluids (normal saline) is recommended, up to 20–30 mL/kg.
Blood pressure goals for penetrating trauma or uncontrollable haemorrhage are generally lower than for blunt trauma in the absence of a major head injury. (SBP values less than 90 mmHg may be acceptable if cerebral perfusion is maintained – that is, if conscious state is normal). Early consultation about such patients is required.
Expose the chest / abdomen and look for any obvious signs of external bleeding from penetrating trauma. If found, use firm, direct compression to stem the bleeding and if possible apply compression bandaging circumferentially over the wounds. Be sure to monitor for any signs of uncontrollable haemorrhage. If a penetrating object is found insitu, do not remove it.
Look for any obvious signs of bruising across the abdomen. A more thorough examination will take place in the secondary survey.

Perform a FAST scan.
Consider the need for FAST if it is available and staff are trained in its use. FAST is more accurate than any physical examination finding for detecting intra-abdominal injury as most are associated with haemorrhage into the peritoneal cavity. Any fluid in the trauma patient on US should be considered to be blood.
The FAST scan in haemodynamically unstable patients should determine the need for laparotomy. A negative FAST in a haemodynamically unstable patient reliably excludes the abdomen as the source of instability. It is important to note that the FAST scan cannot be used to give a specific diagnosis, only to confirm the presence of blood which may warrant operative investigation. If the patients hemodynamic status changes FAST may be repeated.
If the patient is haemodynamically stable and shows no signs of significant internal bleeding then it may be delayed until the secondary survey.

Disability
Assess level of consciousness
Perform an initial Glasgow Coma Scale (best eye opening, motor response and verbalisation).
Check pupil size and reactivity if conscious state is altered.
Test blood sugar levels
Ensure that any alterations in level of consciousness are not related to a metabolic cause.

Exposure and environment
By the end of the primary survey the patient should have been fully exposed so as to ensure no injuries posing an immediate life threat are missed.
Consideration must be given to the patient’s age, gender and culture when exposing them for a trauma examination. Exposure may need to be done sequentially, uncovering one body region at a time to maintain patient dignity.

Trauma patients are prone to hypothermia, so upon completion of the primary survey, they should be covered with dry, warm blankets. External warming devices may be required if the patient is even mildly hypothermic. All intravenous fluid or blood should be warmed prior to administration if a fluid warmer is available.

**Emergency Laparotomy**

Early consultation with Adult Retrieval Victoria when considering emergency laparotomy will allow for:

- Joint assessment of the clinical scenario.
- Discussion of the need for urgent transfer (and retrieval coordination).
- Discussion with an MTS regarding clinical priorities and options.

**Indications for emergency laparotomy**

- Haemodynamic instability systolic BP< 90mHg with a positive FAST.
- Evidence of peritonitis (tenderness on palpation, involuntary guarding and percussion tenderness).
- 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 intraperitoneal free fluid (200-≥500mls).
- Failed non-operative management.

It is essential that early contact is made with retrieval services once any of the above have been identified to initiate transfer to the MTS. Dependent on the availability of local resources and consultation with ARV, consideration should be given to the need for damage control surgery, haemostatic resuscitation and permissive hypotension. These will be discussed in the Early Management section of the guideline.

**Imaging**

In the trauma patient, a primary series of x-rays should be performed:

- Chest: identifies haemothorax, pneumothorax and pulmonary contusion.
- AP Pelvis: identify any pelvic fractures.

**6. Secondary survey**

The secondary survey is performed once the patient has been resuscitated and stabilised. It involves a more thorough head-to-toe examination, and the aim is to detect other significant but not immediately life-threatening injuries that were not detected or managed during the initial assessment and resuscitation.
**History**

Taking an adequate history from the patient, bystanders or emergency personnel of the events surrounding the injury can assist with understanding the extent of the injury and any possible other injuries.

Use the AMPLE acronym to assist with gathering pertinent information:

- **A**llergies
- **M**edication
- **P**ast medical history including tetanus status
- **L**ast meal
- **E**vents leading to injury [xiv]

**Head-to-toe examination**

During the secondary survey, the abdomen is systematically examined in greater detail. Any injuries detected should be accurately documented and any required treatment should occur, such as covering wounds, managing non-life-threatening bleeding and splinting of fractures.

**Abdomen**

**Inspection:**

- Look for any obvious signs of injury, in particular any abrasions and/or ecchymosis.
- Seat belt bruising indicates a large force has been applied to the abdomen and is associated with rupture of hollow viscus and an increased incidence of other intra-abdominal injury. Signs of hollow viscus injury are often delayed, serial abdominal examinations may be warranted.
- Any obvious penetrating injury should have been identified in the primary survey, however further inspection should be undertaken in order to conclusively exclude this as a concern.
- Note the contour of the abdomen, is it flat or distended? Abdominal distention is likely due to either air or blood, with the abdomen holding up to 1.5 litres of fluid before showing any signs of distention.\(^8\)
- Bruising and swelling to the flank may raise suspicion for retroperitoneal injury while Cullen’s sign (periumbilical ecchymosis) may indicate retroperitoneal haemorrhage; however this usually takes hours to develop.

**Palpation:**

- Palpation of the injured abdomen should be commenced in an area where the patient is not complaining of pain.
- Note if there is any guarding of the abdomen, both voluntary and involuntary, as well as any rebound tenderness.
- Fullness to the abdomen may indicate haemorrhage, crepitation of the lower rib cage may be associated with underlying hepatic or splenic injury.
- Significant abdominal tenderness on palpation and involuntary guarding are signs of peritonitis and are suggestive of leakage of intestinal contents but may take several hours to develop.
Percussion:
• Slight movement of the peritoneum occurs on percussion and may show signs of peritoneal irritation.

Auscultation:
• Can be used to note the presence or absence of bowel sounds. An ileus (cessation of peristalsis) causes a quiet abdomen due to haemorrhage or spillage of intestinal contents. This finding is more significant when there has been a change from initial assessment.

Head and face
Inspect the face and scalp. Look for any lacerations and bruising. Gently palpate for any depressions or irregularities in the skull and jaw. Test pupillary reflexes.

Neck
If a cervical collar is insitu it should be opened, the head supported with manual in-line stabilisation and the neck inspected. If there is no collar, consider the mechanism of injury and whether a cervical injury could be likely. Gently palpate the cervical vertebrae. Note any cervical spine pain, tenderness or deformity. Check the soft tissues for bruising, lacerations, emphysema, pain and tenderness. Note also the following
• Veins: look for distension – neck vein distension may be seen in tension pneumothorax or pericardial tamponade.
• Oesophagus: ask the patient to swallow – an oesophageal injury may be suspected if the patient has pain or difficulty swallowing.
Re-apply the cervical collar carefully after examining the neck – the cervical spine will generally be cleared after transfer to a major trauma service and specialist assessment.

Chest
The chest should be palpated for any tenderness and deformities. Auscultate the lung fields; note any percussion abnormality, lack of breath sounds, wheezing or crepitation. If bowel sounds are heard over the thorax during auscultation there may be diaphragmatic rupture. Check the heart sounds: apex beat and presence and quality of heart sounds.

Limbs
Inspect all the limbs and joints, palpate for bony and soft-tissue tenderness. Note any bruising, lacerations, muscle, and nerve or tendon damage. Look for any deformities, penetrating injuries or open fractures. Assess distal colour, warmth, movement, sensation and capillary refill.
**Back**
Log roll the patient. Maintain in-line stabilisation throughout.
Inspect the entire length of the back noting any deformity, bruising and lacerations.
Palpate the spine for any tenderness or steps between the vertebrae. Include a cervical examination at this stage.

**Buttocks and perineum**
Look for any soft-tissue injury such as bruising or lacerations. Penetrating injuries to this area have a high correlation intra-abdominal injuries.
Digital rectal examination may be performed if there is an injury suspected to look for gross blood indicating bowel perforation and to assess tone and position of the prostate.

**Genitalia**
Soft-tissue injuries such as bruising or lacerations should be noted.
Inspect for any blood at the meatus which may indicate urethral injury.
Lacerations to the vagina may occur due to bony fragments from pelvic injury.

The priorities for further investigation and treatment may now be considered and a plan for definitive care established.

### 7. Planning and communication

For a trauma team to run effectively there must be an identifiable leader who will direct the resuscitation, assess the priorities and make critical decisions. Good communication between the trauma team members is vital, as is ensuring that local senior staff are aware and can provide additional support if required.

Once the initial assessment and resuscitation is underway, it is important to plan the next steps in immediate management. Priorities for care must be based on sound clinical judgement, patient presentation and response to therapies. Awareness of limitations in resources as well as training in the emergency field is vital. If escalation of care to senior staff is warranted, then do so early in the patient care episode. Do not wait until the patient deteriorates to ask for assistance.

Front line clinical staff should initiate contact with ARV early in the patient care pathway or, more importantly, as soon as it is identified that the patient meets the major trauma transfer criteria. This is important as they may have sustained injuries beyond the clinical skill set of the hospital or urgent care centre. ARV can be contacted at any time throughout the patient care episode to offer or coordinate clinical advice and consultation.

ARV coordinators can facilitate a three-way conversation between the referral health service, specialist resources and ARV consultant to discuss the best, timely management of the patient.

The decision of when to transfer an unstable patient should ideally be made by the transferring and receiving clinicians in collaboration with the retrieval service. Clear communication is crucial; the transmission of vital information allows receiving clinicians to
mobilise necessary resources while the inadvertent omission of such information can delay definitive care. Information should be conveyed in both verbal and written form (via the patient record) and should include the patient’s identifying information, relevant medical history, pre-hospital management, evaluation and treatment (including procedures performed and imaging obtained).

There are many different types of structured handover. ISBAR & IMIST-AMBO being two of the most common. ARV recommends using the IRMIST model of clinical handover:

- **Identification**: Introduce / identify clinician/self & their role, introduction of the patient – age, sex, name
- **Retrieval**: Reason for retrieval, from which referrer.
- **Mechanism of Injury / presenting complaint**: Specific explanation of the patient's presenting problem and history of presenting complaint.
- **Injuries / Interventions**: Information relating to injuries. Complete top to toe summary. Include what interventions have been performed to help stabilise the patient – e.g. Size 8 ETT
- **Signs / Symptoms**: Looks at the assessment of the patient, requires details of the patient current vital signs and GCS.
- **Treatments / Trends**: Identifies the treatment that was required – e.g. sedation / paralysis & how the patient’s condition has changed. Point of transition of responsibility and accountability for patient care.
- **Allergies**: Include what type of reaction
- **Medication**: Patients usual medication
- **Background History**: Patients medical history
- **Other information**: Relevant social information

It is important that additional communication with the ARV coordinator is initiated when there is:

- Significant deterioration in: conscious state, blood pressure, heart rate, respiratory status, oxygenation.
- Major clinical developments such as significantly abnormal diagnostic tests and new clinical signs.
- The need for major interventions prior to the retrieval team arriving (for example, intubation or surgery).

This will ensure the retrieval team is prepared, the patient receives the appropriate care en route and the patient is referred to the correct facility.

## 8. Early management

**Haemostatic resuscitation**: Early administration of blood products in haemorrhagic shock is advised in order to reduce the lethal triad of coagulation, acidosis and hypothermia. Administration of packed red blood cells (PRBC) is advised if available. If greater than two units are required, specialist consultation, use of a balanced transfusion protocols (PRBC, plasma, platelets) and initiation of a trauma transfusion protocol is advised. Where massive transfusion is required (more than five units of blood in under four hours), blood product
administration should be guided by the Critical bleeding massive transfusion guideline published by the National Blood Authority.\textsuperscript{15}

**Permissive hypotension:** maintenance of a circulating volume at a reduced level whilst maintain adequate perfusion until haemorrhage control is established. Applicable to the penetrating trauma patient pending emergency surgical intervention.\textsuperscript{16}

**Damage control surgery:** emergency temporizing surgery performed in order to gain haemostatic control prior to definitive intervention. Diversion to a RTS may be necessary where capability exists and where flight and landing logistics allow in order to access immediate haemostatic interventions.

**Naso/orogastric tube (N/OGT)**
All patients should be kept nil orally in the initial post-resuscitation phase of injury. A gastric tube should be inserted early in the resuscitation phase to relieve acute gastric dilation, remove gastric contents and decompress the stomach before performing a diagnostic peritoneal lavage (DPL).

**Urinalysis**
Gross haematuria suggests serious renal injury and mandates further investigation. Microscopic haematuria (>25 RBCs per high power field), increases the likelihood of significant intra-abdominal injury.

**Imaging**
Further diagnostic imaging should be considered if available and indicated. **Do not transport an unstable trauma patient to an imaging facility unless absolutely essential.**

If FAST was not completed in the primary survey it should be done now. This is a non-invasive procedure, is quick to perform and can be completed in the ED.

**FAST:**
- Used to identify free fluid in the peritoneal cavity.
- Sensitivity approaching 96% in detecting >800mls blood.
- Involves directing the ultrasound probe in four main regions:
  1. Subxiphoid: to determine fluid in the pericardial space and to assess cardiac filling and contractility.
  2. Right upper quadrant: Liver, kidney, diaphragm (including Morrison’s pouch).
  3. Left upper quadrant: Diaphragm, spleen, kidney.

Positive results from a FAST scan warrant further investigation and management in accordance with the patients’ clinical status.

**CT abdo/pelvis:**
- Allows haemoperitoneum to be identified & allows specific injuries to be graded.
- Permits evaluation of retroperitoneal structures including the kidneys, major blood vessels & bony pelvis.
In the haemodynamically stable patient with suspected intra-abdominal injury the key decision is whether the patient requires CT scanning or a period of observation. CT is the diagnostic modality of choice in the stable patient.

- Contrast extravasation found on CT is a sign of active bleeding and is a strong predictor of failure of non-operative management.
- Hollow viscus, diaphragmatic & pancreatic injuries are frequently missed on initial scanning. Isolated intraperitoneal fluid findings on CT should raise a high suspicion of hollow organ injury.

**Blunt trauma**

Patients who do not present with any predictive factors indicating intra-abdominal injury requiring urgent laparotomy or CT evaluation and have no other presenting problems may be observed with serial abdominal examinations and discharged if no reason for admission is found.

**Penetrating wounds**

In accordance with the inter-hospital major trauma criteria, all penetrating wounds except for isolated/superficial limb injuries should be transferred to a MTS for evaluation. A reliable approach to detecting significant injuries after penetrating wounds to the abdomen may be with serial physical examinations, so long as the patient has no other distracting injuries, is alert and orientated and not influenced by sedation. Ideally serial examinations should be performed by the same clinician.

**Laboratory tests**

Routine laboratory tests are generally of limited value in the management of a trauma patient. Isolated results from single blood tests may be misleading and results should be considered in the context of the whole patient and trended results where available.

- **FBE:** Haematocrit below 30% increases the likelihood of intra-abdominal injury in the setting of blunt abdominal trauma. Haemoglobin levels should be interpreted according to time since injury, amount of fluid administration and extent of haemorrhage.
- **UEC:** and glucose should be routinely taken.

Serial blood gas assessment of pH and lactate levels provides good monitoring of tissue oxygenation, circulatory status and response to resuscitation. Consider performing coagulation studies and group and cross-match if there is a high index of suspicion for haemorrhage.

**Fluid resuscitation**

Avoidance of hypovolaemia in trauma is a cornerstone of management. A balanced approach to fluid replacement is important, especially in establishing early treatment goals.  

Resuscitation goals:

- The main goal of fluid resuscitation in trauma is to preserve vital organ function until bleeding can be controlled.
• The assessment of hypovolaemic shock is difficult during the early phase of major trauma care. The clearest signs of end-organ hypo perfusion include decreased urine output, acidosis, altered conscious state and elevated lactate level.

• In immediate trauma care aim for a blood pressure greater than 90 mmHg systolic or a shock index less than 1 (HR/SBP).

• Blood pressure goals for penetrating trauma or uncontrollable haemorrhage are generally lower than for blunt trauma in the absence of a major head injury. (SBP values less than 90 mmHg may be acceptable if cerebral perfusion is maintained – that is, if conscious state is normal. Early consultation about such patients is required.

• If possible, all blood/fluid administered to a major trauma patient should be warmed with a fluid warmer.

Crystalloid fluids
Initial treatment of hypovolaemia with crystalloid fluids (normal saline) is recommended, up to 20–30 mL/kg.

Colloids
Colloids are not generally recommended in the early treatment of major trauma.

Analgesia
Titrated narcotic analgesia is the initial approach to pain management in trauma. Intravenous administration is the most effective route. Administer as per local protocols and titrate to effect. Analgesia should be administered prior to any wound or fracture care as treatment and dressing of wounds or fractures can be particularly painful. Consider prophylactic antiemetic administration, especially if transfer and retrieval is likely.

Prevent hypothermia
It is important to maintain normothermia. Ensure the patient does not lose excess heat due to exposure or wounds. Make sure all wounds are covered.

Use warmed IV fluids; cover the patient with extra warm blankets as well as keeping the room warm (a general guide is that if clinical staff are comfortable it’s likely to be too cold for a trauma patient). If available, the use of a forced air-warming machine is encouraged. Re-assess the room temperature at regular intervals while awaiting the retrieval team.

Monitoring
Monitoring the heart rate, respiration rate, blood pressure and oxygen saturation should take place at 15-minute intervals or more frequently if indicated. Monitor continuously via electronic monitoring if facilities are available. All monitoring should be maintained until the retrieval team arrives.

A baseline ECG should be taken prior to transfer if time permits and facilities exist.

Glasgow Coma Scale
A focused neurological assessment using the Glasgow Coma Scale should be performed. This should include a description of the patient’s level of consciousness as well as assessments of...
pupillary size and reactivity, gross motor function and sensation. Document the findings and reassess at frequent intervals.

**Tetanus immunisation**

Tetanus immunisation should be updated in the case of significant or contaminated wounds. Tetanus immunoglobulin should be given to patients who have not received a complete primary immunisation.  

**Antibiotics**

Routine IV antibiotic administration is not recommended in major trauma, however, is indicated in patients with penetrating abdominal injury requiring surgical management.

**Reassess**

The importance of frequent reassessment cannot be overemphasised. Serial abdominal examinations should be performed at regular intervals as deterioration in a patient’s clinical condition can be swift. This will be evident in their vital signs and level of consciousness. If in doubt, repeat ABCDE.

### 9. Retrieval and Transfer

Transfer and retrieval response will be managed according to patient need following clinical consultation with ARV, the MTS and the referring facility. The following presentations should be consulted for early transfer to a MTS:

- All penetrating abdominal injuries.
- Fractured or suspected fractured pelvis.
- Haemodynamic instability (BP<90).
- Seatbelt injury.
- Rebound tenderness.
- Abdominal distention or guarding.
- Abdominal trauma with significant distracting injury.
- Positive FAST or DPL.
- Free air under the diaphragm.
- Significant gastrointestinal hemorrhage.

In a resource-limited setting, suspected intra-abdominal trauma patients who are haemodynamically stable and without obvious peritoneal signs should be discussed with ARV and the MTS. The decision to transfer will be based upon a number of factors to include available investigations, the patients’ comorbidities and distance from the closest hospital to provide definitive care should the patient’s condition deteriorate.

It is important to note that an exhaustive clinical workup and interventions is not always necessary or appropriate prior to transfer. Stabilisation and ensuring life-threatening problems are addressed, as well as taking measures to prevent deterioration en route, are essential aspects of early care. Delaying transfer to obtain laboratory results or imaging studies may simply delay access to definitive treatment. Often such studies must be repeated at the receiving facility.
In liaison with ARV clinicians, interventions to stabilise the patient prior to retrieval personnel arriving should be commenced. ARV will coordinate the retrieval and will evaluate the practicality and clinical needs involved in transferring the patient from the source hospital. Once retrieval staff arrives on scene, be prepared to give a thorough handover. Retrieval staff will assess the patient prior to transfer and may make changes to care in order to ensure the patient is safe during transfer.

Patients who do not present with any indications of intra-abdominal injury requiring CT evaluation and have no other distracting injuries requiring closer inspection may be observed with serial abdominal examinations and discharged if no reason for admission is found.
### AGREE II Score Sheet: Abdominal trauma guideline

<table>
<thead>
<tr>
<th>Domain</th>
<th>Item</th>
<th>AGREE II Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope and purpose</td>
<td>1. The overall objective(s) of the guideline is (are) specifically described.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>2. The health question(s) covered by the guideline is (are) specifically described.</td>
<td>X</td>
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<tr>
<td></td>
<td>3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.</td>
<td>X</td>
</tr>
<tr>
<td>Stakeholder involvement</td>
<td>4. The guideline development group includes individuals from all the relevant professional groups.</td>
<td>X</td>
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<tr>
<td></td>
<td>5. The views and preferences of the target population (patients, public, etc.) have been sought.</td>
<td>X</td>
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<td></td>
<td>6. The target users of the guideline are clearly defined.</td>
<td>X</td>
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<tr>
<td>Rigor of development</td>
<td>7. Systematic methods were used to search for evidence.</td>
<td>X</td>
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<tr>
<td></td>
<td>8. The criteria for selecting the evidence are clearly described.</td>
<td>X</td>
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<td>9. The strengths and limitations of the body of evidence are clearly described.</td>
<td>X</td>
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<td>10. The methods for formulating the recommendations are clearly described.</td>
<td>X</td>
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<td>11. The health benefits, side effects and risks have been considered in formulating the recommendations.</td>
<td>X</td>
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<td>12. There is an explicit link between the recommendations and the supporting evidence.</td>
<td>X</td>
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<td>13. The guideline has been externally reviewed by experts prior to its publication.</td>
<td>X</td>
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<td></td>
<td>14. A procedure for updating the guideline is provided.</td>
<td>X</td>
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<tr>
<td>Clarity of presentation</td>
<td>15. The recommendations are specific and unambiguous.</td>
<td>X</td>
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<tr>
<td></td>
<td>16. The different options for management of the condition or health issue are clearly presented.</td>
<td>X</td>
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<td></td>
<td>17. Key recommendations are easily identifiable.</td>
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<tr>
<td>Domain</td>
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<td>AGREE II Rating</td>
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<tr>
<td>Applicability</td>
<td>18. The guideline describes facilitators and barriers to its application.</td>
<td>X</td>
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<tr>
<td></td>
<td>19. The guideline provides advice and/or tools on how the recommendations can be put into practice.</td>
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<td>20. The potential resource implications of applying the recommendations have been considered.</td>
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<td></td>
<td>21. The guideline presents monitoring and/or auditing criteria.</td>
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<tr>
<td>Editorial independence</td>
<td>22. The views of the funding body have not influenced the content of the guideline.</td>
<td>X</td>
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<td></td>
<td>23. Competing interests of guideline development group members have been recorded and addressed.</td>
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<tr>
<td>Overall Guideline</td>
<td>1. Rate the overall quality of this guideline.</td>
<td>2</td>
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<tr>
<td>Assessment</td>
<td>1. Lowest possible quality</td>
<td>X</td>
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<td>2. Highest possible quality</td>
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<td>Overall Guideline</td>
<td>2. I would recommend this guideline for use.</td>
<td>Yes</td>
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<tr>
<td>Assessment</td>
<td>1. Yes, with modifications</td>
<td>X</td>
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<tr>
<td></td>
<td>2. No</td>
<td>X</td>
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</tbody>
</table>
11. References


https://www.thermh.org.au/sites/default/files/media/documents/.../TRM05.03_0.pdf


