



Primary Survey

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Primary Survey

Aims

The primary survey aims to identify and treat immediate threats to life while ensuring airway and spine are protected from further compromise or injury. The patient thus assessed, vital functions stabilised, and further deterioration prevented.

The team-based approach described in the Trauma Team Roles and Responsibilities allows parallel assessment and management of airway, breathing, circulation and neurological systems and should result in identification of:

- **Catastrophic haemorrhage**
- **Airway obstruction**
- **Tension pneumothorax**
- **Open pneumothorax**
- **Massive haemothorax**
- **Flail chest**
- **Cardiac tamponade**

- **Shock**
- **Decompensating head injury**

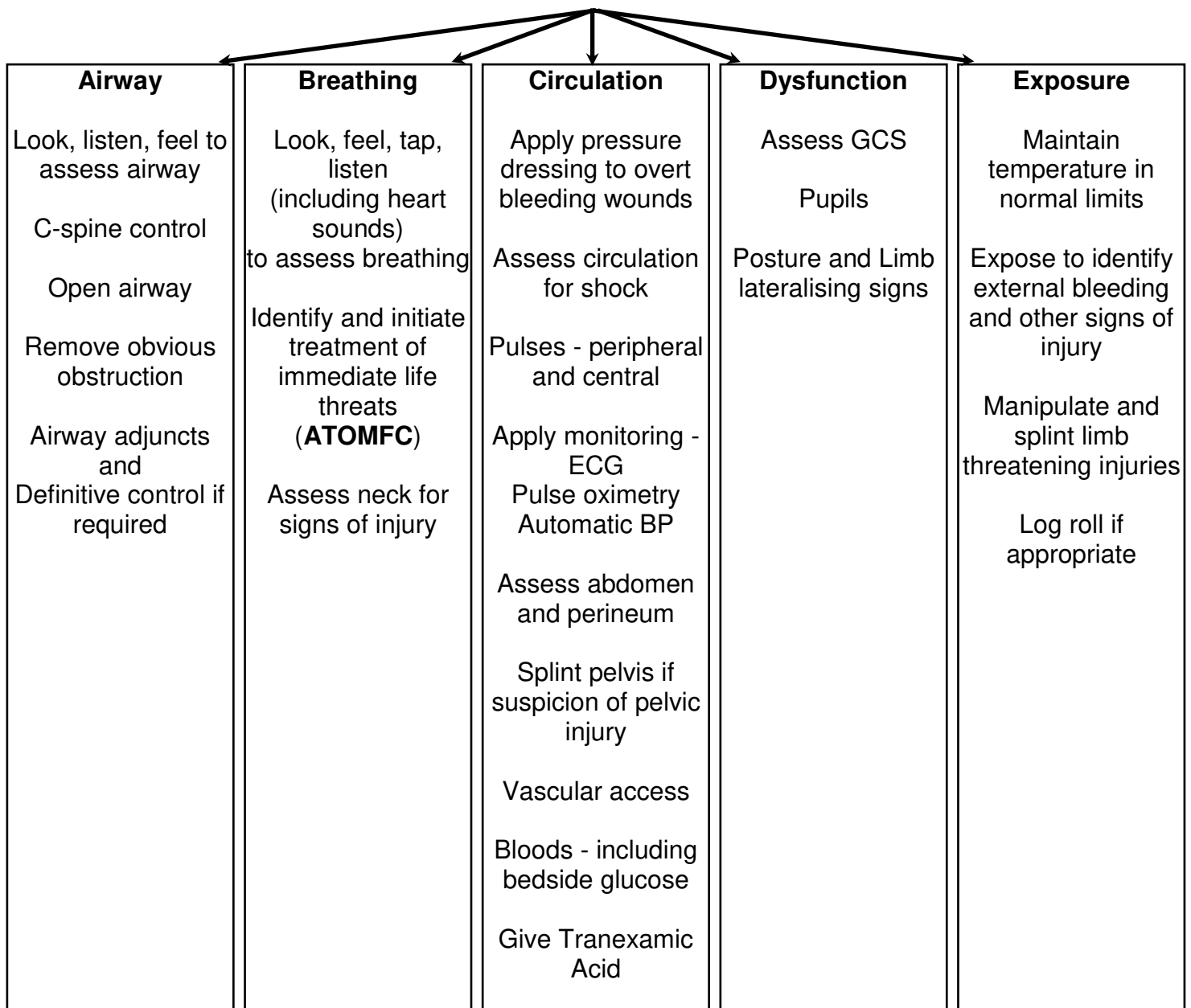
The primary survey should be completed within 5 minutes of arrival into the department.

Patient arrives



TTL performs "5 second round"
Looks for signs of life
Catastrophic haemorrhage

Directs Trauma Team to begin
Primary Survey
and Immediate Actions
including haemorrhage control
measures



Trauma Imaging

As per the Royal College of Radiologists Paediatric Trauma Protocols

Assess, Intervene, Re-assess

Haemorrhage Control

- Five 'Bs' Sources of bleeding - "*Blood on the floor, and five more*":
 - Blood - obvious bleeding
 - Breast (chest)
 - Belly (abdomen)
 - Bum (pelvis)
 - Bones (limbs)
 - Brain - Infants with open sutures significant blood can be lost intracranially without obvious signs of raised intracranial pressure.
- Stop bleeding and manage the effects of bleeding and the coagulopathy of trauma
- Apply direct pressure to overt bleeding
- Apply splints to pelvis / extremities if bleeding or suspicion of bleeding
- Give **tranexamic acid** bolus if not already given then start infusion (see below):

For patients who have an inherent/drug induced (i.e. Warfarin/NOAC) clotting disorder:

If signs of active bleeding:

- Contact the Haematologist immediately for advice to discuss possible reversal of any anticoagulant agent and refer to Massive Haemorrhage Protocol.

If no signs of active bleeding:

- Ensure early communication with Haematologist and refer to Massive Haemorrhage Protocol.

Tranexamic acid

The use of tranexamic acid has been shown to significantly reduce deaths from trauma and should be given to all patients **with** significant bleeding or **at risk** of significant bleeding within 3 hours of injury (after this it may cause more harm).

- Give tranexamic acid to any trauma patient who receives fluid (crystalloid, colloid, blood products) for volume in the first 3 hours.
- Seriously consider giving tranexamic acid to any patient you are worried enough to group and save or cross-match - you've already decided that they have bled or are at risk of bleeding.

Patients under 16 years old:

Loading dose: Dilute 15mg/kg (max. 1g) in 10mL of sodium chloride 0.9% or glucose 5% and give via intravenous injection over 10 minutes (within 3 hours of injury).

followed by

Maintenance infusion: Dilute 1g to 500mL with sodium chloride 0.9% or glucose 5% and infuse intravenously at a rate of 2mg/kg/hr [1mL/kg/hr] (max. 125mg/hr [62.5mL/hr]) for 8 hours or until bleeding stops.

Patients over 16 years old:

Loading dose: Dilute 1g in 10mL of sodium chloride 0.9% or glucose 5% and give via intravenous injection over 10 minutes (within 3 hours of injury).

followed by

Maintenance infusion: Dilute 1g to 500mL with sodium chloride 0.9% or glucose 5% and infuse intravenously at a rate of 125mg/hr [62.5mL/hr] for 8 hours or until bleeding stops.

- Use haemostatic agents e.g. Celox, QuikClot
- **Activate Massive Haemorrhage Protocol if criteria met:**
(see Local Standard Operational Policy)
 - Ongoing severe bleeding (overt or covert) and received 20mL/kg of blood products or 40mL/kg of any fluid for resuscitation in preceding hour
 - Signs of hypovolaemic shock and / or coagulopathy
- Consider definitive or damage control surgery or Interventional Radiology if bleeding not controlled or refractory shock - **Involve Surgeons / Radiology early**

Airway

- Assess and manage airway obstruction-whilest stabilising the cervical spine
- Airway opening manoeuvres - jaw thrust preferred; oropharyngeal airway may help
- Remove obstruction under direct vision only

Indications for intubation:

- Respiratory or cardiac arrest (non-responsive, apnoeic patients who can be ventilated adequately with bag-valve-mask (BVM) do not need immediate intubation but are likely to need rapid sequence induction by a competent practitioner)
- Loss of protective airway reflexes (more likely with GCS<9)
- Persistent or impending airway obstruction as in inhalational burns
- Hypoxia despite high flow oxygen
- Shock unresponsive to fluid resuscitation

- Need for controlled hyperventilation (e.g. management of acute rise in ICP in head injury)
 - Management of agitated/combatative patient at high risk of spinal injury (to allow maintenance of spinal protection)
 - Provision of secure airway for investigations (e.g. CT scan) or prolonged transfer time (e.g. to specialist centre)
 - Obvious need for prolonged control of the airway e.g. multiple injuries
- Refer to Major Trauma Emergency Airway Guidance section in this document (p.33)

Cervical Spine Immobilisation

Indications for C-spine immobilisation:

- Suspicion of or potential for spinal injury or unknown mechanism of injury
- High risk mechanism:
 - RTA pedestrian, cyclist or car passenger at high speed
 - Ejected from vehicle
 - Fall greater than 3 times own height
 - Thrown over handlebars of bike
 - Thrown following electric shock or blast

or any of:

- Midline tenderness
- Focal neurological deficit
- History of altered sensation, weakness or other signs of spinal injury (priapism)
- Reduced / altered conscious level
- Intoxication
- Painful or distracting injury
- Unable to clinically assess

Immobilise child/young person with blocks and tape, unless uncooperative child in which case manual immobilisation should be used.

Breathing

- High flow oxygen
- Monitor oxygen saturations
- Look at chest wall movement
- Feel and percuss chest wall

- Listen for air entry, breath sounds and heart sounds
- Look for and treat immediate life threats
 - Tension Pneumothorax
 - Open Pneumothorax
 - Massive Haemorrhage
 - Flail Chest
 - Cardiac tamponade
- Look for signs of neck injury and assess neck veins
- Support ventilation as required to maintain oxygenation

Circulation

- Feel for peripheral and central pulses - assess heart rate
- Monitor ECG
- Measure blood pressure - put non-invasive cuff on 5 minute auto-cycle
- Assess for signs of shock:
- Indicators of shock in children are a combination of at least 2 of:
 - Tachycardia
 - Bradycardia
 - BP less than 5th centile (see table below)
 - Roughly 70mmHg plus (2 x age in years)
 - Pulse pressure <20mmHg
 - Capillary refill time >3 seconds centrally or central / peripheral gap
 - Abnormal conscious level, agitation, confusion, lack of normal social interaction
 - Glasgow Coma Score <13 or falling, responds to only voice, pain or unresponsive
 - In shock with bradycardia consider neurogenic shock

Indicative values in paediatric shock:

Age	Heart Rate beats/min		Respiratory Rate breaths/min	Systolic BP mmHg
	Tachycardia	Bradycardia		
0-7 days	>180	<100	<30 or >60	<60
7-28 days	>180	<100	<30 or >60	<80
1 month – 1 year	>180	<90	<30 or >40	<75
2-5 years	>140	<60	<25 or >30	<75
6-12 years	>130	<60	<20 or >25	<85
>12 years	>110	<60	<15 or >20	<90

- Remember early shock in trauma may be:
 - Hypovolaemic - due to blood loss
 - Cardiogenic - due to impaired heart function (myocardial injury or impaired filling)
 - Neurogenic - suggested by hypotension without tachycardia
- Haemorrhage control as above
- **Activate Massive Haemorrhage Protocol if criteria met:** (see Local Standard Operational Policy)
 - Ongoing severe bleeding (overt or covert) and received 20mL/kg of blood products or 40mL/kg of any fluid for resuscitation in preceding hour
 - Signs of hypovolaemic shock and / or coagulopathy
- Vascular access - ideally 2 large bore cannulae access **BUT** do not waste time and resources attempting to get second line if this will delay further assessment and resuscitation. Successful resuscitation can occur with a single access. Further access is likely to be required but can be gained once the patient is stable.

- Remember the Intraosseous route for vascular access
- Fluid resuscitation - start in 10mL/kg aliquots and assess response and need for further fluid/blood resuscitation Aim for:
- Heart rate within normal for age range
 - Pulse pressure more than 20mmHg
- Improving conscious level
- Normal pH, base excess and lactate less than 2
- Assess and document GCS at presentation and prior to sedation / anaesthetic or intubation (see below)
- Assess pupils for size, equality and reactivity
- Assess posture and responses for lateralising signs
- Manage raised intracranial pressure
 - Ensure good oxygenation
 - Head tilt 20 degrees and head in midline
 - Ensure blood glucose above 3mmol/L (give 3mL/kg of glucose 10% to correct hypoglycaemia)
 - Maintain blood pressure (aim for age-appropriate MAP or systolic BP > 95th centile for age) with fluid resuscitation and inotropes (e.g. noradrenaline)
 - Treat pyrexia with antipyretics or active cooling (cooling blanket)
 - Treat seizures as per local guidelines (for regional NWTs Guideline for Management of Generalised Convulsive Status Epilepticus in Children see <https://www.nwts.nhs.uk/clinicalguidelines/regionalguidelines-a-z>)
 - Treat pain with opioid analgesia
 - Intubate, paralyse and sedate
 - Specific measures for actual or impending herniation
 - Hyperosmolar therapy with sodium chloride 2.7% or mannitol
 - Controlled ventilation

Dysfunction Glasgow Coma Score

Adult	Child
<p>Best Eye Response (4)</p> <p>4. Eyes open spontaneously 3. Eye opening to verbal command 2. Eye opening to pain 1. No eye opening</p>	<p>Best Eye Response (4)</p> <p>4. Eyes open spontaneously 3. Eye opening to verbal command 2. Eye opening to pain 1. No eye opening</p>

<p>Best Verbal Response (5)</p> <p>5. Orientated 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No verbal response</p>	<p>Best Verbal Response (5)</p> <p>5. Alert, babbles, coos, words or sentences to usual ability 4. Less than usual ability and/or spontaneous irritable cry 3. Cries inappropriately 2. Occasionally whimpers and/or moans 1. No vocal response</p>	<p>Best Grimace Response (5) <i>Use in pre-verbal or intubated patients</i></p> <p>5. Spontaneous normal facial/oro-motor activity 4. Less than usual spontaneous ability or only response to touch Stimuli 3. Vigorous grimace to pain 2. Mild grimace to pain 1. No response to pain</p>
<p>Best Motor Response (6)</p> <p>6. Obeys commands 5. Localising pain 4. Normal flexion to pain 3. Abnormal flexion to pain (decorticate) 2. Abnormal extension to pain (decerebrate) 1. No motor response</p>	<p>Best Motor Response (6)</p> <p>6. Obeys commands or performs normal spontaneous 5. Localises to painful stimuli or withdraws to touch 4. Normal flexion to pain 3. Abnormal flexion to pain (decorticate) 2. Abnormal extension to pain (decerebrate) 1. No motor response to pain</p>	

Exposure and Environment

- Prevent hypothermia - maintain normothermia
 - If temperature below 36 degrees administer warm fluids and use a warming blanket
- Expose to ensure all life-threatening injuries identified
- Log roll
 - Inspect entire back and buttocks for signs of injury
 - Palpate spine for tenderness
 - Assess sensation
 - Remove debris and spinal board

Pain assessment and management

- See local children's pain scores and pain management protocols.
- Step-wise analgesia according to pain score and may include:
 - Intranasal Diamorphine
 - Intravenous Morphine
 - Intravenous Ketamine - in shocked patients
 - Intravenous Paracetamol
 - Entonox
 - Regional/Local Nerve Blocks
 - Non-pharmacological methods-including:
 - Splinting

- POP
- Urinary catheterization unless urethral injury is suspected
- Play/distraction therapy

Titrate analgesia to pain score and re-assess frequently

Laboratory investigations

- Glucose
- Cross match
- FBC
- Clotting and fibrinogen
 - Consider point of care dynamic tests, such as ROTEM or TEG
- Blood gas to include lactate
- Biochemistry profile to include LFTs and Calcium
- Amylase
- Serum beta-HCG in girls of child-bearing age