Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

CUH
Ospidéal Ollscoile Chorcaí
Cork University Hospital

POLICY AND PROCEDURE ON

TRANSFUSION MANAGEMENT OF MASSIVE HAEMORRHAGE

IN THE CORK UNIVERSITY HOSPITAL

Reference Number: PPG-CUH-CUH-210	**Revision No:** 01	**Review Cycle:** 2 years
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Table of Contents

1 Policy Statement

It is the policy of the Cork University Hospital Group that patients undergoing a massive haemorrhage are managed according to this policy.

2 Purpose

Successful treatment of massive haemorrhage depends on prompt action, good communication and involvement of senior clinicians with expertise in the management of massive haemorrhage.
Recent evidence from obstetric and surgical practice suggests that in particular, pre-emptive or early treatment of coagulopathy associated with massive haemorrhage may reduce morbidity and mortality.
This guideline provides:

- Some general guidance on optimal medical/surgical management of patients with massive haemorrhage and
- Specific advice on optimal use of blood components in the management of massive haemorrhage.

3 Scope

All clinical staff working in the Cork University Hospital Group of hospitals

3.1 Target Population

The policy applies to all patients who develop massive haemorrhage.

4 Legislation / Related Policies

- EU Directive 2002/98/EC of the European Parliament and of the Council of 27 January 2003 - Setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood components (Appendix I)
- PPG-CUH-CUH-13: Policy & Procedure on the administration of blood components to patients in Cork University Hospital Group
- PPG-CUH-CUH-36: Policy & Procedure for Sampling and Labelling of Pre-Transfusion Specimens by medical staff in The Cork University Hospital Group
- PPG-NUR-NUR-7: Policy & Procedure for Sampling and Labelling of Pre-Transfusion Specimens by nursing staff in The Cork University Hospital Group

5 Glossary of Terms and Definitions

5.1 Definition of a massive haemorrhage

Blood volume is defined as the total quantity of blood in the body. A patient may be defined as suffering a massive haemorrhage if any of the following occur:

- Transfusion of more than 10 units of red cells in a 24 hr period

or

- Transfusion of >4 units in <1 hour with ongoing haemorrhage

or

- Predicted need for > 8 units in 2 hours

or

- An ongoing transfusion requirement in an adult of more than 150ml/min

or

- Replacement of one blood volume within a 24hr period

or

- Replacement of more than 50% of blood volume in 3 hrs or less (70mls/kg for adult, 90mls/kg for a child older than a neonate).

6 Roles and Responsibilities

It is recommended that all staff involved in the blood transfusion chain are familiar with these guidelines.

7 Procedure

7.1 Massive haemorrhage management

7.1.1 Alert key personnel to the possibility of a massive haemorrhage

- Consultant in charge
- Consultant anaesthetist
- Medical scientist Blood Transfusion Laboratory CUH Ext 22537, (out of hours bleep 199)
- Consultant haematologist

7.1.2 Communication

An experienced clinician (registrar grade or above) should assume overall responsibility for immediate management of the patient.

The senior clinician nominates a named individual (liaison person), who is familiar with the clinical details, to take responsibility for:

- Communication with the blood transfusion laboratory and
- Documentation of all aspects of the massive haemorrhage management from time of initiation to stand down, including the status of blood product support.
- He/she should have appropriate documented training in haemovigilance.

The named liaison person:

- notifies the blood transfusion laboratory that a 'massive haemorrhage' has been diagnosed by the named senior clinician
- provides identification details of the patient affected
- provides their own name and contact details to enable effective communication between the laboratory and the clinical area
- checks that a transfusion sample is available in the laboratory or
- arranges for a transfusion sample to be sent urgently to the laboratory
- arranges for urgent FBC, coagulation screen, fibrinogen to be sent to the haematology laboratory
- informs the laboratory if the emergency O Rh (D) negative blood has been used and is required to be replaced
- advises the laboratory whether emergency uncrossmatched, group specific or fully crossmatched blood is required

7.1.3 General management

- Identify the cause of bleeding
- Control the source of haemorrhage with prompt surgical, obstetric or radiological intervention
- Record pulse, BP, pulse oximetry and monitor urine output
- Provide adequate ventilation & oxygenation and IV access
- Send baseline FBC, PT, APPT, Fibrinogen, Biochemistry Profile.
- Monitor blood gases and lactate levels (acidosis increases the risk of coagulopathy)
- Restore and maintain the circulating volume – give pre warmed crystalloid or colloid as needed. (do not give dextran)
- Restore or maintain normothermia (aim to prevent hypothermia as it increases the risk of coagulopathy)
- Identify those patients at risk of DIC, which results in a greater derangement of coagulation than is seen in dilutional coagulopathy.
- The following groups of patients are at greater risk of DIC:
  - Prolonged hypovolaemia or tissue hypoxia
  - Extensive tissue damage
  - Hypothermia
  - Penetrating head injury
  - Obstetric complications e.g. placental abruption, uterine rupture, amniotic fluid embolism, pre-eclampsia, sepsis.
- Consider the use of IV Tranezamic acid (1-2g)

7.2 Transfusion management

Once a senior clinician has notified the Blood Transfusion Laboratory that a "massive haemorrhage" is underway, the following "pack" will be provided by the Blood Transfusion Laboratory

- **4 units RBC (may contain emergency O neg units)**
- **2 units of solvent detergent plasma (OCTAPLAS-LG)**
- **1 adult therapeutic dose platelets**

An emergency supply of Fibrinogen is available in the drug fridge in anaesthetic ROOM 3 in CUMH for massive obstetric haemorrhage

A second "pack" can follow if requested by the senior clinician containing the following

- **4 units RBC – group specific or crossmatched**
- **2 units of solvent detergent plasma (OCTAPLAS-LG)**
- **1 adult therapeutic dose platelets**
- **2g Fibrinogen**

(Please note: Plasma will take 20 mins to thaw and platelets need to ordered from the IBTS so all products will be available for collection as they become available , rather than in a single delivery)

7.2.1 Red cells

Start blood component therapy; use a blood warmer and/or rapid infusion device. The choice of red cells depends on the degree of urgency. The presence of antibodies will delay the provision of compatible blood.

Note: For males and females beyond child-bearing age it may be necessary to give Rh positive cells.

Indication by blood loss	Degree of Urgency	Transfuse within
>/=2.5L, no response to resuscitation	Emergency	15 mins Use Emergency O Neg
1-1.5L + active bleeding 1.5-2.5L	Very Urgent	30mins 6 units type specific and/or uncrossmatched
1-1.5L + loss controlled	Urgent	1 Hour Urgent Crossmatch
0.5-1L	Normal	Standard

7.2.2 Platelets

Anticipate platelet count <50 x 10^9/L after 1.5 – 2 x blood volume replacement.
Request via Blood Transfusion Laboratory CUH Ext 22537, (out of hours bleep 199) and send Blood Product Requisition Form to Blood Transfusion Laboratory CUH
One unit is the standard adult dose. 10ml /kg for a small child or neonate
Further doses should be guided by platelet count and/or clinical condition
Allow time for platelet collection and delivery
Allow margin of safety to ensure platelet count >50 x 10^9/L
Keep platelet count >100 x 10^9/L if platelet function abnormal e.g. if patient taking aspirin or other antiplatelet agents
Head injury – aim for platelets > 100 x 10^9/L

7.2.3 SD Plasma (Solvent Detergent Plasma – OCTAPLAS LG)

Anticipate need for SD plasma after 1-1.5 x blood volume replacement.
Give SD plasma (solvent detergent treated pooled plasma –'Octaplas') 15-20 ml/kg (Usual dose is 4-6 units)

Base further dosing on coagulation results- aim for PT and APTT <1.5 mean control

Order from Blood Transfusion Laboratory CUH using Blood Product Requisition Form (allow 20 min thawing time)

PT/APTT >1.5 x mean normal value correlates with increased microvascular bleeding

7.2.4 Fibrinogen

Anticipate need for fibrinogen after 1-1.5 blood volume replacement and give Fibrinogen 1-2g IV.

Base further dosing on coagulation results- aim for fibrinogen >1g/L

Order from Blood Transfusion Laboratory CUH using Blood Product Requisition Form

Reconstitute at bedside

Fibrinogen < 0.6 – 0.8 g/L strongly associated with **microvascular bleeding**

7.3 Further Management

Initial doses of platelets, SD Plasma and fibrinogen can be administered before platelet or coagulation results are available.

Repeat Hb, platelet count, PT, APTT and fibrinogen every 2-4 hrs or after administration of initial blood component/product support are necessary to assess the response to blood component therapy and facilitate ongoing management of the patient.

As soon as the second set of results (Hb, platelet count and coagulation screen) are available, the haematology registrar/consultant covering the blood transfusion laboratory should be asked for advice on further blood product support.

Continue to repeat Hb, platelet count, PT, APTT and fibrinogen every 4 hours or after second order of blood components/products have been transfused to assess the response to blood component therapy and guide further therapy.

7.3.1 Factor VIIa

Circumstances where patients with massive haemorrhage may benefit from Factor VIIa include:

- Ongoing clinically significant haemorrhage, despite appropriate attempts to achieve surgical control of bleeding and full correction of other clotting factor/platelet deficiencies.
- Severe obstetric haemorrhage requiring consideration of internal iliac artery ligation, uterine artery embolisation or hysterectomy in the setting of optimal blood product support
- Severe haemorrhage, refractory to local control, in patient who refuses/would refuse blood products, but would accept recombinant blood factors. Administration in these patients may need to be earlier in the course of events, because transfusion is prohibited.

All use of VIIa requires authorisation by consultant haematologist.

7.3.2 Special Clinical Circumstances

Warfarin – add Vitamin K, Prothrombin complex concentrate
Obstetric haemorrhage – early DIC often present, consider increased use of fibrinogen
Head injury – aim for platelets > 100 x 10^9/ L

7.4 Stand-down following control of the episode

The transfusion laboratory should be notified when the massive haemorrhage is controlled and the patient is haemodynamically stable or if the patient has been transferred to another hospital/site within the network.

8 Implementation Plan

- An e-mail will be sent via the CUH and CUMH e-mail system alerting all users that this new P&P has been QSPEG approved.
- This policy will be made available to all wards/units in the haemovigilance documents folder on the Q-PULSE system.
- Education and training will be included in the regular scheduled haemovigilance training sessions provided by the Clinical Midwife / Nurse Specialists in Haemovigilance.

9 Revision and Audit

An audit will be carried out by the haemovigilance personnel following the launch of this policy as per the blood transfusion laboratory audit schedule which is managed on the hospital Q-Pulse system.

This procedure will be reviewed on a 2 yearly basis or earlier if indicated.

10 References/Bibliography

EU Directive 2002/98/EC of the European Parliament and of the Council of 27 January 2003 - Setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood component

National Blood Users Group (NBUG). *Guidelines for the Administration of Blood and Blood Components.* Dublin: Irish Blood Transfusion Service; 2004.

Handbook of Transfusion Medicine 4th ed. Mc McClelland, DBL. United Kingdom Blood Services, London

The administration of blood components, British Committee for Standards in Haematology, AM Harris et al, December 2009
Guidelines on the Management of Massive Blood Loss. *British Journal of Haematology* 2006; 135(5): 634-4.

The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. *J Trauma 2007; 63(4): 805-13.*

Effect of haemostatic control resuscitation on mortality in massively bleeding patients: a before and after study. *Vox Sang 2009; 96(2): 111-8.*

How we treat: management of life-threatening primary postpartum haemorrhage with a standardised massive transfusion protocol. *Transfusion 2007; 47(9): 1564-72.*

Increased plasma and platelet to red blood cell ratios improves outcome in 466 massively transfused civilian trauma patients. *Ann. Surg. 2008; 248(3): 447-58.*

11 Appendices

11.1 Appendix I- EU Blood Directive

Information on the "EU Directive 2002/98/EC of the European Parliament and of the Council of 27 January 2003 - Setting standards of quality and safety for the collection, testing, processing, storage and distribution of human blood and blood component"

The EU directive 2002/98/EC became law in Ireland on the 08.02.05 and has implications for all hospital Blood Transfusion Laboratories. Eight articles of the directive apply specifically to hospital Blood Transfusion laboratories and to all staff involved in blood transfusion process. The major implications refer to the total traceability of every blood product, quality systems for labelling laboratories and the training of personnel. Compliance with this legislation is policed by the Irish Medicines Board, (IMB) under the IMB Act 1995 and in the event of non-directive compliance; the IMB has the authority to close a facility.

Article 10 of the Directive makes specific reference refers to personnel:
"Personnel directly involved in collection, testing, processing, storage, and distribution of human blood and blood components shall be qualified to perform those tasks and be provided with timely relevant and regularly updated training

11.2 Appendix II - Cork University Hospital Protocol for Management of Massive Haemorrhage

Goal	Procedure				Comments
Arrest bleeding	Treat underlying cause; early surgical or radiological intervention				
Restore circulating volume	Insert 2 wide bore peripheral (14 gauge) or central cannulae. Give pre-warmed crystalloid (up to 2L) or colloid (up to 1.5L) as needed [do not give dextrans] Avoid hypotension. Ensure good urinary output >0.5ml/kg/h				Critically important in preventing DIC (disseminated intravascular coagulation) Monitor central venous pressure, insert catheter; Keep patient warm Concealed blood loss is often underestimated
Contact key personnel	Consultant in charge and Consultant anaesthetist Medical Scientist Blood Transfusion Laboratory CUH – Extension 22537 (or out if hours bleep 199) Haematology Consultant				Alert all to possible massive haemorrhage A named senior person must take responsibility for communication and documentation
Request Laboratory Investigations	Crossmatch sample to Blood Transfusion Laboratory CUH. (N.B. full and correct labelling of form and sample) FBC (full blood count) PT (prothrombin time), APTT (activated partial thromboplastin time), Fibrinogen to Haematology CUH Label request "URGENT, MASSIVE HAEMORRHAGE" Biochemistry profile and blood gases to Biochemistry CUH. Monitor pulse oximetry Repeat tests after blood component infusion / q 4hrs/ q 3-4 red cell units transfused				Contact porter to bring urgent samples to laboratory CUH – prioritise crossmatch sample Ensure FULL and CORRECT patient identification – error may delay transfusion support Results may be affected by crystalloid infusion May need to give components before results available
Replace Red Cells Maintain Hb >8 g/dl	Assess degree of urgency: Give red cells: - Group O Rh D Negative Emergency stock available in Blood Transfusion Laboratory CUH in extreme emergency until patient's blood group known - ABO and RhD group specific (uncrossmatched) if patient's blood group is known in Blood Transfusion Laboratory CUH and unable to wait for crossmatch - Fully compatible blood available in 30-40 min provided patient has no irregular antibodies Use blood warmer and/or rapid infusion device if flow rate >50ml/kg/h in adult, >1 unit/10 mins	Indication by blood loss	**Degree of Urgency**	Transfuse within	Blood Transfusion Laboratory CUH will complete crossmatch after issue of emergency blood Further serological crossmatch is not required after one blood volume replacement **Note:** The presence of irregular antibodies will delay the provision of compatible blood. Check patient's notes – Emergency O Negs will not be suitable for patients with certain antibodies e.g. anti-c or anti-e. Note for males and for females beyond childbearing age it may be necessary to use O positive red cells
		>/=2.5L, no response to resuscitation	Emergency	15 mins Use Emergency O Neg	
		1-1.5L + active bleeding 1.5-2.5L	Very Urgent	30mins - 6 units type specific and /or uncrossmatched	
		1-1.5L + loss controlled	Urgent	1 Hour Urgent Crossmatch	
		0.5-1L	Normal	Standard	
Replace Platelets Maintain platelet count >75 x 10^9/L	Dose 1 pool is the standard adult dose. 10ml /kg for a small child or neonate Request via Blood Transfusion Laboratory CUH and send Blood Product Requisition Form to Blood Transfusion Laboratory CUH Anticipate platelet count <50 x 10^9/l after 1.5 – 2 x blood volume replacement. Further doses should be guided by platelet count and/or clinical condition (allow time for platelet collection and delivery)				Allow margin of safety to ensure platelet count >50 x 10^9/L Keep platelet count >100 x 10^9/l if platelet function abnormal eg if patient taking aspirin or other anti-platelet agents Head injury – aim for platelets > 100 x 10^9/ L
Replace Clotting Factors Maintain PT & APTT <1.5 x mean control	Give SD plasma (solvent detergent treated pooled plasma –'Octaplas') 15-20 ml/kg (200mls per unit – usual dose 1 litre) Anticipate need for plasma after 1-1.5 x blood volume replacement. Base further dosing on coagulation results- aim for PT and APTT <1.5 mean control Order from Blood Transfusion Laboratory CUH using Blood Product Requisition Form (allow 20 min thawing time)				PT/APTT >1.5 x mean normal value correlates with increased microvascular bleeding Keep ionised Ca^{2+} > 1.13 mmol/l
Maintain Fibrinogen >1.5 g/l	Give fibrinogen concentrate 1-2g. Anticipate need for fibrinogen after 1-1.5 blood volume replacement. Base further dosing on coagulation results- aim for fibrinogen >1g/L Order from Blood Transfusion Laboratory CUH using Blood Product Requisition Form. Reconstitute at bedside.				Fibrinogen < 0.6 – 0.8 g/L strongly associated with microvascular bleeding
Manage persistent haemorrhage	Where coagulation fully supported by appropriate transfusion and appropriate intervention consider infusion of recombinant Factor VIIa				Unlicensed in this application Requires authorisation by Consultant Haematologist
Avoid DIC (disseminated intravascular coagulation)	Treat underlying cause, Avoid hypothermia and acidosis Avail of expert haematological advice early If suspected, treat empirically if coagulation results unavailable. (4 units plasma, 1-2 pools of platelets, 2g fibrinogen concentrate)				NB Early identification and rapid correction
Restore emergency stock	Inform Blood Transfusion Laboratory CUH when using emergency O Neg blood from Blood Transfusion Laboratory or theatre fridge so stocks can be replaced ASAP.				
Ensure safe transfusion practice and traceability	Adhere to procedures for checking and administering blood components Document Component Number, Volume Transfused and Time on the specified record sheets Record the timing and results of laboratory tests				Incorrect Blood Component transfused is a significant cause of transfusion related mortality / morbidity Under Articles 14 and 15 of EU Directive 2002/98/EC, blood and blood components transfused must be traceable by law.

Jan 2014: Adapted from BCSH Guidelines 2006 – "Guidelines on the management of massive blood loss" BJH> 135, 634-41