

INITIAL ASSESSMENT AND MANAGEMENT OF MAJOR TRAUMA

Trauma in Australia and New Zealand is the leading cause of death in the first four decades of life. Fortunately, injury related deaths have declined over the last twenty years however, they continue to be a significant burden on health resources. The identification and management of seriously ill patients requires a co-ordinated approach including pre-hospital management, emergency management and definitive surgical care. The development of the emergency management of severe trauma course and the definitive surgical trauma course available in Australia and New Zealand have provided the platform for improved trauma management.

MAJOR INJURY – DEFINITION:

Major injury has previously been defined as an injury severity score in excess of 15 as it was associated with a chance of dying in excess of 10%. Scoring at the time of presentation may underestimate the severity of the injury and lead to undertriage. Most trauma centres would now define major trauma as:

1. requirement for urgent surgery
2. intensive care admission
3. inpatient stay greater than 3 days, iss >15
4. head injury with ventilation for greater than 24 hours
5. deaths

Patients with major injuries need to be triage early with activation of a co-ordinated trauma response from accident emergency, anaesthetics, intensive care and surgery.

PRE-HOSPITAL TRIAGE:

Pre-hospital assessment and management by ambulance services now enables the initial triage of patients to regional or major trauma services. Patients meeting the following criteria should be considered as a major injury. These criteria include:

1. Respiratory distress – rate <10 or >30, or cyanaosis
2. Systolic blood pressure <90 or no palpable radial pulse in children
3. Reduced level of consciousness
4. Serious trauma to any body region
5. Burns partial or full >20% in adults or >10% in children

DEFINITION OF SERIOUS INJURY INCLUDES:

1. Penetrating injury of:

- | | | |
|--------|-----------|------------|
| ▪ Head | ▪ Chest | ▪ Perineum |
| ▪ Neck | ▪ Abdomen | ▪ Back |

2. Head injury with:

- One or both pupils dilated
- Open head injury
- Severe facial injury

3. Abdominal injury with:

- Distension
- Rigidity

4. Spinal injury with:

- Weakness
- Sensory loss

5. Limb injury with:

- Vascular injury with ischaemia of limb
- Amputation
- Crush injury
- Bilateral femur fractures

SYSTEMATIC ASSESSMENT AND MANAGEMENT

The care of the injured patient by a trauma team is somewhat different to traditional medicine with diagnosis investigations and management frequently occurring simultaneously and by more than one doctor. A team leader should direct the overall phases of management including:

- Primary survey
- History
- Resuscitation
- Secondary survey
- Definitive care

PRIMARY SURVEY

A primary survey needs to identify immediate life-threatening injuries and manage these simultaneously. The priorities of the primary survey in order are:

1. Airway maintenance with cervical spine protection
2. Breathing and oxygenation
3. Circulation and control of external haemorrhage
4. Neurological disabilities
5. Exposure

The primary survey needs to be continuous throughout the initial care.

1. Airway Maintenance

Patients with a decreased level of consciousness or inadequacy of protective reflexes are prone to airway obstruction and aspiration. All patients should be considered to have a cervical spine injury until proved negative and this has significant implications for airway management. The head and neck should be supported at all times especially during rolling. The first priority is to establish a patent airway. This may require:

- The removal of blood, vomitus and foreign bodies by posture, suction or Magill's forceps.
- Jaw thrust and chin lift manoeuvres
- Though the insertion of oropharyngeal airway
- Endotracheal intubation
- Establishment of a surgical airway

A high concentration of oxygen should be administered to ALL patients.

Nasal-pharyngeal airways or nasotracheal intubation rarely required in acute management and should be performed by experienced anaesthetic staff. A surgical airway is only indicated if there is an inability to perform bag and mask ventilation or failure to intubate.

2. Breathing and Oxygenation

Once the airway has been established the adequacy of ventilation should be assessed. This is achieved by:

- Exposure of the chest
- Inspection for cyanosis, tachypnoea, chest movement and chest wall integrity
- Palpation of the tracheal position, subcutaneous emphysema and chest wall integrity
- Auscultation for the presence and symmetry of air entry
- Oxygen saturation and arterial blood gases

The team should be continuously assessing for and provide immediate management for the following life-threatening injuries well before a chest x-ray has been obtained. These injuries include:

- Tension pneumothorax
- Large haemothorax
- Large flail segment
- Large pulmonary contusion
- Open pneumothorax
- Hypoventilation

An early chest x-ray may provide an early warning of a potentially life-threatening chest injury.

3. Circulation

The maintenance of adequate tissue perfusion especially to the brain is the primary objective of the circulatory phase of the primary survey. Hypovolaemia is almost always due to blood loss. Major blood loss can occur in the following:

- Chest
- Abdomen
- Pelvis
- Long bone fracture
- External haemorrhage

Deteriorating haemodynamic status may be due to:

- Ongoing blood loss
- A tension haemo or pneumothorax
- Pericardial tamponade

Priorities:

- **Control of external haemorrhage**

This may require direct digital pressure over a wound, suturing of briskly bleeding scalp wounds, the reduction of facial fractures and nasopharyngeal packing.

- **Establishment of intravenous access.**

Two large bore cannulas (14 or 16 gauge should be inserted) usually into the cubital fossa on each arm. In patients with severe upper limb or chest trauma one large bore cannula should be above the diaphragm and one below the diaphragm. Intraosseous needles should only be used in children less than 8

years old with life threatening injury if venous access can not be established. Large bore cannulas may be also placed in the subclavian or jugular position or into the femoral vein.

▪ **Assessment of circulatory status:**

○ *Pulse and blood pressure.*

The pulse rate and character and systolic blood pressure should be obtained as an initial assessment of the circulatory status. Hypotension is a late indicator of hypovolaemia as children and young adults can maintain a normal systolic pressure despite a 30-40% blood loss. Patients with systolic blood pressures less than 80mm frequently have absent peripheral pulses.

○ *Skin perfusion*

A capillary refill time greater than 2 seconds or skin pallor is an early indication of hypovolaemia.

○ *Jugular venous pressure*

Frequently neck veins will be collapsed in hypovolaemia however, if the jugular venous pressure is raised this suggests increased intrathoracic pressure such as a tension pneumothorax or a pericardial tamponade.

○ *Pulseless electrical activity.*

This is sometimes called electro-mechanical dissociation and is caused by exsanguination, tension pneumothorax, massive haemothorax or cardiac tamponade. Pulseless electrical activity should be managed by immediate intubation, ventilation, bilateral chest drains, the administration of at least 3L of colloid and consideration for an open thoracotomy and pericardial release. This is a special importance in penetrating chest injuries.

4. Neurological

The degree of consciousness should be recorded as

- Alert
- Responding to verbal stimuli only
- Responding to painful stimuli only
- Unresponsive

A Glasgow coma score should also be assessed as well as the pupillary size and reactivity.

In conscious patients all limbs should be assessed for movement and sensation to detect possible spinal injury.

All patients with a Glasgow coma score less than 12 should have aggressive airway management including early intubation. This will enable controlled ventilation and the ability to focus on the circulatory status.

5. Exposure

Patients who have sustained a major injury should have all their clothing cut off without delay to allow adequate assessment of the entire body in preparation for the secondary survey. A warming mattress and a bear hugger can be used to control the patient's temperature as well as warming intravenous fluids. The history of the injury is extremely important and this should be relayed from the pre hospital setting to the hospital setting via the MIST system.

M Mechanism eg; fall, motor vehicle accident, pedestrian

I Injury eg; abdominal tenderness to chest injury, fractured long bone

S Signs eg; pulse, systolic blood pressure, respiratory rate, conscious level

T Treatment eg; cervical spine, immobilisation, oxygen, intravenous therapy, drugs

This will focus the attention of the trauma team at the initial phrase of resuscitation. The team leader should take a more detailed history from and relatives or ambulance officers which may lead to an increased suspicion of a specific injury.

RESUSCITATION

Once the initial assessment of the cardiovascular system has been undertaken Haemaccel should be given in volumes commensurate with the estimated extend of hypovolaemia. In general hypotensive patients should receive 20mL/kg of colloid infused rapidly. A patient who requires more than 2mL of colloid and remains hypotensive should have blood as the next resuscitation fluid. Ideally, cross-matched blood should be given however, group-specific blood or uncross-matched O negative should be given depending on the clinical status. The ongoing resuscitation status should be monitored by:

- Pulse rate
- Peripheral perfusion
- Bloody pressure
- Respiratory rate and effort
- Glasgow coma score
- ECG rhythm
- Oxygen saturation

Persistent haemodynamic instability should raise the possibility again of:

- Continued blood loss
- Raised intrathoracic pressure resulting from a tension pneumothorax, a blocked intercostal catheter or a flail segment
- Pericardial tamponade
- Dislodgment of central access resulting in extravasation of fluids

At this stage the trauma team leader should decide whether the patient should be transferred immediately to theatre for a resuscitative thoracotomy plus or minus laparotomy.

During the resuscitated phrase a urinary catheter should be passed to assess urine output. A urinary catheter is contraindicated if there is blood at the external meatus, blood in the scrotum or at P.R. the prostate cannot be palpated or is high riding.

In general a urethrogram is indicated in these circumstances and an urgent urology opinion should be sort. A suprapubic bladder catheter is an opinion should there be significant urethral trauma.

A naso-gastric tube should be placed in all intubation patients and patients who have sustained significant abdominal trauma. This is to prevent gastric aspiration and the development of acute gastric dilatation. In the presence of head or facial injuries the tube should be placed via the mouth.

SECONDARY SURVEY

The secondary survey is a detailed systematic head to toe examination in order to detect all injuries and enable planning of definitive care. During the secondary survey all components of the primary survey should be repeated and the team

should be responsive to any new findings. A trauma series of x-rays should be performed simultaneously as the secondary survey. This should include;

- lateral cervical spine x-ray (seeing down the C7/T1)
- AP chest x-ray
- Pelvis x-ray

Further blood should be taken for blood glucose, blood alcohol and arterial blood gas assessment. Unless the patient has been transferred immediately to theatre the secondary survey should be undertaken in the accident emergency department.

Head	The examination should include visualisation and palpation of the scalp, ears, tympanic membrane (for presence of CSF or blood) eyes, fundoscopy, pupillary size, contact lenses and visual acuity.
Face	The nose and ears should be examined as well as facial lacerations and fractures, teeth, bruising and malocclusion, intrabuccal injury.
Chest	The examination should include visualisation and palpation of the chest wall looking for rib fracture, subcutaneous emphysema, haemothorax, pneumothorax and an ECG
Abdomen	The examination should be directed at detecting bruising in the anterior abdominal wall, distention, tenderness and guarding, rectal and vaginal examinations.
Back	All trauma patients need to undergo a log rolled with cervical spine immobilisation to examine the entire length of the spine looking for tenderness, bruising or deformity. A P.R. examination should be done at this time.
Limbs	All limbs need to be examined for fractures, laceration, haematomas, peripheral pulses and neurological deficits. All fractures should be reduced and splinted and consideration given for intravenous antibiotics and tetanus prophylaxis.

DEFINITIVE CARE

Definitive care in all trauma patients needs to be directed by the trauma surgeon or the team leader.

Definitive care involves:

- Specific investigations, eg; CT scan, head, chest
- Consultation with speciality teams
- Documentation of all injuries and treatment
- Specific management plans from all appropriate teams
- Definitive placement to appropriate speciality team