Document Control

Title			
Massive Blood Loss Management Policy (Adults)			
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0.2	Jan 2011	Draft	Amendments made following consultation.
1.0	Mar 2011	Final	Approved by Hospital Transfusion Committee on 22nd March 2011.
1.1	May 2011	Revision	Converted into correct policy template. Minor amendments to document.
1.2	Nov 2012	Revision	Minor amendment to Flow Chart (p 16).
2.0	Feb 2013	Final	Further amendments to Appendix B flow chart. Deleted reference to cell salvage. Additions to associated documents list. Approved at Hospital Transfusion Committee 5th March 2013.
2.1	Sep 2013	Revision	Minor amendments by Corporate Governance to document control report and formatting for document map navigation and semi-automatic table of contents. Update to Equality Impact assessment.
2.2	Mar 2016	Revision	New template added. Resus fluids amended (5.2.3) Removal of reference to TEG and Novoseven from Appendix B. Approved at HTC 22nd March 2016.
2.3	Feb 2017	Revision	Introduction of Massive Obstetric Haemorrhage pack. Amendments to contents of MBLP packs and introduction of designated phone line for communication with the Transfusion Laboratory
2.4	May 2017	Revision	Addition of appendices. For approval at Hospital Transfusion Committee on 1st June 2017.
3.0	Jun 2017	Revision	Approved 01.06.17
3.1	Feb 2018	Revision	Updated flow charts in appendices A and B and removal of appendices C and D
3.2	Jun 2020	Revision	HTC replaced with PBMG References updated. Minor amendments approved at HTT meeting 16.07.2020
4.0	Sept2020	Final	Approved at PBMG 17th Sept 2020
4.0	Oct 2020	FInal	Ratified at CRG 01/10/2020

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Contents

1 Introduction

This document sets out Northern Devon Healthcare NHS Trust's system for the Management of Massive Blood Loss (MBL). It provides a robust framework to ensure a consistent approach across the whole organisation, and supports our statutory duties as set out in the NHS Constitution.

2 Purpose

The following general principles can be applied in order to improve:

- The rapid provision of blood and blood products in emergency situations
- Clinical outcomes for trauma and other massively bleeding patients

in accordance with best practice guidance NPSA Rapid Response Report reference NPSA/2010/RRR017 and NICE guidance 24 (2015).

This policy is applicable to all clinical staff involved in blood transfusion. Deviation from the policy must be for valid clinical reasons only, and the reason for non-compliance must be documented clearly in the patient's notes.

Refer to NDHT guidelines for the management of Obstetric Haemorrhage.

3 Definitions

NPSA: National Patient Safety Agency

NICE: National Institute for Health and Clinical Excellence

PBMG: Patient Blood Management Group

HTT: Hospital Transfusion Team

Massive Blood Loss (MBL) is defined as:

- Replacement of one blood volume or the transfusion of 10 or more units within a 24 hour period
- Replacement of 50% blood volume within 3 hours or less
- Ongoing transfusion requirement in an adult to compensate greater than 150ml / min blood loss
- Bleeding leading to a heart rate of greater than 100 and / or a systolic blood pressure considered to have dropped significantly from patient's base line.
- In the Obstetric patient; Post-partum haemorrhage is defined as blood loss greater than 1 litre and Massive Obstetric haemorrhage is greater than 1.5 litres.

4 Responsibilities

4.1 Role of Clinical Effectiveness Committee (CEC)

The CEC will receive reports from the PBMG and, following analysis, either escalate issues or provide assurance to the Governance Committee.

4.2 Role of Patient Blood Management Group (PBMG)

The main purpose of the PBMG is to provide a multi-disciplinary focus group to ensure safe and effective blood transfusion practice to comply with NICE, National Blood Transfusion Committee recommendations and the Blood Safety and Quality recommendations which are monitored by the MHRA.

4.3 Role of the Consultant responsible for the patient

The consultant is responsible for ensuring that all members of the team are familiar with the policy and are aware of their individual responsibilities.

4.4 Role of Clinical Staff

Clinical staff are responsible for assessing the clinical condition of the patient and activating the policy if appropriate.

Clinical staff are responsible for ensuring swift and accurate communication of the activation of the guideline via the appropriate channels.

4.5 Role of Laboratory staff

Laboratory staff are responsible for ensuring they are aware of the correct procedures to follow when the Massive Blood Loss Policy is activated.

Laboratory staff are also responsible for communication with the portering staff.

4.6 Role of the portering staff

The portering staff are responsible for ensuring a swift response to requests to transport blood and products to the clinical area of the emergency.

5 General Principles of the Management of Massive Blood Loss

5.1 Communication

- A team approach is vital. Early consultation with senior surgical, anaesthetic/ intensive care and haematology colleagues is essential.
- The hospital transfusion laboratory must be informed of a massive transfusion situation at the earliest possible opportunity. In maternity, due to the frequency of significant blood loss and based on local audit evidence, the Major Obstetric Haemorrhage Pack should first be initiated.

The Massive Blood Loss Policy can be activated at any time after this first request.

- Request “Massive Blood Loss Policy” via bleep 045 (Transfusion Laboratory staff)
- A clear phrase to activate the massive blood loss policy should be used (e.g. I wish to activate the massive blood loss policy in ***state site***). A specific member of the team should be nominated to co-ordinate communication with the laboratory and support services for the duration of the incident. See Appendix A.
- Appropriate surgical / radiological expertise for the area of bleeding is vital.
- An intensive care bed is likely to be required. Early warning of this to ICU is advisable.

5.2 Specific aims

- Adequate ventilation and oxygenation.
- Control the source of the haemorrhage.
- Resuscitation to maintain adequate tissue perfusion and oxygenation.
- Start blood component therapy.
- Keep the patient normothermic.
- Anticipate a coagulopathy.

5.2.1 Adequate ventilation and oxygenation

- Establish a patent airway and give 100% oxygen.

5.2.2 Control the source of haemorrhage and set up intravenous access

- Control obvious bleeding points (pressure, tourniquets, haemostatic dressings) Transfer the patient to an area where definitive intervention for diagnosis and treatment can occur.
- Establish intravenous access with at least two short bore cannulae, ideally 14 G or larger.
- If venous access is difficult the use of an intraosseous needle should be considered. Suitable needles are located in the Emergency Department.
- If the source of haemorrhage is below the diaphragm at least one line must be in the upper limb or neck.
- Patients with upper thoracic and neck injuries should have large bore access in the lower extremities.
- In patients with multiple injuries one access site should be above and one below the diaphragm.

5.2.3 Fluid Resuscitation

- The blood pressure is adequate if the patient is conscious, talking, and has a palpable peripheral (e.g. radial) pulse.
- Initial resuscitation involves warmed crystalloids.
- When compared to colloids, crystalloids are cheap, easy to administer, are not associated with adverse reactions and do not affect coagulation. However large volumes are required and extensive tissue oedema occurs.
- A balanced salt solution (not 0.9% sodium chloride) should be used to avoid the hyperchloraemic metabolic acidosis seen if patients are resuscitated with large volumes of 0.9% sodium chloride.
- Red cell transfusion will be required when 30–40% of blood volume is lost i.e. WHO bleeding grade 3/4. Blood loss is usually underestimated, and it must be remembered that haemoglobin and haematocrit values do not fall for several hours after acute haemorrhage.
- Blood cell salvage should be considered if available to reduce the requirement for allogeneic blood. Bacterial contamination of the wound is a relative contraindication.

Clinical goals are:

- A falling heart rate (less than 100 per min)
- Restoration of blood pressure (greater than 100 mmHg systolic)
- An adequate central venous pressure (greater than 5 mmHg)
- Satisfactory urine output (greater than 30 mls/hour or 0.5 mg/kg/hr)
- A falling serum lactate on blood gas analysis

Laboratory Investigations

Send samples as soon as possible for:

- Blood grouping, antibody screening and compatibility testing.
- Haemoglobin and platelet count.
- Coagulation screening (INR, APTR).
- Fibrinogen measurement.
- Biochemistry investigations (U&E).
- Arterial blood gas estimation (including serum lactate).
- Repeat FBC and coagulation screen after every 4 units transfused or every hour, whichever is sooner.

5.2.4 Blood component therapy

- Use group O un-cross-matched red cells if the blood group is unknown in an extreme emergency. Pre-menopausal females should be given O Rh (D) negative red cells.
- Group O blood is available in the following areas:
  - Ward Bank fridge outside the Laboratory (Level 1)
  - Maternity fridge
- It is acceptable to give O Rh (D) positive cells to males and post-menopausal females of unknown blood group.
- Group-specific red cells should be given at the earliest possible opportunity as group O blood is a scarce resource.
- Patients with a known blood group may be eligible for Electronic Issue (EXM) which can be provided very quickly from the Transfusion laboratory.
- Further blood components should be requested from the laboratory as indicated by the condition of the patient and/or blood test results. 'MBLP Pack 2,' if required, will contain 4 units of compatible red cells, 4 units of FFP, 2 units of cryoprecipitate and a further ATD of platelets when available

Fresh Frozen Plasma (FFP)

- FFP at a dose of 15 ml/kg should be considered after the loss of one blood volume (calculated at 70 ml/kg) and definitely given before 1.5 blood volumes have been lost.
- Further administration of FFP should be guided by coagulation tests, but aimed at maintaining the INR at less than 1.5.
- FFP takes 30 minutes to thaw; infusion should be started within 2 hours of thawing and completed within 4 hours of thawing.

Cryoprecipitate

- Early use of FFP may avoid the need for cryoprecipitate but if fibrinogen levels are low (at or below 150mg/dL) cryoprecipitate should be given. An adult dose of cryoprecipitate is 2 pooled units.
- Cryoprecipitate is a frozen product taking approximately 30 minutes to thaw.

Fibrinogen Concentrate

- As an alternative to cryoprecipitate, Fibrinogen Concentrate which does not need to be thawed may be used.
- Fibrinogen Concentrate can be issued if fibrinogen levels are less than 150mg/dL or less than 200mg/dL for obstetric patients.

- ***This is an unlicensed indication in the UK and must be given on a named patient basis on advice from a senior clinician. There is a lack of clinical trials to define safe and effective use.***

- Fibrinogen Concentrate is given at a fixed dose of 4g and the laboratory holds 8 grams.

- The use of prothrombin complex concentrate (PCC) is not recommended.

Platelets

- Platelets should be administered to maintain a platelet count of greater than 50 $x10^9$ /l. Patients who have sustained major trauma or who have an intracranial injury should have a target platelet count of $100x10^9$/l.

- A platelet count of $50x10^9$/litre or less can be anticipated when approximately 2 blood volumes have been replaced; however, individual variation is great. Anticipation of platelet requirements should allow for 'blue light' delivery time from Plymouth (2 hours 35 minutes).
- One adult therapeutic dose (1 ATD = 4 pooled units) should increase the platelet count by approximately 30 x 10^9/l.
- Platelets should be given through a giving set that has not been previously used for red cells as this may reduce the effective transfused platelet dose.

Antifibrinolytic agents

- Tranexamic acid should be considered as an early intervention (loading dose 1g over 10 minutes followed by an infusion of 1g over 8 hours)

Recombinant factor VIIa (rVIIa)

- rVIIa has been used in an attempt to control bleeding in massive transfusion scenarios. Recent data review has highlighted the risk of arterial thrombotic complications. Its use may be considered when major blood loss persists in spite of standard attempts to control bleeding in a normothermic patient who has received adequate replacement of coagulation factors with FFP, cryoprecipitate and platelets and correction of acidosis. Its efficacy depends on the presence of active platelets.

- The product is not licensed for this use in the UK therefore the decision to administer recombinant factor VIIa must be made at consultant level on a named patient basis. An initial dose of 200µg/kg is recommended followed by two doses of 100µg/kg administered at one and three hours following the first dose if bleeding continues. **NB** NDHT does not hold a stock of rVIIa.

5.2.5 Maintain normothermia

- Core temperature should be measured. Hypothermia is an important contributor to continued bleeding and adverse patient outcomes because it causes:
  - Platelet dysfunction.
  - Alteration of coagulation enzyme kinetics.
  - Enhanced fibrinolysis.
  - Increased affinity of haemoglobin for O_2
  - Increased release of red cell potassium.
  - Decreased breakdown of lactate.

- Counter current fluid warmers (Hot Line / Level 1) should be used in patients requiring massive transfusion
- Forced air warming blankets (Bair Hugger) or thermal blankets should be used wherever possible to keep the patient warm

5.2.6 Anticipate a coagulopathy

- Despite immediate appropriate intervention a severe coagulopathy may occur. This is manifested by the onset of micro-vascular bleeding in the operative field and oozing from venepuncture sites.
- At particular risk are:
  - Patients with prolonged hypoxia or hypovolaemia.
  - Patients with cerebral or extensive muscle damage.
  - Patients who become hypothermic.
- Obstetric haemorrhage is frequently associated with DIC.
- Prolongation of the INR and APTR (greater than 1.8) beyond that expected by dilution, accompanied by significant thrombocytopenia (platelet count less than $50x10^9$/litre and low fibrinogen (less than 80mg/dL) are consistent with disseminated intravascular coagulation (DIC). Measurement of fibrinogen degradation products or D-dimers may be useful in making the diagnosis.
- Treatment of DIC consists of platelets (1 ATD), FFP (15 ml/kg) and cryoprecipitate (2 packs) or fibrinogen concentrate, given as soon as possible.

5.3 Specific situations

5.3.1 Major Obstetric Haemorrhage

- Obstetric cases should initially request 'Major Obstetric Haemorrhage (MOH) Pack' containing 4 units of compatible red cells. If further blood products are required the Massive Blood Loss Policy should be activated as described in paragraph 5.1 above. Please refer to flow chart at Appendix B

- See also the Obstetric Haemorrhage Guideline

- Severe PPH increases the risk of post-partum VTE. Thromboprophylaxis should be administered as soon as clinically indicated once haemorrhage is ceased and the woman is stable.

5.3.2 Major trauma call

- In the event of a major trauma call with a high expectation of massive blood loss, the Emergency Department clinician may request 2 units of group O uncross-matched blood for stand-by in a blood transport box.

- The request must be made **directly** to the transfusion laboratory/on call haematology BMS and the blood box can only be collected directly from the transfusion laboratory on level 1.

- The blood box is only valid for a maximum of 3 hours. The time by when the blood must be transfused or returned to the laboratory will be clearly stated on the luggage tag attached to the box.

- The blood box is sealed and this seal must only be broken if the blood is to be transfused. Blood returned to the laboratory in a box with a broken seal will be discarded.

5.3.3 Massive Blood Loss

- Initially, all cases where the policy has been triggered should be issued with 'MBL Pack 1' comprising 4 units of compatible red cells and 4 units of FFP. The transfusion staff will also request delivery of 2 ATD of platelets from Plymouth.

- If the blood transport box remains sealed, the contents can be transfused for up to 3 hours after issue. If the seal is broken, the contents must be set up within 3 hours, or the red cell units should be returned to the blood fridge nearest the specific clinical area. If, on opening the blood transport box, the red cell units are neither transfused nor placed in a fridge, they should be returned to blood transfusion to be discarded.

5.3.4 Patients on anticoagulants or antiplatelet agents

- These are often complex situations, contact the on- call haematologist.

- For reversal of anticoagulation please refer to the linked policy https://ndht.ndevon.swest.nhs.uk/oral-anticoagulation-policy/

- For patients on antiplatelet drugs, platelet function will be abnormal though platelet count may well be normal. In these patients e.g. patients who are taking aspirin, clopidogrel or dual antiplatelet therapy, empirical platelet transfusion may be required.

Note - National guidelines say there is no benefit in giving platelet transfusions to patients on anti-platelet drugs as donor platelets will acquire the same defect as patients' own platelets.

6 After The Event Is Over

Once the event is complete i.e. once haemostasis is achieved with a normotensive patient, or once aggressive treatment has been stopped, or in the event of the patient dying, **inform the laboratory with the phrase 'The massive blood loss policy for (patient name and ID) is no longer active'** – this may prevent further blood products from being wasted / transported.

7 Monitoring Compliance With and the Effectiveness of the Policy

7.1 Process for Monitoring Compliance and Effectiveness

Monitoring compliance with this policy will be the responsibility of the Hospital Transfusion Team. This will be undertaken using the traceability record for each episode when the policy is invoked. The audits will be reviewed by the Hospital Transfusion Team and presented to the Patient Blood Management Group.

Where non-compliance is identified, support and advice will be provided to improve practice.

7.2 Standards/ Key Performance Indicators

Blood usage and wastage is monitored nationally by the Blood Stocks Management Scheme and any change will be reported to the Hospital Transfusion Team (HTT). The HTT will then review the frequency of the policy being used and report to the Patient Blood Management Group.

8. Equality Impact Assessment

Group	Positive Impact	Negative Impact	No Impact	Comment
Age		X		Policy aimed at adults
Disability			X	
Gender			X	
Gender Reassignment			X	
Human Rights (rights to privacy, dignity, liberty and non-degrading treatment)			X	
Marriage and civil partnership			X	
Pregnancy			X	
Maternity and			X	

Breastfeeding				
Race (ethnic origin)			X	
Religion (or belief)			X	
Sexual Orientation			X	

9. References

- British Committee for Standards in Haematology (BSH) (2017) A practical guideline for the haematological management of major haemorrhage
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- Holcomb JB, Tilley BC, Baraniuk S, Fox EE, Wade CE, Podbielski JM, et al. Transfusion of plasma, platelets, and red blood cells in a 1:1:1 vs a 1:1:2 ratio and mortality in patients with severe trauma: the PROPPR randomized clinical trial. JAMA. 2015;313(5):471-82.
- Hunt BJ, Allard S et al. A practical guideline for the haematological management of major haemorrhage. *Br J Haematol* 2015;170:788-803
- National Blood Transfusion Committee (NBTC) (2020) Guidance and triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage
- NICE. Blood transfusion. NICE guideline [NG24]. https://wwwniceorguk/guidance/ng24. November 2015.
- NPSA Rapid Response Report reference NPSA/2010/RRR017
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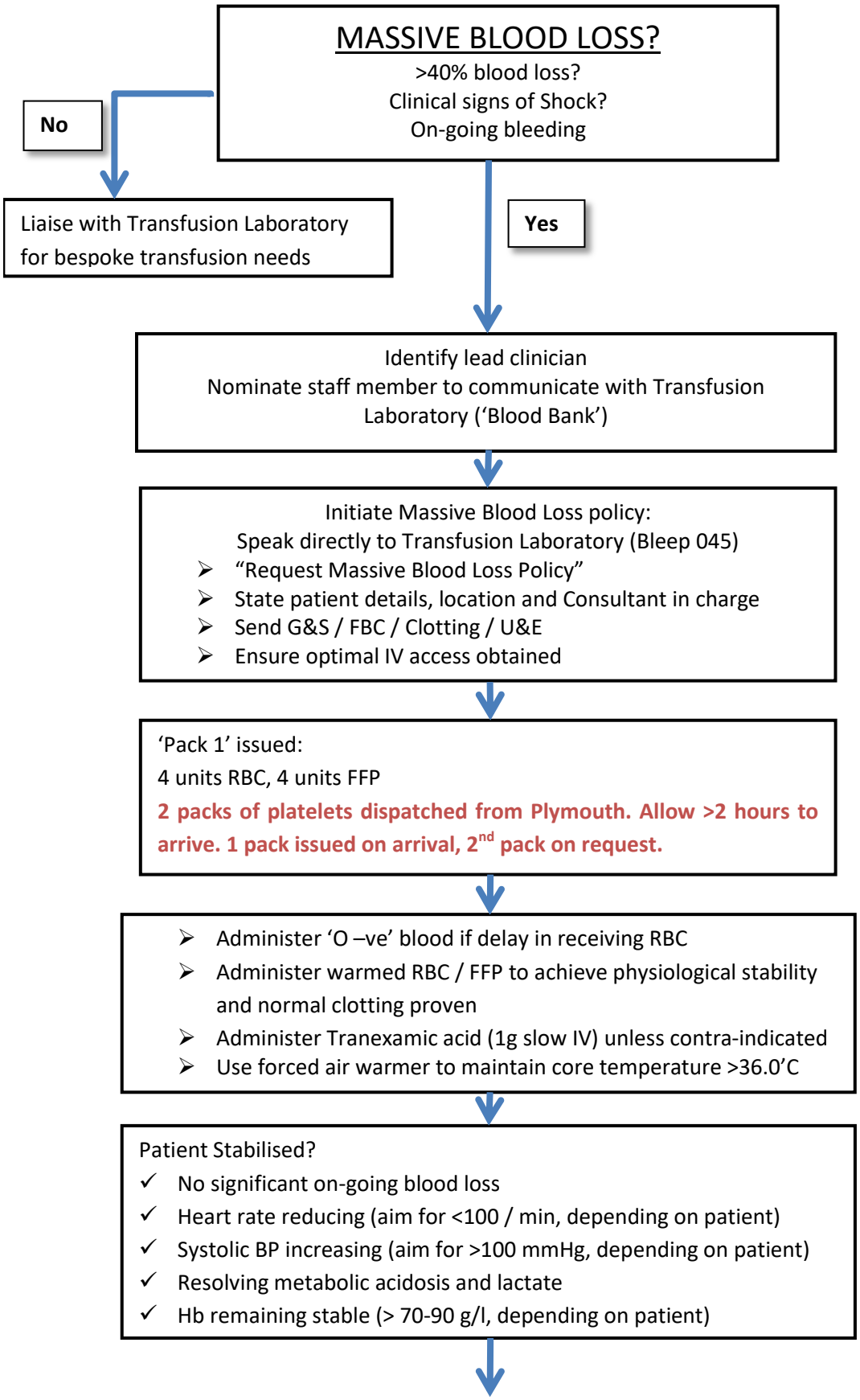
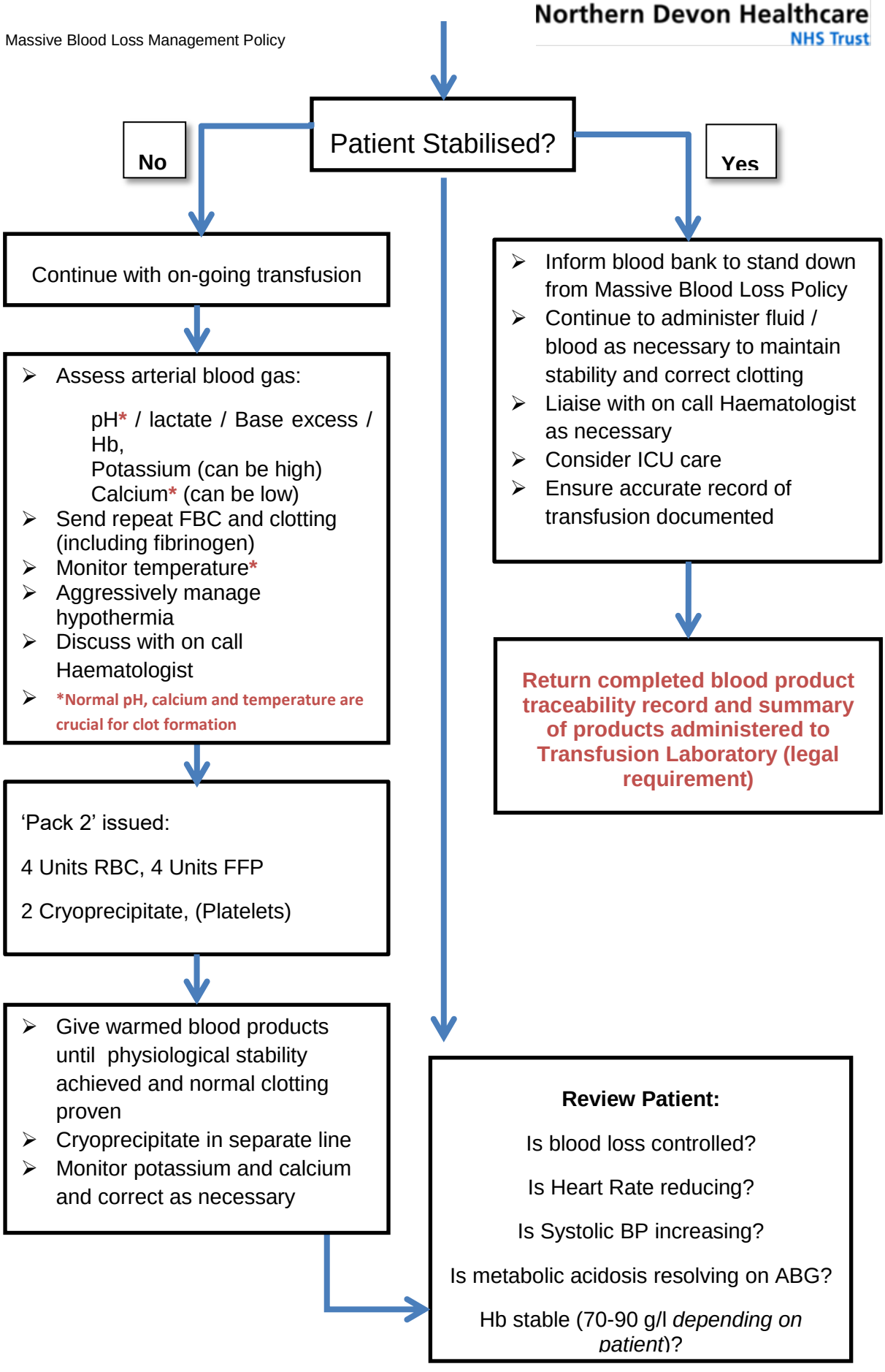
- Spahn D et al. Management of bleeding following major trauma: a European guideline. *Critical Care* 2007;**11**:R177
- Stainsby D, MacLennan S and Hamilton PJ: Guidelines on the management of Massive Blood Loss. *Br J Haematol* 2006;**135:**634 - 641.

10. Associated NDHT Documentation

- Blood Transfusion Policy
- Obstetric Haemorrhage Guideline

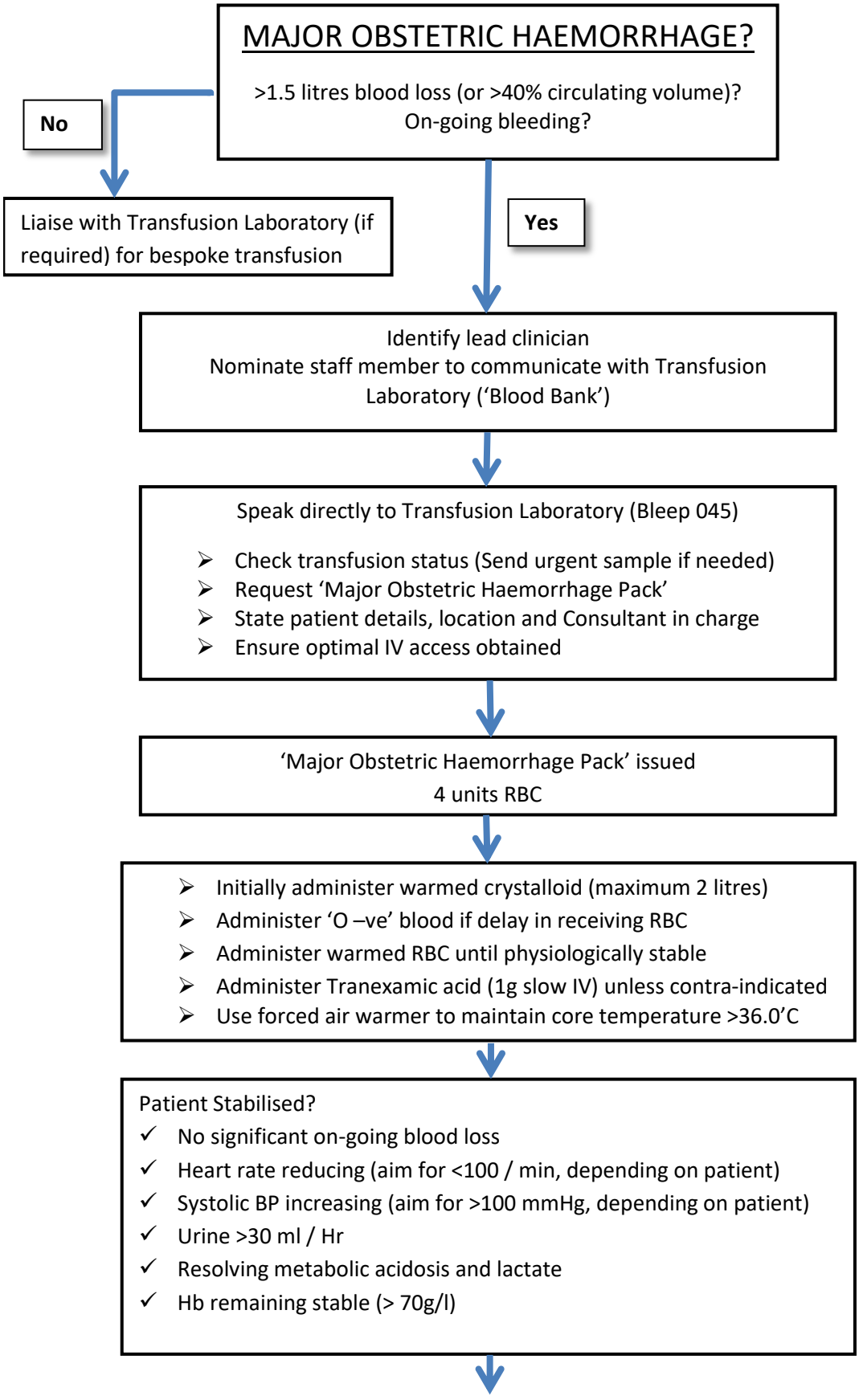
Appendix A


MASSIVE BLOOD LOSS?
>40% blood loss?
Clinical signs of Shock?
On-going bleeding
No
Liaise with Transfusion Laboratory for bespoke transfusion needs
Yes
Identify lead clinician
Nominate staff member to communicate with Transfusion Laboratory ('Blood Bank')
Initiate Massive Blood Loss policy:
Speak directly to Transfusion Laboratory (Bleep 045)
"Request Massive Blood Loss Policy"
State patient details, location and Consultant in charge
Send G&S / FBC / Clotting / U&E
Ensure optimal IV access obtained
'Pack 1' issued:
4 units RBC, 4 units FFP
2 packs of platelets dispatched from Plymouth. Allow >2 hours to arrive. 1 pack issued on arrival, 2nd pack on request.
Administer 'O –ve' blood if delay in receiving RBC
Administer warmed RBC / FFP to achieve physiological stability and normal clotting proven
Administer Tranexamic acid (1g slow IV) unless contra-indicated
Use forced air warmer to maintain core temperature >36.0'C
Patient Stabilised?
No significant on-going blood loss
Heart rate reducing (aim for <100 / min, depending on patient)
Systolic BP increasing (aim for >100 mmHg, depending on patient)
Resolving metabolic acidosis and lactate
Hb remaining stable (> 70-90 g/l, depending on patient)


Patient Stabilised?
No
Yes
Continue with on-going transfusion
Assess arterial blood gas:
pH* / lactate / Base excess / Hb,
Potassium (can be high)
Calcium* (can be low)
Send repeat FBC and clotting (including fibrinogen)
Monitor temperature*
Aggressively manage hypothermia
Discuss with on call Haematologist
*Normal pH, calcium and temperature are crucial for clot formation
'Pack 2' issued:
4 Units RBC, 4 Units FFP
2 Cryoprecipitate, (Platelets)
Give warmed blood products until physiological stability achieved and normal clotting proven
Cryoprecipitate in separate line
Monitor potassium and calcium and correct as necessary
Inform blood bank to stand down from Massive Blood Loss Policy
Continue to administer fluid / blood as necessary to maintain stability and correct clotting
Liaise with on call Haematologist as necessary
Consider ICU care
Ensure accurate record of transfusion documented
Return completed blood product traceability record and summary of products administered to Transfusion Laboratory (legal requirement)
Review Patient:
Is blood loss controlled?
Is Heart Rate reducing?
Is Systolic BP increasing?
Is metabolic acidosis resolving on ABG?
Hb stable (70-90 g/l depending on patient)?

Appendix B

Northern Devon Healthcare NHS Trust



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