A Bleeding Nightmare – Improving Patient Outcomes

Paediatric Major Haemorrhage

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The World of Paediatrics

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Definitions

Neonate <28 days old

Infant 28 days – 1 yr

Child 1-18 yr (but >16 admitted under adult ward)

PAEDIATRIC MAJOR HAEMORRHAGE PROTOCOL
Rapid blood loss with shock or with no likelihood of control.
Anticipated or actual administration of 40 mL/Kg of blood

FOR USE IN CHILDREN under 50Kg
Larger children - use adult protocol

Call **2222.** State "**Major Haemorrhage**". Give Hospital and **Location**

Nominated Transfusion Co-ordinator MUST CONTACT Blood Transfusion with the following:

1. Patient identification – Hospital Number, Name & Date of Birth (or trauma patient details)
2. Approximate weight of child
3. Patient location
4. Name and contact details of Nominated Transfusion Co-ordinator for on-going communication
5. Cause of bleeding
6. Confirm Group &Screen, Full Blood Count & Coagulation Screen samples are being sent to laboratories
   - *If difficulty obtaining blood samples ensure 4mL EDTA sample sent for crossmatch as a priority*

Call the Blood Transfusion Laboratory
Monday-Friday 9am-5pm Ext. 21157
Trauma Ext. 22043
Bleep 1611

Definition of Massive Blood Loss
80mls/kg in 24 hours
40mls/kg in 3 hours
2-3mls/kg/min

The Blood Transfusion Laboratory will issue:
20ml/kg O negative RBC & 20ml/kg FFP
Or
20ml/kg group specific* RBCs & 20ml/kg FFP (*if valid sample in Laboratory)
(If no valid samples continue to issue emergency blood)

Once these components are collected from the laboratory:
The laboratory will continue to issue **20ml/kg RBCs** and **20ml/kg FFP**, whilst the patient is bleeding, until stood down from MHP

Administer Tranexamic Acid

At this stage consider requesting:
- Platelets 15-20ml/kg (up to 1 pack)
- Cryoprecipitate 10ml/kg (up to 10 single-donor units)
- After 10 RBCs given consider Fibrinogen concentrate (50mg/kg)

Porters:
- Report to Transfusion Lab to collect blood, then to ward, except for:
- A&E at SMH & CXH: Report to A&E whereby staff will tell porters when to collect blood components

Availability of Blood For Collection

Fresh Frozen Plasma
30 minutes to thaw

Cryoprecipitate
30 minutes to thaw

Platelets
Immediate if on site

The clinical area will:
- **Nominate a Transfusion Co-ordinator to ensure effective management of blood components**
- Send full blood count & coagulation screen samples as a baseline and hourly thereafter
- Send repeat group & save sample if requested
- Ensure the patient's Consultant has been informed (if not already aware)
- Discuss on-going management including authorisation of other clotting factors with the Haematology SpR (contact through Switchboard if contact details not known)
- Where required ensure RBC are warmed appropriately
- Inform the Blood Transfusion Laboratory when **STOOD DOWN**

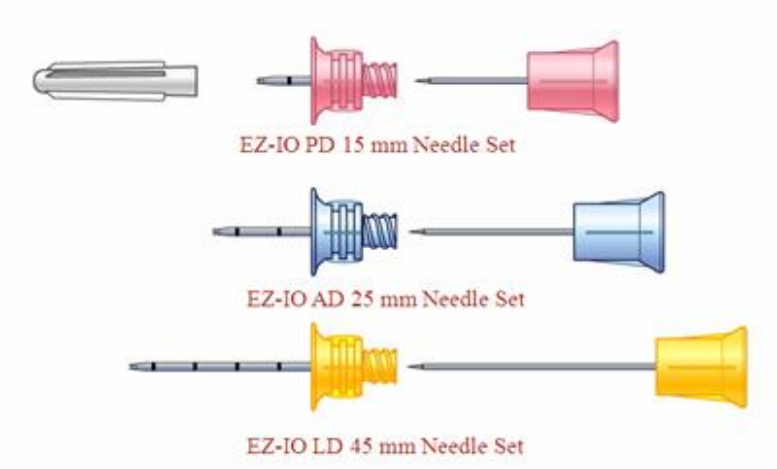
Imperial College Healthcare NHS Trust
PAEDIATRIC MAJOR HAEMORRHAGE PROTOCOL 2018
Version 7
Please remove and destroy any previous versions of the Paediatric Major Haemorrhage Protocol

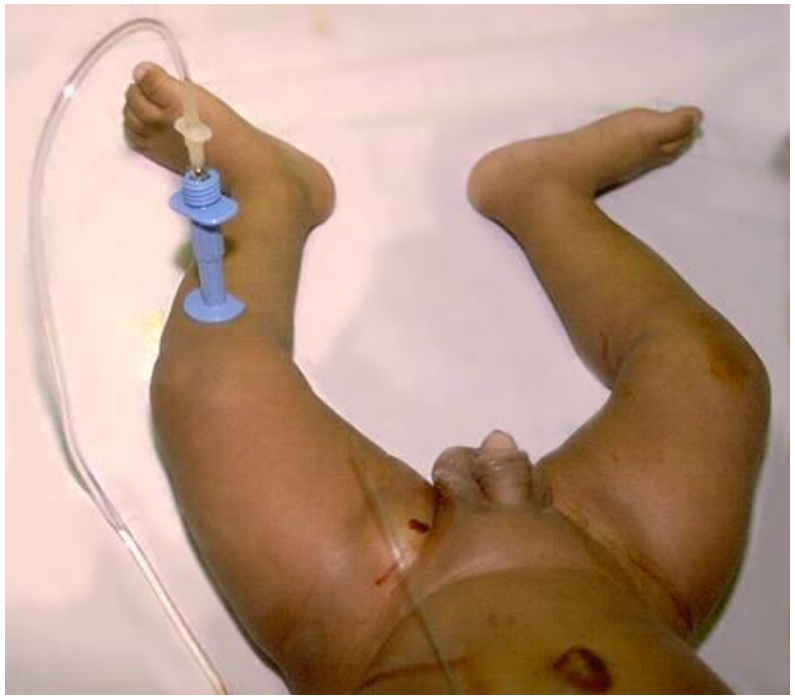
- Call 222
- State hospital / location
- Call transfusion lab
- Provide patient details
- Maintain contact with lab throughout MH call

- GIVE TXA EARLY

Remember
to
STAND DOWN

What if peripheral access is not possible?





Questions

What is the total blood volume for a 2 year old?

Define massive blood loss

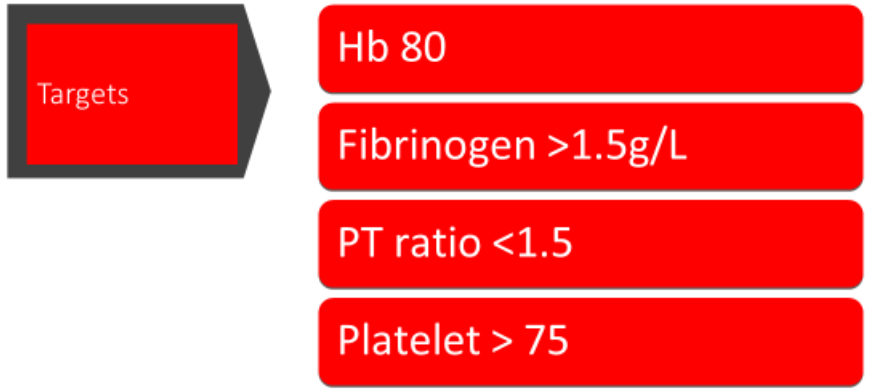
How would you manage this case and what product support would you recommend?

4. What are your targets?

1. Total volume 80mls/kg

2. Massive blood loss

- 80mls/kg in 24 hours
- 40mls/kg in 3 hours
- 2-3mls/kg/min



Activate Resuscitation

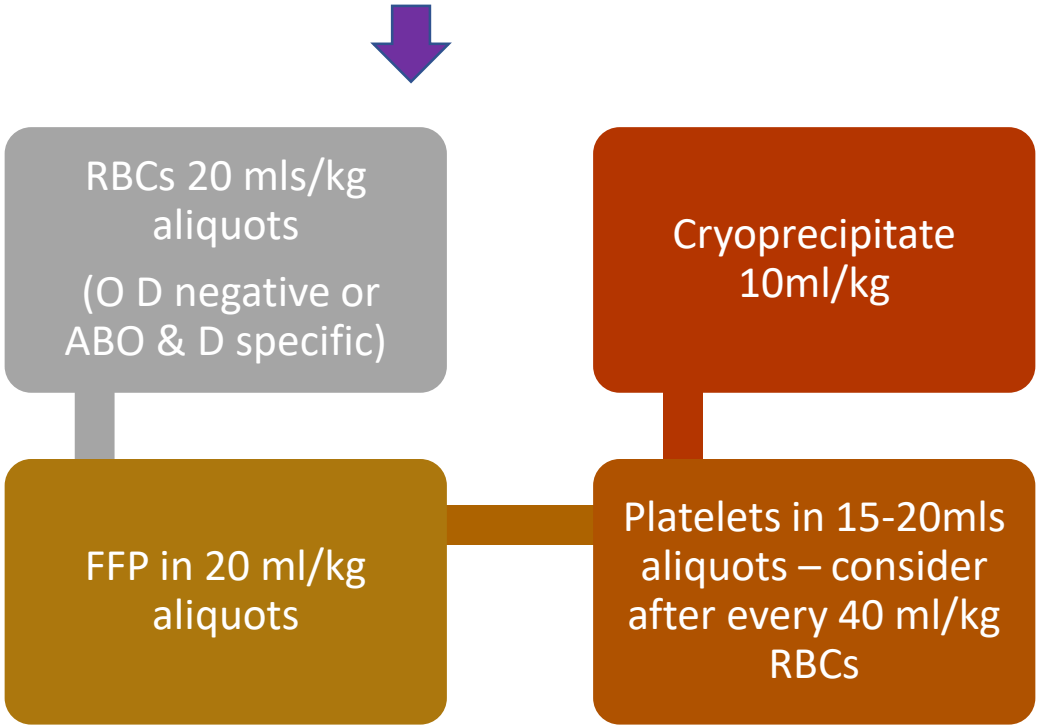
- Tranexamic acid 15mg/kg
- Specialist support
  - Group O Rh D negative / Group specific
  - Replace mls/kg body weight
- Anticipate and treat coagulopathy / low platelet count
  - Ratio 1 FFP (methylene blue): 2RBC
- Avoid
  - hypothermia
  - hypocalcaemia
  - acidosis
  - hyperkalaemia

Immediate transfusion:

- 20 ml/kg RBCs O D-negative or ABO Rh D compatible
- 1 FFP:2 RBC

Early use of FFP, CRYO and platelets prior to the results of coagulation tests where bleeding is on-going.

After initial resuscitation, appropriate aliquots to be transfused are as follows:



A case of an unusual complication

Transfusion Associated Hyperkalaemia

Recognised complication of massive RBC in Paediatrics. 8/9 case reports (in English) of TAHCA. K+ ranged from 9.3-12mmol/L. Rate of blood transfusion, more so than the total volume, cardiac output and site of infusion were key in development of transfusion-associated hyperkalaemia in paediatric patients. (Lee *etal* (2014)

Often multifactorial & difficult to isolate completely to transfusion

RBC during storage from 0-42 days studied by Sezdi, Bayik, Ulgen (2006)

Vraets *etal* (2011) cited that the increase in potassium appears to be roughly linear with time.

Weiskopf *etal* (2005) studied the effects of irradiation (25 Gy) and washing on potassium:

Potassium of irradiated units increaese more rapidly than non-irradiated units. Potassium of units washed after irradiation increased more slowly than if washed before irradiation.

Vraets etal 2011

Irradiated and then washed RBC	
0 hours	1.6 +/- 0.3mmol/L
6 hours	5.3 +/- 0.5mmol/L
12 hours	8.6 +/- 1.0 mmol/L
24 hours	14.3 +/- 1.3mmol/L
Non irradiated RBC (washed)	
24 hours	5.9 +/- 1.4 mmol/L

Causes of high K in this case

5 units RBC – Irradiated

- ? Cold units
- ?Rapid rate of transfusion

Hypovolaemic shock

Storage age

Lack of washing

Measures to reduce K+

Anticipate and replace blood loss before significant haemodynamic compromise

Use large bore (>23gauge) peripheral access

Check and correct electrolyte abnormalities frequently

Use fresher RBC in massive transfusin

Changes in Practice Locally

Changes to practice already implemented in the transfusion lab

1. Avoid issuing irradiated RBC units in all major haemorrhage / trauma calls

2. Ensure that mixture of RBC units issued: ratio of roughly 2 units >21 days with 2 units <14 days old.

3. Reduced stock holding of irradiated RBC units for BMT cover in laboratory at any one time to minimise risk of mixing irradiated units with general stock.

Changes recommended in clinical setting for implementation

1. Clearly document time each unit given to facilitate look backs using form Blood component administration records for Massive Haemorrhage (see attached document)

2. Infuse blood through cell salvage which has the effect of washing the RBC thereby reducing the potassium load given to the patient.

References

Lee A, Reduque L, Luban N, Ness P, Anton B Heitmiller E (2014) Transfusion-associated hyerkalaemic cardiac arrest in paediatric patients receiving massive transfusion.

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Sezdi M, Bayik M, Ulgen Y (2006): Storage effects on the Cole-Cole parameters of erythrocyte suspension.

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