Whittington Health NHS

Major Haemorrhage in Adults

Subject:	Major Haemorrhage in Adults
Policy Number	N/A
Ratified By:	Clinical Guidelines Committee
Date Ratified:	November 2015
Version:	3.0
Policy Executive Owner:	Clinical Director, Surgical Services ICSU
Designation of Author:	Consultant Anaesthetist, Dr K Miltsios
Name of Assurance Committee:	As above
Date Issued:	November 2015
Review Date:	3 years hence
Target Audience:	All medical and nursing staff dealing with haemorrhage; haematology laboratory staff
Key Words:	Major Haemorrhage, bleeding, transfusion

This applies to a (non-pregnant) adult patient with life threatening bleeding.
If the patient is pregnant, please consult the major obstetric haemorrhage guideline

Patient Name
Hospital Number
Date of Birth
or affix sticker

Whittington Health NHS

Major Haemorrhage Pathway

Print, file and complete as treatment progresses. Steps may be modified as clinically appropriate but please document reason for variation

1. Is the patient eligible and suffering from major haemorrhage?		
Patient is eligible: 1) Age 16 or over 2) Not pregnant (see 'massive obstetric haemorrhage' guideline) 3) Treatment is not considered futile by responsible consultant 4) No advance directive or known competent wish to refuse blood or blood products	Yes/no	Details
Patient meets one or more criteria: 1) is thought to be suffering from life-threatening haemorrhage 2) anticipated to need transfusion of *at least 4 units of packed red cells within the next hour* 3) has needed 4 units of packed red cells in the previous hour and is still bleeding 4) Haematology laboratory trigger in response to an *urgent* cross-match of more than 4 units		Details
Major haemorrhage diagnosis	**Time**	**Document date and time**
Call 2222 and say: **'Code Red Major Haemorrhage, in Location'** (specify exact location, *ensure switchboard know it is not an obstetric patient*)		
Inform appropriate Middle Grade (DMR/DSR/ED) to review *urgently*		
DMR/DSR/ED Reg informs responsible consultant *urgently*		
Team Leader nominates one Contact to liaise with Haematology		
Contact phones Haematology (x5766 or bleep 2686 out of hours) with: (i) identity of patient (ii) situation (iii) blood products required		
Contact gives collection slip with full patient details and blood products to be collected to porter		

Patient Name Hospital Number Date of Birth or affix sticker

Whittington Health NHS

Date:

2. Immediate Actions ***(as soon as possible, do not wait for ICU transfer)***				
Action	**Time**	**Initials**	**Grade**	**Variation** (give reason)
15 L/min oxygen via non-rebreather mask				
Initiate definitive haemorrhage control e.g. theatre, endoscopy in parallel with blood products (do not wait)				
Send **urgent cross-match** (pink top), **FBC** (purple top), **clotting including fibrinogen** (blue top)				
Transfer patient as appropriate (e.g. in ED: move to Resus)				
Direct compression and elevation to halt bleeding if applicable (e.g. pelvic sheet compression of pelvic fracture)				
Intravenous access two peripheral 16G (grey) or 14G (orange) cannulae; if access is delayed consider intraosseous or short wide-bore central venous cannula				
Use fluid warmer (available from ED Resus, Recovery or ITU) for all intravenous fluids including blood and blood products.				
Maintain temperature > 36°C. Use warmed fluids, warming blanket				
In torrential bleeding use Level 1 rapid infuser from Labour Ward or theatre; only to be set up by trained operator e.g. ODP				
Bolus 500mLHartmann's *until* blood available, if needed to maintain palpable pulse. However minimise infusion of non-blood intravenous fluids				
Catheterise and measure urine hourly (except pelvic trauma unless discussed with urology)				
Give tranexamic acid 1-2g over 10 minutes. If Ca^{2+}<1 mmol/L on ABG measurement administer 10ml of calcium chloride 10%.				
Monitor Hb on ABGs or Hemocue				
Repeat FBC, clotting, fibrinogen at least hourly until stable				
Immediate actions audit: all steps done/considered ?	yes/no			

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or affix sticker

Date:

3. BLOOD PRODUCT ISSUE AND USAGE		
Give blood to maintain Hb>100 g/L	yes/no	Details
If patient blood group not known, send porter to collect 2 units O (-)ve blood from Laboratory Blood Bank fridge		
Time first unit O (-)ve blood given	Time	
As soon as there are 2 G&S samples on system, haematology biomedical scientist (BMS) to issue 6 units of group-specific blood and 3 units of FFP		
Porter to collect 6 units of group-specific blood as soon as available	Time	Details
Time first unit of group-specific blood given to patient		
Porter to collect FFP as soon as available	yes/no	Details
Time first unit FFP given to patient		
Further Blood: FFP issued in ratio 2:1 on request by Contact		
Other blood products to be issued as per Blood Product Flow Chart, on request by Contact		
Discuss appropriate blood products with Haematology Consultant on call as early as possible		
If parameters below not maintained, discuss with responsible consultant. Make plan for management after bleeding settled, including observation, blood tests, environment for observation and medical plan for next review and criteria for re-escalation of patient		
Parameters achieved THROUGHOUT?		
Haemoglobin >90g/L	yes/no	
Platelet count >$75^{x}10^{9}$/L	yes/no	
INR <1.5	yes/no	
APTT <45	yes/no	
Fibrinogen > 150mg/dL	yes/no	
Ratio of red cells:FFP < 2:1	yes/no	
Peripheral pulse palpable	yes/no	
Heart rate <100bpm	yes/no	
Urine output >30mls/hr	yes/no	
Temperature >36°C	yes/no	
pH>7.3 on arterial blood gas	yes/no	

BLOOD PRODUCTS SUMMARY FLOW CHART

Calls via 2222: 'Code Red Major Haemorrhage, in Location' (specify exact location)

O Rh Negative Non cross-matched red cells Use in life-threatening emergency 2 units available for **immediate collection** from the blood transfusion laboratory **Risk of incompatibility**	**Group-specific** Non cross-matched red cells **Available in 15 minutes** From receipt of current sample by blood transfusion laboratory Patient's own ABO and Rh D group **Risk of incompatibility**	**Cross-matched red cells** **Available in 1 hour** From receipt of current sample by blood transfusion laboratory Patient's own ABO and Rh D group **Fully compatible with patient**

Red Cells	**Fresh Frozen Plasma**	**Cryoprecipitate**	**Platelets**	**Other**
Issue 6 units group-specific **Immediately that blood group is known** Then as required	Thaw and issue 3 units **Immediately that blood group is known** Then thaw 1 unit for every 2 units of red cells issued as required OR if INR, APTTR increasing by 50% or more OR to maintain INR, APTTR less than 1.5	Thaw and issue 2 - 4 pools as required for every 15 units of red cells issued OR if fibrinogen level falling by 50% or more OR to maintain fibrinogen greater than 150 mg/dL	Order and issue 2 pools as required for every 15 units of red cells issued OR if count falling by 50% or more OR to maintain platelet count greater than $75^{x}10^{9}$/L	**Beriplex** 25iu/kg For emergency reversal of Warfarin **Novoseven** 3 x 2 mg
Once blood group known	**45 minutes to thaw**	**45 minutes to thaw**	**1- 2 hours for delivery from NHSBT**	**Instantly available once authorised by Consultant Haematologist**

Major Haemorrhage Guideline: Background Information

➢ Criteria for use

This guideline applies to a (non-pregnant) adult patient with life threatening bleeding. If the patient is pregnant, please consult the major obstetric haemorrhage guideline

Inclusion criteria:

1) 'Major haemorrhage' is defined as *any one of* the following:
   a) The need for transfusion of 4 units of red blood cells in the previous hour, with an ongoing transfusion requirement
   b) The anticipated need for the transfusion of at least 4 units of red cells within the next hour
   c) Obvious or suspected life-threatening haemorrhage; for example:
      - major peri-operative bleeding
      - major vascular injury
      - severe trauma e.g. pelvic or multiple long bone fractures, significant blunt or penetrating chest or abdominal trauma. This should occur in conjunction with the trauma guideline:

	Please see the Whittington Health NHS Trust Guideline: ***Trauma Management – Care of the Injured Patient***

   d) Haematology laboratory staff may trigger the major haemorrhage protocol in response to an *urgent* request for more than 4 units of red cells

Exclusion Criteria:

1) This guideline does not apply to children under the age of 16.
2) Bleeding in the Obstetric department is covered by a separate guideline.

	Please see the Whittington Health NHS Trust Guideline: ***Massive Obstetric Haemorrhage***

3) Futility. This guideline is not appropriate for use in a patient whose prognosis has been assessed as futile by the responsible consultant.

➢ Background / introduction

Major blood loss jeopardises the survival of patients in many clinical settings and the management is a challenge for all involved.
A clear, precise guideline can help to achieve efficient and effective interaction between clinicians and laboratory services, maximising the chance of a good outcome for the patient.

➢ Clinical management

This guideline covers the following areas in relation to major haemorrhage:

1. Call for help
2. Who does what
3. Intravenous access
4. Haematological monitoring
5. Haemodynamic monitoring
6. Resuscitation
7. Fluid administration
8. Source control
9. Avoiding hypothermia
10. Safe blood product administration
11. Red cell transfusion
12. Fresh Frozen Plasma
13. Platelets
14. Recombinant Factor VIIa
15. Acidosis
16. Calcium
17. Tranexamic Acid
18. Specific clotting factor concentrates

1. Call for help

Immediate Actions:
Any member of the clinical staff dealing with the patient may put the call out. The doctor in charge of the patient is responsible for ensuring that the following calls are made:

(i) Dial **2222** and state '**Major Haemorrhage Code Red** in **Location'**
nb please clarify that this is not obstetric haemorrhage
(State location clearly eg. theatre number x in Main Operating Theatres)

(ii) Call appropriate middle grade doctor (DMR/DSR/ED middle grade) as appropriate to review **urgently.**

(iii) DMR/DSR/ED middle grade **must** inform the responsible consultant urgently. If the middle grade is unavailable, the attending junior doctor must contact the responsible Consultant directly.

(iv) The patient **must** be discussed *repeatedly* with the responsible Consultants at intervals of at least every *2-4 hours* if major haemorrhage continues, and the discussions must be documented in the medical notes.

(v) Once haemorrhage is clearly under control, another call must be made to switchboard to 'Step Down' the Code Red.

Switchboard
On receipt of the **'Major Haemorrhage Code Red'** call:

(i) Bleep the following personnel with the message
'Major Haemorrhage Code Red, in Location':

- Anaesthetic Registrar on call
- ICU Registrar on call
- Operating Department Practitioner on call
- Porter to run samples and blood products to and from the laboratory
- Haematology BMS

(ii) **Urgently** telephone or if not available air call:
The patient's Consultant (out of hours this would be the Consultant on call for this speciality)
Further Consultants such as Anaesthetic Consultant on call, ICU Consultant on call and Haematology Consultant on call should be contacted by Anaesthetic Registrar or ICU Registrar on call as required, once patient information is available.

(iii) After 'Step Down' of the Code Red is notified to switchboard, the above persons must be contacted again, by bleep, telephone or air call as appropriate, and notified of the 'Step Down' status.

2. Who does what

- The team leader should be the most experienced doctor present
- The team leader must delegate one person to complete the major haemorrhage pathway that follows this guideline and to liaise with the haematology laboratory regarding blood tests and blood products

3. Intravenous Access

- Immediately: insert two or more large bore cannulae, i.e. 16G (Grey) or 14G (Orange) peripherally
- Subsequently: consider inserting a central venous cannula

4. Haematological monitoring

Immediately: send *correctly labelled* samples for:

- Full Blood Count (FBC) (purple top bottle)
- Clotting studies, Fibrinogen (blue top bottle)
- Urgent Cross Match - (pink top bottle)

Subsequently:

- Monitor venous blood gases unless concerns re hypoxia/hypercapnia Repeat full blood count and clotting and fibrinogen *hourly* until bleeding abates *and then* every 4 hours until it is clear that haemostatic stability has been achieved

5. Haemodynamic monitoring

- Monitor HR, BP, warm peripheries, capillary refill, mental state (AVPU)
- Catheterise and monitor hourly urine output
- Consider central venous cannula for access

- Consider arterial cannulation to monitor blood pressure invasively and facilitate arterial blood gas sampling
- In intubated patient insert Oesophageal Doppler (except in oesophageal pathology e.g. variceal bleeding) to monitor filling or alternative cardiac output monitoring

6. Resuscitation

- The best resuscitation fluid in massive haemorrhage is blood, which should be obtained as early as possible (see Section 11, red cell transfusion).
- Use Hartmann's solution until blood is available. Rapid intravenous fluid bolus of 500mL Hartmann's should be used to maintain circulatory volume. Minimise administration of non-blood fluids to minimise dilutional anaemia and coagulopathy.
- Colloids such as Geloplasma® may be used when no blood is immediately available when a patient is profoundly hypovolaemic.

a) Haemodynamic goals:

The aim is to maintain

- A palpable peripheral pulse
- Heart rate below 100 per minute (although heart rate may remain elevated due to pain or anxiety)
- During haemorrhage, do not target a specific systolic blood pressure value. Aim for adequate organ perfusion. Once haemorrhage is controlled, aim to normalise blood pressure.
- Urine output above 30mls per hour

b) Haematological goals:

The aim is to maintain

- **Haemoglobin over 90 g/L**
- **Platelet count over 75×10^9/L**
- **INR less than 1.5**
- **APTT less than 45 seconds**
- **Fibrinogen over 150 mg/dL**

In major haemorrhage the target haemoglobin in all patients is **90 g/L.** Although frequent blood sampling is mandatory, results may be historical and current coagulation assays may fail to detect coagulopathy, particularly in hypothermia (Johansson 2007).

Blood product administration must therefore be proactive and guided by current rate of bleeding. The aim is to **anticipate** and **prevent** development of anaemia and coagulopathy. For example discuss giving cryoprecipitate with the on call haematology consultant if fibrinogen is falling, do **not** wait for it to fall below 150 mg/dL.

Similarly order platelets in early if the platelet count is falling, as platelets are not kept on site and there may otherwise be a delay in giving patients platelets at the appropriate time.

7. Fluid administration

Blood should be administered as rapidly as necessary to restore and maintain adequate circulatory volume, i.e. at least as fast as the rate of blood loss. The rate of administration of blood or other resuscitation fluid may be increased by:

- Administration preferentially through a wide-bore peripheral cannula
- Pneumatic bag squeezers
- The Level 1® rapid infuser may be borrowed from the Obstetric Theatre; it **must** be operated by an Operating Department Practitioner or other competent person trained in its use.

8. Source control

Immediate:

- Many cases of bleeding can be temporarily arrested by compression and elevation until definitive control is possible (eg pelvic sheet compression for pelvic fractures, use of tourniquet, etc).

Subsequently:

- It is essential to try and definitively arrest the bleeding process through surgery, endoscopy or interventional radiology as appropriate.
- If bleeding is ongoing then repeated review is mandatory. Appropriate surgical or medical review should be sought again after each 4 units transfused.

9. Avoid hypothermia

Aim to maintain normothermia, i.e. temperature above 36°C, since hypothermia worsens coagulopathy (Gonzalez 2007).

- Fluid warming is **mandatory** in major haemorrhage and should be instituted as early as possible, although this must **not** delay administration of available blood products. Fluid warmers are available in the Critical Care Unit, Operating Theatres and in the Resuscitation area in the Emergency Department. In other locations a fluid warmer may be borrowed from Recovery; the borrower is responsible and must ensure safe return to Recovery.
- Warming blankets are available in the Operating Theatres and in critical care and should be used whenever possible.
- Environmental control: cover patient to minimise heat loss whenever possible, aim to maintain a warm room temperature where possible.

10. Safe blood product administration

Blood products **must** be administered safely, in full accordance with:

	Please see the Whittington Health NHS Trust Guideline: ***Blood Policy – from prescription to administration***

11. Red cell transfusion

Give the 2 units of O negative blood first if the patient does not have 2 Group & Save samples on the system. This is kept in the haematology laboratory. **If there are 2 Group & Save samples on the system use group-specific blood**. In response to the initial call, the BMS will release **6 units of packed red cells and 3 units of fresh frozen plasma (FFP)** as soon as there are 2 Group & Save samples on the system.

12. Fresh Frozen Plasma

- **Give *at least* 3 units of FFP for *every* 6 units of blood given**
- Note the preparation time for FFP is 45 minutes
- BMS to thaw more FFP in response to further blood ordering
- Subsequent doses of FFP should be 15mL/kg which is usually 3 to 4 units for an adult patient.

The ***ratio*** of red cells to FFP given should be less than 2:1

13. Cryoprecipitate

Earlier use of cryoprecipitate may be more effective in incrementing the fibrinogen to FFP alone. Discuss with Haematologist on call if after the first 2 doses of FFP there is continued concern regarding bleeding.

14. Platelets

- **Keep platelet count over $75^{\times}10^{9}$/L** in major haemorrhage
- Discuss with haematology **urgently** if platelet count is low or falling
- The need for platelets should be anticipated in any patient needing massive transfusion and **ordering undertaken as soon as possible** given the delay in obtaining platelets from outside the hospital.
- **Order 2 pools for every 15 units of red cells issued**, or if count falling by 50% or more, or as necessary to avoid platelet count falling below $75^{\times}10^{9}$/L

15. Recombinant Factor VIIa

Recombinant factor VIIa may be indicated in rapid severe blood loss, or in ongoing blood loss despite other measures. The early use of Recombinant Factor VIIa may be particularly indicated in severe trauma. The decision to use recombinant factor VIIa **must** be made in accordance with the following guideline or in accordance with the specific Emergency Department guideline:

	Please see Whittington Health NHS Trust Guideline: ***Recombinant Factor VIIa (Novoseven®)***

15. Acidosis

Acidosis is associated with coagulopathy; aim to prevent the development of acidosis by administering sufficient warmed resuscitation fluids. However

pharmacological reversal of acidosis has ***not*** been shown to improve coagulopathy in massive transfusion.

16. Calcium

All patients with major haemorrhage will have an ABG measured. The Ca^{2+} should be maintained >1 mmol/L. Use 10ml of 10% calcium (chloride in preference to gluconate)

17 Tranexamic acid

Tranexamic should be given to all patients with major haemorrhage early. It is cheap and proven in trauma, obstetrics, major joint surgery and cardiac surgery. Although there is no specific data for other patients having major haemorrhage there may be benefit.

(Kerr 2015, Crash 2, 2010)

18. Specific clotting factor concentrates

Specific clotting factor concentrates do **not** form part of the generic major haemorrhage pathway. However, they may have a role in specific circumstances, like in the reversal of existing anticoagulation, hence **all major haemorrhage patients must be discussed with the Haematologist on call**. Also see:

	Please see Whittington Health NHS Trust Guideline: ***Anticoagulant Therapy - Emergency Reversal Guideline***

Cell Salvage- cell salvage is currently only available to use for obstetric patients, and so its use is not covered in this guideline.

➢ Therapeutic Targets

- Maintenance of tissue perfusion and oxygenation by restoration of blood volume and haemoglobin
- Arrest of bleeding through surgery, endoscopy or interventional radiology
- Specific resuscitation and haematological targets as specified in this guideline

➢ Further information

Contact Abdul Adamu the transfusion practitioner on Bleep 2953

➢ Contacts (inside and outside the Trust including out-of-hours contacts)

DMR Bleep 3300
DSR Bleep 3376
Consultants on-call contact via switchboard
Abdul Adamu the transfusion practitioner on Bleep 2953

➢ Compliance with this guideline (how and when the guideline will be monitored e.g. audit and which committee the results will be reported to)

Compliance with this guideline will be monitored by the Transfusion Practitioner Abdul Adamu every 6 months, using the combined pathway and audit tool on pages 2-4. The results will be reported to the Transfusion Committee.

➢ References (evidence upon which the guideline is based)

- Kozek-Langenecker et al (2013) “Management of severe perioperative bleeding – Guidelines from the European Society of Anaesthesiology.” *Eur J Anaesthesiol* **30**:270-382.
- Association of Anaesthetists of Great Britain and Ireland (2010) “Blood transfusion and the Anaesthetist: management of massive haemorrhage.” *Anaesthesia* **65**:1153-1161.
- Johansson (2007) “The blood bank: from provider to partner in treatment of massively bleeding patients.” *Transfusion* **47**:176-181.
- Gonzalez (2007) “Fresh frozen plasma should be given earlier to patients requiring massive transfusion.” *J Trauma* **62**:112-9.
- Henry (2001) “Anti-fibrinolytic use for minimising perioperative allogenic blood transfusion” Cochrane.Database.Syst.Rev., CD001886 REMOVE doesn’t really support gl
- Kerr (2015) “Antifibrinolytic drugs for acute traumatic injury” Cochrane.Database.Syst.Rev., CD004896 better supports content
- Crash 2 trial collaborators (2010) ‘Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (Crash-2): a randomised, placebo-controlled trial. *Lancet* **376**(9734):23-32.

Hunt et al (2015) “A practical guideline for the haematological management of major haemorrhage Br J of Haematology, 2015, 170, 788–803

➢ Co-authors and departmental leads

➢ **Department**	➢ **Author(s)** *with departmental leads in* ***bold***
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Appendix A

Plan for Dissemination and implementation plan of new Procedural Documents

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Acknowledgement: University Hospitals of Leicester NHS Trust

Title of document:	**Major haemorrhage in adults**		
Date finalised:	**Reissued Nov 2015**	**Dissemination lead: Print name and contact details**	**Dr K Miltsios (via cencom)**
Previous document already being used?	**No**		
If yes, in what format and where?	**N/A**		
Proposed action to retrieve out-of-date copies of the document:	**N/A**		
To be disseminated to:	**How will it be disseminated/implemented, who will do it and when?**	**Paper or Electronic**	**Comments**
All medical staff	**Dissemination**	**Intranet**	
Medical staff in specific departments	**Implementation**		**Departmental educational sessions**
Is a training programme required?	**Yes**		
Who is responsible for the training programme?	**Departmental leads in ED, Medicine, Surgery, Anaesthesia & Critical Care**		

Appendix B

Equality Impact Assessment Tool

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

Impact (= relevance) 1 Low 2 Medium 3 High	Evidence for impact assessment (monitoring, statistics, consultation, research, etc	Evidential gaps (what info do you need but don't have)	Action to take to fill evidential gap	Other issues
Race **1**	**N/A**	**N/A**	**N/A**	**N/A**
Disability **1**	**N/A**	**N/A**	**N/A**	**N/A**
Gender **1**	**N/A**	**N/A**	**N/A**	**N/A**
Age **1**	**N/A**	**N/A**	**N/A**	**N/A**
Sexual Orientation **1**	**N/A**	**N/A**	**N/A**	**N/A**
Religion and belief **1**	**N/A**	**N/A**	**N/A**	**N/A**

Once the initial screening has been completed, a full assessment is only required if:

- The impact is potentially discriminatory under equality or anti-discrimination legislation
- Any of the key equality groups are identified as being potentially disadvantaged or negatively impacted by the policy or service
- The impact is assessed to be of high significance.

If you have identified a potential discriminatory impact of this procedural document, please refer it to relevant Head of Department, together with any suggestions as to the action required to avoid/reduce this impact.