# Adult and Paediatric Major Haemorrhage in Trauma Guidelines/Flowcharts 23.4.18 v4

**Scope**

This document sets out the standards for all receiving units in the Midlands Trauma Networks in respect of Major Haemorrhage in trauma. **These are now the preferred adult and paediatric guidelines/flowcharts for all units.**

**Introduction**

The timely provision of tranexamic acid and blood products to major trauma patients is associated with improved outcomes. Evidence suggests that using a high ratio of Plasma (FFP/Octaplas) and platelets to packed red cells (PRC) reduces coagulopathy and overall blood use. Recent publications and consensus guidance has strengthened the recommendation for a PRC to plasma ratio of 1:1 and this should be adopted for all major trauma major haemorrhage protocols. It is recognized that major trauma bleeding ***may be*** different from other sorts of bleeding so providers may need two MHP protocols, one for major trauma and one for other bleeding scenarios.

**Protocol**

1. Every receiving unit should have a clearly defined adult and paediatric major haemorrhage protocol for trauma approved by the local blood transfusion committee.
2. Within the protocol there should be clear guidance on the following:
   a. Activation criteria and method of activation
   b. The roles and responsibilities of the personnel involved
   c. The ratio of packed cells to plasma which should be 1:1
   d. Clear guidance on products to use in persons known or suspected to have been born after 1996.
   e. Adult Major Trauma Centre's should maintain a stock of pre-thawed plasma for immediate use
   f. The ratio of packed red cells to platelet transfusion
   g. What products should be used pre-cross matching, specifically scenarios in which Group O Rh D +ve blood may be used.
   h. The communication mechanism between clinicians and the labs
   i. The availability and method of communicating with the on call haematology consultant.
   j. The stand down criteria,
3. Every receiving unit must have clear guidance on the reversal procedure for oral anticoagulants including Warfarin and direct oral anticoagulants e.g. rivaroxaban, dabigatran, apixaban.
4. Every receiving unit must have facilities for in line warming of blood products immediately available within the resuscitation room.
5. Every receiving unit should have evidence that the activations of the major haemorrhage protocol are monitored and audited.
6. Every receiving unit should have Tranexamic Acid immediately available in the resuscitation room.
7. The time and dose of Tranexamic Acid administration must be recorded on the trauma chart.

**References**


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- NICE guidelines [NG39]. Major trauma: assessment and initial management. *https://www.nice.org.uk/guidance/ng39* 2016.
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- Holcomb JB, Tilley BC, Baraniuk S *et al.* 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 . *The Journal of the American Medical Association* 2015; **313:** 471-82.

# Adult Major Haemorrhage in Trauma Management Flowchart

**MHP Activation**: ☎ 2222
- Nominate roles
- Distribute action cards
- Assess patient and MOI

**Call Blood Bank: ☎ xxxxx**
- Identify biomedical scientist
- Give patient details
- State urgency of XM (15 min v 45 min) if known

**Check availability and location of Emergency Group O red cells:**

Use O RhD neg red cells if female <50 yr/ child known RhD neg/antibodies

## Rapid assessment. Pre-hospital/hospital

**SUSPECT MAJOR HAEMORRHAGE**: HAS TXA BEEN GIVEN PRE-HOSPITALLY?
Significant MOI / severe bleeding / shock/ Poor physiological response to IV fluids/pre-hospital transfusion (RCC or plasma). Consider Blood to Scene or pre-activate hospital Major Haemorrhage Protocol

## Activate Major Haemorrhage Protocol

### Activate team: 222
'Major Haemorrhage, Specialty, Location'
**Team collect action cards**
**Secure IV access & ensure ID band**
**Consultant involvement essential**

RESUSCITATE
Airway
Breathing
Circulation

STOP THE BLEEDING

### Baseline bloods
XM (x 2), FBC, PT, APTT, Fibrinogen, U+E, $Ca^{2+}$
ABG, lactate (and if available, TEG / ROTEM)

**Order Pack 1**

**Prevent Hypothermia**
**Manage shock**
Minimise unnecessary use of crystalloids

**Consider:**
Haemorrhage control
Interventional Radiology
Early surgery

### Pack 1
| | |
|---|---|
| Red cells* | 4 units |
| Plasma | 4 units |

(*Emergency O blood, or group specific blood).
Anticipate need for platelets and cryoprecipitate

**Aims for post resuscitative therapy**

| | |
|---|---|
| Hb | 80-100g/dl |
| Platelets | > 75 x $10^9$/l |
| PT ratio | < 1.5 |
| APTT ratio | < 1.5 |
| Fibrinogen | > 1.5g/l |
| $Ca^{2+}$ | > 1 mmol/l |
| Temp | > 36°C |
| pH | > 7.35 (ABG) |

Monitor for hyperkalaemia

**Cell salvage** Haemostatic component support may be required during use of intra-operative salvage of washed red cells

Reassess: Suspected continuing haemorrhage
**Repeat Trauma bloods**
FBC, PT, APTT, Fibrinogen, U+E, $Ca^{2+}$
ABG, lactate (and if available, TEG / ROTEM)

**Haemostatic Drugs**
Vit K and Prothrombin complex concentrate (PCC) for warfarinised patients
Other haemostatic agents and reversal of new anticoagulants: discuss with Consultant Haematologist

**Anticipate low calcium**
10mls 10% calcium chloride IV over 10 mins after pack 1.

### Pack 2
| | |
|---|---|
| Red Cell | 4 units |
| Plasma | 4 units |
| Platelets | 1 dose (ATD) |

Give 2 pools (of 5) Cryoprecipitate if fibrinogen <1.5g/l or 2g/l and falling
(Fibrinogen concentrate may be available – use as per trust guidelines)

STAND DOWN
- Inform lab ☎ Ext xxxx
- Track all blood units
- Return unused products
- Complete documentatation including audit proforma

### Goal directed therapy
Monitor patient
Adjust component support based on Pack 2

**TERMS**
ABG – Arterial Blood Gas
FFP – Fresh Frozen Plasma
PT – Prothrombin Time
APTT – Activated Partial Thromboplastin Time
MHP – Massive Haemorrhage Pack
TEG/ROTEM –Thromboelastography
ATD – Adult Therapeutic Dose
NPT – Near Patient Testing
XM - Crossmatch

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# Paediatric Major Haemorrhage in Trauma Management Flowchart

**Ongoing severe bleeding e.g.**
**Received 20 ml / kg of RBC or > 2ml / kg / min blood loss or >40 ml / kg of any resuscitation fluid in 3 hours. Signs of hypovolaemic shock and or coagulopathy**
**Administer tranexamic acid (in trauma) if < 3 hours post injury**
**Aim to give bolus within 1 hour**

**ACTIVATE PAEDIATRIC MAJOR HAEMORRHAGE PROTOCOL**

**MHP Activation: x 2222**
**ENSURE A CONSULTANT IS CALLED TO LEAD IF NOT ALREADY PRESENT**

- Nominate roles
- Distribute action cards
- Call Blood Bank: ☎xxxx
- Identify Biomedical Scientist
- Give patient details inc. age, weight and gender to Blood Bank. They will advise if a further sample is required or if blood can be issued straight away
- State urgency of XM (15 mins v 45 mins
- Patients born after 1/1/1996 will require MB treated FFP or **Octaplas (generically referred to as plasma in this flow chart)**
- Issue identification band

**Activate team X 2222**
**'Paediatric Major Haemorrhage, Specialty, Location'**

Team collect action cards
**Consultant involvement essential. Paed SpR or Consultant**

**RESUSCITATE**
**Airway**
**Breathing**

**PREVENT HYPOTHERMIA**

- Use a blood warmer
- Use forced air warming blanket

**Baseline bloods**
**If needed obtain bloods and send to Lab with porter**
1st XM, FBC, PT, APTT, Fibrinogen, U&E, $Ca^{2+}$

**NEAR PATIENT TESTING: ABG, TEG if available**
**ORDER PACK 1**

Give 0.2 ml /kg 10% calcium chloride or 0.3 ml/kg calcium gluconate after pack 1. Repeat if necessary. Max 10 ml

**ADMINISTER PACK 1**
**RBC 20 ml / Kg + Plasma 20 ml / Kg RBC – Plasma ratio 1:1**

**Additional aims:**
Ph >7.2
Lactate < 1 mmol/L

**STOP THE BLEEDING**

**Reassess**: Suspected continuing haemorrhage
Repeat Trauma bloods and send to lab:
2nd XM if possible, FBC, PT, APTT, fibrinogen, U&E, $Ca^{2+}$
**NEAR PATIENT TESTING: ABG if available**
**Objectively evaluate after each 10ml/kg aliquot (max 250ml)**
**1) Extent of bleeding 2) Response to treatment 3) Evidence of TACO + repeat baseline lab tests every 30-60 minutes if on-going bleeding**

**IF REQUIRED ORDER PACK 2**
**RBC 1:1 Plasma**
**If > than 40ml / Kg RBC consider PLTS 15-20 ml / Kg + Cryo 10ml/Kg (aim to keep the PLT count above 100)**

**STAND DOWN** ☎xxxx

- **End fate all blood and components**
- **Return unused components to blood bank or transfer blood with patient**
- **Ensure adequate handover**

**Consider:**
**1. Haemorrhage control:**
- Appropriate Surgical Specialists
- Inform Theatres so they can prepare i.e. cell salvage

**2. Call Interventional Radiologist**
**3. Call Haematologist for advice**

**ADMINISTER PACK 2**

**Once bleeding under control laboratory testing should guide blood component therapy**

**Continue Transfusing to achieve:**

**Hb > 80g/L**

**Plt > 100**

**Fibrinogen > 1.5**

**APTT/PT < 1.5**

**After administering Pack 2 repeat bloods**
2nd XM if not already gained, FBC, PT, APTT, fibrinogen, U&E, $Ca^{2+}$
**NEAR PATIENT TESTING: ABG if available**
**Consider further calcium (keep the ionised Ca >1mmol/L)**

**HAEMOSTATIC DRUGS**
Patients on warfarin
Vit K (250 – 300 mcg / kg up to 5 mg slow IV) + PCC

**Other haemostatic drugs**
Discuss with Haematologists

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**Blood Components to request by weight**

| | 20ml / kg | 20ml / kg | 15-20 ml / kg | 10ml / kg |
|---|---|---|---|---|
| **WEIGHT** | **RBC** | **Plasma** | **PLTS** | **CRYO** |
| < 5 kg | 80-100 ml | 80-100 ml | 50-80 ml | 50 ml |
| 5-10.9 kg | 1 unit | 1 unit | 100 ml | 80 ml |
| 11-20 kg | 2 units | 2 units | 1 unit | 1 pool |
| 20-50 kg | 3 units | 3 units | 1 unit | 2 pools |
| >50 kg | 4 units | 4 units | 1 unit | 2 pools |

90ml /kg in term infants and 70-80 ml/kg in adolesence