

## Paediatric Major Haemorrhage - Full Clinical Guideline Joint

Reference no.: CH CLINC C53/2

### 1. Introduction

Paediatric Traumatic Major Haemorrhage is a rare event at UHDB. Notwithstanding it is essential that a clear protocol exists to support clinical decision making and management of process during what is likely to be a busy resuscitation. This guidance can be accessed in combination with local and regional major trauma pathways and specific injury guidance available on the trust intranet.

### 2. Aim and Purpose

Establish a defined protocol for management of major haemorrhage in children of UHDB based on national and international guidance as well as more recent studies with a summation of the evidence behind them.

### 3. Definitions, Keywords

Major Haemorrhage, Major Trauma, Tranexamic acid, Jehovah's witness

### 4. Main body of Guidelines

Early use of blood products as opposed to crystalloid infusion has been shown to reduce the rate of mortality in major haemorrhage [7].

When a paediatric major haemorrhage has been recognised the major haemorrhage protocol should be activated. The first steps to be taken are outlined on the major haemorrhage action card. NB Major Haemorrhage can be declared prior to arrival if massive haemorrhage expected.

- Senior clinician declares a major haemorrhage
- A runner is assigned to take all samples and collect all blood products from the lab
- A named blood bank liaison (to request products) is assigned.
- Blood bank is contacted via telephone or pager and "Paediatric Massive Haemorrhage Alert" must be stated
- Inform blood bank of the patient id (if known), Weight, Location and contact number
- Request initial products (see below)

#### Haemorrhage Control

As part of the trauma primary survey control of life threatening haemorrhage should be an early priority [7]. This may be via direct pressure, application of a tourniquet, splinting of fractures or application of a pelvic binder. In the case of massive internal bleeding early consideration of damage control surgery or interventional radiology is essential. Recommendations for management of specific injuries are contained within local, regional and national trauma guidance.

#### Requesting Products

Initial requests during major haemorrhage should be made verbally via the contact details on the massive haemorrhage action card.

In the case of no group and save sample being available O RhD-ve red cells are available on the level 5 issue fridge at all times. Emergency Plasma can be made available within 20 minutes.

If a group and save is already available group specific red cells can be requested from blood bank (5 minutes) and group compatible plasma (20 minutes)

Fully compatible (cross-matched) red cells are available 40 minutes after group and save samples are received. If the patient is eligible for electronic issue then subsequent red cells are available in 5 minutes.

For infants under the age of 4 months a maternal sample (if available) should also be sent.

### **Selection of Products and Transfusion Ratio**

In children with major haemorrhage in the context of trauma there is clear evidence that crystalloid resuscitation is associated with increased mortality [1,3,5-6]. Early transfusion of blood products is therefore recommended. UHDB does not have set 'packs', meaning clinicians are expected to request the blood products that they need as per the process outlined above. The evidence base for which products to give and in what ratios are either based upon registry studies or extrapolated from randomised control trials in adults [1-6].

Early goal directed therapy is recommended by international consensus guidelines [3] and may be associated with an increase in survival. Near patient testing is not available at UHDB therefore regular laboratory samples should be sent to guide requests. Clinicians should aim for the following parameters when giving massive transfusion [1]

- Hb > 80
- Platelets > 75
- Fibrinogen > 1.5
- PT Ratio or APTT ratio < 1.5
- Ionised Calcium > 1 mmol/L
- pH > 7.35

During early resuscitation – prior to receiving laboratory results red blood cells and fresh frozen plasma should be given in a 1:1 ratio in 20ml/kg aliquots. After each 40ml/kg consider transfusing platelets at a dose of 20ml/kg (upto 1 adult unit) and cryoprecipitate 10ml/kg. The evidence base for these recommendations is summarised below.

The British Committee for Standards in Haematology Guidelines (revised 2015) [1] advises that Fresh Frozen Plasma: Red Cells should be transfused in a 1:1 or 1:2 ratio and 20ml/kg of platelets to be given after each 40ml/kg of red cells.

The PROPRR trial 2015 [2] in adults demonstrated no statistically significant difference in mortality between patients transfused in 1:1:1 and 1:1:2 ratio although more patients in 1:1:1 group achieved homeostasis. Akl et al [5] undertook a retrospective review of US trauma data

and demonstrated increased 24 hour survival and reduced 24 hour red cell transfusion requirements when a 1:1 ratio of FFP:RBC was used as opposed to 1:2 or 1:3.

Data from the US based Trauma Quality Improvement Project [4] (a US trauma registry) examined children receiving more than 40ml/kg of blood products post traumatic haemorrhage. Those who received cryoprecipitate within the first 4 hours had a lower 24 hour mortality compared to propensity matched controls who did not. Cryostat-2 is a randomised control trial in adults examining the timing of cryoprecipitate administration on mortality which will shortly be reporting its findings.

### **Tranexamic Acid (TXA)**

The evidence base behind tranexamic acid in children is mainly extrapolated from the adult literature. The CRASH-2 study [9] demonstrated a 10% reduction in 28 day all-cause mortality in adults given TXA within 3 hours of injury resulting in major haemorrhage. The follow-up CRASH-3 Study [10] was unable to demonstrate a statistically significant difference in mortality in isolated traumatic brain injury when adults were given TXA within 3 hours. However in a subgroup with mild-moderate head injury (GCS > 8) the risk of head injury related death tended towards significant (0.81-1.0) with no increase in complications. A retrospective propensity matched cohort study of paediatric warzone victims in Camp Bastion demonstrated a survival benefit for those treated with TXA [11]. A meta-analysis combining studies in paediatric combat and civilian trauma [12] failed to demonstrate a survival benefit when giving TXA, whilst noting the wide heterogeneity of studies and their retrospective nature.

Consensus guidance [8] therefore recommends in children that are injured with suspected bleeding that demonstrate either:

- Significant tachycardia (age specific)
- Hypotension
- Known significant bleeding

Should receive tranexamic acid within the first 3 hours of injury. UHDB has a TXA monograph for use in paediatric trauma. The recommended dose in major trauma is 30mg/kg for a single dose (max 2g).

### **Trauma Induced Coagulopathy**

In multiply injured patients a systemic endotheliopathy due to tissue damage, hypoperfusion and systemic inflammation leads to the traumatic coagulopathy which is associated with increased mortality [3]. Systemic hypothermia, acidosis and dilution of coagulation factors in combination with consumption of coagulation factors are risk factors for traumatic coagulopathy and should therefore be avoided.

- Avoid hypothermia. Replace clothing or blankets following examination and use active warming measures (e.g forced air warming) for trauma patients. Transfuse blood via active warming devices.
- Avoid acidosis – monitor blood gas aiming pH > 7.35 and lactate < 1.
- Avoid Hypocalcaemia – Blood products contain calcium chelating agents (citrate). Calcium may require replacement. Can be given as Calcium Gluconate 10% at a dose

of 0.11mmol/kg (max 4.5mmol) over 10 minutes. Dilute to 0.045mmol/mL if given peripherally. (Further details in pharmacopoeia)

### **Jehovah's Witnesses**

Children are defined as those under the age of 18. No child should die due to not receiving a blood transfusion. It may therefore be required to treat children against parental wishes in an emergency. The trust policy on managing such situations can be found on Koha: [Trust Policy and Procedures for Managing Requests of Exclusion from Treatment with Blood Components / Products](#)

# Paediatric Massive Haemorrhage Action Card

Activate when evidence of hypovolaemia + suspected massive haemorrhage

**Contact Blood Bank via Pager Number 3090 or Ext. 88532  
Emergency Mobile 07384914100 (Derby Only)**

## Declare a Paediatric Massive Haemorrhage

Designate a Runner to collect **all** products

Designate a Blood Bank Liaison

Blood Bank Liaison Calls Blood Bank and states "**Paediatric Massive Haemorrhage Alert**"

Provide Patient ID (if arrived), Weight, Location and Contact Number

## General Measures

Control Haemorrhage

Strongly Consider Tranexamic Acid

Avoid Hypothermia, Hypocalcaemia, Acidosis, Take bloods ^

## Initial Requests (Verbal) \*

20ml/kg Red Cells (up to 4 adult units)

20ml/kg FFP (up to 4 adult units)

## If Continuing Bleeding Request

Further Red cells and FFP (20ml/kg)

20ml/kg (up to 1 adult unit) Platelets

10ml/kg Cryoprecipitate (up to 2 pools)

- Then -

## **Consult the Massive Haemorrhage Pathway**

Contact on-call Haematology consultant for advice on transfusion management

\*If G&S (Group and Save) Available – Request Group specific Red Cells (5 minutes) and Compatible plasma (20 minutes)

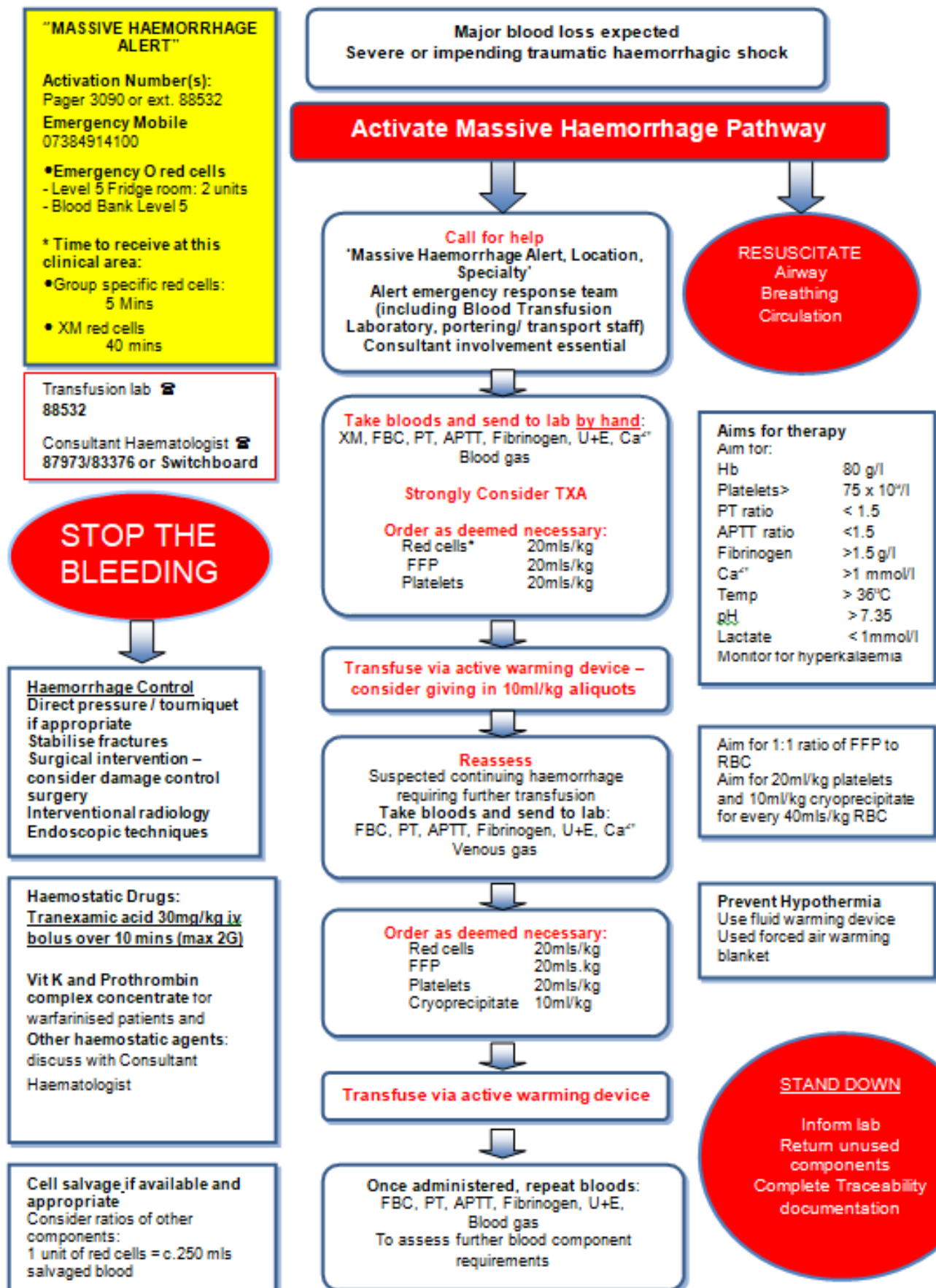
If No G&S Available – 20ml/kg O Negative Uncrossmatched Red Cells (immediately available in level 5 issue fridge. Emergency Plasma (20 minutes)

Transfuse in a 1:1 of FFP:RBC awaiting blood results  
CMV Negative for infants < 6 months of age

ALWAYS – Complete checking procedures. Blue Traceability tabs MUST be completed



# Transfusion Management of Massive Haemorrhage in Children



## References

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**Documentation Controls**

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