1. Key messages

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

This 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 directly at the Major Trauma Service (MTS) as well as those working outside of a MTS.

These guidelines provide the user with accessible resources to effectively and confidently provide early care for critically injured patients. They provide up-to-date information for frontline healthcare clinicians. The guideline has followed the AGREE methodology for guideline development and is auspiced by the Victorian State Trauma Committee.

Clinical emphasis points

- A trauma team approach with good communication, clearly understood roles and established clinical guidelines and practices is key to good trauma care.
- The primary survey or initial assessment and management of a trauma patient are designed to detect and treat actual or imminent life threats and prevent complications from these injuries.
- The main goal of early care is to ensure optimum resuscitation in the emergency setting as well as activation of the retrieval network, with timely transfer to an appropriate facility.
- Avoidance of hypovolaemia in trauma is a cornerstone of management. A balanced approach to fluid replacement is important, especially in establishing early treatment goals.
- The main goal of fluid resuscitation in trauma is preservation of vital organ function until bleeding can be controlled.
- Avoid hypothermia in major trauma patients.
- Adult Retrieval Victoria (ARV) is the first point of call to initiate retrieval and transfer in the adult patient.
Early Trauma Care

Make early contact with ARV for advice and to initiate retrieval.

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

Primary Survey

AIRWAY / C SPINE:
- Protect Airway
- Airway adjuncts as available
- Secure the airway using any available means
- Maintain full spinal precautions

BREATHING:
- Identify and treat any life threats (i.e. pneumo)
- Apply oxygen
- Ventilate as necessary
- SpO2 monitoring
- ETCCO2 monitoring

CIRCULATION:
- Control life threatening haemorrhage
- Insert 2 large bore IV cannulas
- Assess HR/ BP/ Shock Index
- Take bloods
- Identify source of haemorrhage
- Continuous ECG monitoring

DISABILITY:
- Assess level of consciousness
- Check pupils
- Check BSL

EXPOSURE / ENVIRONMENT:
- Fully expose patient
- Ensure normothermia

ADJUNCTS:
- FAST scan
- X-rays: LAT c spine, Chest, Pelvis
- 12 lead ECG

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Early Management

Airway management
- If there is potential that the patient’s airway may deteriorate then intubation should be considered.
- Always have emergency airway equipment available.

Fluid resuscitation
- Crystalloid fluids: Initial treatment of hypovolaemia with normal saline is recommended, up to 20 - 30 mL/kg.
- Blood products: If minimal response to fluids, administration of packed red blood cells (PRBC) is advised if available.

Prevent hypothermia
- Use warmed IV fluids; cover the patient with warm blankets as well as keeping the room warm, use a forced air warming machine if available.

In-dwelling catheter / Naso or orogastric tube
- Ensure the above are placed if necessary and time allows.
- Glasgow Coma Scale
- Assess the patient’s level of consciousness as well as pupillary size and reactivity, gross motor function and sensation.

Reassess
- Patients should be re-evaluated at regular intervals as deterioration in a patient’s clinical condition can be swift.
- If in doubt, repeat ABDE.

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Secondary Survey

History
- If there is potential that the patient’s airway may deteriorate then intubation should be considered.
- Use AMPLE to assist with gathering relevant information.

Head-to-toe examination
- A thorough exam of all body regions should take place.
- Document any findings and treat accordingly.

Log Roll
- Maintain in-line stabilisation.
- Inspect the entire length of the neck and back noting any deformity, bruising and lacerations. Palpate for any tenderness or steps between the vertebrae.
- The cervical spine will generally be cleared after transfer to a major trauma service and specialist assessment.
3. Introduction

Victorian hospitals treat almost 3,000 major trauma patients each year, and this number is increasing by about 3% per annum, with 85% being managed at an appropriately designated trauma service. About 42% of patients meeting major trauma criteria require an intensive care admission, and three-quarters of these require mechanical ventilation.1

The majority of trauma seen in Victoria is blunt trauma, with falls, motor vehicle accidents, motorbike accidents, pedestrians and pedal cyclists the most common mechanisms of injury. In recent years there has been a significant increase in the number of major trauma patients older than 65 years, representing approximately one-third of all major trauma cases. Of note, the incidence of low falls is rising significantly in this age group, with head injuries being the most common serious injury sustained in this demographicii. Paediatric cases represent between 4-5% of major trauma cases in Victoriai.

Approximately two-thirds of major trauma patients will be transported directly from the scene to a major trauma service, meaning one in three will be managed initially at a peripheral hospital or health servicei.

Patients who meet major trauma criteria outlined in the Major trauma advice and Inter-hospital transfer guidelines should be stabilised at the receiving health service and discussed with ARV within 60 minutes of arrival to arrange for transfer to a major trauma service. ARV provides clinical advice on the management and stabilisation of major trauma patients and coordinates subsequent retrieval and transfer if required.

The Review of Trauma and Emergency Services (RoTES) report (1999iii) underpins much of the Victorian State Trauma System and specified the following in response to the general team approach to early management of major trauma patients:

‘The multidisciplinary trauma team approach to trauma resuscitation and stabilisation is one recommended by several bodies (ACS, 1993; NRTAC, 1993). All hospitals designated to receive trauma patients must have a formal organised response to the initial reception and management of trauma patients. The establishment of a trauma team is crucial to achieving this. Clarifying the roles and responsibilities of each member of the team enables an optimally coordinated approach during resuscitation, when many tasks must be carried out simultaneously. Trauma team members should comprise the most skilled clinicians available to fulfil each role within the team. Clinicians should, therefore, be sourced from throughout the health facility to provide optimal expertise in trauma resuscitation. The practice of allocating the various roles of the trauma team to particular “craft groups” may restrict the development of skills and the subsequent adaptability of team members. Ambulance paramedics should play an active role in the trauma team within rural or regional hospitals where availability of experienced and skilled hospital staff may be limitedii.”
4. Early activation

Emergency medical services responding to the scene will notify ARV and the receiving hospital that a trauma patient is on their way. This may be a major, metropolitan or regional trauma service or sometimes an urgent care centre, depending on distance, facilities available and the patient’s condition. Notification information is crucial to managing a severely injured patient 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. Personal protective equipment is vital in the care of trauma patients. Ensure all staff involved in patient care are wearing gloves, aprons and eye protection.

3. Activate the trauma team and available support departments (medical imaging, pathology). In smaller 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 a major trauma service 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 which leads to improved clinical outcomes for the patient.

If you are undecided, call the ARV coordinator, who can provide expert guidance and advice over the phone or via tele or videoconference, and link to a major trauma service as required.

Ambulance handover

On arrival at the emergency department, a formal handover should be given by the paramedics to the treating team, preferably using the MIST format. The timing of the handover depends on the stability of the patient. If the patient is stable, it may be best to perform the handover before placing the patient on a trolley. If the patient is unstable or critically unwell, it may be necessary for the patient to be transferred to the trolley so the team can commence the resuscitation, while the team leader receives the handover.
Reception and resuscitation
The reception and resuscitation of major trauma patients involves simultaneous assessment and management, with multiple activities occurring in parallel. Resuscitation follows the standard ABCDE approach, with some modifications based on recognising and treating immediate life threats that are unique to trauma patients, as well as preventing secondary complications.

The response to resuscitation will vary depending on the injuries sustained, the treatment administered or omitted as well as other factors such as the patient’s age and medical comorbidities.

Ongoing resuscitation is guided by the response to treatment and the need for definitive management.

Assessment must also be made of medical conditions and comorbidities that may have preceded or contributed to the patient sustaining an injury, particularly in older patients. Cardiac or neurological events leading to syncope or falls are common events that predispose to injury in older patients.

Ensure the patient is correctly identified and appropriate patient identification labels applied.

5. Primary survey

The primary survey, or initial assessment and management of a trauma patient, is designed to detect and treat actual or imminent life threats and prevent complications from these injuries. A systematic approach using the ABCDE approach is used. If a group of clinicians is assembled to perform the initial assessment, there will be multiple simultaneous activities occurring and resuscitation does not always proceed in a purely linear, sequential fashion.

On arrival to the emergency department, the patient should have full non-invasive monitoring applied, including:

- ECG monitoring
- non-invasive blood pressure cuff
- oxygen saturation probe
- the patient’s temperature should be checked and documented
- consider cutting off the patient’s clothing if it is unable to be removed. Oxygen should be applied at 15 L/min via a non-rebreather mask. It may be removed upon completion of the initial assessment if no significant injury is found.

The primary survey of a trauma patient involves:

A  Airway – with cervical spine control
B  Breathing
C  Circulation including control of exsanguinating external haemorrhage
D  Disability
E  Exposure

In single responder settings these may need to be addressed in a linear or sequential fashion; however, when a team is assembled, these elements may be addressed simultaneously. The term ‘survey’ is somewhat misleading in that it implies that only
assessment is occurring; however, each phase requires simultaneous assessment for, and management of, any life threats detected.

Control of exsanguinating external haemorrhage
Failure to control large-volume external haemorrhage has been found to be a common omission in trauma resuscitation. Obvious large volume external blood loss must be managed as an immediate priority in the field and on arrival of the patient into the emergency department, with the aim being to stop life-threatening external haemorrhaging.

Airway with cervical spine protection
Unless the patient is in cardiac arrest, immediate securing of the airway with endotracheal intubation is rarely required upon arrival for a major trauma patient. An assessment of airway patency and stability should be performed during the primary survey and a plan for airway management instituted if required.

Life threats
The following airway life threats must be assessed and managed.

Airway obstruction:
- Vomit, blood, dislodged teeth
- Remove with suction.

Blunt or penetrating neck injury:
- Consider early endotracheal intubation if neck wounds or haematomas are causing the airway obstruction or if there is an airway disruption.

Caution: Rapid-sequence intubation in patients with blunt or penetrating neck injuries carries the risk of total loss of airway patency upon administration of sedative and/or muscle relaxant medication.

Reduced conscious state:
- This can lead to hypoventilation and/or airway obstruction.

Assess for airway stability
Attempt to gather a response from the patient.
Look for signs of airway obstruction (use of accessory muscles, paradoxical chest movements and see-saw respirations).
Listen for any upper-airway noises and breath sounds. Are they absent, diminished or noisy?

Assess for soiled airway
If the patient has vomit, blood or excessive secretions on their airway, these should be removed with suction. If there is excessive bleeding into the airway that cannot be removed with suction, it may be necessary to manage the patient on their side to allow drainage of blood from the mouth or nose, while maintaining spinal alignment. Patients can be placed on their side by performing a log-roll manoeuvre.
If this is insufficient to clear large volumes of blood from the airway, consideration should be given to sitting the patient upright. The risk of potential spinal injury must be weighed against the potential for complete airway obstruction or choking from aspirated blood. If there is uncertainty about the safety of this, a senior doctor with airway experience should
be involved or the ARV clinician can be contacted for advice or for telehealth review of the situation.

**Attempt simple airway manoeuvres 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)/nasopharyngeal airway (NPA) if required.
If the airway is obstructed, simple airway-opening manoeuvres 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 basal skull fracture has not been excluded.

If the patient is already intubated, document the size and position of the endotracheal tube, including lip level, end-tidal carbon dioxide trace, cuff pressure and any intubation difficulty (or Mallampati grade).
Where possible, delegate ongoing airway management to an airway doctor/nurse and continue the initial assessment.

**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, unprotected airway, uncooperative/combative patient leading to distress and further risk of injury
- a pending airway obstruction: stridor, hoarse voice.

**Maintain full spinal precautions if indicated**
Suspect spinal injuries in all poly-trauma patients. Ensure a cervical collar, head blocks or in-line immobilisation is maintained throughout patient care.

**Breathing and ventilation**

**Life threats**
- Tension pneumothorax
- Massive haemothorax
- Open pneumothorax
- Flail chest
- Ruptured diaphragm

**Administer high flow (15 L) of oxygen**
Oxygen administration is pivotal, regardless of oxygen saturation recording.

**Assess the chest**
The chest should be fully exposed and inspected for any open wounds, bruising or deformity. Note should be made of the patient’s respiratory effort, respiratory rate and oxygen saturation.
A mobile chest x-ray should be performed in the resuscitation bay at the earliest opportunity (and performed with a pelvic and lateral neck x-ray during the primary and secondary survey).

The chest should be auscultated for breath sounds.

If a tension pneumothorax is detected, it should be managed by 14G needle decompression or with a finger thoracostomy. Blunt dissection and digital decompression through the pleura is the essential first step for pleural decompression, as decompression of the pleural space is a primary goal during the reception and resuscitation of the hemodynamically unstable patient with a hemothorax or pneumothorax. Insertion of an intercostal catheter connected to an underwater seal drain is a secondary priority and can be completed at a later stage.

Record the oxygen saturation ($\text{SpO}_2$)

### Circulation with hemorrhage control

#### Assess circulation and perfusion

Circulation assessment in major trauma focuses on detecting and managing shock, or reduced tissue perfusion. The most common cause of shock in a major trauma patient is hypovolaemic shock from blood loss. Blood loss may be external/visible, and therefore compressible, or internal/concealed and non-compressible.

Assess:

- heart rate
- blood pressure
- shock index (heart rate/systolic BP) (take caution if the shock index is 1.0 or more)
- peripheral circulation and skin (pale, cool, clammy).

Insert two large-bore peripheral intravenous (IV) cannulas. If access is difficult consider a central or intraosseous insertion if the equipment/skills are available.

#### If necessary, perform a FAST scan

Consider the need for FAST (Focused Assessment with Sonography in Trauma) if it is available and staff are trained in its use. FAST is used primarily to detect pericardial and intraperitoneal blood, and it is more accurate than any physical examination finding for detecting intra-abdominal injury. If the patient is hemodynamically stable and shows no signs of significant internal bleeding then it may be delayed until the secondary survey.

#### Circulation – control of exsanguinating external hemorrhage

Control of external hemorrhage usually requires firm compression bandaging with combine pads applied over the wounds, and firm crepe bandages applied circumferentially over the affected areas. Several layers may be required.

Causes include major amputations, severe crush injuries, open fractures, massive degloving injuries or multiple deep lacerations, especially of the scalp. Where external hemorrhage is identified, an attempt must be made to control it using direct pressure, elevation or tourniquets (if available).

Smaller injuries (for example, puncture wounds) that are bleeding excessively should be managed by direct, local pressure over the wound with 10 cm × 10 cm gauze squares folded...
in half, and folded again to make a 5 cm × 5 cm gauze pad, and placed over the wound with firm, single digit pressure. This will control haemorrhaging better than loosely applied, large absorbent pads.

It is best to avoid suturing or stapling wounds closed prior to transfer, unless the haemorrhaging cannot be controlled with direct pressure. If wounds are closed purely for haemostasis, this must be documented in the clinical record and communicated to the receiving team as they may need to be re-opened and/or explored on arrival at a receiving hospital.

**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.

**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. If during the examination any deterioration is detected, go back and reassess the primary survey.

**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 Allergies
M Medication
P Past medical history including tetanus status
Head-to-toe examination
During this examination, 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.

Head and face
Inspect the face and scalp. Look for any lacerations and bruising including mastoid or orbital bruising, which is indicative of a base of skull fracture. Gently palpate for any depressions or irregularities in the skull.
Look in the eyes for any foreign body, subconjunctival haemorrhage, hyphaema, irregular iris, penetrating injury or contact lenses.
Assess the ears for any signs of cerebrospinal fluid leak, bleeding or blood behind the tympanic membrane.
Check the nose for any deformities, bleeding, nasal septal haematoma or cerebrospinal fluid leak.
Look in the mouth for any lacerations to the gums, lips, tongue or palate. Note any swelling which may indicate inhalation injury. Inspect the teeth, noting if any are loose, fractured or missing.
Test eye movements, pupillary reflexes, vision and hearing.
Palpate the bony margins of the orbit, maxilla, nose and jaw.
Inspect the jaw for any pain or trismus.

Neck
A plain lateral neck x-ray may be indicated when assessing a poly-trauma patient.
The cervical collar should be opened, the head supported with manual in-line stabilisation and the neck inspected.
Gently palpate the cervical vertebrae. Note any cervical spine pain, tenderness or deformity. Check the soft tissues for bruising, pain and tenderness.
Note also the following:

- Trachea (midline or deviated): the trachea may deviate away from the side of a tension pneumothorax
- Wounds: blunt or penetrating injuries
- Emphysema: subcutaneous emphysema – its presence indicates an airway disruption such as a laryngeal fracture or pneumothorax
- Larynx: laryngeal tenderness or crepitus – this may indicate and underlying laryngeal fracture (caution: firm palpation may disrupt a fractured larynx leading to total airway obstruction)
- 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 rib tenderness and subcutaneous emphysema. The entire thorax must be palpated including the supraclavicular fossae, right and left ribs and both axillae. A hand can be slid posteriorly along a supine patient to check for occult blood loss; however, a formal examination of the back of the chest occurs when the patient is log rolled.

Auscultate the lung fields; note any percussion abnormality, lack of breath sounds, wheezing or crepitations.

Check the heart sounds: apex beat and presence and quality of heart sounds.

**Abdomen**

Inspect the abdomen. Palpate for areas of tenderness especially over the liver, spleen, kidneys and bladder. Look for any bruising, lacerations or penetrating injuries.

Check the pelvis. Perform a pelvic x-ray if there is any suspicion of injury. Gently palpate for any tenderness. **Do not spring the pelvis.** Any additional manipulation may exacerbate haemorrhage. Apply a binder if a pelvic fracture is suspected.

Auscultate bowel sounds.

Inspect the perineum and external genitalia.

**Limbs**

Inspect all the limbs and joints, palpate for bony and soft-tissue tenderness and check joint movements, stability and muscular power. Note any bruising, lacerations, muscle, nerve or tendon damage. Look for any deformities, penetrating injuries or open fractures.

Examine sensory and motor function of any nerve roots or peripheral nerves that may have been injured.

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.

A digital rectal examination should be performed only if a spinal injury suspected. Note any loss of tone or sensation.

**Buttocks and perineum**

Look for any soft-tissue injury such as bruising or lacerations.
Genitalia
Inspect for soft-tissue injuries such as bruising, lacerations or burns. Note any priapism that may indicate a spinal 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.\textsuperscript{xv} 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, is it 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).

ISBAR is an acronym for facilitating health professional communication ensuring clarity and completeness of information in verbal communication.

- **I** Identify: Who are you and what is your role? Patient identifiers (at least three).
- **S** Situation: What is going on with the patient?
- **B** Background: What is the clinical background/context?
- **A** Assessment: What do you think the problem is?

It is important that additional communication with the ARV coordinator is initiated when there is:
1. Significant deterioration in:
   - conscious state
   - blood pressure
   - heart rate
   - respiratory status
   - oxygenation

2. Major clinical developments such as significantly abnormal diagnostic tests and new clinical signs.

3. 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

Airway management
Fluid resuscitation
Analgesia
Fractures and dislocations
Prevent hypothermia
In-dwelling catheter
Monitoring
Glasgow Coma Scale

Pathology tests
X-ray or FAST scan
Naso/orogastric tube
Wound care
Tetanus immunisation
Antibiotics
Reassess

**Airway management**

If there is potential that the patient’s airway may deteriorate then intubation prior to retrieval should be discussed with the ARV coordinator.

Always have emergency airway equipment available.

**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.\(^{xvii}\)

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 hypoperfusion 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.)\textsuperscript{xvii} 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.

The main causes of shock in trauma patients are summarised below.

Hypovolaemic shock – from obvious external blood loss or concealed internal blood loss.

Sites of concealed blood loss include:
- chest – massive haemothorax
- abdominal/pelvic cavities
- retro-peritoneum
- femoral fracture.

Obstructive shock – due to impaired filling or obstructed outflow to/from the heart.

Causes of obstructive shock in trauma include:
- tension pneumothorax/haemothorax
- pericardial tamponade.

Neurogenic shock occurs due to loss of sympathetic vascular tone, which may occur in spinal lesions at or above the sixth thoracic vertebral level. It is characterised by hypotension, relative bradycardia and peripheral vasodilatation.

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.

Blood products

After initial resuscitation, administration of packed red blood cells (PRBC) is advised if available. If greater than two units of PRBC are required, specialist consultation, use of 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 \textit{Critical bleeding massive transfusion guideline} published by the National Blood Authority.\textsuperscript{\textsc{ix}}

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 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.

Fractures and dislocations

Closed-limb fractures:
• Assess and record neurovascular status.
• Straighten/align the limb.
• Apply a splint in an anatomical position.
• Continue to regularly monitor neurovascular status.
• If neurovascular compromise is evident arrange an urgent orthopaedic consultation or retrieval/transfer.

Open-limb fractures:
• As per closed-limb fractures above.
• Administer IV antibiotics (flucloxacillin or cephazolin). For grossly contaminated wounds or delayed presentation (more than eight hours) use piperacillin + tazobactam or ticarcillin + clavulanate. For patients with a penicillin allergy, consult.
• Perform a simple emergency department wound cleanse by removing any easily identified foreign objects or contamination (do not actively wash out the wound).
• Apply a saline-soaked gauze dressing and bandage then leave it intact.
• Organise an immediate orthopaedic consultation or activate an urgent transfer/retrieval.
• Note: if definitive management occurs more than six hours after injury the likelihood of chronic infection is significantly increased, therefore immediate transfer to a destination where early definitive management can be undertaken is imperative.

Joint dislocation:
• Joint dislocation may be associated with a fracture or may be mistaken for a juxta-articular fracture – always obtain an x-ray before management.
• Neurovascular structures are at risk. Always assess and record the findings.
• Reduce dislocated joints if possible and splint in a stable position.
• Monitor the patient’s neurovascular status after reduction.
• An open dislocation requires the same antiseptic precautions as an open fracture.
• Arrange immediate orthopaedic consultation.

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. Ensure wound care is attended to prior to commencement. Avoid moist dressings when using a forced air-warming machine due to evaporative cooling effects. Re-assess the room temperature at regular intervals while awaiting the retrieval team.

In-dwelling catheter
A urinary catheter should be inserted and urine output measured hourly. The desired urine output for adults is 0.5–1.0 mL/kg/hr.
A urinalysis should be performed also to check for blood. Discoloured, brown urine may indicate myoglobinuria, a sign of rhabdomyolysis.

**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.

<table>
<thead>
<tr>
<th>Best response</th>
<th>Eye opening</th>
<th>Verbal response</th>
<th>Motor response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Does not open eyes</td>
<td>Makes no sounds</td>
<td>Makes no movements</td>
</tr>
<tr>
<td>2</td>
<td>Opens eyes in response to painful stimuli</td>
<td>Incomprehensible sounds</td>
<td>Extension to painful stimuli (decerebrate response)</td>
</tr>
<tr>
<td>3</td>
<td>Opens eyes in response to voice</td>
<td>Utters inappropriate words</td>
<td>Abnormal flexion to painful stimuli (decorticate response)</td>
</tr>
<tr>
<td>4</td>
<td>Opens eyes spontaneously</td>
<td>Confused, disoriented</td>
<td>Flexion or withdrawal to painful stimuli</td>
</tr>
<tr>
<td>5</td>
<td>N/A</td>
<td>Oriented, converses normally</td>
<td>Localises painful stimuli</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td>N/A</td>
<td>Obeys commands</td>
</tr>
</tbody>
</table>

**Pathology tests**

Pathology tests should be taken for FBE (full blood count), UEC (urea electrolytes and creatinine) and glucose as well as a blood gases and lactate level if available. Use of bedside/point-of-care testing is useful.

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 major injuries requiring further care. 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.
**X-ray or FAST scan**

Baseline chest, pelvis and lateral neck x-rays are performed in the primary survey or early secondary survey. Consider further diagnostic imaging if available and indicated. **Do not** transport an unstable trauma patient to an imaging facility unless absolutely essential. Consider the need for FAST (Focused Assessment with Sonography in Trauma) if available and if staff are trained in its use. FAST is used primarily to detect pericardial and intraperitoneal blood, and it is more accurate than any physical examination finding for detecting intra-abdominal injury.

In haemodynamically stable patients, FAST is delayed until the secondary survey and is ideally performed by a second operator while the remainder of the secondary survey is completed.

**Naso/orogastric tube (N/OGT)**

All patients should be kept nil orally in the initial post-resuscitation phase of injury. The potential for a base of skull fracture in poly-trauma should be considered as a relative contraindication in the decision to insert an NGT. An OGT may be inserted following consultation and under direct visualisation.

**Wound care**

In a major trauma patient, early wound closure (pre-transfer) is not a priority.

- Remove gross contamination and irrigate the wound.
- Gain haemostasis through pressure and elevation where possible.
- Simple dressings with saline, gauze, combine and moderate compression bandages are generally adequate.
- Ensure tetanus immunoprophylaxis is managed.
- Do not routinely administer antibiotics for wound care.
- Suture simple wounds if time allows.

**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 compound fractures (see open-limb fractures above).

**Reassess**

The importance of frequent reassessment cannot be overemphasised. Patients should be re-evaluated 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

It is important to note that an exhaustive clinical workup and intervention 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 delay access to definitive treatment. Often such studies must be repeated at the receiving facility regardless.

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 practical and clinical needs involved in transferring the patient from the referral 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.

The use of a transfer checklist can help to ensure that important information is not omitted and the patient is packaged accordingly. See links via the Resources page for an example checklist from ARV.
10. Guideline Implementation

These guidelines are designed to push for quality improvement using evidence-based practice across the entire care pathway. They aim to achieve consistent advancement in people’s health and lead to access of good-quality care.

Putting these guidelines into practice benefits everyone; this includes the staff directly involved in patient care, those involved in managing the health facility, local healthcare organisations and members of the public. It can help to monitor service improvements, demonstrate that high-quality care is being provided and also highlight areas for improvement.

One of the most difficult aspects of working with guidelines is how best to implement them into routine daily practice. Many of us provide patient care according to usual routines (‘how it’s always been done’) instead of looking at developments and change in practice to reflect the latest evidence-based research. Barriers to implementation can include organisational constraints, such as a lack of time, obstructive opinions of key people who may not agree with the evidence or do not want to change their practice, and lack of leadership to effect change. Additionally, there may be a perceived poor sense of competence by staff who question their skills.

In order for change to be effective there must be an identified need, a willingness to adapt and promote current practices, a driving force behind it and acceptance from all levels, be it individual, team or organisational. For these guidelines to be successfully implemented, the following is recommended.

High-level support and clear leadership

Successful implementation plans have a person on the board, such as a medical director, who drives the implementation agenda forward as well as a clear implementation policy approved at the highest level.

A nominated lead for the organisation

One person should be identified who is responsible for driving the education and development of these guidelines into practice. They should be involved in coordinating, disseminating and monitoring the implementation as well as for arranging educational events to promote the use of these guidelines in the workplace. The responsibility for this could be included into an existing role such as that of the clinical governance manager or anyone involved in quality assurance.

A multidisciplinary forum

The multidisciplinary forum should have decision-making powers and report to the chief executive or senior managers of the organisation. New guidelines should be reviewed after they are published and their relevance to the organisation assessed. A clinical lead for each guideline should be identified and steps taken to disseminate to the appropriate personnel. Implementation is most effective if a wide range of disciplines are involved in the forum.

A local policy

Organisations should have a clear, structured policy in place for implementing new guidelines. This policy should be endorsed at the highest level of management and be available for all.
What can you do as an individual?

Become a project champion. One way to begin implementation in your workplace is to take the initiative and volunteer to represent your department. Review these guidelines and compare them with the current ones you have in place. Note any changes to practice that need to be addressed in order to standardise your organisation with current best practice.

In staff meetings, bring up the idea of implementation and seek feedback from other staff members on the best way to do this. Collaborate with colleagues across all boards and emphasise the importance of team communication and cohesion. Print handouts, send out links to workmates and arrange for flowchart posters to be placed in relevant areas.

If you have a clinical educator at your site, inform them of the current updates and discuss ways they can influence training and provide moulage-based simulation scenarios. Often training with the staff you work with on a regular basis can help to foster communication and a real sense of teamwork.

Speak with your organisation about placing access to the Victorian trauma guidelines on your intranet to allow easy access to the site.

As always, your feedback is encouraged. If you have any comments or suggestions, or would like to share how you have adopted these guidelines into your practice, we would appreciate your thoughts.
Trauma Victoria

The Victorian state trauma system (VSTS) facilitates the management and treatment of major trauma patients in Victoria. The VSTS aims to reduce preventable death and permanent disability and improve patient outcomes by matching the needs of the injured patient to an appropriate level of treatment in a safe and timely manner.

The system works to have the right patient delivered to the right hospital in the shortest time.

One of the best ways to facilitate this is to provide an education resource to all clinicians. Trauma Victoria is a statewide education initiative directed towards clinical staff (doctors, nurses, allied health, paramedics) that provide early patient care for major trauma outside of a major trauma service.

Guidelines are in place to support awareness of key aspects of the trauma system and early trauma care and include specialist trauma transfer guidelines.

A web-based learning management system provides modules to support each of the principle guideline areas. Skills tutorials on key trauma procedural interventions will also be accessible.

Moderated remote tutorials will also be offered in the future. Clinicians will join a multisite, multiparty video conferenced meeting room for tutorials and discussion on relevant trauma subjects. It will allow local practitioners to tap into specialised clinician knowledge to develop learning in a scenario to the fullest extent.

Regional simulation and team training will also be supported via a remote expert facilitator and will involve regional and subregional simulation trainers. It will build capacity among simulation trainers to enhance local trauma team training programs.

Facilitated visits will also be arranged whereby medical, nursing and allied health staff may be placed for brief rotations with a major trauma service in order to increase their experience and familiarity in major trauma management. The aim is also to promote the development of clinical relationships between organisations.

Created by Adult Retrieval Victoria on behalf of the Victorian State Trauma System.

To receive this document in an accessible format phone Acute Programs on 9096 7741.

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### AGREE II score sheet – early trauma care guideline

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


ii Victorian State Trauma Registry Special Focus Report. Elderly Major Trauma Patients. VSTORM. November 22, 2012.


Pascoe S, Lynch J. Adult Trauma Clinical Practice Guidelines - Management of Hypovolaemic Shock in the Trauma Patient. NSW Institute of Trauma and Injury Management. 2007. p 8


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