Trauma Reception and Resuscitation: The Initial Approach

Course Manual 2017
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1. Contributors

**Professor Mark Fitzgerald**  ASM  
*MBBS, MD, FACEM, AFRACMA*
Director, National Trauma Research Institute
Director, Trauma Services, The Alfred
Professor, Faculty of Medicine, Nursing and Health Sciences, Monash University

**Ms Ellaine Boo**  
*BN, BASc, Crit Care Grad Dip (ED), MNurs (Research)*
Head of East Asia International Programs, Trauma Services
National Trauma Research Institute
Dr Gerard O’Reilly  
MBBS, MPH, MBiostat, AStat, PhD, FACEM  
Head, International Programs, National Trauma Research Institute  
Emergency Physician and Head, International Programs, Emergency and Trauma Centre, The Alfred  
Senior Research Fellow, Faculty of Medicine, Nursing and Health Sciences, Monash University  

Dr Mike Noonan  
MBChB (Hons), BPhty (Hons), PGCertMedEd, FACEM  
Emergency Physician Emergency and Trauma Centre, The Alfred  
Medical Educator, King Saud Medical City-The Alfred International Trauma Program, National Trauma  
Research Institute
2. Objectives

This course is a structured learning trauma team program for medical and nursing staff focusing on the initial immediate management of seriously injured patients.

At the end of the program, participants are expected to:

1. Appreciate the importance of the initial management of the trauma patient.
2. Appreciate the importance of lifesaving interventions for the severely injured patient.
3. Have a team-based approach in trauma resuscitation.
4. Discuss the correct sequence of priorities in assessing a trauma patient who is unconscious, in respiratory distress and shock.
5. Demonstrate resuscitation techniques in the initial management of a trauma patient.
3. Chapter 1: The importance of initial trauma management

Trauma (physical injury) has contributed significantly to the rise of 21st Century non-communicable disease.

By 2030 the leading disease burdens worldwide are predicted to be unipolar depressive disorders, ischemic heart disease, trauma and cerebrovascular disease. All of these conditions are characterized by sudden and unpredictable healthcare demands. All require immediately accessible, systemized and multidisciplinary approaches to care for improved outcomes.

Severe trauma is life-threatening and life-disrupting. Individual physical capacity, relationships, education and employment are all endangered. Unsurprisingly, effective trauma care that results in reduced mortality and improved functional outcome is a current global imperative.

The World Health Organization (WHO) Essential Trauma Care project advocates a spectrum of activities to decrease trauma morbidity and mortality. These comprise surveillance, basic research, prevention programs and effective trauma management. Understandably, much weight has been placed on preventive strategies (e.g. speed limits, seatbelts, alcohol breath-testing and weapons control). There are also major gains to be made by improving trauma management - particularly the initial reception and resuscitation on arrival at hospital.

The overall impact of trauma is exaggerated by the lack of integrated emergency healthcare. There is commonly minimal pre-hospital medical intervention and long delays to hospital arrival. There is often no pre-arrival hospital notification of trauma patients. Triage may be ineffectual and expert medical and nursing attendance to a trauma patient is often delayed. In many hospitals there is no Trauma Team or activation system in place - and no interdisciplinary approach to trauma reception. Unsurprisingly, 55-91% of reported errors that contribute to preventable trauma deaths occur during the initial trauma reception and resuscitation in the Emergency Department.

Although trauma reception and resuscitation has improved dramatically over the last three decades, even in the best centres there is an ongoing rate of errors contributing to adverse outcomes.

____________________________


This is because, trauma reception and resuscitation - for the seriously injured patient - requires recognition that the patient has an immediately life-threatening problem, activation of both an appropriate medical and nursing response and numerous, correctly determined management decisions in a short span of time.

Errors occur because of time pressure, inexperience, reliance on memory, multitasking, and failures in trauma team coordination, especially during the initial minutes of patient reception and resuscitation\(^6\), \(^7\). In particular, failure to immediately correct airway, ventilation and circulatory compromise has devastating consequences.

There are several programs that teach early trauma care in an attempt to address these priorities. However, are few education programs that involve both medical and nursing staff working as a team to ensure standardization of trauma response including immediate deployment of life-saving interventions and a reduction in errors of omission.

This program – ‘Trauma Resuscitation – the Initial Approach’ has been developed to provide this foundation for initial care of the severely injured for all hospitals staffs involved in the care of the severely injured. It concentrates on the immediate management of patients with three commonly presenting scenarios - airway compromise, threats to breathing and severe blood loss.

The program has been successfully delivered to medical and nursing staff in China, India and the Philippines and has been adapted for King Saud Medical City-The Alfred International Trauma Program.


4. Chapter 2: Patient and staff safety

Patients with severe injury may behave in an unpredictable fashion, threatening their own safety and the safety of attending medical and nursing staff.

**Staff safety is the priority.**

Staff should first check that the environment is safe and secured to allow effective and uninterrupted care. Security staff should be deployed if required.

Staff should routinely implement steps to ensure their ongoing safety. Barrier protection against transmissible disease is a basic necessity. Safe sharps disposal is mandatory. Imaging radiation protection may be required.

Finally, the patient’s safety requires consideration. Attention to life threatening condition; the correct performance of appropriate and indicated procedure; falls prevention; infective risk reduction; close supervision; and transfusion and medication delivery care are all key steps in improving patient safety.

*Figure 1: Safety is a priority*
5. Chapter 3: Introduction to the Trauma Team

The reception and resuscitation of the seriously injured requires rapid attention to assessment, priorities, and interventions. Multiple decisions and procedures need to be completed in a limited time period. This involves multiple staff and is essential to optimize patient outcomes.

Optimal care of the major trauma patient places high demands on available resources, including the doctors and nurses working in a busy Emergency Department/Trauma Centre.

Often, seriously injured people arrive with no or little warning. There is little information regarding what has happened and there is no immediate knowledge of the patient’s past medical history.

A coordinated and organized response by a team of doctors and nurses is required during the reception and resuscitation of major trauma patients. Importantly the team should be trained in the technical and team skills of trauma resuscitation. This enables the rapid assessment and management of major trauma patients and improves the patients’ immediate and longer-term outcomes.

Recognized as being essential to improved trauma resuscitation is the need for a systematic and co-ordinated approach to the initial assessment of Haemorrhage Control, the Airway, Breathing, Circulation support and neurological Disability. Simultaneous attention is placed on prioritising immediate life-saving interventions based on initial assessment findings. Central to effective trauma resuscitation is an effective and highly functioning trauma team.

Members of the trauma resuscitation team include doctors and nurses who have specialized training in the life-saving technical skills required during trauma resuscitation. For team members to work quickly, efficiently and effectively, each member of the team must have a clear understanding of what is expected.

Before patient arrival Trauma Team members must be confident that they have the skills required to perform the role and tasks allocated to them. In addition, communication among team members and the team as a whole is essential to this process. Clear communication of assessment findings and outcomes is essential for effective trauma resuscitation.

Trauma team composition varies depending on resources available and the number of patients requiring immediate resuscitation. On the commencement of any rostered shift, it is important to assign doctors and nurses to the trauma resuscitation team, clearly delegating roles and responsibilities. On patient arrival, pre-established members of the trauma resuscitation team can focus their attention on the systematic assessment of the patient and intervene with life-saving priorities when necessary. As there are many tasks to be carried out simultaneously, team members must focus on the tasks allocated to them.
Trauma Team Roles

- Medical Team Leader
- Nurse Team Leader
- Airway Doctor
- Airway Nurse
- Procedure Doctor
- Procedure Nurse

**Figure 2: Initial Trauma Team set up**
5.1 Medical Team Leader

- Communicates closely with Nurse Team Leader to ensure pre-arrival preparation is completed
- Receives/collects relevant information regarding patient presentation, for example, mechanism of injury, relevant past medical history, allergy status, any treatment to date
- Co-ordinates team activities during initial trauma resuscitation and beyond
- Remains focused/ensures a systematic approach (ABCs) to trauma assessment and resuscitation
- Remains 'hands free' if possible
- Identifies interventional priorities based on team members assessment findings and ensures effective interventions are undertaken and completed
- Ensures appropriate radiological investigations are available and completed
- Communicates with other specialties as required based on initial assessment findings – including the need for urgent theatre, the need for urgent blood products and consultation by trauma surgeons, orthopaedic surgeons, neurosurgeons
- Communicates plan of interventional priorities to the whole team based on an initial assessment findings
- Supports/guides all members of the trauma team
- Promotes teamwork through effective clear and concise communication, remains calm and is a role model for other members of the team
- Encourages team members to talk out loudly and clearly so that all team members are aware of the priorities in patient management
- Gathers the whole team together after the trauma resuscitation and discusses what went well and opportunities for improvement
5.2 Nurse Team Leader

- Communicates and co-ordinates trauma team activities alongside the medical team leader
- Ensures that all team members are following universal precautions and that roles are clearly delegated
- Ensures adequate number of team members present with the ‘right’ skill mix
- Documents the initial history following patient arrival
- Documents baseline set of vital signs and ongoing patient monitoring including all interventions and procedures
- Ensures that a chronological order of treatment interventions and procedures is documented and maintained
- Ensures that the primary and secondary surveys have been completed and outcomes documented
- Communicates with other departments based on patient needs and as directed by the Medical Team Leader, for example, blood bank (blood products), operating suite (urgent transfer to theatre)
- Communicates with family members regarding patient progress in consultation with Medical Team Leader
- Arranges disposition of the patient, admission and transfer
5.3 Airway Doctor

- Introduces self to the Airway Nurse
- Ensures a clear understanding of the expected role and responsibilities
- Prepares and checks all essential airway equipment is available and functioning, bag valve mask circuit, oxygen source, suction equipment, intubation equipment, drugs available for rapid sequence intubation if required
- Communicates clearly and effectively to the whole team but importantly remains in close communication with Medical Team Leader
- Performs a systematic assessment of Airway and Breathing on patient arrival and communicates assessment findings to the Medical and Nurse Team Leaders
- Assesses the patient's Disability status using AVPU scale initially then the Glasgow Coma Scale including pupil size and reactivity. Clearly delegates team responsibilities and tasks in preparing for rapid sequence intubation if required
- Performs rapid sequence intubation if necessary
- Maintains patient's airway and ventilation requirements and continues to monitor requirements
5.4 Airway Nurse

- Introduces self to the Airway Doctor
- Ensures a safety check of all necessary airway equipment has been completed prior to arrival of patient
- Ensures that a functioning bag valve mask circuit attached to oxygen flow meter is ready for use
- Ensures drugs are available for rapid sequence intubation if required
- Ensures that oxygen is being delivered via a face mask with high flow oxygen
- Assists Airway Doctor in the initial assessment and maintenance of a patent Airway
- Assists in the assessment of Breathing – looks for equal rise and fall of chest
- Ensures that a well sized and fitting cervical collar is on the patient if necessary according to mechanism of injury
- Ensures spinal immobilization is maintained as required
- Counts the patient’s respiratory rate and monitors oxygen saturation on patient arrival and ongoing as required. Reports findings to the Nurse Team Leader for documentation
- Assesses the patient’s Disability status using AVPU scale initially then the Glasgow Coma Scale including pupillary size and reactivity. Reports findings to Nurse Team Leader for documentation
- Reassures the conscious trauma patient, explaining what is happening and why
- Assists with drug administration
- Assists with rapid sequence intubation if necessary – performs cricoid pressure
- Ensures that the endotracheal tube is tied securely
- Ensures ongoing monitoring of patient’s airway and breathing status
- Prepares equipment for portable monitoring for transfer to CT or operating suite
5.5 Procedure Doctor

- Introduce self to the Procedure Nurse
- Assist with attaching monitoring equipment and undressing of patient
- Assesses the patient’s Circulation status – feels the pulse (rhythm and quality), assesses adequacy of the blood pressure
- Ensures external Haemorrhage Control
- Obtain/ensure patent large bore intravenous access X2
- Obtain trauma pathology bloods and ensure the bloods are processed/sent to the laboratory
- Perform procedures based on initial assessment findings and interventional priorities as delegated by the Medical Team Leader, for example, insertion of intercostal chest tube, indwelling urinary catheter, gastric tube
5.6 Procedure Nurse

- Introduces self to Procedures Doctor
- Assists in removal of patient clothing on patient arrival
- Covers the patient with warm blankets to prevent hypothermia
- Attaches all monitoring equipment
- Clearly communicates a baseline set of vital signs to the Nurse Leader for documentation
- Assists Procedure Doctor with external **Haemorrhage Control**
- Assists Procedure Doctor with intravenous access
- Prepares and administers all intravenous fluid (warmed) as prescribed by the Procedure Doctor
- Provides haemorrhage control of active bleeding sites as directed by Procedure Doctor
- Is familiar with and assists in all procedures undertaken by the Procedure Doctor, for example, prepares equipment for the following procedures: intercostal tube insertion, indwelling urinary catheter insertion, gastric tube insertion
- Assesses level of patient’s pain and administers prescribed pain relief as required
- Assists in splinting of limbs as required
- Assesses, cleans and apply dressing to wounds
5.7 Trauma Call Out Criteria

Figure 3: Trauma Call Out Criteria
6. Chapter 4: Initial assessment of a trauma patient

The immediate initial assessment of the injured patient centres on performance of a ‘primary survey’ and immediate life-saving interventions when required.

6.1 Primary Survey

- Dangers
- Response
- External Haemorrhage
  - Control with pressure, pressure bandages, tourniquet(s) or proximal control
- Airway
  - Ensure patency and establish a protected airway if necessary
  - Cervical spine immobilization if required
- Breathing
  - Assist ventilation if required
- Circulation
  - Commence CPR if required

6.2 Assessment

- Brief clinical history
- Mechanism of injury
- Past medical history
- Pain
- Medications
- Allergies
- Other information
- Vital sign survey
- Respiratory status assessment (RSA)
- Perfusion status assessment (PSA)
- GCS

Call for help immediately if the patient has life-threatening external haemorrhage, moderate respiratory distress, inadequate perfusion, or has eyes shut and is not responding to command.
<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Mild Distress</th>
<th>Moderate Distress</th>
<th>Severe Distress (Life Threat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Appearance</td>
<td>Calm, quiet</td>
<td>Calm or mildly anxious</td>
<td>Distressed or anxious</td>
<td>Distressed, anxious, fighting to breathe, exhausted, catatonic</td>
</tr>
<tr>
<td>Speech</td>
<td>Clear and steady sentences</td>
<td>Full sentences</td>
<td>Short phrases only</td>
<td>Words only or unable to speak</td>
</tr>
<tr>
<td>Breath Sounds and Chest Auscultation</td>
<td>Usually quiet No wheeze</td>
<td>Able to cough</td>
<td>Able to cough</td>
<td>Unable to cough Upper Airway Obstruction: Inspiratory stridor</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>12 – 16</td>
<td>16 – 20</td>
<td>&gt; 20</td>
<td>&gt; 20 Bradypnoea (&lt;8)</td>
</tr>
<tr>
<td>Breathing effort</td>
<td>Normal chest movement</td>
<td>Slight increase in normal movement</td>
<td>Marked chest movement +/- use of accessory muscles</td>
<td>Marked chest movement with accessory muscles, intercostal retraction +/- tracheal tugging</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>60 – 100</td>
<td>60 – 100</td>
<td>100 – 120</td>
<td>&gt; 120, bradycardia late sign</td>
</tr>
<tr>
<td>Skin</td>
<td>Normal</td>
<td>Normal</td>
<td>Pale and sweaty</td>
<td>Pale and sweaty, +/- cyanosis</td>
</tr>
<tr>
<td>Conscious State</td>
<td>Alert</td>
<td>Alert</td>
<td>May be altered</td>
<td>Altered or unconscious</td>
</tr>
</tbody>
</table>

Table 1: Respiratory Status Assessment (modified from Clinical Practice Guidelines, Ambulance Victoria)
<table>
<thead>
<tr>
<th>Perfusion Status</th>
<th>Skin</th>
<th>Pulse</th>
<th>BP</th>
<th>Conscious state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td>Warm, pink, dry</td>
<td>60 – 100/min</td>
<td>&gt; 100mmHg systolic</td>
<td>Alert and orientated in time and place</td>
</tr>
<tr>
<td>Borderline</td>
<td>Cool, pale, clammy</td>
<td>50 – 100/min</td>
<td>80 – 100mmHg systolic</td>
<td>Alert and orientated in time and place</td>
</tr>
<tr>
<td>Inadequate</td>
<td>Cool, pale, clammy</td>
<td>&lt; 50/min or &gt; 100/min</td>
<td>60 – 80mmHg systolic</td>
<td>Either alert and oriented in time and place or altered</td>
</tr>
<tr>
<td>Extremely Poor</td>
<td>Cool, pale, clammy</td>
<td>&lt; 50/min or &gt; 110/min</td>
<td>&lt; 60mmHg systolic or unrecordable</td>
<td>Altered or unconscious</td>
</tr>
<tr>
<td>No Perfusion</td>
<td>Cool, pale, clammy</td>
<td>Absence of palpable pulse</td>
<td>Unrecordable</td>
<td>Unconscious</td>
</tr>
</tbody>
</table>

**Table 2:** Perfusion Status Assessment *(modified from Clinical Practice Guidelines, Ambulance Victoria)*

<table>
<thead>
<tr>
<th>Eye opening</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>4</td>
</tr>
<tr>
<td>To Voice</td>
<td>3</td>
</tr>
<tr>
<td>To Pain</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 3:** Conscious State Assessment *(modified from Clinical Practice Guidelines, Ambulance Victoria)*

<table>
<thead>
<tr>
<th>Verbal response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obeys command</td>
<td>6</td>
</tr>
<tr>
<td>Localises to pain</td>
<td>5</td>
</tr>
<tr>
<td>Withdraws (pain)</td>
<td>4</td>
</tr>
<tr>
<td>Flexion (pain)</td>
<td>3</td>
</tr>
<tr>
<td>Extension (pain)</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

Total GCS (A + B + C) =

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7. Chapter 5: Trauma resuscitation and management

7.1 (H) Haemorrhage: Life threatening External Haemorrhage

Recognition of external haemorrhage is an immediate priority in trauma resuscitation.

The initial aim is to control external haemorrhage with local pressure and pressure dressings. Haemostatic dressings and proximal tourniquet application may assist.

Occasionally more proximal control is required with direct pressure, open surgical control or endovascular balloon occlusion.

7.2 (A) Airway: Management of an unconscious trauma patient (airway management and spinal immobilization)

Recognition of airway compromise or obstruction is a key priority in the first few minutes of trauma reception. The aims for airway assessment are:

1. Identify and/or predict the impaired or obstructed airway
2. Secure a patent airway
3. Maintain a patent airway
4. Maintain in-line spinal immobilization

Assessment:

Look for:
- Agitation or reduced conscious state
- Cyanosis
- See-saw respiration
- Use of accessory muscles of respiration
- Foreign body, blood or vomitus in airway
- Fracture or laceration to the face larynx, neck or maxillofacial region
- Evidence of airway burns

Listen for:
- Noisy breathing
- Hoarse voice
- No sounds of air movement
- Stridor
- Inability to talk in sentences

Feel for:
- Facial instability
- Crepitus of neck
- Movement of air
Management:

Airway opening maneuvers

- Jaw thrust / Chin lift / roll patient onto side if required
- Suction

Airway adjuncts

- Nasal airway
- Oral airway
- Endotracheal tube
- Laryngeal mask airway

Surgical airway

- Cricothyroidotomy

Provide high-flow oxygen

- Start pre-oxygenation early, add nasal cannula for apnoeic oxygenation during intubation

Airway adjuncts

<table>
<thead>
<tr>
<th>Adjunct</th>
<th>Uses</th>
<th>Contraindications/Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suctioning</td>
<td>Removes debris or blood from upper respiratory tract</td>
<td></td>
</tr>
<tr>
<td>Nasopharyngeal airway</td>
<td>Maintains open nasopharyngeal airway in a stuporous or comatose patient</td>
<td>Head/facial trauma particularly if presence of a basilar skull fracture is suspected; risk for placement into the brain with basilar skull fracture</td>
</tr>
<tr>
<td>Oropharyngeal airway</td>
<td>Prevents tongue from obstructing airway; used only in unconscious patients</td>
<td>Placement may be difficult or impossible if patient’s jaws is clenched; may induce gagging and vomiting</td>
</tr>
<tr>
<td>Laryngeal mask airway</td>
<td>Provides unsecured airway; easy to position for placement; used only with unconscious patients</td>
<td>May cause aspiration</td>
</tr>
<tr>
<td>Endotracheal intubation</td>
<td>Provides secure airway, avenue for artificial ventilation; high degree of skill required for placement</td>
<td>Risk for oesophageal intubation</td>
</tr>
<tr>
<td>Rapid sequence intubation</td>
<td>Delivery of sedative and paralytic agents to facilitate orotracheal intubation</td>
<td>Failure of intubation; removal of patient’s ventilatory drive</td>
</tr>
<tr>
<td>Needle cricothyroidotomy</td>
<td>Short-term, rapid airway security; high training competency requirements for placement</td>
<td>Penetration of the airway; difficult to find landmarks in bloody or oedematous patients</td>
</tr>
<tr>
<td>Surgical cricothyroidotomy</td>
<td>Used in emergency situations when endotracheal intubation cannot be performed</td>
<td>High training requirements for placement</td>
</tr>
</tbody>
</table>

Table 4: Airway adjuncts (Trauma nursing from resuscitation through rehabilitation, McQuillan, Makic & Whalen)
7.3 (B) Breathing: Management of a trauma patient in Respiratory Distress (tension pneumothorax, haemothorax and open pneumothorax)

Compromised ventilation may rapidly kill the patient. The aims for ventilation assessment are:
1. Ensure adequate oxygenation and ventilation
2. Monitor ongoing status of airway patency and ventilator status
3. Identify and treat any life-threatening injuries

Assessment:

Look for:

- Patient's chest wall integrity
  - Fractures, laceration and bruising
  - Paradoxical chest movements
  - Asymmetry of chest wall movement
  - Posterior chest wall
- Respiratory effort
  - Agitation or reduced conscious state
  - Cyanosis
  - Reduced chest wall movement
  - Use of accessory and/or abdominal muscles
  - Tachypnoea or abnormal respiration rate

Listen for:

- Absent or decreased breath sounds and unequal air entry
- “Sucking” through an open chest wound
- Stridor

Feel for:

- Subcutaneous air
- Chest wall instability and crepitus
- Position of trachea
- Dullness or hyper resonance

Management of life threatening injuries:

1. Tension pneumothorax

Signs and symptoms

- Dyspnoea, laboured respirations
- Decreased or absent breath sounds on affected side
- Unilateral chest rise and fall
- Tracheal deviation from affected side
- Cyanosis
- Jugular venous distension
- Tachycardia and hypotension
- History of chest trauma or mechanical ventilation
- Chest pain
- Decreased oxygen saturation
Interventions

- Requires immediate intervention without radiological confirmation!
- Provide high-flow oxygen (100%)
- Perform rapid digital decompression followed by tube thoracostomy on affected side

Figure 4: R Tension Pneumothorax
2. **Haemothorax**

*Signs and symptoms*

- Dyspnoea, laboured respirations
- Decreased or absent breath sounds on affected side
- May have unilateral chest rise and fall
- May have visible wound to chest or back
- History of chest trauma (often penetrating)
- Tachycardia
- Bruising or lacerations on chest
- Pain
- Decreased oxygen saturation

*Interventions*

- Provide high-flow oxygen (100%)
- Digital decompression followed by tube thoracostomy on affected side

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*Figure 5: Massive Right Sided Haemothorax*

(Source: Case courtesy of Dr Andrew Dixon, Radiopaedia.org, case rID: 31573)
3. Open pneumothorax

**Signs and symptoms**

- Dyspnoea, laboured respirations
- Decreased or absent breath sounds on affected side
- Visible, sucking wound to chest or back
- Chest pain
- May have decreased saturations

**Interventions**

- Provide high-flow oxygen (100%)
- Cover wound with occlusive dressing and secure on three sides with tape
- Watch for signs of tension pneumothorax and remove dressing during exhalation if they are noted
- Place chest tube on affected side

*Figure 6: Open Left Pneumothorax secondary to gunshot wound*
7.4 (C) Circulation: Management of a trauma patient in Shock (recognising shock, haemorrhage control, IV fluid resuscitation)

Haemorrhage is the principal cause of preventable death after traumatic injury. It is essential that all hypotension is considered hypovolemic until proven otherwise.

The aims of circulation and haemorrhage control are to:
1. Identify signs and sources of haemorrhage
2. Assess mental status
3. Assess pulses
4. Assess skin colour, temperature and moisture

Assessment:

Look for:
- Obvious signs of external bleeding
- Skin colour for pallor or cyanosis
- Level of consciousness
- Neck veins (collapsed or distended)
- Abnormalities underneath the hard collar

Listen for
- Muffled heart sounds that indicate pericardial tamponade

Feel for
- Assess skin for moisture and temperature
- Palpate pulses for presence, quality, rate and rhythm

Management:

1. External haemorrhage control is a priority (see 1. Life-threatening external haemorrhage).

Signs and symptoms
- Obvious bleeding site

Interventions once controlled
- Elevation where able
- Direct pressure applied to stop bleeding
- Splint long bones and pelvic fractures
2. Shock

Causes of shock

- Haemorrhagic (internal and external)
- Tension pneumothorax
- Cardiac tamponade
- Spinal cord injury

Types of shock

- Hypovolemic (most common in trauma patients)
- Neurogenic
- Cardiogenic
- Distributive

Signs and symptoms

- Tachycardia
- Weak, thready pulse
- Cool, pale, clammy skin
- Tachypnoea
- Altered mental state
- Delayed capillary refill
- Decreased urine output

Interventions

- Provide high-flow oxygen (100%)
- Treat cause of shock (control bleeding)
- Place two large-bore IV cannula and infuse with isotonic crystalloid solution
- Administer fluid bolus (1L in adults or 20 ml/kg in children)
- Prepare to administer blood
- Chest and pelvic X-rays
- Ultrasound
- +/- laparotomy or thoracotomy

3. Pericardial tamponade

Signs and symptoms

- Tachycardia
- Muffled heart sounds
- Distended neck veins
- Hypotension
- ECG showing electromechanical dissociation
- Signs of hypovolemic shock

Interventions

- Pericardial decompression
<table>
<thead>
<tr>
<th></th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Blood loss (ml)</strong></td>
<td>Up to 750</td>
<td>750 - 1500</td>
<td>1500 - 2000</td>
<td>&gt; 2000</td>
</tr>
<tr>
<td><strong>Blood loss (% blood volume)</strong></td>
<td>Up to 15%</td>
<td>15% - 30%</td>
<td>30% - 40%</td>
<td>&gt; 40%</td>
</tr>
<tr>
<td><strong>Pulse rate</strong></td>
<td>&lt; 100</td>
<td>&gt; 100</td>
<td>&gt; 120</td>
<td>&gt; 140</td>
</tr>
<tr>
<td><strong>Blood pressure</strong></td>
<td>Normal</td>
<td>Normal</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
<tr>
<td><strong>Pulse rate (mmHg)</strong></td>
<td>Normal or increased</td>
<td>Decreased</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
<tr>
<td><strong>Respiratory rate</strong></td>
<td>14 – 20</td>
<td>20 – 30</td>
<td>30 – 40</td>
<td>&gt; 45</td>
</tr>
<tr>
<td><strong>Urine output (ml/hr)</strong></td>
<td>&gt; 30</td>
<td>20 – 30</td>
<td>5 - 15</td>
<td>Negligible</td>
</tr>
<tr>
<td><strong>CNS/mental status</strong></td>
<td>Slightly anxious</td>
<td>Mildly anxious</td>
<td>Anxious, confused</td>
<td>Confused, lethargic</td>
</tr>
<tr>
<td><strong>Fluid replacement (3:1 rule)</strong></td>
<td>Crystalloid</td>
<td>Crystalloid</td>
<td>Crystalloid and blood</td>
<td>Crystalloid and blood</td>
</tr>
</tbody>
</table>

The guidelines in Table 5 are based on the “3-for-1” rule. Applied blindly, these guidelines can result in excessive or inadequate fluid administration. For example, a patient with a crush injury to the extremity may have hypotension out of proportion to his or her blood loss and require fluids in excess of the 3:1 guidelines. In contrast, a patient whose ongoing blood loss is being replaced by blood transfusion requires less than 3:1.

**Table 5:** Estimated fluids and blood losses based on patient’s initial presentation
(Adapted from Trauma Nursing from resuscitation through rehabilitation, McQuillan, Makic & Whalen)