ALGORITHMS

Algorithms for managing the common trauma patient

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Fig. 1. Approach to penetrating abdominal trauma (ATLS = advanced trauma life support; FAST/USS = focused assessment with sonography in trauma/ultrasound scan; EUA = examination under anaesthesia; CT = computed tomography; NG = nasogastric; SAMPLE = signs and symptoms, allergies, medications, pertinent medical history, injuries, illnesses, last meal/intake, events leading up to the injury and/or illness).
**Approach to blunt abdominal trauma**

Haemodynamically unstable → ATLS principles – A, B, C, D & E → Haemodynamically stable

- Resuscitate with 2 L crystalloid solution and monitor response
- Consider blood transfusion

Still unstable → Acute abdomen

- Emergency laparotomy

No → Admit for observation and serial examinations

- FAST/USS (if unavailable)

Yes → Clinical deterioration

- Peritonitis
- Decreasing haemoglobin

Still unstable → Emergency laparotomy

No → Abdomen soft, non-tender

- FAST/USS (if unavailable)

Yes → Free fluid or clinical uncertainty

- CT abdomen

Consider CT abdomen

No → Solid organ injury

- Admit for observation and serial examinations

**Approach to penetrating chest trauma (central chest wall)**

Haemodynamically unstable → ATLS principles – A, B, C, D & E → Haemodynamically stable

- Erect CXR

Clinical features of tension pneumothorax, pneumothorax or haemothorax → Yes → Insert ICD

Clinical improvement?

- Yes → Stable
- No → Unstable

Observe and manage as appropriate

Clinical deterioration → Consider Thoracotomy

- FAST/ECHO

+ Pericardiocentesis

Bleeding > 1500 mL or > 200 mL/hour → Yes → Insert ICD

Minimal or no pneumothorax

- Repeat CXR in 4 - 6 hours

Clinical deterioration → Pericardiocentesis

Clinical features of cardiac tamponade → Yes → Bleeding > 1500 mL or > 200 mL/hour

Yes → Insert ICD

No → Increase in size of pneumothorax

- FAST/ECHO

Observe and manage as appropriate

**Fig. 2. Approach to blunt abdominal trauma (ATLS = advanced trauma life support; FAST/USS = focused assessment with sonography in trauma/ultrasound scan; CT = computed tomography; SAMPLE = signs and symptoms, allergies, medications, pertinent medical history, injuries, illnesses, last meal/intake, events leading up to the injury and/or illness).**

**Fig. 3. Approach to penetrating chest trauma (central chest wall) (ATLS = advanced trauma life support; ICD = intercostal drain; FAST/ECHO = focused assessment with sonography in trauma/echocardiography; CXR = chest X-ray).**
**Approach to penetrating chest trauma (lateral chest wall)**

- Haemodynamically unstable
  - ATLS principles – A, B, C, D & E
  - Clinical features of tension pneumothorax, pneumothorax or haemothorax
    - Yes
      - Insert ICD
    - No
      - Clinical improvement?
        - Yes
          - Stable
          - Observe and manage as appropriate
        - No
          - Unstable
          - Consider Thoracotomy
      - No
      - Haemodynamically stable

- Haemodynamically unstable
  - Erect CXR
  - Haemothorax
    - Yes
      - Haemothorax
      - Pneumothorax
    - No
      - Minimal or no pneumothorax
        - Insert ICD
  - Increase in size of pneumothorax
  - Bleeding >1 500 mL or >200 mL/hour
    - Yes
      - Insert ICD
    - No
      - Repeat CXR in 4 - 6 hours

**Clinical features of cardiac tamponade**

- Yes
- No Clinical improvement?
  - Yes
  - Thoracotomy
  - No
  - Observe and manage as appropriate

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**Approach to penetrating neck trauma**

- Haemodynamically unstable
  - ATLS principles – A, B, C, D & E
  - Emergency neck exploration
    - Yes
      - Active arterial bleeding
        - Insert ICD if evidence of haemo-/pneumothorax
      - Absent radial pulse
      - Air bubbling through wound
      - Respiratory distress
    - No
      - Did injury penetrate platysma muscle?
        - Yes
          - Zone III
            - (above angle of mandible)
            - Suspected pharyngeal injury
            - Suspected parotid gland injury
        - No
          - Zone II
            - (between the cricoid cartilage and angle of the mandible)
            - Suspected vascular injury (haematoma, bruising, neurological fallout, BP difference >10 mmHg in each arm, widened mediastinum)
            - Suspected oesophageal injury (odynophagia/dysphagia)
            - Suspected aortic injury
          - No
            - Zone I
              - (inferior to cricoid cartilage)
              - Rule out pneumothorax
              - Chest X-ray
              - C-spine X-ray
              - Angiogram
              - Endoscopy
              - Spiral CT chest

- Haemodynamically stable

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Fig. 4. Approach to penetrating chest trauma (lateral chest wall) (ATLS = advanced trauma life support; ICD = intercostal drain; FAST/ECHO = focused assessment with sonography in trauma/echocardiography; CXR = chest X-ray).

Fig. 5. Approach to penetrating neck trauma (ATLS = advanced trauma life support; ICD = intercostal drain; CT = computed tomography; C-spine = cervical spine; BP = blood pressure).
Approach to penetrating limb trauma

ATLS principles – A, B, C, D & E

1. Observe and manage as appropriate
2. Measure Doppler pressures (ankle brachial index) and compare with unaffected limb

>0.9

Yes

Angiogram

<0.9

No

Any hard signs

Any evidence of distal ischaemia

Absent or diminished pulses

Active bleeding

Expanding or pulsatile haematoma

Audible bruit

Palpable thrill

Multiple sites of entry

Extensive bone and soft tissue damage

Pre-existing vascular disease

No

Emergency limb exploration

Approach to frank haematuria in trauma (bladder and renal injuries)

ATLS principles – A, B, C, D & E

1. Haemodynamically unstable
2. Resuscitate with 2 L crystalloid solution and monitor response
3. Consider blood transfusion

Haemodynamically stable

1. Blunt trauma
2. Pelvic fracture
3. Cystogram or CT cystogram

Penetrating trauma

1. CT abdomen with delayed phase for ureter views
2. Renal injury
3. Haemodynamic instability
4. Suspected renal pelvis injury
5. Renal artery thrombosis
6. Other intraperitoneal visceral damage

Clinical deterioration

1. Peritonitis
2. Serial abdominal examinations

Emergency laparotomy

Admit for conservative management

1. Urethral catheter for 10 days
2. IV antibiotics
3. Repeat cystogram at 10 days

Isolated extraperitoneal bladder rupture

Admit for conservative management

1. Strict bed rest
2. IV antibiotics
3. Serial abdominal examinations

Emergency laparotomy

Fig. 6. Approach to penetrating limb trauma (ATLS = advanced trauma life support).

Fig. 7. Approach to frank haematuria in trauma (bladder and renal injuries) (ATLS = advanced trauma life support; IV = intravenous; FAST/USS = focused assessment with sonography in trauma/ultrasound scan; CT = computed tomography).
Fig. 8. Approach to frank haematuria in trauma (urethral injuries) (ATLS = advanced trauma life support; SAMPLE = signs and symptoms, allergies, medications, pertinent medical history, injuries, illnesses, last meal/intake, events leading up to the injury and/or illness).

Approach to frank haematuria in trauma (urethral injuries)

ATLS principles − A, B, C, D & E

Complete primary survey (adjuncts, SAMPLE history)

Complete secondary survey

Suspected urethral injury with blood at the external urethral meatus

Emergency exploration and insertion of suprapubic catheter

Blunt injury

Ascending urethrogram

Penetrating injury

Incomplete injury (slight extravasation, contrast enters bladder)

Insert transurethral catheter

If fails

Insert suprapubic catheter

Fig. 9. Approach to head injury (ATLS = advanced trauma life support; CXR = chest X-ray; FAST/USS = focused assessment with sonography in trauma/ultrasound scan; ICD = intercostal drain; GCS = Glasgow Coma Scale; LOC = loss of consciousness; CT = computed tomography; C-spine = cervical spine).

Approach to head injury

ATLS principles − A, B, C, D & E

Isolated head injury

Discharge with head injury form

1. GCS <13 at any point since injury
2. GCS <15 2 hours since injury
3. Suspected open/depressed fracture
4. Focal neurological deficit
5. Post-traumatic seizure
6. Any penetrating head/orbital injury
7. >1 episode of vomiting since injury
8. LOC/amnesia in patients >65 years, with coagulopathies or dangerous mechanism of injury

Admit ± theatre (discuss with neurosurgeon)

Multiple system injuries/polytrauma

Check A, B, C

Haemodynamically unstable

CXR

FAST/USS

Pelvic X-ray

Examine limbs + X-rays

Consider laparotomy

Consider angi-embolisation ± external fixation

Thoracotomy

Still unstable

ICD

Intracranial injury/depressed or compound skull fracture

Admit ± theatre (discuss with neurosurgeon)
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Further reading