



Queensland Trauma Education

**HAEMOSTATIC
RESUSCITATION**

Blood administration in trauma

**Procedural skill
Facilitator resource kit**

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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Haemostatic Resuscitation – Blood administration in trauma: Procedural Skill – Facilitator resource kit

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About this training resource kit

This resource kit provides an opportunity to discuss and practice the preparation for delivery of haemostatic resuscitation.

National Safety and Quality Health Service (NSQHS) Standards



Target audience

Emergency department medical and nursing clinicians.

Duration

30-40 minutes.

Group size

Suited to small group participation.

Learning objectives

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

- Understand the indications for a massive transfusion in trauma
- Discuss the concepts of haemostatic resuscitation
- Demonstrate IV/IO access and preparation for blood delivery

Facilitation guide

1. Utilise the case examples to discussion options for vascular access and massive haemorrhage blood product delivery theory
2. Hands-on practical session with local equipment

Supporting Resources (in Printable Resources)

- Statewide MHP
- Flow rates of devices
- ETM Flow Rate Guide
- Hand pump set for rapid transfusion

Procedural skill

Resources required

Equipment	<ul style="list-style-type: none"> • IO drill, insertion plates/ crunchy bars • Fluid hand pump set • Bucket, cannula (22-16g), bags of fluid- to demonstrate flow rates • Warmer device used at the local facility (EnFlow, QinFlow, MEQU, Belmont, Ranger, Level 1) • Arterial line set, central line set, MAC/RIC line
Delivery tool	Hands-on practical skill session- adapted to learner cohort

Case 1

A 23yr old man arrives via ambulance after a motor bike crash. He has a positive EFAST and is hemodynamically unstable with a HR 140 and BP 80/60mmHg.

Case 2

A 45yr old female is brought to ED after falling from a 3rd story balcony. She has injuries to her R femur, L ankle and R humerus. There is concern she has a pelvic injury and has a binder placed.

Case 3

An 89yr old man is brought to ED by his family after a trip and fall in the garden. At triage he collapses and is found to have a barely palpable radial pulse. He has a wound to his occiput with a large scalp degloving.

Case 4

A 33yr old man is brought to ED after a Motor Vehicle Collision where he was the driver. He has a history of IVDU and the paramedics were unable to gain IV access. On arrival he is altered with a GCS 9 (M6), HR 110, BP 118/78mmHg.

Question and answer guide

What is a massive transfusion?

The definition can vary - LifeBlood who supply all blood products in Australia define it as replacement of the patient's blood volume in 24 hours, or >50% in 4 hours.

What components are available?

Blood products in Australia are fractionated, meaning they are provided as individual components. This includes Red Cells, Fresh Frozen Plasma (FFP), Cryoprecipitate, Platelets.

How do we decide what to give to the bleeding trauma patient?

The evidence suggests the best transfusion strategy is a balanced one. Think about what the patient has lost-> whole blood, so what they need replaced is balanced blood components therapy. Some hospitals have a massive haemorrhage box- which often contains 4 PRBC, 4 FFP and 10 units cryoprecipitate. This will vary site to site so always need to check local protocols.

The PROPPR study (Holcomb et al 2015) demonstrated the benefit of 1:1:1 (Plasma, Platelets, RBCs) transfusion in trauma patients (more haemostasis, less death by exsanguination at 24 hours, but no change in mortality at 24 hours or 30 days).

When thinking about resuscitation in trauma the focus is on 1) volume state and 2) coagulopathy. Volume is managed with balanced transfusion of RBC and FFP. Coagulopathy can be managed through normal coagulation studies and empirically (ratio based) or via a viscoelastic test (VHA- ROTEM/TEG)- there is no evidence either strategy is better, but less products are given with a VHA strategy.

How do we deliver blood/blood products?

Ideally through a large proximal cannula. If this is not achievable other options include:

1. Ultrasound guided cannula
2. Intraosseous- proximal humerus or proximal tibia.
3. Central line- femoral, subclavian and internal jugular- Seldinger approach
4. MAC line- sheath introducer and additional lumens- insertion as per CVL
5. Rapid Infuser Catheter (RIC line) - Seldinger exchange of line over 20G canula

Do not give blood/blood products via IO or cannulas in the lower limbs *if* there is suspicion of major pelvic or femoral fractures.

What are the important considerations when giving blood/blood products?

1. Right patient/Right time/Right amount and How fast- this is usually rapidly!
2. Consider the risk of Trauma Induced Coagulopathy- to minimise the risk: keep the patient warm, replace calcium (Ca²⁺ gluconate every 2nd bag blood/blood products), consider TXA (tranexamic acid), use VHAs to direct coagulopathy management

How is blood delivered in a trauma patient?

Two important considerations:

1. Give it fast- DO use a hand pump set (see image attached), DO NOT use an infusion pump set (ie Braun pump extension line, Alaris transfusion set or Braun Infusomat space line) as the flow is too slow! Some centres use Level 1, Ranger or Belmont systems- find out what is used locally.
2. Keep the patient warm- blood warmers, Bair huggers and a warm environment.

Do we need an arterial line?

Often no, not immediately- a 'finger on the pulse' and focussing on delivery of blood/blood products is more important than early arterial access. It will be useful later for repeated blood gas samples and continuous blood pressure measurements, but this might occur in the operating theatre or ICU rather than in ED.

Other notes:

- Ensure participants understand local process to request and receive blood, recognise importance of rapid delivery of blood/products, need for warming and delivery devices.
- Large bore preferred over narrow, short preferred over long cannula, aim large/proximal vein and upper limb placement- especially in suspected pelvic/abdominal trauma!

Practical skills

1. Use various lines and cannula gauges to demonstrate flow rates supporting the need for large bore vascular access and pressure delivery (hand pump set and manual delivery)
2. Use trainer to demonstrate seldinger technique for RIC and MAC lines
3. Discuss the use of IO and location for insertion (including avoiding lower extremities in pelvic trauma), risks of dislodgement with limb movement
4. Set up blood warmer and discuss local policy for use
5. Demonstrate features of arterial and central lines

Acronyms and abbreviations

Term	Definition
MHP	Massive Haemorrhage Protocol
TXA	Tranexamic Acid
RIC	Rapid Infuser Catheter
MAC	Multi-lumen Access Catheter

References

1. Holcomb JB, Tilley BC, Baraniuk S, et al. (2015). Transfusion of Plasma, Platelets, and Red Blood Cells in a 1:1:1 vs a 1:1:2 Ratio and Mortality in Patients With Severe Trauma: The PROPPR Randomized Clinical Trial. *JAMA*, 313(5), 471–482. <https://doi:10.1001/jama.2015.12>
2. <https://www.lifeblood.com.au/health-professionals/clinical-practice/clinical-indications/massive-transfusion>

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