Major Haemorrhage in Adults

Document Control:

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	Theatres, Intensive Care, Accident and Emergency		
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Version	Date	Author	Reason/Change
V 5.0	17/08/2021	Dr Steve Wilson	New BCSH guideline on major haemorrhage information added
V 6.0	12/09/2024	Dr Daniel Soltanifar	Adoption of East of England Regional Transfusion Committee Major Haemorrhage in Adults protocol

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
Massive blood loss in adults	17/08/2021

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

The following were consulted during the development of this document:
East of England Regional Transfusion Committee, Hospital Transfusion Committee.

Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g. changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline and protocol applicable to the Norfolk and Norwich University Hospital NHS Foundation Trust; please refer to local Trust's procedural documents for further guidance, as noted in Section 5.

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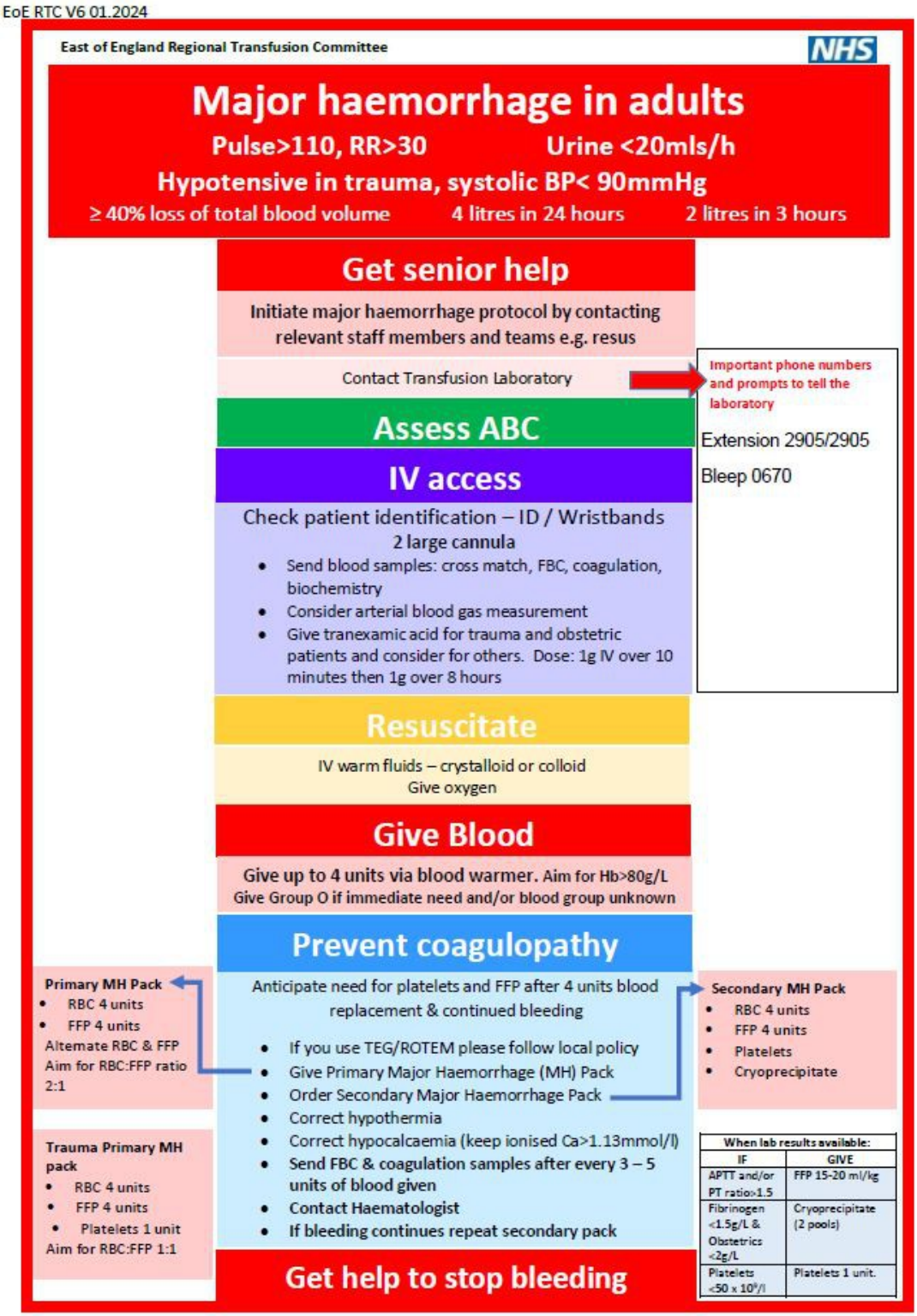
Quick reference



For a larger clearer version please refer to Trust Doc 9321 Massive blood loss protocol.

Adult blood volume = 70ml/Kg

1. *Introduction*

1.1. Rationale

Avoidable death from major haemorrhage is well recognized, and locally agreed and/ or specialty specific guidelines are needed to ensure effective management.

This guideline is based on one produced in 1998 which was subsequently revised in 2008 in light of the guidelines issued by the British Committee for Standards in Haematology (National Blood Service) in 2006, which remains of value in those Trusts using it[1]. It has been used as the basis for recent recommendations published by the UK Blood transfusion services.[2]

These guidelines have been produced by the East of England Regional Transfusion Committee with the aim of standardising the approach to major haemorrhage management across the East of England.

The recommendations contained in these guidelines must be regarded as Level C, as they are based on uncontrolled observational studies and consensus of expert opinion (level 3 evidence). Well-designed case control studies and randomized clinical trials are lacking in this area.

National guidelines exist for the use of blood in the elective surgery[3] and should also be consulted. (www.sign.ac.uk)

1.2. Objective

The objective of the guideline and protocol is to:

- Facilitate a multidisciplinary approach to management of major haemorrhage in adults
- Employ a simple step by step flow chart
- Employ a universal approach to management of major haemorrhage across hospitals in the East of England
- It is intended that the guideline is used alongside existing Trust policies for the checking and administration of blood and blood products. See Trustdocs ID 1086

1.3. Scope

These guidelines are for use in Theatres, Intensive Care, Accident and Emergency and involve the following staff groups: Medical and Nursing Staff, ODAs, ODPs, Laboratory Staff Blood, Paramedics and Hospital Transfusion Committee. The guideline is applicable to adults aged 18 or older suffering major haemorrhage.

1.4. Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
ABG	Arterial Blood Gas
APPT	Activated Partial Thromboplastin Time
BV	Blood Volume
CNS	Central Nervous System
CVP	Central Venous Pressure
DIC	Disseminated Intravascular Coagulation
ECG	Electrocardiogram
EDTA	Ethylenediamintetraacetic Acid
FBC	Full Blood Count
FFP	Fresh Frozen Plasma
Hb	Haemoglobin
HES	Hydoxy Ethyl Starch
INR	International Nationalised Ratio
MBFFP	Methylene Blue Fresh Frozen Plasma
NCCG	Non-Consultant Career Grade
ODA	Operating Department Assistant
pO_2	Partial Pressure of Oxygen
PT	Prothrombin Time
PRBC's	Packed Red Blood Cells
PLT's	Platelets
RBC's	Red blood cells

2. *Responsibilities*

This guideline is applicable to all staff groups that may be involved in the management of major haemorrhage within the trust. This includes medical, nursing, laboratory and theatre staff.

3. *Processes to be followed*

3.1. Overall management goals

- Major haemorrhage is defined as the loss of >40% of total blood volume, 2 litres blood lost in 3 hours, or 4 litres blood lost in 24 hours. Such definitions highlight the importance of early recognition of major haemorrhage and the need for early intervention.
- Normal adult blood volume is 70ml/Kg
- There is evidence that survival from massive transfusion continues to improve[5] and recent reports have demonstrated success even in patients receiving in excess of 50 units in 48 hours[6].
- The management of major haemorrhage in adults should proceed using the approach illustrated in document ID 9321, the Major Haemorrhage in Adults Protocol. See quick reference above and appendix 1 at the end of the document.
- The main goals of treatment which should be initiated are:

- Assessment and initial stabilization.
- Activation of the major haemorrhage protocol.
- Restoration of blood volume to maintain tissue perfusion and oxygenation.
- Achieving haemostasis and prevention of coagulopathy by the early use of blood component(s) therapy.
- Get help to stop the bleeding.

- In practice these goals should be dealt with simultaneously in a patient who presents with major haemorrhage.

3.2. Assessment and initial stabilisation

- Major haemorrhage may be overt and obvious, however concealed haemorrhage in body cavities should always be considered, particularly in the context the trauma patient who is hypotensive.
- Major blood loss may be indicated by physiological parameters including a pulse>110, respiratory rate>30, urine output <20ml/hr or a systolic blood pressure<90mmHg.
- Senior Consultant help should be sought early in any patient with suspected major haemorrhage from the appropriate teams which may include, ICU, Anaesthetics, Gastroenterology and Surgery.
- An ABC approach to initial stabilisation of the patient should be followed including the administration of oxygen via a reservoir/non-rebreathing mask at 15L/minute.
- Intravenous access should be sought with 2 large bore peripheral cannulae (minimum16G or bigger) and bloods taken and sent to the laboratory ensuring the correct patient identification/wristbands are in use.
- Blood samples should include two 6ml samples in pink EDTA bottles to enable a cross match (collected according to trust policy).
- Include samples for a FBC and coagulation including fibrinogen level.
- Consider an arterial blood gas measurement.
- Give tranexamic acid 1g IV over 20 minutes followed by 1 g over 8 hours.
- Start IV warm crystalloid while awaiting blood products.

3.3. Activation of major haemorrhage protocol

- Initiate the major haemorrhage protocol by contacting the relevant staff members and teams including the transfusion laboratory on extensions 2905/2906.
- Blood Bank must be informed using the trigger phrase to activate the major haemorrhage protocol; “I want to trigger the major haemorrhage in adults protocol”.
- All subsequent communications between clinical areas and laboratory staff should be preceded by the trigger phrase “This call relates to the major haemorrhage protocol”. A specific member of the team should be nominated to co-ordinate communication with the laboratory staff and support services.
- Activation of the major haemorrhage protocol will result in the delivery of the primary MH pack from blood bank which includes 4 units of PRBCs and 4 units of FFP. In trauma, 1 pool of platelets is also provided.

3.4. Restoration of blood volume to maintain tissue perfusion and oxygenation

- Give up to 4 units of blood via a blood warmer, aiming for a Hb>80g/l
- Use Group O blood if there is an immediate need for blood and/or the group is unknown.
- Group O blood will be available until group specific blood is ready. O Negative blood is available immediately for all patients. O Positive blood can be used as an alternative to O negative for men > 18 years old and women > 50 years old until the group is known.
- Group specific blood is available in 25 minutes.
- Crossmatched blood is available in 45 minutes

3.5. Achieving haemostasis and prevention of coagulopathy

- Ongoing bleeding can precipitate coagulopathy. This should be anticipated and early administration of clotting products is required to prevent this.
- With ongoing bleeding, give the primary major haemorrhage pack.
- Clotting products are contained in FFP in the major haemorrhage packs and should be administered alternating RBC and FFP (N.B. the Blood Bank will issue compatible FFP and platelets)
    - Primary pack
        - RBCs 4 units
        - FFP 4 units.
        - (In trauma, 1 pool of platelets in addition)

- If bleeding continues, contact the blood transfusion lab to order the secondary major haemorrhage pack. Send further FBC and coagulation screen urgently. The on-call haematologist can also be contacted for advice at this point.
    - Secondary pack
        - RBCs 4 units
        - FFP 4 units
        - Platelets
        - Cryoprecipitate
- If bleeding continues, repeat the secondary pack and send urgent FBC and coagulation screen every 20-30 minutes.
- General measures to prevent coagulopathy should be undertaking including:
    - External warming of the patient
    - Giving all blood products through a warmer
    - Correct hypocalcaemia (keep ionised Ca2+ > 1.13mmol/l)
    - FBC and coagulation samples including fibrinogen levels should be sent after every 3-5 units of RBC's given. U and E's should also be sent as hyperkalaemia can occur with massive blood product replacement.
    - Suspect development of DIC, the risk of which is increased with shock, hypothermia and acidosis
- When lab results are available:
    - If APTT and or PT ratio > 1.5 give FFP 15-20ml/kg.
    - If fibrinogen <1.5g/l (or <2g/L in Obstetrics) give cryoprecipitate 2 pools and consider giving fibrinogen concentrate. Microvascular bleeding is associated with fibrinogen concentrations <0.5g/L.
    - If Platelets <50x106/l give platelets 1 unit and repeat to achieve a platelet count >100 x106/l if there is ongoing active haemorrhage.
- Consider TEG/ROTEM to help guide product replacement according to guidelines.

3.6. Get help to stop the bleeding

- Remember simple measures (pressure/elevation) can be useful.
- Early surgical intervention.
- Consider interventional radiology.
- Consider cell salvage.

3.7. Additional useful information

- **Cell Salvage**

- Early consideration should be given to the use of cell saver equipment when appropriate. This is available in theatres and should be considered in most vascular and trauma cases. Contraindications are malignancy, contaminated fields and sickle cell anaemia. Cell salvage should be considered where more than 1000mLs intra-operative blood loss is anticipated.

- **Antifibrinolytics**
    - Early use of Tranexamic Acid should be considered. Maximum benefit is obtained if this is given within the first hour after injury (1g Tranexamic Acid iv over 10 minutes followed but 1g Tranexamic Acid iv over 8 hours7). Tranexamic Acid should not be given more than 3 hours after injury8. Tranexamic Acid may also be considered when giving blood is likely to be a problem (e.g. difficult antibodies or religious objection)
- **FFP**
    - Based on current recommendations, FFP should be used early during massive blood transfusion [9, 10] . This is based on several large civilian and military retrospective studies which have shown improved survival when FFP is used in ratios of more than 1:2 (FFP:PRBCs)[11, 12] Although FFP will be issued without clotting study results, samples should have been taken. A minimum dose of 12-15 mL kg-1 (3 units in an adult) should be given[13]. FFP does not need to be Rhesus matched as there appears to be no risk of anti D immunization. Also note that group O FFP is being seriously restricted for group O patients only as it has caused haemolysis in non-O patients. In other patients you will receive from blood bank FFP which is compatible but not necessarily identical with the patients group[14].
- **Platelets**
    - Recommendations suggest that platelet therapy may be unnecessary in major blood loss situations unless the count is <100 x 10with ongoing haemorrhage[, 15, 16, 17,18], These guidelines, however, may not be easy to apply in a clinical setting [19]. Platelets are obtained from the NBS in Cambridge and take 1-2h to arrive. Stock platelets may be available immediately at the NNUH but if not the triggering of the major blood loss protocol will ensure blood bank staff order platelets for the patient proactively and before an FBC demonstrates thrombocytopenia. There may also be circumstances when it will be necessary to give platelets despite an “adequate” count e.g. with known platelet function disorder such as Glanzmanns thrombasthenia
- **Blood tests**
    - Ideally FBC and clotting studies need to be repeated 4 hourly or after every 4 units of blood. FFP and platelets contain citrate anticoagulant (red cells in solution contain only traces of citrate). In theory, infused citrate could lower plasma ionised calcium levels, but in practice rapid liver metabolism of citrate usually prevents this. However, patients who are hypothermic and/or acidotic, the combined effects of hypocalcaemia and hyperkalaemia may be cardiotoxic. Monitor acid base, serum calcium and potassium in these situations. If ECG shows evidence of hypocalcaemia, 5mL (10%) calcium gluconate (adult) should be given by SLOW IV injection. The problem is best avoided by keeping the patient warm
- **Cryoprecipitate**

- Cryoprecipitate is indicated when the plasma fibrinogen is less than 1.5g litre – see Trustdocs ID 6406 (Or <2g/L Obstetric patients) and should be given in a volume of 1-1.5 packs per 10kg body weight. Cryoprecipitate is now pooled (5u per pool) so adults need 2 pools. Throughout resuscitation and surgery it is important to maintain patient temperature by increasing the ambient temperature of theatre, the use of external patient warming devices and in line blood warmers. For Obstetric patients, fibrinogen concentrate may be used instead of cryoprecipitate early in massive blood loss. This is kept in the Obstetric theatre fridge. Please see Trustdocs ID 17727, Using Fibrinogen Concentrate as part of Major Obstetric Haemorrhage Protocol in Obstetric Theatres for further information.

- **Disseminated** intravascular **coagulation**
  - Disseminated intravascular coagulation occurs when an unregulated thrombin explosion causes release of free thrombin into the circulation. Widespread microvascular thrombosis leads to tissue ischaemia whilst the consumption of coagulation products and activation of fibrinolysis results in haemorrhagic complications. It is primarily a clinical diagnosis with laboratory tests being used to confirm the diagnosis and monitor replacement of blood products. In the peri-operative period the most likely cause of DIC will be either sepsis or trauma and treatment is that of the underlying cause. At the same time blood volume and tissue perfusion must be maintained whilst blood components are replaced in an attempt to correct the coagulopathy. Indications for treatment with heparin are not established.

4. *Training & Competencies*

Training and competencies in the administration of blood component therapy should be undertaken by any healthcare professional involved in the administration of blood products. These competencies can be found on the learning and management pages via ESR under blood transfusion.

5. *References*

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13. Editorial. Multiple trauma and massive transfusion. Horsey PJ. Anaesthesia 1997;52: 1027-1029

6. *Monitoring Compliance*

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
All events which trigger the major haemorrhage protocol will be audited.	100% compliance with the guidelines will be used as the audit standard	Hospital Transfusion Team	Hospital Transfusion committee	Presented 4 monthly to HTC
The reserve of platelets/FFP and their ordering will be audited so that potential over ordering and cost can be established	Blood product stock levels	Hospital Transfusion Team	Hospital Transfusion committee	Presented 4 monthly to HTC

The audit results are to be discussed at relevant governance meetings including the Hospital Transfusion Committee meetings and the Hospital Transfusion Team meetings to review the results and recommendations for further action. Then sent to divisional sub board who will ensure that the actions and recommendations are suitable and sufficient.

7. *Appendices.*

7.1. Appendix 1. East of England Major Haemorrhage in adults protocol – Trust Doc ID: 9321

8. *Equality Impact Assessment (EIA)*

Type of function or policy	Existing

Division	Surgery, Critical care and Emergency care	**Department**	Anaesthetics
Name of person completing form	Dr Daniel Soltanifar	**Date**	29/09/2024

Equality Area	**Potential** **Negative Impact**	**Impact** **Positive Impact**	**Which groups are affected**	**Full Impact Assessment Required YES/NO**
Race	No	No	n/a	No
Pregnancy & Maternity	No	Yes	Different blood products and specifications of blood products are used in pregnancy	No
Disability	No	No	n/a	No
Religion and beliefs	Some groups will refuse blood products	No	Jehovah's Witnesses	No
Sex	No	Prevention of haemolytic disease of fetus and newborn (HDFN) and CMV infection in neonates	Different specifications of blood products are used for males and females, and pregnant females	No
Gender reassignment	Yes	No	FtM – if Blood Bank are unaware of biological sex incorrect specification blood products may be issued with risk of HDFN	No
Sexual Orientation	No	No	n/a	No
Age	No	Yes	Different specifications of blood products are issued to females < age 50 and males <age 18	No

Marriage & Civil Partnership	No	No	n/a	No
EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?				

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.