

# Trauma Resuscitation

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## **Contents**

|  |    |
|--|----|
| List of Contributors                   | 22 |
| Guidelines for Trauma Resuscitation    | 23 |
| Guidelines for Head Injury             | 28 |
| Guidelines for Spinal Injuries         | 31 |
| Guidelines for Penetrating Neck Injury | 34 |
| Guidelines for Chest Injuries          | 37 |
| Guidelines for Abdominal Trauma        | 39 |

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## 2 Guidelines: Trauma Resuscitation

### Introduction

The following outlines the priorities for managing the seriously injured or potentially seriously injured patient according to **ATLS Guidelines**. This is a framework for the ongoing assessment and evaluation, although it must be recognized that deviations will be necessary according to the patient's status and ongoing re-evaluation.

**GUIDELINES for primary and secondary survey:** The guidelines below list priorities in the primary survey, resuscitation, and secondary survey phases of trauma management.

### 2.1. Primary Survey (Life Support)

#### 2.1.1. Airway:

- a. Guarantee patency – clear secretions, insert oropharyngeal air way and also assure that the patient can protect the airway to prevent aspiration.
- b. Oxygen therapy -100% if available.

Cervical spine injury – (*suspect until proven otherwise*) maintain manual in-line stabilization as early as possible, sandbags on side, collar and straps. Use spinal board if available.

Apnea – immediate orotracheal intubation with in-line stabilization. Rapid Sequence Induction (RSI) is appropriate in most patients when needed.

Possible exceptions are airway obstruction and predicted difficult intubation.

Consider **awake intubation** or **urgent surgical airway** under local anaesthesia.

## **2.1.2 Breathing:**

### **a. Ventilation**

Look for signs of respiratory distress.

Management and assist ventilation.

Look for the following life threatening conditions and treat early.

### **2.1.2.1 Tension pneumothorax**

Diagnostic criteria- reduced chest movements and air entry, hyper resonance on percussion, deviated trachea, reduced blood pressure

#### **Management-**

Immediate needle decompression (Insert 14g cannula at the second intercostal space mid clavicular line) followed by tube thoracostomy (Insert IC tube at the fourth or fifth intercostal space between the mid and the anterior axillary lines.)

### **2.1.2.2 Massive haemothorax**

Diagnostic criteria-reduced chest movements and air entry, dull on percussion, deviated trachea

#### **Management-**

Tube thoracostomy after fluid resuscitation.

### **2.1,2.3 Open Pneumothorax –**

Diagnostic criteria- reduced chest movements and air entry, hyper resonant on percussion,

#### **Management-**

Close the opening immediately followed by tube thoracostomy as the definitive treatment.

#### **2. 1.2.4. Flail chest combined with lung contusion –**

Diagnostic criteria –paradoxical chest movements, reduced air entry

##### **Management-**

consider mechanical ventilation if oxygenation is not adequate.

Consider **Emergency room Thoracotomy** when required if facilities are available.

No radiological confirmation of the above mentioned conditions is necessary before treatment.

### **Trauma Guidelines**

#### **2.1.3 Circulation:**

*External Bleeding.* – arrest bleeding by direct pressure.

*Assess for signs of blood loss.*

Pulse, blood pressure, pallor, capillary refill

#### **Replace the blood loss-Fluid or blood resuscitation**

Insert two (preferably size 14) large bore cannulae, send blood for grouping, cross matching and basic investigations.

Initial therapy should consist of isotonic crystalloid /colloid infusions/ blood.

Failure to respond or shock state that is difficult to correct should illicit a search for bleeding that requires operative control.

Look for internal haemorrhage in patients with unrecordable blood pressure/absent pulses (radial pulse) and severe pallor.

**CONSIDER** Uncross-matched blood –O negative or Group specific.

**2.1.3.1 Cardiac Tamponade** – Pericardiocentesis is required.

Refer guidelines for chest injuries.

## **2.1.4. Disability (Neurological)**

Consider AVPU (Alert, best Verbal response, Response to pain, Unresponsive), pupil size and limb movements

## **2.1.5 Exposure:**

Front and back. Remove clothing, remove backboard when present. Log roll if necessary.

Avoid hypothermia –Use blankets, warm fluids and warm room.

## **2.2. Secondary Survey**

Head to toe exam, front and back including internal examination. (PR and VE)

1. Head/Maxillofacial
2. Neck
3. Chest.
4. Abdomen
5. Pelvis
6. Extremities
7. Full neurological examination which includes GCS.

## **Investigations**

1. Radiological: Three basic x-rays i.e. Cervical spine (AP/Lateral/Open Mouth), Chest and Pelvis and any other as required.-CT
2. FAST scan-when available.

## **Procedures to be consider at this stage**

- a. Naso/orogastric tube – consider placement in all **trauma** victims.
- b. Catheter – place after rectal exam, unless deemed unnecessary by team leader.

### **After Stabilization:**

1. Determine disposition: OT, ICU, HDU/Ward
2. Determine need and sequence of advanced radiographic studies. (plain film, CT, angiography.)
3. Consult specialty services.
4. Re-evaluation and assessment

## 3 Guidelines for Head Injury

### OBJECTIVES:

Early diagnosis and management of traumatic brain injury is of utmost importance to improve outcome. During resuscitation it is imperative to avoid hypoxia, hypocarbia, hypovolaemia, hypo and hyperglycemia which will further aggravate the initial brain insult leading to secondary brain injury.

### Guidelines

- a. **Initial management consists of the ABCD's of resuscitation.**  
**Primary and secondary survey** (see resuscitation guidelines)
- b. **Establish level of consciousness** according to the Glasgow coma Scale.  
GCS Scale-

### 3. Management of Respiration.

#### 3.1 Airway

- Intubate all unconscious patients (GCS < 8) to secure airway with short acting neuromuscular blockade and sedation eg. propofol and midazolam
- Maintain cervical spine immobilization in all patients.

#### 3.2. Breathing: Oxygenation and ventilation.

##### 3.2.1. Administer high flow oxygen to all patients with suspected head injury

##### 3.2.2. Monitor oxygen saturation Avoid hypoxia (SaO<sub>2</sub>) > 90% or PaO<sub>2</sub> > 60 mmHg.)

##### 3.2.3. Initiate ventilation if abnormal breathing pattern GCS < 8

##### Hypoxia inspite of high flow oxygen.

Moderate hyperventilation;

Maintain PaCO<sub>2</sub> 35-40 mmHg.

### **3,4. Management of Circulation:**

- Maintain SBP>90 mmHg.
- Resuscitate to achieve a goal of mean arterial pressure of (MAP) 90 mmHg to maintain a cerebral perfusion pressure (CPP)>60 mmHg.
- Fluids- 0.9% Saline, colloid and/or blood. Do not infuse hypovolaemia fluids as these will worsen cerebral oedema. Inotropes (dobutamine) and noradrenaline will be necessary if BP cannot be maintained by fluid resuscitation.

### **3.5. Recognize and manage brain herniation syndromes**

Diagnostic criteria-

- Pupils: Asymmetric (Anisocoria) irregular, or sluggish reaction, progressing to fixed, dilated, non-reactive.
- Motor: hemiparesis, decerebrate posturing, Babinski reflex. Progressive neurological deterioration, not attributable to extra-cranial causes.

#### **Management**

- Hyperventilation is a PaCO<sub>2</sub> of 35-40mmHg.
- Mannitol (1g /kg) if not hypotensive. [In the absence of a herniation syndrome, do not initiate treatment for intracranial hypertension, until CT scan is done or ICP monitor inserted.]

### **3.6. Indications for head CT scan**

(without i.v. contrast): should agree with radiology and neurology.

- Unconscious.
- History of loss of consciousness.
- Focal neurological deficits.
- Post-traumatic seizure.
- Decreasing level of consciousness.
- Penetrating injury.
- Skull fracture.

### **3.7. Indications for neurosurgery consultation:**

- Moderate or severe head injury: GCS<14.
- Post-traumatic seizure.
- Unequal pupils.
- Neurological deficit.
- Abnormal head CT scan:  
(Haematoma, Contusion, Edema, Compressed basal cisterns, Fracture.)

**3.8.** All head injured patients should be admitted to the **trauma** service for a minimum of 24 hours or until all multisystem issues are resolved.

**3.9.** Intracranial pressure (ICP) and cerebral perfusion pressure (CPP) monitoring will be determined by the Neurosurgical service.

### **3.10. Nutritional support.**

Enteral feeds should be instituted within 72 hours of injury.

## 4 .Guidelines for Spinal injuries

### OBJECTIVES:

Early identification and initiation of spinal immobilization in patient at risk for spinal injury following trauma will reduce the risk of damage to the spinal cord.

Radiographic evaluation of suspected spinal injuries and appropriate neurological consultation will determine further management.

### 4.1 Management of cervical spine injury.

#### Initial management-

Perform ABCDE, primary and secondary surveys. Secondary survey includes a focused neurological examination and palpation of the cervical, thoracic, and lumbosacral spine, while maintaining spinal immobilization.

Further evaluation and management depending on presentation.

#### 4,1,1. Asymptomatic Patient:

No neurological sign.

Not intoxicated.

No neck pain or midline tenderness.

No distracting injury that would make it difficult for the patient to discern the presence or absence of neck pain

(long bone fracture, visceral injury, large wounds or burns.)

#### Management

If above criteria are met, remove C-collar. If patient can demonstrate voluntary flexion, extension, and rotation without pain they are clinically cleared (without radiographic evaluation.)

Document clinical clearance in the medical record.

## **4.1.2. Symptomatic Patient:**

**4.1.2.1** Complains of neck pain or has midline tenderness on examination.

Obtain 3-view plain radiographs of C spine. If plain radiographs suspicious or abnormal CT scan of C- spine:

- Continue immobilization.
- Neurosurgical consultation.
- Normal radiographs:
- Continue immobilization while symptomatic.
- Neurosurgical consultation.

**4.1.2.2** Neurological Deficit referable to a Cervical Spine Injury:

### **Management-**

- Maintain spinal immobilization.
- Neurosurgical consultation.
- Obtain CT scan if stable. Further imaging as advised by neurosurgery.
- Methylprednisolone protocol to start within 8 hrs.of injury (discuss with neurosurgeon.)

**4.1.2.3.** Obtunded, intubated, or comatose patient:

### **Management-**

- Maintain spinal immobilization.
- Obtain X-ray, CT scan of C-spine.
- If negative, remove rigid C-collar, apply soft collar until able to clear clinically.
- Document radiographic clearance in the medical record.
- If abnormal -neurosurgical consultation.

**4.1.2.4.** Intoxicated Patient:

- Asymptomatic:
  - immobilize until sober and awake.
  - clear as for asymptomatic patient in 4.1.1.
- Symptomatic:
  - evaluate and manage as symptomatic patient above in 4.1.2.

**4.1.2.5. Distracting Injury (with mechanism suspicious for spine injury):**

- Asymptomatic:

**Management-**

Obtain 3-view C-spine series.

Supplemental CT scan of C-spine .

If negative remove collar. Document clearance in the medical record.

If abnormal Neurosurgical consult.

- Symptomatic:

Evaluate and manage as asymptomatic patient in 2.2.

## **4.2. Management of thoracic, lumbar, and sacral spine injury-**

Initial evaluation and management as for cervical spine, above. If unable to clear clinically, and symptoms or a suspicious mechanism exists:

Obtain antero-posterior and lateral radiographs of the vertebrae.

4.2.1 Asymptomatic or negative radiographs: Clear spine and document clearance in the medical record.

4.2.2 Symptomatic or abnormal radiographs: Obtain Neurosurgical consultation.

## 5. Guidelines for Neck Injuries

### OBJECTIVES:

Early identification, evaluation and initiation of management strategies will significantly reduce morbidity and mortality in patients with penetrating neck injury.

To achieve these objectives it is necessary to be aware of the indications for diagnostic testing and indications for immediate surgery.

### DEFINITIONS:

1. Neck: The circumferential region bounded by the clavicles and base of the skull. Generally divided into three zones.

a. Zone I: Extends from the sternal notch and clavicles to the cricoid cartilage, encompassing the structures in the thoracic outlet.

b. Zone II: Extends from the cricoid cartilage to the angle of the mandible.

c. Zone III: Extends from the angle of the mandible to the base of the skull.

Penetrating injury: is a open wound which penetrates deep to the platysma muscle. This excludes superficial abrasions and lacerations of the skin and subcutaneous tissues only.

### GUIDELINES:

#### 5.1. Primary survey and resuscitation

**5.1.1 Airway:** compromise will be the most immediate life threatening associated condition. Options for airway control:

- i. Orotracheal intubation is preferred route.
- ii. Emergency cricothyroidotomy in the ETU if unable to intubate or ventilate. (Risk of releasing a contained hematoma.)
- iii. Surgical airway in the O.R. Tracheostomy under local anesthesia if airway is patent, but threatened.

### **5.1.2 Breathing/Chest:**

Evaluate for associated chest injuries.

### **5.1.3. Circulation:**

- i. Control bleeding with direct pressure and tamponade with Foley catheter; more than one if necessary.
- ii. Intravenous access preferred in extremity opposite from injury.

### **5.1.4. Disability:**

Assess for neurological deficit.

- Stab wounds/lacerations – if no neurological deficit, no immobilization required.
- Gunshot wounds/comatose patients – maintain immobilization until fracture ruled out by x-ray.
- Combined blunt and penetrating mechanism (rare) – immobilize as for blunt injury.

If cervical collar used, remove and re-examine neck frequently.

## **5.2 Secondary survey.**

Includes focused examination of head neck and chest.

### **5.2.1.** Determine if the platysma has been violated.

- i. Do not probe neck wounds.
- ii. Small wounds that appear superficial may be locally anesthetized and enlarged to inspect the depth of penetration.
- iii. Superficial wounds may be closed in the E.D. If large or complex, operative closure is an option.

### **5.2.2** Determine zone of injury.

### **5.2.3** Obtain AP and lateral neck, and AP chest radiographs.

**5.2.4** Examine for physical findings of significant injury:

- i. Bleeding.
- ii. Bruit or thrill.
- iii. Dysphagia.
- iv. Hoarseness or stridor.
- v. Subcutaneous emphysema.
- vi. Hecatombs.
- vii. Oropharyngeal bleeding.
- viii. Haemoptysis.
- ix. Neurological deficit.
- x. Absent or diminished pulses.

**INDICATIONS FOR EXPLORATION IN THE OPERATING THEATRE.**

- Unstable patient
- Active bleeding.
- Expanding or pulsatile haematoma.
- Need for surgical airway.
- Obvious tracheal or esophageal injury.
- Impaled object.

## 6. Guideline for Chest Injuries

### OBJECTIVES:

- Identify life- threatening injuries during Primary survey and treat them immediately
- Identify the patient requiring surgical intervention
- Identify other potentially life threatening injuries and manage them
- Maintain adequate gas exchange

### GUIDELINE

#### 6.1. Primary Survey

As for 2,1 ABCDE, Look out for;

1. TENSION PNEUMOTHORAX
2. MASSIVE HAEMOTHORAX
3. OPEN PNEUMOTHORAX
4. FLAIL CHEST WITH LUNG CONTUSION
5. CARDIAC TAMPONADE

6.1.1 Tension Pneumothorax, decompress with needle in second intercostal space mid clavicular line, followed by chest drain insertion.

6.1.2 Massive haemothorax, large chest drain (minimum size 32FG) is inserted along side with fluid resuscitation.

6.1.3 Cardiac Tamponade, pericardiocentesis: a wide bore needle is inserted into pericardium (L/S Sub-costal angle at 45 degrees to the skin directed at L/S Inferior scapular angle) while applying suction throughout, preferably with cardiac monitoring.

Thoracic surgeon is informed immediately or thoracotomy should be performed at the treating institution if cardiac tamponade is diagnosed.

#### 6.1.4 Criteria for insertion of an intercostal tube

- **presence of significant pneumothorax.**
- **Preoperatively if the situation is likely lead to development of pneumothorax during surgery or IPPV.**
- **Severe chest injuries prophylactically.**
- **Before transfer of patient with chest injury if there is possibility of developing pneumothorax.**
- **Haemothorax**

6.1.5. Immediate Surgery may be required in the following conditions. If facilities are not available patient needs to be transferred to the nearest hospital after resuscitation.

- **Initial intra thoracic bleeding is massive i.e. >1000cc**
- **Continuous bleed from IC tube approximately about 200ml of blood per hour.**
- **Cardiac tamponade.**
- **Penetrating cardiac injuries.**
- **When internal cardiac massage is required.**
- **If massive air embolism is suspected.**

## 7.Guidelines for Abdominal Injuries

### OBJECTIVES:

Early identification and timely management of patients at risk of developing life-threatening complications following abdominal injury will reduce morbidity and mortality.

### GUIDELINES:

#### 7.1. Initial evaluation

**Perform** primary survey as for 2.1. In situations where the patient is unstable and the site of bleeding is undetermined, **Examination of Abdomen** is mandatory during Primary Survey to exclude intra abdominal bleeding.

**Perform secondary** survey. Should include focused abdominal pelvic, rectal examination.

**7.2.1** In a patient, who is **haemodynamically unstable with abdominal injury**, laparotomy may be diagnostic as well as therapeutic and it could be performed while resuscitation is being carried out simultaneously. Ultra sound scan (FAST) and diagnostic peritoneal lavage ( DPL) could be performed prior to surgery for the patients whose diagnosis is uncertain.

**7.2.2** In a patient who is **haemodynamically stable but with a strongly suspected abdominal injury and minimal signs** perform regular clinical evaluation.

Close observation and documentation of vital parameters.

Serial Hb% and PCV.

Plain X Ray of abdomen- it is valuable only in some penetrating Injuries.

Ultra sound scan

Diagnostic Peritoneal Aspiration and Lavage

Triple contrast abdominal CT;

Angiography etc.  
IVP in the case of suspected renal injury  
eg. haematuria.

In a patient who is paralyzed and ventilated, evaluation of abdomen is extremely difficult.

- **DPL**:- Prior insertion of NG tube and Bladder catheter is required.  
It is a good investigation to determine the site of bleeding in an unstable patient.  
( Performed through a supraumbilical incision if pelvic haematoma is suspected.)

### **7.2.3 Criteria for Non-operative management of liver and spleen injuries.**

- Patient should be haemodynamically stable.
- Triple contrast CT scan of the abdomen is required to evaluate the injuries prior to decision on non operative management.
- Important to exclude the hollow viscus injury.
- Adequate monitoring facilities should be available.

### **7.2.4 Criteria for surgical interventions in penetrating abdominal injuries**

- All anterior abdominal stab wounds in stable patients should be explored.
- Any penetrating injury breaching the peritoneum will require laparotomy.
- High velocity i.e. gunshot, blasts injuries will require laparotomy.

### **7.3. Management of pelvic fractures.**

- Fluid and blood are required in haemodynamically unstable patient.
- Orthopaedic advice is required at an early stage.
- Exclude other associated intra abdominal injuries.
- In an ‘Open Book’ type of fracture, attempt at closing the ring with folded GS towel wrapped around the pelvis until an external fixator is applied.

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