MAJOR HAEMORRHAGE PROTOCOL (MHP)

	ADULT	PAEDIATRICS
Early Recognition	• Suspected ongoing haemorrhage • Systolic BP <90mmHg • Poor response to initial fluids	• Signs of shock
Call for Senior Help	• Establish Team Leader and roles • Escalate via parent team • Get specialist help - 'Out of theatre response' = Anaesth, Nurse, Orderly • Consider need for Anaesthetic or Critical Care input ring ————	• Establish Team Leader and roles • Escalate via parent team • Get specialist help - • **Consider paediatric arrest call or need for paediatric critical care / anaesthetist**
Assess ABCDE	• Attach monitoring • High flow O_2 via face mask • Large bore IV or IO access, use rapid infuser e.g. Belmont (if available). (Paediatric specific equipment—page 2)	
Take Samples	• Group and Save, FBC, Coag, U&E and LFT • Near patient testing - ABG, HaemoCue, ROTEM (if available)	
Initiate Major Haemorrhage Protocol	• Phone Blood Bank on ———— • State **'Activate Major Haemorrhage Protocol'** • Give Patient's: **MRN, Forename, Surname, Date of Birth, Male/Female, Location** • Give a '**nominated contact person'** name and **number** for further communication during the Major Haemorrhage resuscitation • Immediately send **any member of staff** for Major Haemorrhage cool box 1 • Use **Major Haemorrhage Prescription** documents delivered in cool box	
Early Haemorrhage Control	• **Compressible**	• Direct pressure/haemostatic dressing • Splint fractures including pelvis • Apply tourniquet proximal to wound
	• **Non Compressible**	• Consider Interventional Radiology • Consider Damage Control Surgery
	• **Obstetrics** 4 T's – Tone, Tissue, Trauma, Thrombin	Consider: • Uterotonic Drugs • Early transfer to theatre for resuscitation & exploration - Bimanual compression, intra -uterine balloon +/- brace suture, packing or IR.
	• **GI Bleed**	• Consider Drugs – Terlipressin and Antibiotics for varices (as per Cirrhosis Care Bundle) • Early review by Gastro Reg (in hours) or Medical Reg (out of hours) • Consider IR or Surgery
	• **Reverse Anticoagulation**	• Discuss with Haematology Registrar on Call (via switchboard)
Cell Salvage	• Consider use in all cases • Avoid in gross contamination/infection and malignancy • Consider need for leucocyte filter e.g. Obstetrics/ malignancy • Don't rely on cell salvaged blood for resuscitation (rate of return too slow) – continue with MHP & use salvaged blood when available	
Resuscitate and Prevent Coagulopathy	• Give Tranexamic Acid 1g IV bolus + 1g infusion over 8 hrs • Transfuse in ratio of 1RBC:1FFP ♦ Cool box 1 – **4 RBCs, 4 FFP** ♦ Cool box 2 – **4 RBCs, 4 FFP, 2 Platelets** ♦ Cool box 3 onwards – **4 RBCs, 4 FFP, 1 Plt, 2 Cryo** • Keep products in cool box after checking, prior to use	• Give Tranexamic Acid 15mg/kg IV bolus + 15ml/kg infusion over 8hrs • Use Paediatric MHP practical aide memoire to aid delivery of correct ratios (bolus size <1 unit of blood) • Transfuse in ratio of **5ml/kg RBC: 5ml/kg Plasma** • After every 15ml/Kg RBC and 15ml/Kg FFP - give **5ml/kg Plt** and **5ml/kg Cryo**
Repeat samples (After each MH pack)	• Prioritise near patient testing - ABG, Haemoccue, ROTEM (if available) • Group and Save 2nd sample (unless already done), Lab tests if POCT not available - FBC, Coag, U&E	
Prevent	• **Hypothermia**	• Early active patient warming • Warmed blood components
	• **Acidosis**	• Take ABG sample. Aim Lactate <2.
	• **Hyperkalaemia**	• Aim K^+<5.5 • Give 10 units Actrapid in 50ml 50% Dextrose IV over 30mins, check BM as per Trust protocol. • Aim K^+ <5.5 . Give 0.1units/kg Actrapid in 5ml/kg 10% Dextrose IV over 1 hour, check BM after 15mins, then every 30 mins as per Trust protocol.
	• **Hypocalcaemia**	• Aim ABG iCa>1.0. Give 10mls 10% $CaCl_2$ IV over 10mins for each cool box administered. • Give 0.1ml/kg 10% $CaCl_2$ IV over 10 mins for each cycle of the MHP.
Treatment Targets	• Temp >36°C • pH >7.2 Base Excess < -6 Lactate <2 • Hb 70-90 during haemorrhage, Hb >75 after haemorrhage control. Plts >75, Fib >1.5 (Fib >2.0 for obstetrics) • iCa > 1.0 • K+ <5.5	

Stand-down Major Haemorrhage Protocol when no longer required.
Inform Blood Bank and return any unused blood components to the laboratory immediately.

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Practicalities for Delivery of Paediatric Massive Transfusion

Paediatric Major Haemorrhage

BEWARE OVER TRANSFUSION WITH RAPID INFUSER

Child < 20Kg

Do not connect directly to rapid infuser. Use the 3-way tap & 50ml syringe system.

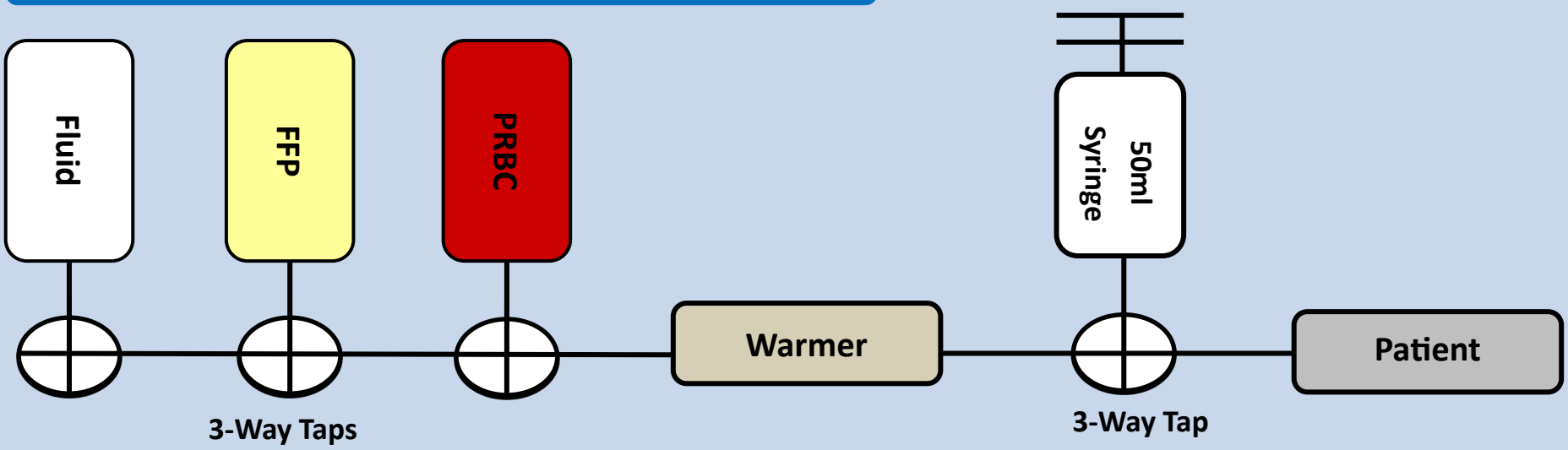
Child 20-30Kg

If sufficient expertise, direct connection to the rapid infuser may be used.

Child > 30Kg

Connect directly to the rapid infuser. Ensure safe and appropriate settings. Note the Belmont only warms at flows of >10ml/hr.

3-Way Tap System for Rapid Fluid Administration



Re-evaluate regularly and beware fluid overload

Best Practice Guidance for Hospital Blood Banks

No Sample

MH Pack 1
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group A or AB)

MH Pack 2
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group A or AB)
- 2 Platelet Pools (Group A)

Subsequent MH Packs
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group A or AB)
- 1 Platelet Pool (Group A)
- 2 Pools Cryoprecipitate (Maintain Fib >1.5g/dL)

Sample Received—Results Pending

MH Pack 1
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group A or AB)

No Historical Group or patient still in Emergency Department

MH Pack 2
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group of sample)
- 2 Platelet Pools (Group of sample)

Subsequent MH Packs
- 4 units Red Blood Cells (Group O)
- 4 units FFP (Group of sample)
- 1 Platelet Pool (Group of sample)
- 2 Pools Cryoprecipitate (Maintain Fib >1.5g/dL)

Known Historical Group and patient in isolation

MH Pack 2
- 4 units Red Blood Cells (Group Specific)
- 4 units FFP (Group Specific)
- 2 Platelet Pools (Group Specific)

Subsequent MH Packs
- 4 units Red Blood Cells (Group Specific)
- 4 units FFP (Group Specific)
- 1 Platelet Pool (Group Specific)
- 2 Pools Cryoprecipitate (Maintain Fib >1.5g/dL)

Valid Sample in accordance with the Two Sample Rule

MH Pack 1
- 4 units Red Blood Cells (Group specific)
- 4 units FFP (Group specific)

MH Pack 2
- 4 units Red Blood Cells (Group Specific)
- 4 units FFP (Group Specific)
- 2 Platelet Pools (Group Specific)

Subsequent MH Packs
- 4 units Red Blood Cells (Group Specific)
- 4 units FFP (Group Specific)
- 1 Platelet Pool (Group Specific)
- 2 Pools Cryoprecipitate (Maintain Fib >1.5g/dL)

Paediatric Major Haemorrhage

Age/Weight	RBC	FFP*	Plt
<1 year <10 Kg	1	1	1
1-10 Years 10-30 Kg	2	2	1
10-16 Years 30-50 Kg	3	3	1
>16 years >50 Kg	Refer to Adult Protocol		

*Octaplas will be provided after pack 1 for patients <1 Year Old

Paediatric MH Pack 2 and Subsequent MH Packs

- Red Blood Cells,FFP* and Platelets as in Paediatric MH Pack 1
-5ml/Kg Cryoprecipitate

References

1. Defence Medical Services: Defence Anaesthesia, Pain and Critical Care Faculty, Paediatric Anaesthesia in the Role 2/3 Field Hospital.
2. British Society for Haematology Guideline (2022). Haematological management of of major haemorrhage.

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