

# **BLOOD COMPONENT MANAGEMENT OF CHILDREN IN MASSIVE HAEMORRHAGE QUICK GUIDE**

Supplementary to  
Safe Transfusion of Blood and Blood Components TX001

TX004p

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- There is a sister document for transfusion laboratory staff controlled by the pathology document management system

## Massive Paediatric Haemorrhage & Transfusion Protocol

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Distribution	A&E resus, ITU and theatre may display the flowchart as a poster. Only the neonatal unit will display and use the specific neonatal flowchart. Please refer to the intranet version for the latest version of this policy. <b>Any printed copies may not necessarily be the most up to date</b>

<b>Location of Copies</b>
Trust intranet <a href="http://intranet/pathology/transfusion/protocols.asp">http://intranet/pathology/transfusion/protocols.asp</a>

### Control and Archive arrangements:

Documentation control including archiving will be maintained in accordance with the Trusts mandatory guidance on policies and related documents, as stated in the Policy for the Development and Management of Organisation-Wide Documents, Gov 01, version 2, September 2011. Superseded versions will be retained automatically for a minimum of 15 years.

### Version history

Version	Date	Author	Status	Comment
1.0	August 2012	K Cooper	Draft	Developed and initial draft signed off by Dr Cowley and Dr Powell as transfusion haematologist
2.01	May 2013	K Cooper	Final	Age range and order volume of components changed to reflect weight ranges, location of emergency Oneg blood. Mention of phase 1 and 2
3.0	Jan 2015	K Cooper	Final	Flowchart changed to mirror that issued by the west midlands critical care network and the policy amended accordingly – change to initial call to switchboard, use of flashcards issued to key people managing the haemorrhage which lists their actions
3.02	Aug 2017	T Parsons	Final	Section 2 - Clarification that any neonate presenting to ED should be managed according to the paediatric flowchart pending discussion with the on-call Consultant Paediatrician. The Neonatal MH flowchart is only for use on labour ward and the neonatal unit

## Massive Paediatric Haemorrhage & Transfusion Protocol

### Review and Amendment log for minor changes

Version No	Type of Change	Date	Description of change
3.01	Addition of the neonatal flowchart	Oct 2016	Addition of flowchart which is only for use on the neonatal unit and refers to their speciality policy and clarification given in the overview section
3.02	Minor amendment following update issued in APLS manual	Aug 2017	Threshold for cryoprecipitate has changed from the trigger of fibrinogen <1.5 to <1 (section 4.3 & flowchart) and in the first box of the flowchart, added severe significant bleeding - > 20ml/kg of volume replacement. Update to immediate circulatory management in line with APLS 7 <sup>th</sup> Edition (section 4.1 and flowchart)

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# Massive Paediatric Haemorrhage & Transfusion Protocol

## 1 Overview

This guideline is designed to assist clinical staff in the transfusion management of the haemorrhaging child. Neonates treated in an area other than the neonatal unit should still use the paediatric protocol, but contact a neonatologist immediately. It may also be used as an education tool as part of the management of trauma patients. This protocol is not meant to be followed in a set time frame, and is flexible in this respect. Telephone numbers, bleeps etc were correct at the time of review, but please be aware that these may change with short notice. Such changes will be altered in the policy as soon as viable.

## 2 Guidance Notes (Policy detail)

The information given is by no means exhaustive and is intended to assist practitioners where professional judgement is still required.

**NB;** *the neonatal unit, because neonates often have a selection of different requirements, will be following the same basic protocol, but have a specific neonatal flowchart. This will only be displayed in the unit and their Neonatal Guidelines Section and only pertains to neonates (see table 1b).*

### Age Range

- The policy applies to children up to the age of 16 years
- There is a separate flowchart for massive haemorrhage in neonates up to age of 4 weeks for use on the neonatal unit.
- Any neonate presenting to the ED should be managed according to the paediatric flowchart pending discussion with the on-call Consultant Paediatrician who will liaise with the on-call Consultant Neonatologist if necessary
- Children who weigh <10kg should receive blood products in mls/kg as documented on the flowchart
- Children who weigh 10-60kg should receive blood products in units as documented on the flowchart
- Children >60kg should be managed on the adult flowchart

## 3. Introduction

Massive haemorrhage in children is usually the result of major trauma. It is associated with significant mortality and therefore the urgent provision of blood for life threatening haemorrhage requires a rapid, focused approach.

### Important points to remember:

- a. A child's circulating blood volume per kilogram body weight is higher than that of an adult but the actual volume is small. This means that in infants and small children a relatively small volume of blood loss can be critically important.
  - Infant 85ml/kg
  - Child 80ml/kg
  - Adult 70ml/kg

***The Massive Haemorrhage Management Protocol should be activated when >40ml/kg of volume replacement is required in any child with suspected ongoing haemorrhage (obvious bleeding or significant mechanism of injury)***

- b. Extensive coagulopathy is often seen in situations which necessitate major transfusion. This occurs because of a number of factors that affect normal haemostasis including:

## Massive Paediatric Haemorrhage & Transfusion Protocol

- Tissue factor release from the site of trauma and injured brain parenchyma and activation of the Thrombomodulin Protein C pathway as a result of systemic hypoperfusion
- Transfusion of packed red cells which lack platelets and clotting factors
- Haemodilution, hypothermia and citrate overload secondary to rapid transfusion

### Massive Haemorrhage Management Protocol

Activation of the Massive Haemorrhage Management Protocol mitigates the negative effects of transfusion and limits the development of coagulopathy by ensuring that appropriate blood components/products are transfused as quickly and as safely as possible.

## 4. Using the Massive Haemorrhage Management Protocol

The flowchart is a step by step guide to the management of massive haemorrhage in children including the administration of appropriate blood components, therapeutic goals and measures to stop on-going bleeding.

### 4.1. Assessing the Child and Identifying Massive Haemorrhage

#### A. Assess Airway.

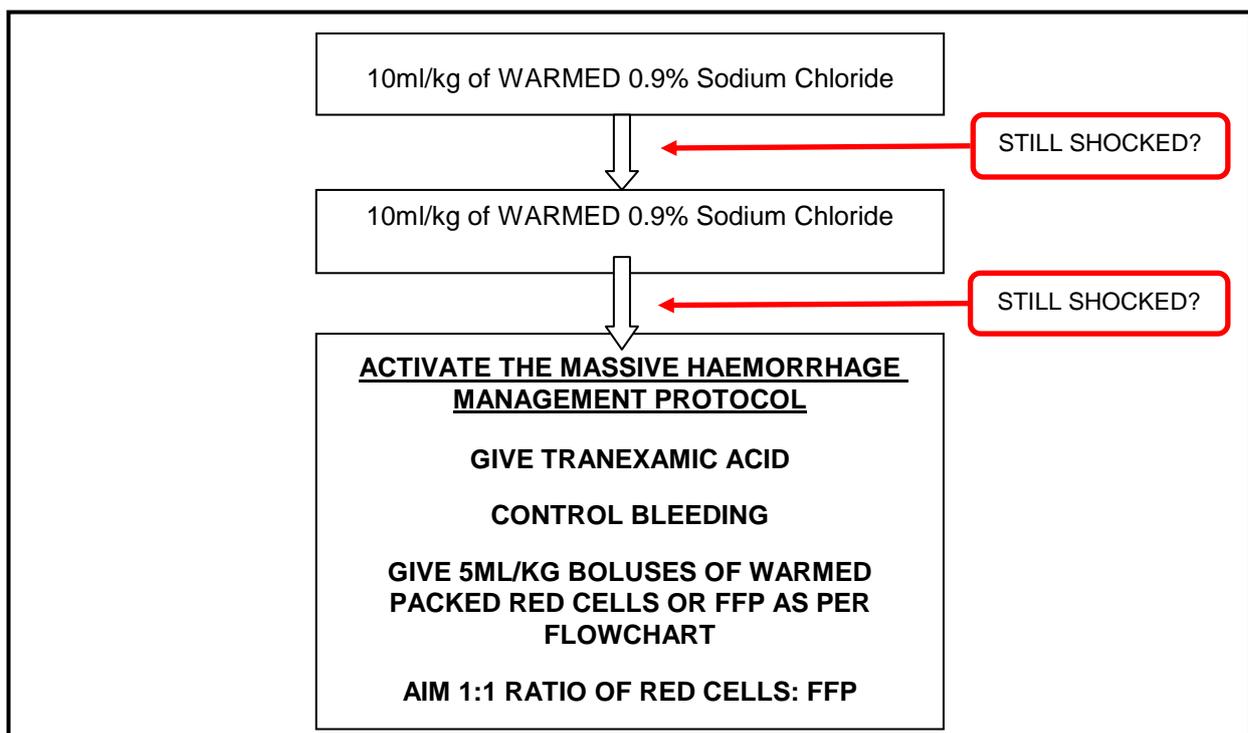
- Check airway patency and support if required.
- Call for anaesthetics assistance if airway compromised.

#### B. Assess Breathing.

- Administer 15L/min of oxygen via a non-rebreathing facemask
- Record respiratory rate, oxygen saturations and examine the chest

#### C. Assess the Circulation.

- Record pulse, blood pressure and capillary refill time
- Obtain IV or IO access
- Send blood for FBC, U&E, bone, clotting inc. fibrinogen, G&S, gas and lactate



## Massive Paediatric Haemorrhage & Transfusion Protocol

### 4.2. Activation of the Massive Haemorrhage Management Protocol

Activate if >20ml/kg of volume replacement is required in the first hour in a child with suspected ongoing haemorrhage (obvious bleeding or significant mechanism of injury)

#### 4.2.1. Mobilising People

- The lead clinician assigns each team member a role and issues them with the appropriate flashcard listing their duties:
  - Team Leader
  - Communication Facilitator
  - Fluid Resuscitator
- The Communication Facilitator immediately dials 2222 and asks switchboard to activate the Paediatric Massive Haemorrhage Protocol and state location, direction for porter e.g go to location or blood bank . Switchboard will fast bleep a porter and blood bank.
- The Communication Facilitator should then ring blood bank to give the patient details including weight, state the urgency of the situation and request blood components according to the flowchart. The bleep should not be necessary as switchboard has sent the aircall message

<b>PRH</b>	<b>4305 or 4306</b>	<b>Out of hours bleep</b>	<b>115</b>
<b>RSH</b>	<b>3556 or 3542</b>	<b>Out of hours bleep</b>	<b>512</b>

- The Paediatric Consultant on Call should be informed if not already present
- Please remember the biomedical scientist in blood bank needs to be kept informed in order to efficiently provide the requirements for the patient. This includes any change in patient location and contact numbers

#### 4.2.2. Order Blood and Blood Components

(as Massive Haemorrhage Packs 1 & 2)

##### A. Immediately life threatening bleeding, blood required immediately.

- Use O negative blood for initial resuscitation and request further units of O negative from blood bank if group specific blood is not ready
- Emergency O negative blood is stored at the following locations in SATH:

<b>PRH Issue Fridge</b>	2 Units O negative (fridge outside blood bank)
<b>PRH Maternity Fridge</b>	2 Units O negative .+ paedi pack <i>which should only be used for neonates</i> (fridge outside labour ward theatres)
<b>PRH Theatre Fridge</b>	2 Units O negative (fridge in recovery entrance)
<b>RSH Theatre Fridge</b>	2 Units O negative (fridge in inner lobby of changing rooms)
<b>RSH Issue Fridge</b>	2 Units O negative (fridge outside blood bank)

##### B. Urgent bleeding

- Group Specific – blood available from blood bank in 30 minutes
- Full Cross Match – blood available from blood bank in 60 minutes

##### Fresh Frozen Plasma (FFP)

- Ratio of units of FFP to units of RBC should be in the range of 1:1 or 1:2
- Requires 30 minutes to thaw

# Massive Paediatric Haemorrhage & Transfusion Protocol

## Platelets

- Should be ordered with the second and subsequent issue of red cells – Massive Haemorrhage Pack 2
- Request platelets sooner if there is multiple trauma, head injury, known thrombocytopenia, abnormal platelet function (aspirin), or persistent active bleeding
- Platelets are not kept in stock and generally need to come from Birmingham and may not be available for over 60 minutes.
- As always, close liaison with blood bank and the early involvement of a consultant haematologist is required.

## Cryoprecipitate (discuss with on-call Consultant Haematologist)

- Fibrinogen deficiency may develop when > 1 TBV has been replaced
- FFP may provide enough fibrinogen without the need for cryoprecipitate
- If fibrinogen remains <1g/L then give 5ml/kg (1 unit = 50mls)
- Requires 30 minutes to thaw

## Other drugs and blood products:

### 4.2.3. *Tranexamic Acid*

- Administer as soon as possible

**Loading dose: 15mg/kg (max 1g) diluted in 10ml of 0.9% Sodium Chloride as IV bolus over 10 mins**

**Maintenance infusion: 2mg/kg/hr (max 1g) for 8 hours or until bleeding stops (suggested dilution 500mg in 500mls of 0.9% Sodium Chloride)**

**IF > 12years USE ADULT DOSING i.e. LOADING 1g AND MAINTENACE 1g OVER 8 HOURS**

### 4.2.4. *Haemostatic Drugs*

- Always discuss with the Consultant Haematologist On Call (via switchboard)
- Consider if worsening coagulopathy or if the patient is known to have an inherited bleeding disorder or to be anti-coagulated
- Agents include Vitamin K, Prothrombin Complex Concentrate (Octoplex) and recombinant factor VIIa (NovoSeven)
- These products are ordered via blood bank and a request form is required and can be found in 'test search' in review

### 4.2.5. *Controlling Bleeding*

- Direct pressure for external haemorrhage
- Application of tourniquet for traumatic amputation
- Stabilisation of long bone and pelvic fractures using splints
- Urgent endoscopic or surgical intervention
- Embolisation under radiological guidance

## Massive Paediatric Haemorrhage & Transfusion Protocol

### 4.3 Monitoring & Therapeutic Goals

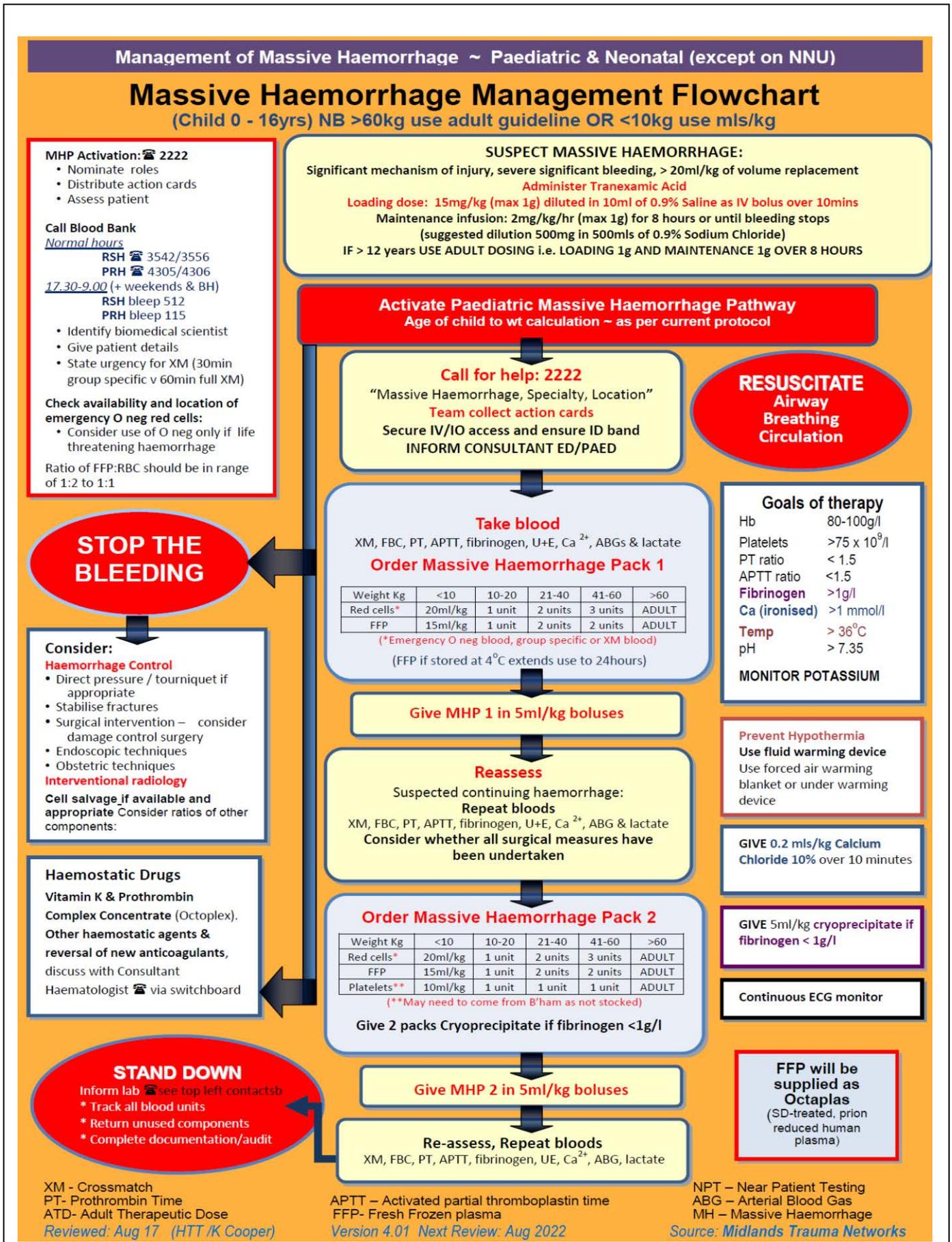
- Continuous HR, ECG, RR, SpO2 monitoring
- Record temperature every 30 minutes
- Record non-invasive blood pressure every 5 minutes until stable
- Start a fluid balance chart including a tally of fluids & components administered
- Insert urinary catheter and document urine output hourly until stable
- Consider arterial and CVP monitoring
- Take blood for FBC, U&E, bone, clotting including fibrinogen, blood gas, lactate and blood sugar after each Massive Haemorrhage Pack

<b>Haemoglobin</b>	<b>80-100g/L (no more than 12g/L)</b>
<b>Platelets</b>	<b>&gt;50</b>
<b>PT ratio</b>	<b>&lt;1.5</b>
<b>APPT ratio</b>	<b>&lt;1.5</b>
<b>Fibrinogen</b>	<b>&gt;1g/L</b>
<b>Ionised Calcium</b>	<b>&gt;1 mmol/L</b>
<b>Potassium</b>	<b>3.5-5 mmol/L</b>  *Treat K <sup>+</sup> levels > 6 mmol/L with bolus of 0.1 unit/kg insulin (Actrapid) and 10 ml/kg of 10% Glucose
<b>pH</b>	<b>&gt; 7.35</b>
<b>Temperature</b>	<b>&gt; 36°C</b>

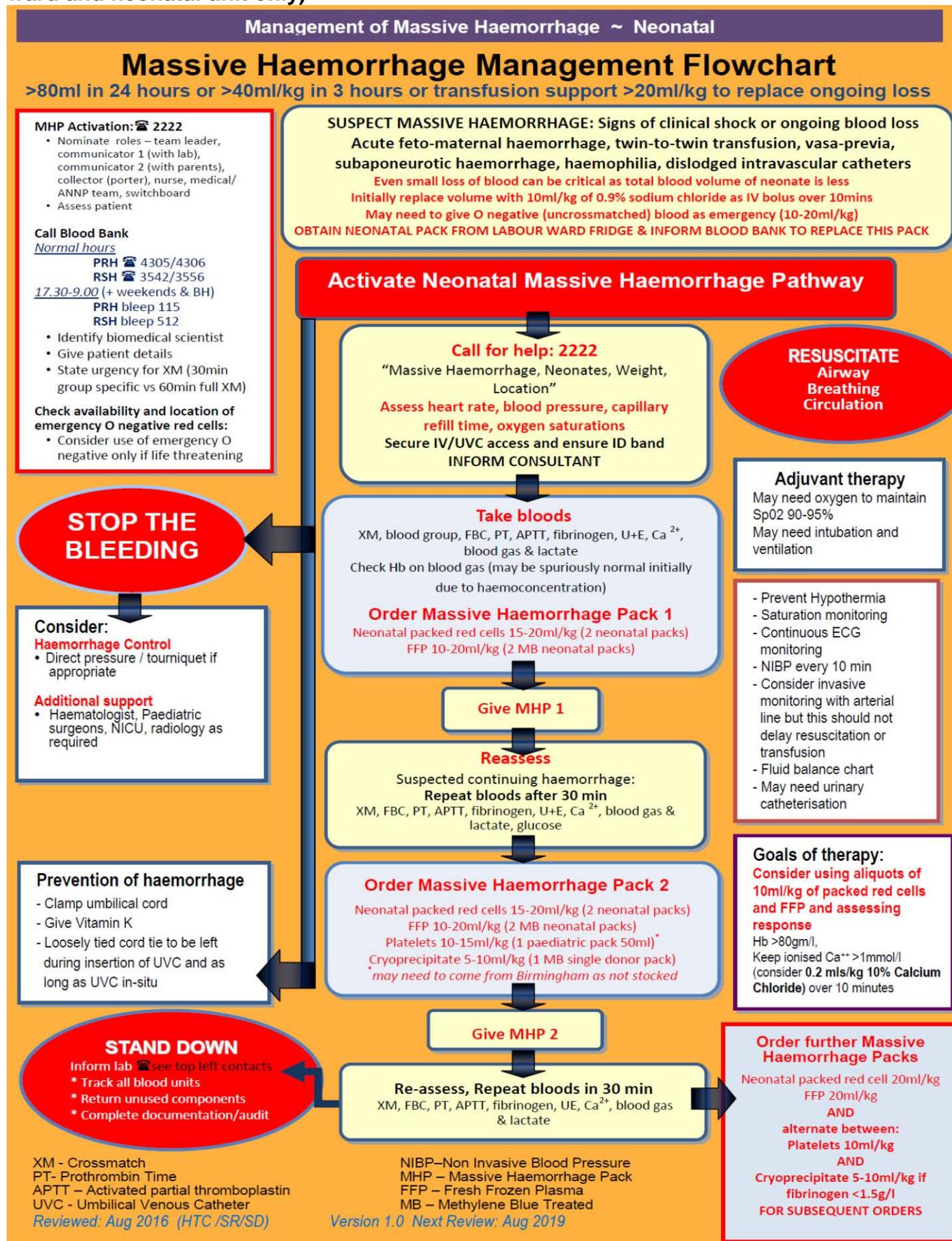
### 4.4 Deactivation

- Bleeding controlled and patient stable
- Inform blood bank
- Track all blood components
- Return unused components to blood bank

Table 1a – Flowchart for management of the haemorrhaging patient (all areas excluding neonatal unit)



**Table 1b – Flowchart for management of the haemorrhaging patient (display in labour ward and neonatal unit only)**

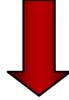


XM - Crossmatch  
PT- Prothrombin Time  
APTT – Activated partial thromboplastin  
UVC - Umbilical Venous Catheter  
Reviewed: Aug 2016 (HTC/SR/SD)

NIBP– Non Invasive Blood Pressure  
MHP – Massive Haemorrhage Pack  
FFP – Fresh Frozen Plasma  
MB – Methylene Blue Treated  
Version 1.0 Next Review: Aug 2019

**Table 2 - Unanticipated Blood Loss in the theatre environment**

Patient discussed at Team Brief following the WHO Safer Surgery Checklist



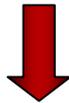
**In the event of an “Unanticipated Blood Loss”.**

The scrub practitioner/circulating practitioner or any other member of the team will **verbalise** any blood loss concerns to the theatre team.



**Surgeon and Anaesthetist alerted to unanticipated blood loss.**

- Decision agreed to begin measurement of blood loss from swabs, suction and other losses including drapes and floor
- Theatre team to agree regular interval for verbal update to surgeon and anaesthetist



**Consideration to be given for the following:**

- Blood component replacement therapy including red cells, FFP, platelets, cell salvage. Communicate with Blood Bank.
- Invasive monitoring i.e. CVC to monitor central venous pressure, Arterial Pressure monitor.
- Anaesthetist and Surgeon to consider continuing or abandoning procedure.



If significant blood loss, or 50% of TBV loss in 3 hrs. Instigate “Massive Transfusion Protocol” (table 1)

## 5 Review Date

This policy will be reviewed every 3 years unless there are significant changes at either at national policy level, or locally.

## 6 Monitoring and Review Process

This guidance will be monitored by the clinical audit process. Activation of the massive transfusion protocol should be recorded via the laboratory MHP activation worksheet and reviewed quarterly via the HTC

## 7 References

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- Handbook of Transfusion Medicine 4th Edition (2007) The Stationery Office. [WWW.transfusionguidelines.org.uk/index.asp?Publication=HTM&Section=9&pa](http://www.transfusionguidelines.org.uk/index.asp?Publication=HTM&Section=9&pa).
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- CRASH 2 study: Tranexamic acid and trauma patients. *Lancet* 2011;vol 377 (9771) 1096-1101

## 8 Associated Documentation

- ♦ BBMTP - Massive Transfusion Protocol (laboratory)

**Flashcards for specific tasks**

**TEAM LEADER**

- Activate the massive haemorrhage protocol (**2222, state speciality**)
- Assign roles for communication and IV resuscitation

**Ensure the following;**

- Patient has IV access x 2
- Tranexamic acid has been/is administered
- Blood samples to lab (utilise porter)

**Early consideration of;**

- Methods of haemorrhage control (e.g. early activation) theatre/endoscopy/radiology/cell salvage
- Temperature control & aims for therapy (monitor hyperkalaemia)

**COMMUNICATION FACILITATOR**

- Ensure 2222 has been carried out
- Phone (bleep if no answer) blood bank (*numbers on reverse of this card*)
  - Give patient details
  - State urgency – (*may just require red cells initially and will phone for FFP if bleeding not under control by ¾ of initial issue of RBC*)
  - Ordering pack 1 = RBC +FFP as wt chart
  - Order pack 2 & subsequent packs as required = RBC +FFP + platelets as wt chart
- Co-ordinate porter to collect components
- Contact consultant if not in attendance
- Contact theatre/other depts as required
- PHONE BLOOD BANK WHEN COMPONENTS NO LONGER REQUIRED

*RBC = red blood cells,  
FFP = fresh frozen plasma*

**FLUID RESUSCITATION FACILITATOR**

- Blood warmer if red cells administered >50mls/kg/hr (*e.g. >100ml/min or via a central line*)
- Fluid chart
  - Tally of components/fluid administered (as components will not arrive together as a pack)
- Make team leader aware of number components given, >10 units red blood cells, consider 10% calcium chloride
- Return unused components to blood fridge/blood bank (*preferably within the 30 min rule*)
- Complete audit form

**MASSIVE  
HAEMORRHAGE  
PROTOCOL FLASHCARDS**

**PLEASE ALLOCATE EACH OF THE 3  
CARDS TO EACH PERSON  
CARRYING OUT THIS SPECIFIC  
ROLE**

**PLEASE RETURN THESE CARDS TO THE DRIP STAND  
HANGER ON THE RESCUSCITATION TROLLEY**

## Massive Paediatric Haemorrhage & Transfusion Protocol

To go onto the back of the communication card

### Normal hours

**RSH** ☎ 3542/3556

**PRH** ☎ 4305/4306

17.30-9.00 (+ weekends & BH)

**RSH** bleep 512

**PRH** bleep 115

### **SWITCHBOARD will;**

On receiving 2222 call;

- Put aircall message only to blood bank and porter carrying the emergency bleep, stating;
  - Massive haemorrhage (adult/paed/neonatal)
  - Location

**PLEASE RETURN THESE CARDS TO THE DRIP STAND HANGER ON THE RESCUSCITATION TROLLEY**

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