Queensland Trauma Education

TRAUMA TEAMS

Performing the trauma primary survey

Facilitator resource kit

Clinical Excellence Queensland
JAMIESON TRAUMA INSTITUTE
CSDS Clinical Skills Development Service
Queensland Government

Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

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Queensland Trauma Education
Trauma Teams – Performing the Trauma Primary Survey – Facilitator resource kit
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About this training resource kit

This resource kit provides information to give the opportunity for the learner to explore and understand the priority assessment features during the trauma primary survey to identify serious injury.

National Safety and Quality Health Service (NSQHS) Standards

Target audience and Group Size

Small group activity for emergency department medical and nursing clinicians.

Duration

Facilitator preference: recommended 30-45 minutes.

Learning objectives

By the end of this session the participant will be able to:

- Perform a structured clinical primary survey assessment
- Identify important life-threatening injury
- Rationalise need for immediate vs delayed intervention

Facilitation guide

- Consider demonstrating a primary assessment or displaying video.
- Resource can be delivered in separate components or in a stepwise format (pause and proceed).
- Case scenarios can be used to highlight areas of concern to direct the participant patient assessment.
- Facilitator can deliver session with monitoring set up to provide vital signs and moulage or as low fidelity demonstrating each assessment step, and the slide deck provides visual cues, imaging and key information for discussion.

Supporting resources (in Printable resources)

1. Pre-simulation briefing poster
2. Structured trauma assessment poster
3. TWELVE-C anterior neck assessment poster
4. CXR: L) Tension Pneumothorax.
5. CXR: Normal.
6. Pelvic XR: Normal.
7. Pelvic XR: Open book pelvic injury.

Contents:

This resource kit contains the following:

Resource requirements

Room setup	Clinical treatment area
Simulator/s	ALS manikin / SimMan3G / Essential
Simulator set up	ALS manikin in hospital gown on trolley/bed with interventions as per scenarios
Clinical equipment	Catastrophic Haemorrhage - Tourniquets, haemostatic gauze, and pressure bandages **Airway** - Basic, advanced, and surgical airway equipment - Suctioning equipment - Soft collar (C-spine not clear) **Breathing** - Stethoscope - Variety of oxygen masks - Chest decompression equipment for needle, finger thoracostomy and intercostal catheter insertion - Supporting Documents 1 and 2 (CXR) **Circulation** - IVC (Intravenous cannula) insertion and blood collection equipment - Difficult access equipment (CVL, RICC, IO – As per local) - Fluid and Blood products - Pelvic binders + bandages - Supporting Documents 3 and 4 (PXR) **Disability** - Torch - Glucometer - Medication – glucose, analgesia, sedation, neuromuscular blockade, mannitol/hypertonic saline **Exposure / environment** - Warming Equipment
Faculty:	Facilitator to lead clinical scenarios

Clinical scenarios:

Scenario 1: 23-year-old male presents to the Emergency Department (ED) after sustaining a large laceration to his R shin from a chainsaw.

C: Ongoing external haemorrhage from R leg wound requiring direct pressure and sutures to control.
A: (A) VPU, Nil requirement for c-spine immobilisation.
B: RR 28, Saturations 99% RA,
C: HR 120, BP 120/80mmHg.
D: GCS 15, PEARL 3+. BGL 7.
E: Temp 36.5

Scenario 2: 46-year-old male is brought to ED by ambulance after high-speed Road Traffic Collision (RTC).

C: Nil obvious external haemorrhage.
A: (A) VPU, C-spine requires immobilisation.
B: RR32, Saturations 80% RA (91% on 15L NRB). He complains of significant chest wall pain, trouble breathing and is hypoxic on room air. Clinical examination demonstrates crepitus and pain on palpation of his L chest wall with extensive subcutaneous emphysema**.**
C: HR 120, BP 90/77mmHg
D: GCS15. PEARL 4+. BGL 6.1
E: Temp 37

Supporting Document a: CXR - L Tension pneumothorax

Scenario 3: 75-year-old female is found lying on the footpath. She is brought to ED by ambulance.

C: Patient has sustained large scalp laceration, which is under a bandage applied prehospital. Nil catastrophic haemorrhage.
A: AV(P)U, Soft collar insitu.
B: RR20, Saturations 99% RA
C: HR 80, BP 165/98.
D: GCS 7 (M5). Pupils R 5mm, unreactive. Only localising to pain on left. BGL 6.5.
E: Temp 36.5

Supporting Document b: Normal CXR

Supporting Document c: Normal PXR

Scenario 4: 65-year-old male motorbike vs post at 100kmph. He is brought to ED by ambulance.

C: Nil obvious external haemorrhage.
A: A(V)PU, Soft collar insitu.
B: RR24, Difficulty obtaining SP02.
C: HR130, BP 90/54. Cool peripheries. Groin/Pelvic pain ++, PXR.
D: GCS14 (E3V5M6). PEARL 2S.
E: Temp 35.5

Supporting Document d: PXR – Open book fracture

Primary Survey:

The Primary Survey is designed to detect and treat life threatening injuries rapidly. This is done systematically using the CABCDE pneumonic to avoid missing important information and should be practiced so that it can be completed in a structured and efficient manner.

This may occur sequentially when performed by an individual clinician, however as a team these assessments and investigations should occur simultaneously rather than a linear fashion. Where a life-threatening abnormality is detected, it must be immediately managed. Within the team, this may occur in a step wise manner or be performed concurrently while the primary survey is continued, depending on the available resources.

STEP 1: CONTROL EXTERNAL HAEMORRHAGE		
Details	**Assessment**	**Management**

Participants perform an initial examination focussed on identification of external haemorrhage.
 	
Obvious large volume external blood loss must be managed as an immediate priority with the aim being to control life-threatening external haemorrhage.
	Remove patient clothing for full exposure.
	
	Perform 'blood sweep'- ensuring no blood on gloved hand when feeling under patient thorax and limbs.
	
	Remove any bandaging to review wounds/external haemorrhage sites.
		Immediately control.
		
		Consider:
		- Direct pressure
		- Elevation
		- Indirect pressure
		- Adjunctive equipment:
		  ○ Tourniquet
		  ○ Haemostatic Dressings
		  ○ Suture
		  ○ Pressure bandages
		  ○ Specialist dressings
		  ○ Splinting and fracture reduction [1, 2]

Supporting Notes

Details

- Performing the initial exposure to identify any rapidly controllable sites of ongoing haemorrhage is important to ensure that the early management of life threats occur. Some common causes include severe crush injuries, major amputations, open fractures, degloving injuries or deep lacerations – especially of the scalp.
- The most common cause of shock in major trauma patients is hypovolaemic shock secondary to haemorrhage [2].

Assessment

- Initial and early exposure to identify sites of uncontrolled bleeding to achieve immediate haemostasis to limit further blood loss.

Management

- Delegate haemorrhage control where appropriate to ensure that assessment can continue.
- Early application of direct pressure, or indirect pressure where direct pressure and elevation is ineffective, as a temporising measure to facilitate use of tourniquets or other wound management to control external haemorrhage.
    - The tourniquet used in this setting is preferably a specialist piece of equipment (i.e.: CAT) but in the absence of availability other equipment can be used (i.e.: BP cuff, pressure bandage).
    - Remember to note the time of application – the risk of long-term complications from tourniquet application can occur after 2 hours, with evidence that increasing application time increases the risk of ischaemia and metabolic complications on release [3].
- Haemostatic dressings, if available, can be used for severe junctional haemorrhage not appropriate for tourniquet application or in situations where it is difficult to maintain effective compression.
- If bleeding from a visualised vessel cannot be controlled by direct pressure, a figure of 8 suture may be used to control the ongoing haemorrhage. Recognition that injury to the vessel, and therefore possible requirements for advanced vascular repair may occur if sutures are utilised.
- Apply a three-sided occlusive dressing to sucking chest wounds.
- Reduce long bone fractures to improve alignment, reduce effect of bone-end bleeding and facilitate the application of splints.
- All haemodynamically unstable trauma patients with appropriate mechanism or clinical signs of pelvic injury should have a pelvic binder placed early.

STEP 2: AIRWAY AND CERVICAL SPINE		
Details	**Assessment**	**Management**

- Identify and manage airway obstruction
 	
- Airway compromise in trauma can occur due to mechanical obstruction (from direct injury, foreign bodies including teeth, and vomitus) or reduced conscious state and is life threatening
 	
- Assessment includes airway patency (partial or complete), the anterior neck and cervical spine
 	
- Always consider ongoing risk
 	
Burns considerations:
- Thermal injury can cause airway oedema
- Inhalation injury can cause pulmonary damage and hypoxia
	Airway: Check response (AVPU)
	
	Look for:
	Airway obstruction (contaminants, such as blood, teeth).
	
	Listen for:
	Upper-airway noises, breath sounds (absent, diminished, noisy) and adequacy of vocalisation.
	
	Assess for facial fractures.
	
	Remove collar temporarily (maintain manual in-line stabilisation (MILS)).
	
	Assess Anterior neck – **TWELVE C**
	
	- **T**rachea - tenderness, deviation
	- **W**ounds/haemorrhage
	- o**E**sophageal (pain on swallow)
	- **L**aryngeal tenderness/crepitus
	- **V**ascular injury- bruising/bruit/expanding haematoma
	- Surgical **E**mphysema
	- **C**arotid haematoma, bruit
	
	C-Spine: Look and feel for:
	- Midline or lateral tenderness
	- Wounds/site of haemorrhage
		Airway:
		
		Ask yourself - Do you need to take control of the airway right now?
		
		Attempt simple airway manoeuvres:
		
		- Perform chin lift and jaw thrust.
		- Clear airway
		  ○ suction catheter
		  ○ log roll
		- Use of adjuncts (OPA/NPA)
		- Consider patient positioning.
		
		Secure the airway, if necessary:
		
		- Consider intubation
		- Consider surgical airway.
		-
		
		C-Spine: Maintain full spinal precautions, if indicated:
		
		- Apply soft collar if appropriate
		- Maintain MILS during intubation (as cervical collar is removed during the procedure).

Supporting Notes:

Details:

- High c-spine injury will impair respiratory drive (C3 – C5)
- Indications for early or immediate intubation:
    - Severe head injury, with significantly decreased mental status (GCS <8, GCS Motor Score <6)
    - Penetrating neck trauma (such as gunshot wounds, or poorly visualized stab wounds)
    - Severe burns (especially involving inhalation injury to the airway)
    - Significant blunt or penetrating chest trauma impairing breathing efforts
    - Severely intoxicated or agitated patients prohibiting assessment of life-threatening injuries
    - Anticipated course (such as transport to another facility, or immediate surgery). [4]

Assessment:

- Changes in voice, gurgling, stridor, or the inability to speak in full sentences should be noted as clues to impending airway problems [5].
- Tracheal deviation is a late sign and often does not occur with tension pneumothorax (as the haemodynamic effect is a result of mediastinal shift). Signs of tracheal injury, including tenderness, crepitus or deviation, should alert the clinician to increased risk of a difficult airway.

Management:

C-spine and Spinal Precautions:

- During evaluation and intervention ensure neck that the cervical spine is immobilised manually.
- Types and indications for cervical collar use
- Soft collars may hide non bony neck injury (as identified by TWELVE-C) and so use is contraindicated in this cohort (patients at risk from blunt or penetrating neck injury)- remove and use manual inline stabilisation techniques.

Airway**:** OPA/NPA

- If unable to oxygenate in suspected TBI (traumatic brain injury), the use of these adjuncts should be balanced against the possible risks associated with their use
- Use with caution where clinical signs of base of skull fracture are present, oral trauma and coagulopathy due to risk of worsening the difficult airway or possible insertion into the cranial vault.

Airway**:** Intubation/Supraglottic Airway

- Carefully consider induction medication selection in the context of the patient's physiology and other potential injuries.
  E.g. Significant hypovolaemia from facial trauma haemorrhage may mean that dose reduction of anaesthetic agents is recommended to avoid a precipitous drop in BP.
- During intubation one clinician maintains immobilisation and the other manages the airway.
- A supraglottic airway is an appropriate adjunct where a skilled intubator is not available.

Further investigations (before or after initial assessment):

The timing of further investigations may occur before or after initial management depending on mechanism (primarily penetrating trauma cases) and index of suspicion. Hard and soft signs may indicate presence of major aerodigestive or neurovascular injury of the neck and indicate preference for immediate surgical management over further investigation (ie: CT) [6].

Hard Signs

Require surgical exploration.

These include:

- Severe/Uncontrolled haemorrhage
- Large/expanding pulsatile haematoma
- Thrill/bruit
- Absent pulse or neurological deficit distally

Additional signs (Aerodigestive injury):

- Air bubbling
- Massive haemoptysis/haematemesis
- Respiratory distress

Soft Signs

May undergo CT-A +/- Naso endoscopy/bronchoscopy/ esophagoscopy as required.

These include:

- Minor haemorrhage
- Non-pulsatile/non-expanding haematoma
- Minor haemoptysis/haematemesis

Additional signs (Aerodigestive injury):

- Dysphonia
- Dysphagia
- Subcutaneous or mediastinal air

STEP 3: BREATHING		
Details	**Assessment**	**Management**

Chest assessment is focussed on the identification of reversible causes contributing to profound hypoxia and obstructive shock.
 	
Life threats include:
 	
- Tension pneumothorax
- Massive (tension) haemothorax
- Open pneumothorax
- Flail chest
- Cardiac tamponade
- Ruptured diaphragm.
 	
Fine detail of injury will be identified during serial examination and further investigations.
	Look for:
	
	- Work of breathing (recession, respiratory rate, accessory muscle use)
	- Effectiveness of breathing (oxygen saturation, symmetry of chest movement, and degree of chest expansion)
	- Other indication of inadequate respiration (heart rate, mental state)
	- Signs of injury (seat belt marks, bruising, wounds).
	
	Feel for:
	
	- Chest wall tenderness, crepitus, and subcutaneous emphysema (bubbling or evidence of air leak should be managed as open pneumothorax)
	- Utilise plain imaging and ultrasound*
	
	Listen for:
	
	- Breath sounds or added sounds**
		Support respiratory status:
		
		- Administer oxygen to achieve oxygen saturations between 94 – 98%
		- Use of BVM (Bag Valve Mask) in a patient requiring ventilatory support
		  ○ Do not use a BVM device in a spontaneously breathing patient
		
		Emergent treatment is based on underlying injury:
		
		- Tension pneumothorax - perform chest decompression.
		  ○ Needle decompression is a temporising, emergency treatment and will require finger thoracostomy followed by intercostal catheter insertion (ICC).
		- Massive haemothorax – decompression and insertion of an ICC
		- Open pneumothorax – three-sided dressing and insertion of an ICC
		- Flail chest - positive pressure ventilation

*Point of care imaging includes chest x-ray, pelvic x-ray and E-FAST (Extended Focused Abdominal Sonography for Trauma). These rapid investigations assist to identify major life-threating pathology that requires immediate intervention or will change disposition [7].

**Auscultation of the chest is often challenging due to noise in trauma bay- evidence of chest wall injury and shock should prompt intervention.

Supporting Notes

Assessment:

- Chest x-ray is commonly performed in a supine position due to the requirement for spinal precautions (AP). This impacts the interpretation of haemo-pneumothorax.
- Mediastinal structures may add weight to the presence of a radiological tension but cannot be used to exclude an aortic or cardiac injury. Pulmonary contusions may be identified by patchy airspace opacification and indicate the need for positive pressure ventilatory support [7].

Management:

- Abnormal physiology should be used with signs of chest trauma as an indicator for the need for chest decompression
- In spontaneously breathing patients (who are creating negative intrathoracic pressure), 'un-formalised' finger thoracostomies require early management with the placement of an ICC to avoid the 'sucking chest wound' and creation of an open pneumothorax which may lead to obstructive tension physiology [8].
- In patients receiving positive pressure ventilation (i.e., is intubated and paralysed) the risk of tension and obstructive physiology post finger/surgical decompression is lower, and an ICC should be placed when clinically able.
    - Sometimes (i.e., prehospital) this may be delayed until arrival at hospital and in this case the patient is continually reassessed to inform need to reopen (re-finger) the thoracostomy site if evidence of tension physiology reoccurs.
    - In this setting, the placement of an ICC may be delayed until clinically appropriate. In some scenarios, including long prehospital transfers this may be a number of hours. Close attention to the patient is required so further intervention may occur if required during transfer.
- Over ventilation can do more harm than good. Ventilation provided with too much volume, speed or force can increase pressure in the chest, reducing blood return to the heart. This can have a negative effect on circulation, especially on trauma patients progressing towards shock or with raised intracranial pressure [9].

STEP 4: CIRCULATION		
Details	**Assessment**	**Management**

The circulation assessment in trauma is focussed on the identification of reversible causes for shock.
 	
The major life threat is haemorrhage leading to shock. (Other causes of shock: obstructive and neurogenic shock also occur and should be considered– tension pneumothorax, cardiac tamponade, spinal cord injury)
 	
The circulation assessment is threefold:
 	
1. Reassess for external sites of haemorrhage
 	
2. Assess the perfusion state of the patient for evidence of shock
 	
3. Identify potential sources of blood loss or ongoing haemorrhage
	Re-examine for sites of active external haemorrhage. Do not remove any penetrating foreign bodies.
	
	Perfusion is assessed by checking:
	
	- Capillary refill and skin temperature
	- Pulse strength - carotid (SBP >60), femoral (SBP>70), radial (SBP >80)
	- Vital signs- HR and BP.
	
	Assess concealed sites of haemorrhage:
	
	- Intra-thoracic (respiratory failure and decreased breath sounds)
	- Intra-abdominal (tenderness, bruising, guarding and rigidity)
	- Pelvic (discomfort, wounds, bleeding).
	
	Perform E-FAST for free intraperitoneal, intrapleural and pericardial fluid.
	
	- Intra-pelvic (tenderness, alignment, and bruising/wounds +/- PXR)
	- Long bone fractures (swelling, deformity)
	- Retroperitoneal (no obvious bleeding elsewhere or flank tenderness)
	- Estimate how much blood was identified at the scene
		- Control haemorrhage [10]
		- Insert two large-bore intravenous cannulas*
		- Obtain blood: VBG, FBC, crossmatch, UEC, LFTs, lipase, coagulation screen, ROTEM/TEG.
		
		If circulation is inadequate **replace volume**:
		
		Administer fluid resuscitation/blood products as per local protocol (aiming for balanced transfusion).
		
		Consider need for anti-coagulation reversal and tranexamic acid.
		
		Emergent treatment is based on underlying injury:
		
		- Concealed haemorrhage:
		  ○ Organise theatre.
		- Cardiac tamponade:
		  ○ Perform pericardiocentesis or thoracotomy.

Supporting Notes

Details:

- Differential for Hypotension in the Trauma Patient
    - Haemorrhagic Shock - Bleeding (chest, abdomen, pelvis, retroperitoneum, long bones, street)
    - Obstructive Shock - Tension pneumothorax and cardiac tamponade
    - Neurogenic Shock - Spinal cord injury
    - Cardiogenic Shock - Myocardial dysfunction (contusion, underlying heart disease, arrhythmia, infarction)
    - Distributive Shock (or other mechanisms) - Toxic ingestion (poisoning, substance use) [11].

Assessment:

- Vital sign assessment for perfusion may be misleading, with evidence of peripheral perfusion and quality of radial pulse better measures to determine presence of shock.
- Focussed Assessment with Sonography for Trauma (FAST):
    - Is used to rapidly identify the presence of free fluid within a body cavity to direct the initial operative management. [11]
    - An 'extended' FAST (EFAST) may indicate presence of a haemo-pneumothorax but can be limited by the presence of subcutaneous emphysema.
    - An EFAST will not delineate the type of fluid identified nor identify retroperitoneal fluid.

Pelvic X-Ray (PXR) is performed during the assessment of circulation to assist with the identification of pelvic sites of haemorrhage that may be contributory to the shock state. Identification of injury can then direct the management to reduce haemorrhage from bone ends and venous disruption [12].

- *Assessment involves gentle palpation of iliac crests and pelvic rim, and is not repeated. Do not 'rock' or 'spring' the pelvis as it may aggravate haemorrhage.
- Abnormal PXR should prompt the progression to CTA of the pelvis to exclude arterial bleeding sources.

Management:

- Control haemorrhage and replace circulating volume if required.

Suspected or confirmed pelvic fractures:

- Application of a pelvic binder with feet bound in internal rotation, in conjunction with haemostatic resuscitation and definitive surgical or angioembolisation if available [1].

- In lateral compression fractures there remains controversy for the role of pelvic binders, and they should be used on an individual case basis.
- In a hemodynamically stable patient, the binder can be removed and a repeat PXR performed to identify any pelvic displacement as a well-positioned binder may mask injury. Deterioration in clinical state (haemodynamics) with binder removal should prompt the replacement of the binder

- *If an IV cannula cannot be sited rapidly (within 90 seconds), consider the use of an intra-osseous needle inserted into a non-traumatised limb (leg, humerus or chest), ultrasound peripherally inserted or central venous access depending on available skill [10].
- Sternal (chest) IO can only be used with specialised equipment and training.
- Vascular access (IV/IO) is placed above the level of the injury- Important: in suspected pelvic trauma tibial IO and femoral access should be avoided, with sites in the upper body as preference in this setting.
- In a haemodynamically unstable patient:
    - Targeted resuscitation:
        - MAP: 65 mm Hg (consider an increase to 80 mm Hg in any patient suspected of head injury or spinal cord injury)
        - Consider the concept of ‘permissive hypotensive’ resuscitation to avoid thinning the blood or losing established clots [1].However, this is a temporising measure to definitive care and is balanced against the risk of organ injury from low flow states.
    - Replace volume loss: Whole blood massive transfusion/haemorrhage protocol (MTP/MHP). These vary by institution but should include a mix of blood products containing packed fresh frozen plasma, platelets and packed red blood cells to maintain a ‘balanced transfusion’.
- The CRASH-2 trial demonstrated the efficacy of tranexamic acid (TXA), if administered within the first three hours, to improve mortality in patients in haemorrhagic shock from trauma [13].

STEP 5: DISABILITY		
Details	**Assessment**	**Management**

Neurological assessment focuses on identification of localising neurological or spinal pathology.
The life threat to identify is penetrating cranial injury, intracranial haemorrhage, diffuse axonal injury, high spinal cord injury.
Assessment should include:
- Glasgow Coma Scale (GCS, focus on motor response)
- pupillary exam
- gross motor/sensory assessment (of all four extremities.)
- localising neurological or spinal pathology.
This should be repeated frequently in the sedated or intubated patient to ensure pupillary abnormalities are identified.
	Assess level of consciousness:
	- GCS assessment (best eye opening, verbalisation and motor response)
	Assess pupillary functions:
	- Pupil size
	- Equality
	- Reaction to light
	Assess:
	- focal neurological deficits
	- four-extremity movement
	Check BSL and Na (confounders and treatment end points in traumatic brain injury).
	Check external signs of head/neck trauma
		Aimed at reducing raised intracranial pressure or preventing secondary brain injury
		- Position patient 30^{o} head up
		- Manage anxiety, agitation, and pain:
		  o analgesia and sedation
		  o treatment of underlying cause.
		- Monitor and treat hypoglycaemia (glucose <3 mmol/L)
		- Control any seizure activity, advice from local neurosurgical centre regarding seizure prophylaxis.
		Medication:
		- Neuromuscular blockade to facilitate intubation and mechanical ventilation to optimise oxygenation and $C0_2$.
		- Hypertonic saline or Mannitol as osmotherapy for immediate treatment of raised intracranial pressure.
		Other management based on CT findings.

Secondary Information:		
	Organise emergent non-contrast CT Brain +/- CTA Brain	Subdural/epidural haematoma: Organise urgent surgical review for early consideration of decompression. Subarachnoid/parenchymal haemorrhage or Diffuse Axonal Injury (DAI): Organise urgent surgical review.

Supporting Notes

Details:

- Neurological localising deficits include:
    - unilateral motor and sensory changes
    - pupillary inequality (size and reactivity).
- Intracranial haemorrhage includes subdural haematoma, subarachnoid haemorrhage, epidural haematoma, intraparenchymal or intraventricular haematoma.

Assessment:

- Consider performing a thorough neurologic baseline exam, if possible, prior to intubation if using induction or paralytic agents for intubation. Including a Glasgow Coma Scale (GCS) assessment, in particular motor score (as most sensitive to outcome) [2]
- Abnormal glucose:
    - may potentially precipitate trauma
    - will worsen TBI outcome if abnormal.
- Sodium (Na^+)
    - Low Na+ may mimic symptoms of traumatic brain injury.
    - In setting of (suspected or known) raised intracranial pressure (ICP), hypertonic saline is used to reduce ICP

Management:

- While the primary brain injury cannot be reversed, secondary brain injury can be reduced by avoiding hypoxia/hypotension, implementing neuroprotective measures to reduce intracranial pressure, and emergently facilitating further investigations (CT Brain) and ensuring the patient is managed in a location where any required neurosurgical intervention can be performed.

STEP 6: EXPOSURE		
Details	**Assessment**	**Management**
Expose patient from head-to-toe to examine thoroughly for injuries. Careful attention must be paid to areas that hide injuries, such as the axilla, skin folds, and the perineum	Expose: - Expose the patient and examine for concealed injuries. - Perform log roll if not done. Environment - Ensure re-cover patient once assessment completed. - Where possible warm fluid and blood as infusion of large volumes of cold fluid will rapidly cause hypothermia. Re-evaluate interventions.	- Maintain normothermia (warm blankets, foil/chemical heating, forced air, warmed rooms). - Where possible warm fluid and blood. - Treat injuries identified

Supporting Notes

Assessment:

- Consider the need for ongoing examination and investigation to identify unidentified less obvious injuries
- Ensure regular temperature measurement and keep patient warm [1].

Management:

- The trauma triad of death:
    - Hypothermia is a critical factor in trauma care. It is a key part of the trauma triad of death, including hypothermia (low body temperature), Acidosis (which disrupts the blood's ability to properly carry oxygen), and coagulopathy (blood that has a reduced ability to clot).
    - The trauma triad can begin with any one of these elements, and each feed into the other. As the patient's clinical state worsens, the body temperature drops, reducing clotting function. As further haemorrhage occurs, the shock cycle worsens leading to a progressive acidosis. As acidosis worsens, metabolism slows, and body temperature continues to fall. [14]
- Infusion of large volumes of cold fluid will rapidly cause hypothermia and should be avoided.

Acronyms and abbreviations

Term	Definition
CT / A	Computed tomography / arteriogram
MILS	Manual In-line Stabilisation
HoB	Head-of-bed
CTA	Computed Tomography Angiography
NPA	Nasopharyngeal Airway
OPA	Oropharyngeal Airway
SGA	Supraglottic Airway
BVM	Bag Valve Mask
FAST	Focussed Assessment with Sonography for Trauma
EFAST	Extended Focussed Assessment with Sonography for Trauma
PXR	Pelvic Xray
CXR	Chest Xray
IV	Intravenous
IO	Intraosseous
MTP/MHP	Massive Transfusion Protocol/ Massive Haemorrhage Protocol
TXA	Tranexamic Acid
SBP/BP	Systolic Blood Pressure/ Blood Pressure
VBG	Venous Blood Gas
FBC	Full Blood Count
ROTEM/TEG	Rotational Thromboelastometry/ Thromboelastography
UEC	Urea, Electrolytes and Creatinine
LFT	Liver Function Test

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