The Royal Liverpool and
Broadgreen University Hospitals
NHS Trust

Trust Standard Operating Procedures (SOP)

Management of Massive Haemorrhage

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Management of Massive Haemorrhage
Appendix 4 of the EQMS 5 V10 Blood Transfusion Policy

Steps for Successful Coordination in Massive Haemorrhage

4.1 Initial Action

Recognise that patient has a massive haemorrhage and Senior Medical staff activate pathway for management of massive haemorrhage; Communication lead to activate Massive Haemorrhage pathway by calling "2222" and stating "Massive Haemorrhage" followed by the location and contact extension number. The laboratory will contact the clinical area back on this number.

4.2 Allocate team roles (Clinical Area)

- Team leader
- Communication lead– dedicated person for communication with other teams, especially the Transfusion Laboratory and support services. Should this change during the event the laboratory MUST be inform as soon as possible.
- Sample taker / investigation organiser / documenter
- Transporter - porter, member of team from clinical area

4.3 Complete request forms / take blood samples, label samples correctly / recheck labelling

U+E, FBC, Crossmatch, PT, APTT, Fibrinogen, ABG, Calcium, Lactate

All blood request forms must be completed as per Trust policy - Laboratory Investigations Minimum Data Standard.

4.4 Communication lead to contact laboratory:

Massive Haemorrhage Activation - **2222**

Transfusion (RLUH) Ext **4331 / 4332** **24 hours**

Inform the Switchboard Operator:

- Massive Haemorrhage
- State Location
- State Contact Extension Number

The Biomedical Scientist (BMS) will call back on this extension number and will require:

- Your name, location and extension number
- The patient's details: ideally surname, forename, hospital number, DOB (For unknown patients, as a minimum they must have a unique hospital unit number. For any unknown details write 'unknown' do not leave blank spaces).
- Order massive haemorrhage pack(s) and /or appropriate blood components (See step 4.5 for guidance on timings)
- Contact the Transfusion Laboratory if blood has been transferred in with a patient from another Trust or a patient is being transferred to another Trust.

BMS in Transfusion Laboratory will complete part 1 of the Massive Haemorrhage Form (Appendix 4) using the information given above and ensure part 2 is made available to be taken to clinical area.

4.5 Request blood / blood components

Team leader should consider Massive Haemorrhage Pathway (Appendix 1) and decide on use of:

- **Red Cells**
- **Emergency Group O*** (immediate) Available within 5 minutes of call to Laboratory. **O Negative to females of child bearing potential. O Positive to females not of child bearing potential and all males.*
- **Crossmatched**
  Available usually within 45 minutes of sample arriving in Laboratory providing the antibody screen is negative (90% of cases). The Transfusion Laboratory will inform the clinical lead if there will be any delay due to a positive antibody screen, anomalous grouping or technical problems.
- **FFP and Cryoprecipitate:**
  Be aware that FFP and Cryoprecipitate will take approx. 30 minutes from request to thaw and be issued. If patients' blood group is unknown group AB FFP/Cryoprecipitate will be issued. Once the patients group is known group specific frozen components will be issued.
- **Platelets**
  It should be noted that it **cannot be guaranteed** that the Transfusion Laboratory will have a stock of platelets. This is governed by the availability of national supplies. Platelets may need to be ordered from the NHSBT. **The minimum time for platelets to be delivered in an emergency situation is 65 minutes.**
  For patients who group is unknown group A platelets will be issued if available. Once the patients group is known group specific platelets will be issued.

  If there are NO platelets available within the Laboratory, for patients whose group is unknown, group A platelets will be ordered from the NHSBT and issued. Once the patients group is known group specific platelets will be ordered from the NHSBT issued.

  The policy does not advocate the availability of thawed group AB FFP and group A platelets on standby.

Repeat process as clinical situation requires further blood components – Please refer to Massive Haemorrhage Pathway for guidance (Appendix 1) It should be understood that the Massive Haemorrhage Pathway is intended as guidance and that further blood components can be ordered by senior Anaesthetists, Intensivists and ED medics should the clinical situation warrant it.

4.6 The Clinical / Laboratory interface

- Communication lead to arrange for transport of samples / request form to the laboratory
- BMS to telephone communication lead with results of urgent investigations
- BMS to telephone communication lead when blood / blood components are available for collection.
- Communication lead to arrange to collect blood and blood components from the Laboratory.

4.7 Stand down

Communication lead to communicate stand down of pathway to Laboratory and ensure used components have been fated on electronic blood tracking system. Any unused components to be returned to Laboratory in a timely manner.

4.8 Ensure documentation is complete

- Clinical area: monitoring of vital signs, timings of blood samples and communications, transfusion documentation in patient record, blood components fated on blood tracking.
- Laboratory: keep record of massive transfusion form

Transfusion Management of Massive Haemorrhage in Adults

Activation:
Dial "2222"
State "Massive Haemorrhage, Location, Extension Number"
Ensure Telephone Extension available for laboratory to call back

Emergency Uncrossmatched Blood:
- 4 units RLH ED Blood Fridge
- Transfusion Laboratory

Time to receive at the clinical area:
•Emergency Group O – 5 mins.
•XM red cells – 45 mins. (if antibody screen negative)

Transfusion ☎ RLH 4331/2
RLH 4330 (Out of Hours)
BGH 1293

Consultant Haematologist ☎
Mobile via Switchboard

Patient bleeding / collapses
Ongoing severe bleeding eg: 150 mls/min and Clinical shock
Administer Tranexamic Acid – esp in trauma and ideally within 1 hour
(1g bolus followed by 1g infusion over 8 hours)

Activate Massive Haemorrhage Pathway

Call for help - 2222

"Massive Haemorrhage, Location, Extension Number"
Alert emergency response team (including blood transfusion laboratory, portering staff)
Consultant involvement essential

RESUSCITATE
Airway
Breathing
Circulation

Take bloods and send to lab:
XM, FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}
NPT: ABG, TEG / ROTEM if available
and
Order Massive Haemorrhage Pack 1
Red cells* 4 units
FFP 4 units
(*Emergency O blood, group specific blood, XM blood depending on availability)

Continuous cardiac monitoring

Prevent Hypothermia
Use fluid warming device
Used forced air warming blanket

Consider 10 mls Calcium chloride 10% over 10 mins

STOP THE BLEEDING

Haemorrhage Control
Direct pressure / tourniquet if appropriate
Stabilise fractures
Surgical intervention – consider damage control surgery
Interventional radiology
Endoscopic techniques

Give MHP 1

2 packs cryoprecipitate if fibrinogen < 1.5g/L or as guided by TEG / ROTEM (< 2g/L for obstetric haemorrhage)

Reassess
Suspected continuing haemorrhage requiring further transfusion
Take bloods and send to lab:
FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}
NPT: ABG, TEG / ROTEM if available

Aims for therapy
Aim for:

Hb	80-100g/L
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 (on ABG)
Monitor for hyperkalaemia	

Haemostatic Drugs

Vit K and Prothrombin complex concentrate for warfarinised patients and
Other haemostatic agents and reversal of new anticoagulants: discuss with Consultant Haematologist

Order Massive Haemorrhage Pack 2
Red cells 4 units
FFP 4 units
Platelets 1 dose (ATD)
and subsequently
request Cryoprecipitate 2 packs
if fibrinogen <1.5g/l or according to TEG / ROTEM (<2g/l for obstetric haemorrhage)

STAND DOWN
Inform lab
Return unused components
Complete documentation
Including audit proforma

Give MHP 2

Cell salvage - if available and appropriate
Consider ratios of other components:
1 unit of red cells = c.250 mls salvaged blood

Once MHP 2 administered, repeat bloods:
FBC, PT, APTT, fibrinogen, U+E,
NPT: ABG, TEG / ROTEM if available
To inform further blood component requesting

Thromboprophylaxis should be considered when patient stable

ABG – Arterial Blood Gas
APTT – Activated partial thromboplastin time
ATD- Adult Therapeutic Dose
FFP- Fresh Frozen plasma
MHP – Massive Haemorrhage Pack
NPT – Near Patient Testing
PT- Prothrombin Time
TEG/ROTEM- Thromboelastography
XM - Crossmatch

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Laboratory Management of Massive Haemorrhage

Massive Haemorrhage Pathway Activated

Transfusion receives Call
'Massive Haemorrhage, Location, Specialty'
Transfusion lab to liaise with other labs if appropriate

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Receive call from designated communication lead in clinical area:
'This relates to massive haemorrhage situation'
The caller will state: Lab to complete **Massive Haemorrhage Form part 1**
Part 2 clinical area form to be sent with first blood components
Name and contact telephone number, name of consultant responsible
•Patient's ID (surname, forename, hospital number, DOB or minimum acceptable patient identifiers if unknown)
•Requirements:
- Whether O Neg/Pos is to be used
- Order massive haemorrhage pack 1 +/- other components deemed appropriate.
- Clarify urgency of requirements to decide on need for further emergency group O , or time to wait for group specific or crossmatched red cells (issue as part of pack 1)
- FBC, PT, APTT, Fibrinogen, U+E*, ABG*, Calcium*, lactate*

*may be near patient test or communication lead to liaise with appropriate labs

Receive samples and request forms

Haematology
Perform FBC, PT, APTT, Fibrinogen

Ring results to communication lead when available

Receive further calls from communication lead in clinical area:
Repeat investigations
Order for MHP 2
Liaise with on call haematologist (consultant / SpR) if needed
Order for further components dependent on ongoing results
Stand down

Transfusion
Perform Group, antibody screen and crossmatch

Prepare MHP 1
Red cells* 4 units
(*emergency group O blood, group specific blood, XM'd blood depending on urgency)
FFP (group specific) 4 units
(If no plt stock order 2ATD on blue light from NHSBT)

Ring clinical area (communication lead) when blood / components ready

Prepare MHP 2
Red cells 4 units
FFP 4 units
Platelets 1 ATD
Cryoprecipitate 2 units if Fibrinogen < 1.5g/l

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Transfusion Management of massive haemorrhage in children

Ensure a consultant is aware of the massive haemorrhage and a senior member of staff is available to take charge of resuscitation if not already present

Activation Tel Number(s)
Transfusion lab RLUH
Ex 4331 (24 hours)

Transfusion lab BGH
Ex 1293 (24 hours)

•Emergency uncrossmatched O red cells are available in the transfusion lab
•O negative issued for females
•O positive issued for males

•Time red cells available in Lab:
• Emergency Group O 5 mins
•Group specific red cells 20 mins.
• XM red cells 45 minutes (if antibody screen negative)

Tranexamic acid 15mg/kg bolus over 10 mins (max 1000mg) and 2 mg/kg/hr infusion (max 125mg/hr)
Ongoing severe bleeding (overt / covert) and received 20ml/kg red cells or 40ml/kg any fluid for resus in preceding hour
Signs of hypovolaemic shock and / or coagulopathy

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Activate Massive Haemorrhage Pathway

Call for help
'Massive Haemorrhage, Location, Specialty'
Alert Blood transfusion laboratory
Alert emergency response team including paediatric SpR on call and portering/transport staff
Consultant involvement essential

RESUSCITATE
Airway
Breathing
Circulation

Take bloods and send to lab:
XM, FBC, PT, APTT, fibrinogen, U+E, Ca^{2+} **(A)BG, and**
Order MHP 1 (see table 1)

Continuous cardiac monitoring

Prevent Hypothermia
Use fluid warming device
Used forced air warming blanket

Consider 0.2 ml/kg 10% calcium chloride (max 10ml) over 30 min

STOP THE BLEEDING

Haemorrhage Control
Direct pressure / tourniquet if appropriate
Stabilise fractures
Surgical intervention (consider damage limitation surgery)
Interventional radiology
Endoscopic techniques

Haemostatic Drugs
Vitamin K and Prothrombin complex concentrate for warfarinised patients
Other haemostatic agents: discuss with Consultant Haematologist

Give MHP 1
Red cells and FFP: give 10ml/kg in aliquots in a 1:1 ratio, reassess blood loss and response to treatment and repeat as necessary.

Further cryoprecipitate (10ml/kg) if fibrinogen < 1.5g/l

Reassess
Suspected continuing haemorrhage requiring further transfusion
Take bloods and send to lab:
FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}**(A)BG**
Order MHP 2 (see table 2)
When half of MP1 Used consider ordering MHP2

Aims for therapy
Aim for:

Hb	80-100g/l
Platelets	>75 x 10^9/l
PT ratio	< 1.5
APTT ratio	<1.5
Fibrinogen	>1g/l
Ionised Ca^{2+}	>1.0 mmol/l
Temp	> 36°C
pH	> 7.35 (on ABG)
pH	> 7.25 (capillary BG)

Monitor for hyperkalaemia

Give MHP 2
Red cells and FFP: give 10ml/kg in aliquots in a 1:1 ratio, reassess blood loss and response to treatment and repeat as necessary.
Plts give upto 10ml/kg
Cryo give up to 10ml/kg

STAND DOWN
Inform lab
Return unused components
Complete documentation including audit proforma

Once MHP 2 administered, repeat bloods:
FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}
NPT: (A)BG
To inform further blood component requesting

Thromboprophylaxis should be considered when patient stable

(A)BG – (Arterial) Blood Gas
APTT – Activated partial thromboplastin time
FFP- Fresh Frozen plasma
MHP – Massive Haemorrhage Pack
NPT – Near patient Testing
PT- Prothrombin Time
XM - Crossmatch

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Table 1 – Major Haemorrhage pack 1 (MHP 1) order these volumes, which are also the maximum volumes to be administered from this pack in each weight category. Calculate volumes to be administered as detailed in the flow chart, but do not exceed these maximums (see example below)

Weight	Red cells * group O, group specific, crossmatched depending on availability	FFP
<5kg	2 Paediatric units (80-100ml)	100ml of OCTAPLAS
5-10kg	1 Adult unit (suitable for neonatal use if less than 12 months old) (250ml)	1unit of OCTAPLAS
10-20kg	2 Adult units (suitable for neonatal use if less than 12 months old) (500ml)	2 units of OCTAPLAS
>20kg	4 Adult units (1000ml)	4units of OCTAPLAS

Table 2 – Major Haemorrhage pack 2 (MHP 2) order these volumes, which are also the maximum volumes to be administered from this pack in each weight category. Calculate volumes to be administered as detailed in the flow chart, but do not exceed these maximums (see example below)

Weight	Red cells	FFP	Cryoprecipitate	Platelets
<5kg	2 Paediatric units (80-100ml)	100ml of OCTAPLAS	1 single donor unit MB treated (40ml)	1 Paediatric pack of platelets (50ml)
5-10kg	1 Adult unit (suitable for neonatal use if less than 12 months old) (250ml)	1unit of OCTAPLAS	2 single MB donor units (80ml)	2 Paediatric packs of platelets (100ml)
10-20kg	2 Adult units (suitable for neonatal use if less than 12 months old) (500ml)	2 units of OCTAPLAS	1 pool (5 units) (200ml) not MB treated	1 Adult apheresis pack (200ml)
>20kg	4 Adult units (1000ml)	4units of OCTAPLAS	2 pools (10 units) (400ml) not MB treated	1 Adult apheresis pack (200ml)

Red cells and FFP may be given through the same cannula via a Y-connector or 3-way tap provided the connection to the cannula is a short line. Platelets are ideally infused through a separate line, or after a clear flush, but may be given infused with red cells or FFP at a Y-connector or 3-way tap with a short connection to the cannula, **but the mixing must only occur after the platelets have passed through the filter.**

Administer red cells and FFP in aliquots of 10 ml/kg and in a ratio of 1:1; constantly assessing and reassessing the extent and rate of blood loss and the response to each such aliquot.

When half of MHP1 has been administered consider ordering MHP 2, if bleeding is on-going and control of the situation remains elusive.

Continue to administer aliquots of red cells and FFP in 10 ml/kg boluses as dictated by the patient's response to fluids, rate of blood loss etc (the whole clinical picture) until MHP2 is available.

With MHP2 use Red cells and FFP in the same fashion and administer a dose of platelets via a separate line (if at all possible) and give up to 10 ml/ kg of platelets. In addition administer a bolus of cryoprecipitate in a dose of up to 10 ml/kg .
Stop administering red cells and FFP if the patient's condition stabilises and it does not seem to be clinically indicated. Fine tune what products to give and in what volumes based on the lab results (when these become available) or TEG / ROTEM and bedside evidence of coagulopathy (microvascular bleeding).

Appendix 1 Document History and Version Control

Version	Date	Comments	Author
1.0	25TH May 2018	Approved as part of the Blood Transfusion Policy.	Dr David Simcox
2.0	21/11/2018	Updated with new contact details to activate Massive Haemorrhage Protocol	Dr David Simcox

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