Name of Policy: Management of Massive Blood Transfusion

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This policy supersedes all previous issues.
## Version Control

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1. INTRODUCTION

This policy should be read in conjunction with Policy RM36, Blood Transfusion Policy.

Emergency situations create further risks for both patients and staff.

These are critical times when errors can occur very easily and it is essential policy is followed.

Major blood loss can be described as:
- One blood volume or more in 24 hours
- 50% volume blood loss in 3 hours
- 150 mls or more per minute

It is vitally important that this is recognised and acted upon early to prevent shock and the subsequent complications of shock.

2. POLICY SCOPE

This policy applies to all staff employed by Gateshead Health NHS Foundation Trust who are involved in the care of a patient who needs massive blood loss management.

3. AIM OF THE POLICY

The policy is based on national guidance for the management of massive blood loss.

Main aim of this policy is to ensure effective restoration of circulating volume and arrest of bleeding where there is major blood loss/massive haemorrhage.

This is dependent upon effective communication and quick action by experienced staff if the process is to be successful.

4. DUTIES – ROLES AND RESPONSIBILITIES

The Trust Board.
- Are ultimately responsible for ensuring safe effective practice is in place for transfusion
- Must ensure a Hospital Transfusion Committee (HTC) is in place to support good transfusion practice.
- Should support the HTC in their role within the organisation.

Risk Management
- Support the HTC within the organisation
- Provide advice on risk management issues in transfusion
- Ensure any risks are identified to the HTT and HTC through the Transfusion Nurse.
The Hospital Transfusion Committee.
- To produce hospital transfusion policies, based on up to date evidence based guidelines.
- The HTC will feed into the Risk, Patient Safety and Quality committee
- To ensure staff are aware of the current policies through training and education
- Monitor practice through audit
- Support the Transfusion nurses in their role
- Promote strategies encouraging the appropriate use of blood and monitor conservation of blood stocks.
- Produce a contingency plan for blood shortages.
- Produce a maximum blood order schedule.
- Encourage the use of clinically and cost effective alternatives to donor blood.

The Quality Management Committee
- Ensure safe and effective transfusion practice through monitoring the feedback from the HTC
- Ensure Quality systems are introduced using an evidence-based process.
- Use a systematic approach to management of the Quality systems to ensure compliance of protocols and standardisation of documentation.
- Monitor Blood Safety and Quality Regulation compliance within Blood Transfusion

The Transfusion Practitioner.
- Promote best practice through provision of training for all staff involved in the transfusion process within the organisation according to their role.
- Devise and implement audits on areas of transfusion practice agreed at HTC
- Investigate, and report all incidents at local level i.e. HTC and Clinical Improvement Group, SHOT and MHRA as appropriate.
- Lead in the writing and revision of policies related to Blood Transfusion.
- Collaborate with departments to improve and manage changes in practice.

The Transfusion laboratory.
- Promote the effective use of blood through compliance with MSBOS and HTC guidelines.
- Maintain a Quality Blood Transfusion service by observing stated protocols within the Quality Management System of the Clinical Pathology Services.
- Establish patient’s blood group and antibody status, and their suitability for electronic issue.
- Analyse samples for FBC and coagulation
- Inform the clinician of any discrepancies
- Issue blood compatible /suitable for the patient
- Check stock levels and liaise with the NBTS to ensure a supply of blood
- Call in staff if required.
- Contact the Haematologist on-call if specialist advice is required
- Co-ordinate the use of components other than red cells.

Medical staff.
- Promote the appropriate use of blood through observing BCSH guidelines and HTC recommendations.
- To complete competency assessment in blood transfusion
Discuss risks and benefits of Blood Transfusion with the patient.
Use effective alternatives where indicated.
Contact the Haematologist on-call if specialist advice is required
Prescribe all blood components.
Maintain patient safety throughout the transfusion process.
Report any adverse reactions or events to the Blood Transfusion Department or Hospital Transfusion Liaison Nurse as soon as possible.
Attend Mandatory training and induction.
Familiarise themselves with the Hospital Blood Transfusion and Patient ID policies.
Record the reason for transfusion and any benefits gained in the patient’s health record.

Nursing staff: qualified and unqualified.
- Follow Trust Transfusion and Patient ID Policies.
- All staff caring for transfused patients should have specific training.
- Attend Nursing Induction and Mandatory training
- To complete competency assessment in blood transfusion
- Ensure all adverse incidents within their area are reported through the proper channels
- Complete the transfusion record and blood confirmation slip

THE INITIAL INTERVENING CLINICIAN
- Insert a wide bore cannula, up to 14G.
- Make the initial base line blood samples for FBC, Coagulation screen, Cross match and biochemistry.
- Commence fluid resuscitation, either colloid or crystalloid as necessary.
- Maintain BP and Urine output
- Be aware that concealed blood loss is often underestimated

CO-ORDINATOR.
- One member of the team will act as co-ordinator.
- This person should be experienced in managing major bleeding episodes.
- Their responsibilities lie in diagnosis, liaison, communication and documentation
- Diagnosis: Confirm diagnosis of bleeding.
- Clinically assess extent of bleeding: haemodynamic status, lactate, base deficit, urine output.
- Prescribe appropriate resuscitation fluid and oxygen.
- Identify source of bleeding.
- If source of bleeding is unidentified, arrange appropriate investigations e.g. ultrasound, CT scan, endoscopy

Liaison:
- Contact a senior clinician/s most appropriate to the patient’s condition.
- Contact the transfusion laboratory, and porters, to warn of the situation and keep them up to date with what is happening.
- Contact on-call anaesthetist
- Contact on-call ITU consultant to warn of the possible need for a bed
- Act as point of contact for everyone
- Link between laboratory staff with the surgeon and anaesthetist.
• Ensure any blood product sent for the patient accompanies them when transferring to another department e.g. ITU.

Communication:
• Order blood components as required. See Appendix 1.
• Needs to have the ability to decide how soon blood is required (immediately, 20 minutes, 1 hour)
• Needs to have the authority to decide if the blood is to be cross-matched or not.
• Reduce the number of calls to blood bank, causing interruptions during a critical task
• Prevent confusion and conflicting information being passed to laboratory staff.
• Ensure the right people get the right information in a timely way
• Follow up blood results and gives the information to the surgeon and anaesthetist.

Documentation:
• Keep an accurate record of events as they happen in chronological order.
• Record all blood tests sent/processed and the subsequent results,
• Record all fluids, drugs, and blood components given and the time they were given over.
• Record the reason why blood components are given including coagulation/hemoglobin levels etc
• Ensure that all blood confirmation slips for each unit used are returned to blood bank at the end of the event.

SURGEON/ ENDOSCOPIST / RADIOLOGIST
• Arrest the bleeding as soon as is reasonably possible.
• Ask for assistance from other appropriate surgical specialists if considered necessary.

ANAESTHETIST.
Volume resuscitation.
• Maintain tissue perfusion and oxygenation.
• Rapid infusion of colloids and crystalloids through a large bore cannula (up to 14 Gauge) to restore the circulation volume.
• Insert a larger bore central venous access if required
• Use a blood warmer and/or rapid infusion device if flow rate >50ml/kg in an adult
• Patient warming devices such as an Inditherm mattress with or without warm air blankets should be used to maintain body temperature if possible.
• In patients without a head injury, a systolic blood pressure of 80 – 100mmHg should be aimed for, with a target haemoglobin of 7-9g/dl.
• Maintain APTT and PT <1.5 x mean control
• Maintain fibrinogen >1.0g/l
• Maintain platelets >75 x 109/L

5. DEFINITIONS

Major blood loss can be described as:
• One blood volume or more in 24 hours
• 50% volume blood loss in 3 hours
• 150 mls or more per minute

6. GUIDELINES ON THE MANAGEMENT OF MASSIVE BLOOD LOSS.

N.B. It is essential the patient’s safety is maintained by ensuring a blood sample is available for blood transfusion.

Positive patient identification is an essential part of this process therefore the patient must have an ID wristband, and the sample must have the patient’s full name, date of birth, hospital record number and gender handwritten on the tube and be signed and dated.

Any deviation from the Blood transfusion policy (RM 36) is unacceptable and will only result in delays while the sample is amended or repeated.

Major incident and unknown patients should be identified in accordance with RM40 policy

Effective communication is an essential quality in major blood loss. It is vitally important that senior, experienced staff lead in co-ordinating treatment for this group of patients.

As soon as it is apparent that patient is experiencing major blood loss, steps need to be taken to contact the consultant looking after the patient, as well as any other specialist who may be able to assist with arresting the bleeding e.g. a vascular specialist.

The transfusion laboratory must be informed as soon as a massive haemorrhage is identified.

Trauma Calls –The transfusion laboratory staff carry a trauma call bleep, and will be alerted by switchboard when the trauma team is called.

6.1 BLOOD COMPONENT USE.

Blood component support may take time to organise. The hospital blood bank carries a small supply of blood components especially Rh D negative blood.

See appendix 2

6.1.1 RED CELLS

Emergency O Rh D Negative blood.

Emergency O Rh D negative blood is a limited resource best kept for O Rh D negative patients.
Wherever possible blood of the patients own specific group should be used but this may depend upon the availability within the hospital blood bank and the National Blood Service (NHSBT).

**In a dire emergency, prior to a sample being available**, females of child bearing age should be given O Rh D negative and Kell negative blood in order to avoid problems with any future pregnancy. In the same situation, females over 60 and men should be given O Rh D positive.

**Electronic issue.**

Blood can be electronically issued if there is a current group and save sample in the lab, which has already been grouped, and where the antibody screen is negative.

There will also need to be an historical blood group record.

This means blood will be ready within **5 minutes**

**Group specific blood.**

Group specific blood, which is not cross-matched but is the right group for the patient will be available within **5-10 minutes**.

Compatibility testing will still take place but after the blood has been issued.

If any units are subsequently found to be incompatible, the team will be informed and the unit withdrawn where possible.

**Cross-matched blood.**

Blood will be cross-matched if the patient has an antibody or is not eligible for electronic issue.

The time taken from receiving the sample to getting the blood will be approximately **45 minutes**

If there is a current sample in the lab which has been grouped and antibody screened, the cross match will take 30minutes.

**Appropriate use of Red cells.**

Intra-operative cell salvage should be used when possible to reduce the need for donor blood.

Red cells should not be used as a volume expander.

Red cells are likely to be needed when 30-40% blood volume is lost. Blood loss of >40% is more life threatening and red cell transfusion is definitely required.
Blood use should be guided by clinical estimation of blood loss and the effect volume replacement with fluids.

The haemoglobin and haematocrit should be measured frequently, however a haemoglobin level may not be a good indicator of total blood loss in an acute bleed.

Red cells are rarely needed with an Hb of 10g/dl or above.

Red cells are essential with an Hb of 6g/dl or less.

The decision to transfuse should be based on: blood loss, cardio respiratory reserve, oxygen consumption, and history of atherosclerotic disease.

Physiological variables such as: heart rate, arterial pressure, urine output and cardiac output can be used to assess the patient, however silent tissue and organ ischaemia may still occur with stable vital signs.

6.1.2 PLATELETS

Platelets should not allowed to fall below $50 \times 10^9/l$ in the acutely bleeding patient

A count of $50 \times 10^9/l$ may be anticipated when approximately two blood volumes have been replaced by fluids or red cells, however there is individual variation.

A higher trigger of $100 \times 10^9/l$ has been recommended in high velocity trauma or central nervous system injury.

In Gateshead platelets are ordered directly from the NHSBT and this will cause a delay in provision.

It may be necessary to order platelets at a higher than desired count to ensure that they are available when they are eventually required.

Regular platelet levels should be measured so that platelets can be ordered as soon as possible. In on going bleeding a transfusion trigger of $75 \times 10^9/l$ is recommended to provide a safety margin, ensuring the level does not fall below a level critical for haemostasis.

Platelet transfusion may be required when platelet count is above $75 \times 10^9/l$ when their function is abnormal e.g. in renal dysfunction or secondary to anti-platelet therapy (aspirin, clopidogrel etc).

Platelets can be given via a platelet or blood giving set. **Do not use a pump for platelets**
6.1.3 FRESH FROZEN PLASMA

Regular coagulation tests are essential and may need to be interpreted by a Haematologist.

There is evidence that early FFP replacement in a major haemorrhage situation improves outcome by reducing transfusion associated coagulopathy.

The standard FFP replacement dose is 12-15ml/kg (4 units in an adult)

FFP takes 30 minutes to thaw in the laboratory.

The laboratory will prepare an adult dose of FFP once a major haemorrhage situation has been confirmed to minimise delay.

After 4 units of red cells have been given, it is advised to give one unit of FFP for every unit of red cells given.

6.1.4 CRYOPRECIPITATE

Cryoprecipitate should be given where the fibrinogen levels are critically low (less than 1.0g/L) and they cannot be corrected by administration of FFP.

The adult dose of cryoprecipitate is 2 packs (10 units).

Cryoprecipitate takes 30 minutes to thaw in the laboratory.

Cryoprecipitate is rarely needed except in DIC and end-stage liver disease.

Cryoprecipitate is a pooled product which exposes the patient to multiple donors.

Comparison of FFP and cryoprecipitate contents:

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<tr>
<th>FRESH FROZEN PLASMA</th>
<th>CRYOPRECIPITATE</th>
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<tbody>
<tr>
<td>1 litre of FFP (4 units)</td>
<td>150-200mls (2 packs)</td>
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<tr>
<td>2 - 5gs of fibrinogen</td>
<td>3.2 - 4gs fibrinogen + FVIII + FXIII and von Willebrand factor</td>
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N.B. Giving sets should be changed after each blood component use, or a clot may occur in the set.

6.1.5 PROTHROMBIN COMPLEX CONCENTRATE:

This should be employed for the emergency reversal of warfarin treatment in the event of life or limb threatening haemorrhage. The INR may be high or in the therapeutic range.

The current prothrombin complex concentrate in use at QEH is Beriplex.
Requests for Beriplex must go through the Haematologist on-call. Beriplex must be ordered from the Blood Transfusion laboratory.

Procedure:
- Check the patient’s INR
- Give Beriplex 30 u/kg rounded to the nearest 250u.
- Give vitamin K 5mg iv at the same time
- Recheck the INR after Beriplex administration to ensure complete reversal. A second dose may be given after discussion with the Haematologist on-call.

See appendix 3

6.1.6 PHARMACOLOGICAL MANAGEMENT

ANTIFIBRINOLYTIC AGENTS:
Antifibrinolytic agents work by inhibiting clot breakdown.

1. Tranexamic acid (first choice): 0.5 – 1.5 g by slow IV injection 8 hourly

2. Aprotinin has been withdrawn.

RECOMBINANT FVIIA (NOVOSEVEN):

Novoseven is licensed for the treatment of major bleeding in Congenital haemophilia with inhibitors, patients with acquired haemophilia, Congenital Factor VII deficiency and Glanzmann's thrombasthenia
It can be used outside its product licence to treat major haemorrhage.

The requesting clinician should be aware that there is an increased incidence of significant vascular complications in older patients and those with vascular disease or damage.

It is reasonable to consider the use of Novoseven in situations where there is blood loss of >300ml/h, with no evidence of heparin or warfarin effect, where surgical control of bleeding is not possible and there has been adequate replacement of coagulation factors and platelets and correction of acidosis.

The decision to use rFVIIa should be made by the Consultant looking after the patient, in conjunction with a Haematology Consultant.

The dose is 90u/kg to the nearest full vial.

It is available from the transfusion lab.

Thrombocytopenia and abnormal coagulation tests should be corrected as far as possible before administering Novoseven
Novoseven has a short half life and a second dose of may be administered after 2 hours following discussion with the haematology consultant

Novoseven is a recombinant product and is acceptable to Jehovah’s Witness Patients

6.1.7 Risks of Massive Transfusion

The most common reported adverse event of transfusion is administration of the incorrect patient’s blood, which can be fatal.

Transfusion-related acute lung injury (TRALI) and other immunological reactions are uncommon, but occur more commonly following administration of platelets and FFP than red cells.

Any suspected transfusion reactions should be reported to the transfusion laboratory immediately.

Disseminated Intravascular Coagulation (DIC)

DIC may be triggered by trauma, hypoxia, hypovolaemia and hypothermia.

It can be detected by prolongation of prothrombin and thrombin times, a fall in the platelet and fibrinogen count and a raised d-dimer.

The precipitating cause should be treated if possible, and blood products given to correct the coagulopathy.

Metabolic consequences of massive transfusion:

Hypocalcaemia occurs due to the effect of citrate in the administered blood. If the ionised calcium level is low, it should be corrected with a slow injection of 10ml of 10% calcium chloride.

Hyperkalaemia may occur and should be treated with glucose / insulin regimes, along with correction of metabolic acidosis.

7. Training and Competency Assessment

Staff should have general transfusion training as per TNA.

Massive transfusion is included in induction for all doctors.

The request form for blood transfusion also provides advice for urgent blood requests.
8. **EQUALITY AND DIVERSITY**

The Trust is committed to ensuring that, as far as reasonably practicable, the way we provide services to the public and the way we treat our staff reflects their individual needs and does not discriminate against individuals or groups on any grounds. The policy has been appropriately assessed.

9. **PROCESS FOR MONITORING COMPLIANCE WITH THE POLICY**

Monitoring compliance with the policy is the responsibility of Hospital transfusion committee (HTC). This will be undertaken by:

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<th>Monitoring and audit</th>
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<td>Method</td>
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<tr>
<td>Massive transfusion</td>
<td>Review of events.</td>
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10. **CONSULTATION AND REVIEW OF THE POLICY**

This policy will be led by the HTC, which includes clinicians with experience in massive blood loss for example, Haematologists, Surgeons and Anaesthetists and Accident and emergency consultants, Obstetricians.

The policy is circulated to members for comment then passed by the HTC as the approving body.

11. **IMPLEMENTATION OF THE POLICY**

This policy will be circulated by the Trust Secretary as detailed in OP27 Policy for the development, management and authorisation of policies.

Also see section 7 Training.

12. **REFERENCES**


Management of bleeding following major trauma: European guidelines Spahn, Cerny et al. Critical Care 2007, 11:414

12.1 Gateshead - Risk Management policies
RM 36 Blood transfusion Policy
RM 40 Patient identification Policy

12.2 Gateshead - Obs and Gynae Policies
6.1-2 Antepartum haemorrhage
6.3-4 Postpartum Haemorrhage
6.5 Patient at risk of postpartum haemorrhage
6.6 Treatment of haemorrhage in the patient refusing blood transfusion.

13. ASSOCIATED DOCUMENTS

This policy should be read in conjunction with Policy RM36, Blood Transfusion Policy and the Patient identification policy RM40
Appendix 1: Summary of Blood products recommended for the management of major haemorrhage
Inform laboratory at once of major haemorrhage situation
Send urgent FBC, group and save and coagulation screen to laboratory.
Blood will be required when 30-40% circulating volume has been lost
It is advisable to repeat FBC and coagulation screen after every 8 units of red cells transfused (if practicable)

Red cells:
Quantity depends on rate of blood loss and suitability for electronic issue. Initial order suggested is 4 units.
O Negative Immediate issue
Group specific – 5-10 mins
Cross match (patient has antibodies) -45 minutes
Electronic issue – 5 mins (patient has Group and save result)

Platelets:
Platelet transfusion should be considered when platelets <75 x10^9/l, or at higher levels where patients are on drugs which inhibit platelet function (aspirin, clopidogrel)

FFP:
An adult dose of FFP will be thawed by the laboratory once a major haemorrhage situation is confirmed
After the first 4 units of red cells have been given replace FFP on a 1:1 basis, irrespective of coagulation results
The average adult dose of FFP required to correct coagulopathy is 4 units

Other products
Cryoprecipitate:
Consider cryoprecipitate if fibrinogen is <1.0g/L
The adult dose of cryoprecipitate is 2 packs (10 units)

Beriplex:
Beriplex may be used to reverse warfarin in the event of life or limb threatening bleeding – see appendix 3

Novoseven:
Novoseven may be issued on the advice of a consultant haematologist in a life threatening haemorrhage, provided that there has been an attempt to correct thrombocytopenia and abnormal coagulation tests as far as possible.
ORDERING BLOOD IN AN EMERGENCY

Someone senior MUST co-ordinate care in an emergency
This is very important as inexperience can cause delays.
Phone the lab immediately and inform them of the impending need for blood products.

Is there a G&S sample already in the lab?

YES
Decide how quickly you need the blood

NO
Take a specimen and send it immediately to the lab

YES

Emergency ‘O’ Negative

Only available in a DIRE emergency where there is insufficient time to establish a blood group.
A sample MUST be sent for further blood.
Not suitable for everyone.
**Will NOT be crossmatched**
Clinician who decides takes full responsibility for the decision.
Max 2 units Ready within 5 minutes.

Group Specific

The same group as the patient.
**Will NOT be crossmatched**
Clinician who decides takes full responsibility for the decision.
Ready within 5-10 minutes.

Full Serological cross match

**Will be fully cross matched**
Less chance of a reaction.
Ready within 45 minutes of sample arriving in lab.

PLEASE NOTE
The co-ordinator should communicate with the lab.
Contact details are essential for good communication with the lab extn on 2281 bleep 2082.
Only specifically trained people are allowed to collect blood. Use THEM.
In a dire emergency only 1 unit of Blood can be sent in the chute.
Appendix 3

Guide to warfarin reversal

NO BLEEDING

INR>8  
Vitamin K 1mg PO (iv if very high INR or high risk of bleeding*, or nil by mouth or concerns about absorption of Vit K from GI tract)  
Check INR within 24 hrs

INR 4.5-7.9  
Omit or reduce dose  
Vitamin K 1mg PO if high risk*

*High risk if >70, hypertension, DM, renal failure, prev. MI, CVA, GI bleed, unsteady

BLEEDING

Minor  
Vitamin K 2mg PO (iv if very high INR or high risk patient or nil by mouth or concerns about absorption of Vit K from GI tract)  
Check INR within 24 hrs

Significant  
Vitamin K 5mg iv  
Consider Beiplex if cannot wait 4-6 hours for Vit K effect.  
Check INR and APTT at 4-6 hrs or sooner

Life/limb/sight-threatenning  
(Intracranial, retroperitoneal, intra-ocular, spontaneous muscle bleed, with compartment syndrome, pericardial, active bleeding from any orifice with BP<90/oliguria/Hb drop)

   Vitamin K 5mg iv  
   Beriplex 30 units/kg iv (PT complex concentrate)  
   Round up to nearest 250iu  
   Check INR and APTT immediately

   Adequate correction (INR<1.5) then repeat INR/ APTT in 4-6 hrs

   Inadequate correction –discuss with Haematology on-call

All patients on warfarin with rapid onset CNS signs need urgent INR If CT scan not immediately available, administer Beriplex and iv Vitamin K prior to being sent to scan. Advise CT scan within 1 hour. Reverse INR even if in therapeutic range.

Vitamin K can cause anaphylaxis iv so give as a slow bolus

Never use FFP to reverse the effects of warfarin

Beriplex is issued from the hospital blood bank – no group and save required. Administer as a slow iv bolus (3-5 mins)