APLS: Trauma Scenario 3

This is a Teaching Scenario. Some flexibility in how it progresses is possible according to individual learner needs.

History {initial candidate briefing prior to arrival of child}

A 10-year-old girl is shot in the left chest by a drive by drug related shooting.
Found side of road and loaded onto ambulance trolley.
Estimated weight 30 kg

Initial impression {provide information as candidate assesses child and applies monitoring}

RR 34. HR 120. BP 100/65. SpO_2 96% in air. She is agitated, crying, calling for her mother. GCS 15 (E 4, M 5, V 4). Cervical soft collar in place.

Clinical Course {to be given to candidate as they progress}

The child initially is stable with oxygen. She has a small sucking chest wound on the left side of her chest. Decreased A/E. No tamponade. Epigastric tenderness and a blood-stained vomit. No exit wounds on log roll.

Subsequently RR rises and SaO_2 falls and there is decreased AE on the left side as a pneumothorax enlarges. Perfusion deteriorates and HR rises. BP starts to drop.
DDx – hemo-pneumothorax, tamponade, haemorrhagic, spinal shock. FAST -ve.

INSTRUCTORS INFORMATION

Key Treatment Points ☑

<C>	Assess for and control external bleeding	
Airway & C-spine	Establish airway patency	
	Protect cervical spine	
	High flow O2 via face mask commenced early Titrate O2 therapy to SpO2 94-98% when stable	
Breathing	3 sided or ported occlusive dressing followed by ICC	
Circulation	Early IV access X 2 wide-bore cannulae	
	Blood for cross-match etc	
	Urgent surgical consult for penetrating injury mx. Focus is urgent surgery.	
	Fluid bolus 10 mls/kg x 2 warmed crystalloid/blood	
	TXA	
	Massive transfusion protocol	
	Analgesia	
General Therapy	Arrange CXR and AXR to ascertain bullet passage and likely organ injury. Pelvic x-ray not appropriate in penetrating injury.	

Diagnosis: Left pulmonary contusion with open pneumothorax. Hypovolemic shock. Stomach laceration.

Learning objectives

At the end of this session participants should be able to:

- Apply the structured approach to assessment, management and diagnosis of penetrating trauma and shock
- Recall, classify and apply the differential diagnosis of hypotension in penetrating trauma
- Recall the management of open chest wounds
- Recall and apply the management of hypovolemic shock and massive transfusion in their own practice

Potential Issues to be Discussed

- Principles of resuscitation in penetrating trauma and shock
- Penetrating trauma, shock and the role of urgent surgery
- Massive transfusion
- DDx of hypotension in penetrating trauma including hypovolemia, tension pneumothorax, tamponade, spinal shock
- Management of open chest wound

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Open pneumothorax

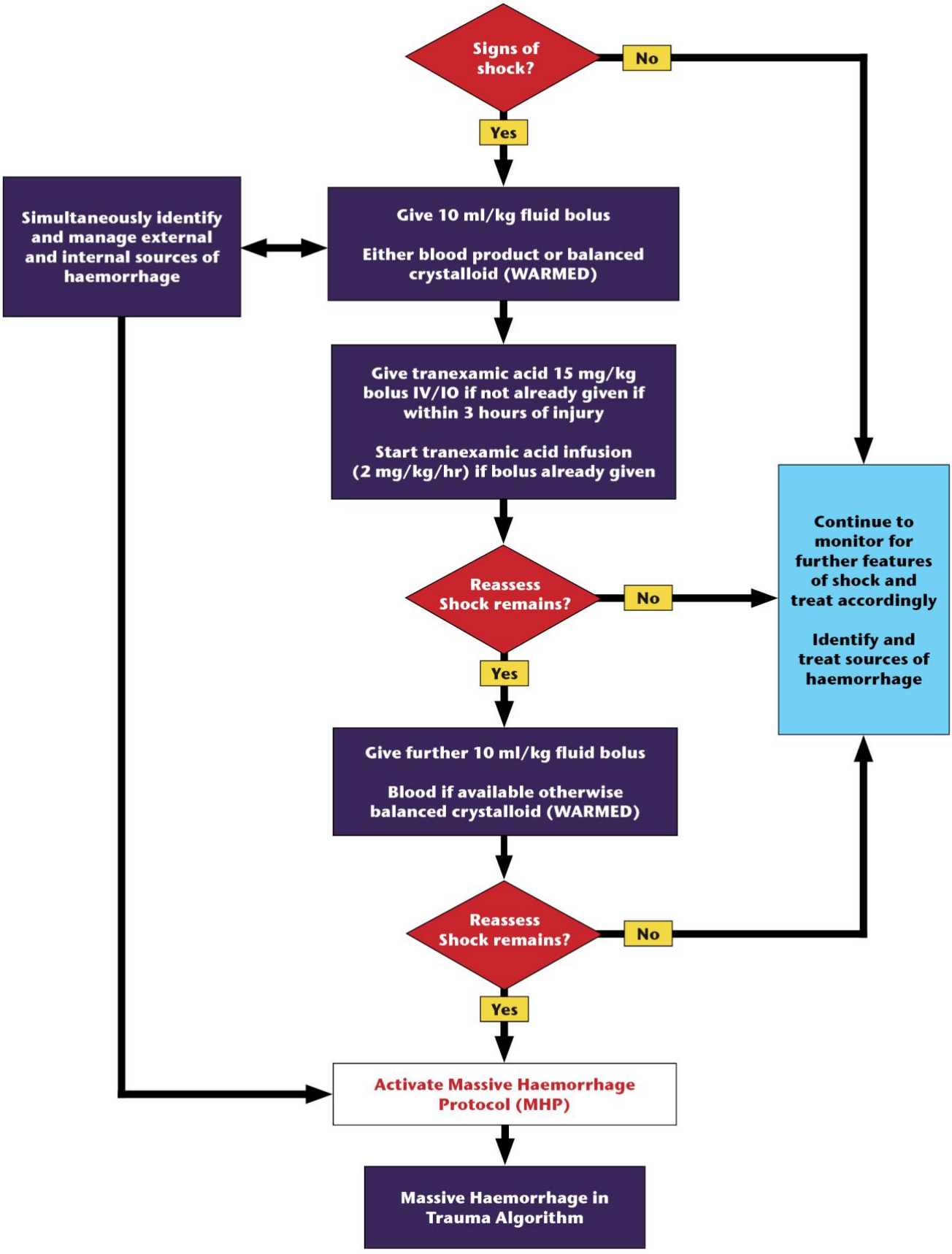
In this situation there is a penetrating wound in the chest wall with associated pneumothorax. The wound may be obvious, but if it is on the child's back it will not be seen unless actively looked for. If the diameter of the defect is greater than about one-third of the diameter of the trachea, air will preferentially enter the pleural space via the defect rather than be drawn into the lungs via the trachea when the child takes a breath. It is then referred to as a sucking chest wound.

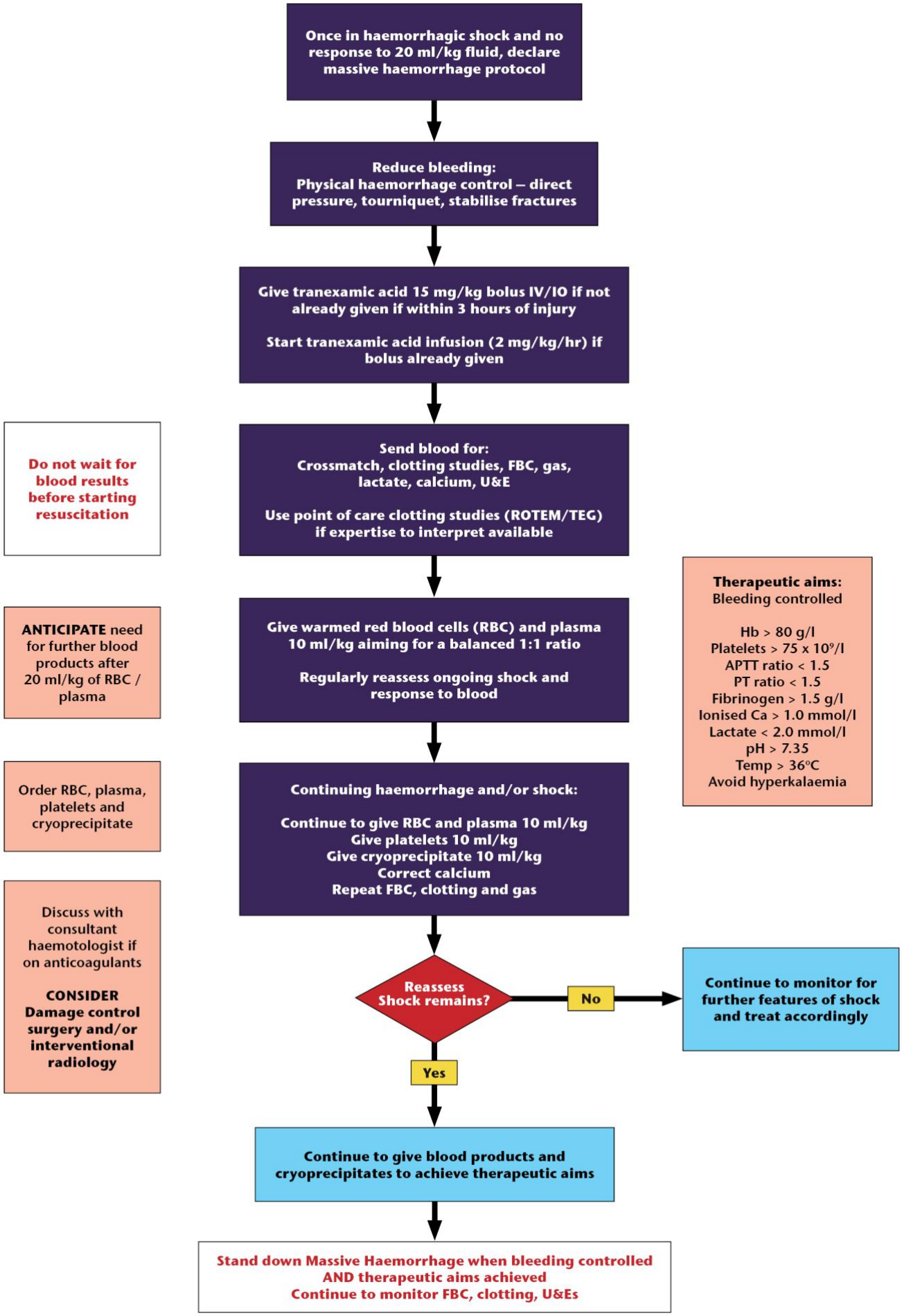
Signs

Air may be heard sucking and blowing through the wound
The other signs of pneumothorax will be present
There may be an associated haemothorax (i.e. a haemopneumothorax)
POCUS of the chest may be useful

Resuscitation

High-flow oxygen should be given through a reservoir mask
The immediate treatment for a sucking wound is to occlude the wound site by using a ported chest seal, provided that the defect is not larger than the base of this device (Figures 9.4 and 9.5). If a ported seal is unavailable, use a three-sided occulsive dressing (Figure 9.4)
A chest drain will be required as part of emergency treatment. It should not be inserted through the defect itself, as this may spread contamination and restart bleeding


Signs of shock?
No
Yes
Simultaneously identify and manage external and internal sources of haemorrhage
Give 10 ml/kg fluid bolus
Either blood product or balanced crystalloid (WARMED)
Give tranexamic acid 15 mg/kg bolus IV/IO if not already given if within 3 hours of injury
Start tranexamic acid infusion (2 mg/kg/hr) if bolus already given
Reassess Shock remains?
No
Yes
Continue to monitor for further features of shock and treat accordingly
Identify and treat sources of haemorrhage
Give further 10 ml/kg fluid bolus
Blood if available otherwise balanced crystalloid (WARMED)
Reassess Shock remains?
No
Yes
Activate Massive Haemorrhage Protocol (MHP)
Massive Haemorrhage in Trauma Algorithm


Once in haemorrhagic shock and no response to 20 ml/kg fluid, declare massive haemorrhage protocol
Reduce bleeding:
Physical haemorrhage control – direct pressure, tourniquet, stabilise fractures
Give tranexamic acid 15 mg/kg bolus IV/IO if not already given if within 3 hours of injury
Start tranexamic acid infusion (2 mg/kg/hr) if bolus already given
Send blood for:
Crossmatch, clotting studies, FBC, gas, lactate, calcium, U&E
Use point of care clotting studies (ROTEM/TEG) if expertise to interpret available
Do not wait for blood results before starting resuscitation
Give warmed red blood cells (RBC) and plasma 10 ml/kg aiming for a balanced 1:1 ratio
Regularly reassess ongoing shock and response to blood
ANTICIPATE need for further blood products after 20 ml/kg of RBC / plasma
Therapeutic aims:
Bleeding controlled
Hb > 80 g/l
Platelets > 75 x 10⁹/l
APTT ratio < 1.5
PT ratio < 1.5
Fibrinogen > 1.5 g/l
Ionised Ca > 1.0 mmol/l
Lactate < 2.0 mmol/l
pH > 7.35
Temp > 36°C
Avoid hyperkalaemia
Continuing haemorrhage and/or shock:
Continue to give RBC and plasma 10 ml/kg
Give platelets 10 ml/kg
Give cryoprecipitate 10 ml/kg
Correct calcium
Repeat FBC, clotting and gas
Order RBC, plasma, platelets and cryoprecipitate
Reassess Shock remains?
No
Continue to monitor for further features of shock and treat accordingly
Yes
Discuss with consultant haemotologist if on anticoagulants
CONSIDER Damage control surgery and/or interventional radiology
Continue to give blood products and cryoprecipitates to achieve therapeutic aims
Stand down Massive Haemorrhage when bleeding controlled AND therapeutic aims achieved
Continue to monitor FBC, clotting, U&Es

APLS: Trauma Scenario 4

This is a Teaching Scenario. Some flexibility in how it progresses is possible according to individual learner needs.

History {initial candidate briefing prior to arrival of child}

A 6 year old boy was playing in the roof of a shed with his friend. They had some petrol and matches. Two hours before admission, he dropped a lighted match onto some of the spilled petrol which erupted into flames in his face. He ran screaming for the ladder and fell one storey. Hearing the screams, the farmer arrived finding the boy on the floor of the shed with his shirt on fire and writhing in pain. The farmer put out the flames with a blanket and called the ambulance who are now en route to your hospital.
Estimated weight 20 kg.

Initial impression {provide information as candidate assesses child and applies monitoring}

On arrival he is in pain, is crying and has stridor. He has burns with blisters and sloughed skin to the face, trunk and right arm. HR 135, BP 94/61, RR 40, SpO_2 95% in air, Temp 36.2. The ambulance officers report that he would not tolerate a cervical collar or face mask oxygen

Clinical Course {to be given to candidate as they progress}

Early in the assessment, provide the comment that the face is becoming very swollen. Urgent intubation needs to be arranged for worsening stridor and increasing work of breathing. Worsening perfusion from a ruptured spleen which stabilises after two boluses of crystalloid or blood. Burns fluid therapy needs to be considered

INSTRUCTORS INFORMATION

Key Treatment Points ☑

<C>	Assess for and control external bleeding	
Airway, C-spine & Breathing	Establish airway patency	
	Protect cervical spine	
	Attempt high flow O_2 via face mask but urgently arrange for intubation and ventilation	
Circulation	Early IV / IO access	
	Blood for X-match, COHb, etc.	
	Fluid bolus 10 mls/kg x 2 warmed crystalloid/blood	
General Therapy	Initial analgesia.	
	ICU/Retrieval, Gen surg & Burns service consultation	
	Trauma imaging	

Diagnosis:
Compromised airway
30%, partial and full thickness burns to face, trunk and upper limbs
Ruptured spleen

Learning objectives

At the end of this session participants should be able to:

- Apply the structured approach to assessment, management and diagnosis of burns and airway oedema
- Recall and apply the principles of airway management regarding airway oedema and obstruction due to burns injury
- Recall and apply the principles of acute management of severe burns

Potential issues to be discussed/instructor resources

- Burns – acute management. Used with permission and endorsed by the Paediatric Improvement Collaborative https://www.rch.org.au/clinicalguide/guideline_index/burns/
- Ensure debrief includes a discussion of burns dressings and ongoing fluids.
- Because oedema occurs following thermal injury, the airway can deteriorate rapidly.
- Thus even suspicion of airway compromise, or the discovery of injuries that might be expected to cause problems with the airway at a later stage, should lead to immediate consideration of tracheal intubation.
- All but the most experienced should seek expert help urgently, unless apnoea requires immediate intervention.

[APLS Manual 7th Ed Ch 13 pp 184]