University Hospitals of Leicester NHS
NHS Trust

BLOOD TRANSFUSION

POLICY AND PROCEDURES FOR THE PRESCRIBING, COLLECTION, STORAGE AND ADMINISTRATION OF BLOOD AND BLOOD COMPONENTS

Approved By:	**Clinical Policy and Guideline Committee**
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Trust Lead:	**Dr. Hafiz R Qureshi, Consultant Haematologist**
Board Director Lead:	Medical Director
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REVIEW DATES AND DETAILS OF CHANGES MADE DURING THE REVIEW

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JUNE 2024	LONG-TERM AGENCY STAFF WHO HAVE A PRESENCE ON HELM AND HAVE COMPLETED THE RELEVANT TRANSFUSION TRAINING ARE PERMITTED TO HOLD A BLOODTRACK BARCODE
JUNE 2024	IMPLEMENTATION OF PRE-THAWED FRESH FROZEN PLASMA FOR MH AND EMERGENCY CASES
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JUNE 2024	ANY TRANSFUSION EPISODES DURING THE CURRENT ADMISSION MUST BE INCLUDED IN THE PATIENTS DISCHARGE LETTER

KEY WORDS

Blood, Transfusion, Blood Components, Blood Track, Cell Salvage, consent, NPSA assessment, SHOT, MHRA, NHSBT, 2 sample rule, special requirements, group and screen/save, cross-match, positive patient identification, integrated care pathway, anaemia, bleeding, haemoglobin, OSBOS, iron, therapeutic, prophylactic, thrombocytopaenia, Disseminated Intravascular Coagulopathy (DIC), plasma exchange, warfarin reversal, coumarin

derivative, vitamin K, Beriplex, Octaplex, recombinant, haemorrhage, Novoseven, irradiation, Cytomegalovirus (CMV), congenital immunodeficiency, Transfusion Associated Graft versus Host Disease (TA-GvHD), assent, risks and benefits, group specific, traceability, haemolysis, anaphylaxis, Transfusion Associated Circulatory Overload (TACO), Transfusion related Acute Lung Injury (TRALI), Post Transfusion Purpura (PTP), reaction, cell salvage, leucodepletion, Jehovah's Witness, Haemodialysis, Haemofiltration, controlled storage, cold chain, Haemobank/Smart Fridge.

1 INTRODUCTION AND OVERVIEW

1.1 This document sets out the University Hospitals of Leicester (UHL) NHS Trusts Policy and Procedures for prescribing, collection, storage and administration of blood and blood components.

1.2 The procedures set out in this document, which must be considered in its entirety, constitute the UHL NHS Trust policy for transfusion of blood and blood components. The contents of this policy are broadly based on the national guidelines, 'The administration of blood and blood components and the management of transfused patients' published in 2009. The guidelines reflect current professional opinion and have been produced by the British Committee for Standards in Haematology (BCSH), in collaboration with the Royal College of Nursing and the Royal College of Surgeons of England.

1.3 It takes into account the Blood Safety and Quality Regulations (BSQR, 2005) Statutory Instrument 2005/50 as amended, the National Patient Safety Agency (NPSA) Safer Practice Notice 14 (2006) *Right Patient, Right Blood,* and recommendations from Serious Hazards of Transfusion (SHOT).

1.4 There is a separate policy for Management of Individuals Declining Blood and Blood Products (Trust Ref. B39/2010)

2 POLICY SCOPE –WHO THE POLICY APPLIES TO AND ANY SPECIFIC EXCLUSIONS

1.4 This policy applies to all health care professional staff caring for patients within the University Hospitals of Leicester (UHL) NHS Trust.

2.2 This policy applies to all UHL NHS Trust employees who have involvement in the transfusion process, including individuals employed by a third party as locums or as agency staff.

2.3 This policy is supported by several appendices which must be used in conjunction with it.

2.4 Some specialist areas such as renal dialysis, ECMO, neonatal unit and obstetrics, have local transfusion protocols in use. These should be followed in conjunction with this policy.

3 DEFINITIONS AND ABBREVIATIONS

The following definitions are associated with this policy:

Medicine and Healthcare products Regulatory Authority (**MHRA**) - is responsible for regulating all medicines and medical devices in the UK by guaranteeing they reach specific standards ensuring safety for patients.

Serious Adverse Blood Reactions and Events (**SABRE**) is an electronic system for the mandatory notification of blood related events to the MHRA.

Serious Hazards of Transfusion (**SHOT**) is the United Kingdom's independent, professionally led haemovigilance scheme.

Safety of Blood Tissues and Organs (**SaBTO**) is an advisory committee to the UK Ministers and Health Departments on the most appropriate ways to ensure the safety of blood, cells, tissues and organs for transfusaion/transplantation.

The term of **Blood Components** refers to units, paedipacks or pooled units of:

- Red Cells
- Platelets
- Fresh Frozen Plasma
- Cryoprecipitate
- Granulocytes

Blood Track refers to the electronic system used within UHL, which provide the control, visibility and traceability needed to safely and properly store, dispense and transfuse blood components at the point of care and verify that the right blood is transfused to the right patient at the bedside.

Traceability demonstrates a full audit trail of each blood component from donor to recipient. The Trust are legally obliged to demonstrate 100% traceability for all blood components issued. Compliance is monitored by the MHRA.
Cold Chain – system for storing and transporting blood and blood components within the correct temperature range and conditions, from the point of collection from blood donors to the point of transfusion to the patient.

Thromboelastography **(TEG)** is a diagnostic instrument that provides comprehensive whole blood hemostasis testing that can help assess bleeding and thrombotic risks, and also monitor antithrombotic therapies.

Prothrombin Complex Concentrate **(PCC)** is used to reverse the effects of oral anticoagulant therapy when bleeding occurs.

Blood Transfusion Laboratory formally known as Blood Bank.

Group and Save (or Group and Screen) – a test to determine the blood group and antibody status of a patient prior to receiving a Blood Transfusion.

Cross-matching - refers to the testing that is performed prior to the release of blood for a blood transfusion, in order to determine if donor unit(s) are compatible with the blood of the intended recipient.

Integrated Care Pathway **ICP** – approved document used within UHL for prescribing, managing, monitoring and recording patient's care during transfusion.

4 ROLES AND RESPONSIBILITIES

4.1 Responsibilities within the Organisation

4.1.1 The Chief Executive has the overall legal responsibility to ensure that the Trust is fully compliant with Blood Safety and Quality Regulations 2005 *(BSQR 2005, SI 50, as amended).*

4.1.2 The Medical Director is the Executive Lead for this policy and has delegated responsibilities for the safety and quality blood transfusion practice within the Trust.
4.1.3 The Chief Nurse, acting through the Director of Clinical Quality has responsibility for ensuring that all Guidance documents covered by this policy are produced as required.

4.2 CMG Management Teams

4.2.1 Are responsible for ensuring that all members of their staff are fully aware of UHL Blood Transfusion Policy and guidelines.
4.2.2 CMG management teams are also responsible for ensuring staff compliance with UHL blood training and competencies requirement.
4.2.3 To ensure all clinical areas, including Emergency Department (ED), have trained and competent personnel to take pre-transfusion samples, obtain written consent, prescribe, collect and transport blood components, administer blood components, carry out clinical observations and manage any adverse transfusion incidents or reactions .
4.2.4 To nominate a suitable individual to represent the CMG on the Hospital Transfusion Committee (HTC).
4.2.5 To ensure that transfusion related incidents are reported through the Trust Incident reporting procedure, in accordance with the UHL Incident and accident reporting policy(Trust Ref: A10/2002) and to ensure there is resultant organisational learning through the CMG structure and more widely across the Trust.

4.3 Line managers

Ensure that all members of staff involved in the blood transfusion process are:
4.3.1 Fully aware of the content of the UHL Blood Transfusion policy
4.3.2 Appropriately trained and competent to perform their duties in line with the requirements of the UHL Blood Transfusion Training Policy (Trust Ref:B39/2009).
4.3.3 Fully aware of their role in the investigation of adverse clinical incidents relating to blood transfusion and in the implementation of action plans drawn up as a result of incidents and audit.
4.3.4 Ensure legal compliance with transfusion traceability as required under BSQR 2005.

4.4 UHL Hospital Transfusion Committee (HTC)

4.4.1 Oversee, develop, implement and review Trust policy, procedures and guidelines relating to blood transfusion.
4.4.2 Audit the practice of blood transfusion compared to Trust policy and national guidelines, focusing on critical points of patient safety and the appropriate use of blood.
4.4.3 Make recommendations regarding appropriate use of blood and blood components.
4.4.4 Identify and manage risks associated with blood transfusion.

4.5 UHL Hospital Transfusion Team (HTT) including Transfusion Practitioners' Team

4.5.1 Assists in the implementation of the HTC objectives.
4.5.2 Review and update transfusion guidelines and Trust policy.
4.5.3 Review adverse events including 'near misses'
4.5.4 Report to SHOT and HTC adverse events related to blood transfusion.
4.5.5 Provide formal transfusion training within the Trust as specified in Blood Transfusion Training Policy for Clinical and Support Staff (Trust Ref. B39/2009).
4.5.6 Investigate transfusion reactions or other clinical incidents in relation to transfusion practice.

4.5.7 Audit blood transfusion practice

4.5.8 Transfusion Practitioners' team provide advice and support during normal working hours (Monday to Friday 9 a.m. to 5 p.m.) and can be contacted on the following numbers:

LRI – 07890903133 / 07890903128 **GH** – 07816193868 **LGH** – 07890903127

4.6 Medical staff

4.6.1 Provide patients with both verbal and written information including risks and benefits, allowing them to make an informed decision about receiving a blood transfusion. Also refer to the UHL Consent to Examination or Treatment Policy (Trust Ref: A16/2002)

4.6.2 Obtain written consent for transfusion and document it in the patient's medical notes. Patients should always be offered information leaflets on blood transfusion at the time of proposing this treatment. Further supply of leaflets can be obtained by contacting the UHL transfusion practitioners' team.

4.6.3 Ensure positive patient identification when taking blood samples, which must be labelled in accordance with this policy.

4.6.4 Ensure the request forms are fully completed, clearly indicating the reason for transfusion and communicating the degree of urgency to the Blood Transfusion laboratory.

4.6.5 Any special requirements must be identified and communicated to blood transfusion laboratory, and the checklist on the ICP completed.

4.6.6 Complete the TACO checklist at the time of prescription and request of blood components

4.6.7 Prescribe blood, blood components and blood products in accordance with this policy.

4.6.8 Investigate and manage transfusion reactions (see appendix 14)

4.6.9 Ensure that upon discharge, any transfusion and the outcome(s) are included in the discharge letter.

4.7 Registered Healthcare Professionals:

4.7.1 Explain the procedure to the patient offering the patient a patient information leaflet.

4.7.2 Ensure patient is cannulated prior to ordering blood / blood products.

4.7.3 Use safe techniques, as outlined in Appendix 1 of this policy, for obtaining blood samples.

4.7.4 Request collection of blood.

4.7.5 Perform positive patient identification at all stages of the transfusion process.

4.7.6 Carry out all appropriate observations before, during and after the transfusion.

4.7.7 Fully complete all documentation associated with the transfusion.

4.7.8 Administer transfusions in accordance with this policy.

4.7.9 Monitor patients during transfusion in accordance with this policy.

4.7.10 Notify medical staff of any suspected transfusion reactions.

4.7.11 Ensure that upon discharge, any transfusion and the outcome(s) are included in the discharge letter

Note: Bank staff can carry out blood transfusions after successful completion of e-learning and competency assessments.

*Agency staff can only monitor the patient during the transfusion but cannot take samples or administer blood or blood components. However, **long-term** agency staff who have completed the HELM training can undergo training and receive a BloodTrack barcode, which must be surrendered to the BloodTrack team upon termination of their tenure.*

Only HCP's (Health Care Professionals) who have successfully completed the Non-medical Authorisers course are permitted to request blood components for a patient. In all other circumstances registered HCP's are NOT authorised to request/prescribe blood components

4.8 Health Care Assistants/Nursing Associates

4.8.1 Carry out observations before, during and after the transfusion.
4.8.2 Notify any abnormal observations to the nursing or medical staff.

NB: Nursing Associates are not able to administer blood components.

4.9 Phlebotomists and other staff groups performing phlebotomy:

Staff taking blood samples for transfusion must have:

4.9.1 Completed the UHL phlebotomy course, or equivalent;
4.9.2 A current LCAT (Leicestershire Competency Assessment Tool) assessment in taking blood samples for transfusion;
4.9.3 A unique barcode for electronic BloodTrack, following BloodTrack training.
4.9.4 Must perform positive patient identification in accordance with the UHL Patient 'Identification Band Policy' (Trust Ref B43/2007) and ensure that blood samples are taken and labelled in accordance with the policy titled 'Procedure for obtaining a venous blood sample from adult' (Trust Ref: B16/2010),
4.9.5 Must use the BloodTrack TX system for confirming positive patient identification and for producing the sample labels for the correct patient.

4.10 Porters and other staff groups collecting blood components

4.10.1 Staff collecting blood components must be trained and assessed as competent to use the Blood Track system.
4.10.2 Staff collecting blood components must collect a BloodTrack TX generated pick-up slip from the clinical area prior to attending the blood transfusion laboratory.
4.10.3 Details on the collection slip must be checked against the compatibility label attached to the blood pack.
4.10.4 Staff collecting blood components must place the component into a red transport bag and return to the clinical area as soon as possible.

5. POLICY IMPLEMENTATION AND ASSOCIATED DOCUMENTS

This policy is supported by the following procedures and guidelines which must be used in conjunction with this policy:

Procedure	Appendix
UHL Guideline for Obtaining Blood Samples for Transfusion	1
UHL Guideline for the Administration of Blood Components	2
UHL Guideline on Red Cell Transfusion	3
UHL Guideline for the Use of Platelet Transfusion	4
UHL Guideline for the Use of Fresh Frozen Plasma and Cryoprecipitate	5
UHL Guideline for the use of Albumin Solutions	6
UHL Guideline for the use of Haemobanks/Smart Fridges	7
UHL Guideline for the use of Prothrombin Complex Concentrate for the Reversal of Anticoagulant Overdose	8
UHL Protocol for Use of Recombinant Coagulation Factor VIIa (NovoSeven)	9
UHL Guideline for using Irradiated and/or CMV–Seronegative Blood Components	10
UHL Procedure for Informed Written Consent for Blood Transfusion	11
UHL Guideline for the Emergency Use of O Negative Blood and Group Specific	12

Blood	
UHL Massive Haemorrhage Protocol	13
UHL Guideline for the Investigation and Management of Transfusion Reactions	14
UHL Guideline for the Use of Intra-Operative Cell Salvage	15
UHL Guideline for the Use of Intra-Operative Cell Salvage in Obstetrics	16
UHL Guideline for Paediatric and Neonatal Transfusions	17
UHL Guideline for Transfusion Considerations for Renal and Transplant Services	18
UHL Guideline for the Procedure for the UHL Inter-Hospital Transfer of Patients Whilst Receiving Blood Transfusion	19
UHL Guideline for the Transfer of Blood and Blood Components Between Hospitals Outside of UHL Trust	20

6 EDUCATION AND TRAINING REQUIREMENTS

Training for Blood Transfusion is covered in a separate policy (The Blood Transfusion Training Policy for Clinical and Support Staff, Trust Ref: B39/2009)

New staff to the Trust must attend induction session on transfusion.

New staff to the Trust must have a one off face to face competency assessment relevant to their role in transfusion in addition to the e-learning.
A valid competency assessment within the last two years from a previous employer will be accepted if evidence is provided of the training and assessment.

Staff involved in the process of blood transfusion (including prescribing blood, obtaining a sample, collecting or returning and transporting blood, administering blood and caring for patients undergoing a transfusion) must have received training relevant to their role.

All staff involved in any aspect of the transfusion process must complete the e-learning modules for transfusion, or equivalent, every 2 years. This can be accessed via https://uhlhelm.com/

All relevant staff must have read and understood this policy and procedures therein.

Training on transfusion is provided during Trust induction and thereafter through bi-annual updates.

7 PROCESS FOR MONITORING COMPLIANCE

Element to be monitored	Lead	Tool	Frequency	Reporting arrangements
Positive patient identification prior to transfusion	Lead TP	As part of the ICP audit	Annual spot checks audit in different clinical areas.	Hospital Transfusion Committee (HTC) to receive and approve audit reports and action plans.
Minimum dataset of pre-transfusion documentation recorded in the patients clinical records.	Lead TP	As part of the ICP audit	Every two years	HTC to receive and approve audit reports and action plans
Requests for transfusion include minimum dataset on the request forms.	Deputy Service Manager Blood Bank	Audit of transfusion request documentation	Annual audit of completion of BT request forms.	HTC to receive and approve audit reports and action plans
Accurate completion of BT Integrated care	Lead TP	As part of the ICP audit	Every two years	HTC to receive and approve audit reports and action plans

Pathway (ICP)				
Minimum monitoring of patient during transfusion	Lead TP	As part of the ICP audit	Every two years	HTC to receive and approve audit reports and action plans
Compliance with traceability of all blood and blood components.	HTC Chair	Ongo-ing audit	Quarterly reports prepared for the HTC meetings and monitored by MHRA annually.	HTC to receive and approve audit reports and action plans
Compliance with informed written consent for Blood Transfusion	Lead TP	As part of the ICP audit	Every two years	HTC to receive and approve audit reports and action plans

8 EQUALITY IMPACT ASSESSMENT

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.

As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

9 SUPPORTING REFERENCES, EVIDENCE BASE AND RELATED POLICIES

Blood Safety and Quality Regulations (BSQR) 2005: Statutory Instrument 2005/50 (ISBN 0110990412) www.opsi.gov.uk/si/si2005/20050050.htm

British Committee for Standards in Hematology Blood Transfusion Taskforce (2012) *Guidelines for pre – transfusion compatibility procedures in blood transfusion laboratories.*

British Committee for Standards in Hematology Blood Transfusion Taskforce (2007) *The specification and use of information technology systems in blood transfusion practice,* Transfusion Medicine, 17, 1-21

British Committee for Standards in Hematology Blood Transfusion Taskforce (2004) *Transfusion Guidelines for neonates and older children*, British Journal of Haematology, 124, 433-453

British Committee for Standards in Hematology Blood Transfusion Taskforce (2006) *Guidelines for management of massive blood loss,* The British Journal of Haematology, 135, 634-641

British Committee for Standards in Hematology Blood Transfusion Taskforce (2004) *Guidelines for the use of fresh-frozen plasma, cryoprecipitate and cryosupernatant* The British Society for Haematology, 126, 11-28

British Committee for Standards in Hematology Blood Transfusion Taskforce (2007) *Addendum to the Guidelines for the use of fresh-frozen plasma, cryoprecipitate and cryosupernatant, 2004*

British Committee for Standards in Hematology (2009) *Guideline on Administration of Blood Components*

British Society of Haematology Guidelines on the spectrum of fresh frozen plasma and cryoprecipitate products: their handling and use in various patient groups in the absence of major bleeding https://doi.org/10.1111/bjh.15167

Department of Health (2002). HSC 2002/009 *Better Blood Transfusion* 2
FACTSHEET Cytomegalovirus (CMV) Negative Blood Components Information for Healthcare Professionals https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/14652/blc7071.pdf

Fowler, K et al. *The outcome of congenital cytomegalovirus infection in relation to maternal antibody status* New England Journal of Medicine, 326, 663-667

Guidance for the use of Blood Components This guidance is based on the National Blood Transfusion Committee (NBTC) Indication Codes for Transfusion (January 2020) 27632 Indication Codes for Transfusion - An Audit Tool
https://nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/22877/guidance-based-on-the-nbtc-indication-codes-for-transfusion-an-audit-tool-blc6755-jan-2021.pdf

Guideline on the investigation and management of acute transfusion reactions
Richard Soutar, Wendy McSporran, Tracey Tomlinson, Catherine Booth, Sharran Grey
First published: 26 April 2023 https://doi.org/10.1111/bjh.18789

Guidelines on transfusion for fetuses, neonates and older children.
Helen V. New, Jennifer Berryman, Paula H. B. Bolton-Maggs, Carol Cantwell, Elizabeth A. Chalmers, Tony Davies, Ruth Gottstein, Andrea Kelleher, Sailesh Kumar, Simon. J. Stanworth, on behalf of the BCSH, First published: 11 November 2016. https://doi.org/10.1111/bjh.14233

Guidelines for the blood transfusion services in the United Kingdom. 5th edition (2001) HMSO, London

Guidelines for the use of platelet transfusions https://doi.org/10.1111/bjh.14423

Guidelines on the use of irradiated blood components https://doi.org/10.1111/bjh.17015

Linden J. V, Wagner K, Voytovich E. & Sheehan J. (2000) *Transfusion errors in New York State: an analysis of 10 years' experience* Transfusion, 40, 1207-1213

Marconi M. & Sirchia G. (2000) *Increasing transfusion safety by reducing human error*. Current Opinion in Hematology; 7 (6): 382-386

McClelland D. B. L. & Phillips P. (1994) *Errors in blood transfusion in Britain: survey of hospital haematology departments* British Medical Journal, 308, 1205-1206
Handbook of Transfusion Medicine (2013) 5th ed. The Stationery Office: London
Serious Hazards of Transfusion (SHOT) scheme (1996-2012) *SHOT Annual Reports*
SHOT Office. Manchester
http://www.shotuk.org

The European Blood and Marrow Transplantation Handbook*, European School of Haematology (2000)*

The NHS Blood & Transplant *http://www.blood.co.uk/hospitals*

Guidelines for compatibility procedures in blood transfusion laboratories. BCSH Transfusion Medicine, 2004,**14**,59-73

10 PROCESS FOR VERSION CONTROL, DOCUMENT ARCHIVING AND REVIEW

Once this Policy has been approved by the UHL P&G Committee, Trust Administration will allocate the appropriate Trust Reference number for version control purposes.
The updated version of the Policy will then be uploaded and available through INsite Documents and the Trust's externally-accessible Freedom of Information publication scheme. It will be

archived through the Trusts PAGL system. Accompanying letters will be sent to clinical directors, service managers, lead nurses, HTT members and via the monthly HTT newsletter.

This Policy will be reviewed every three years or more frequently if required so that current evidence continuous to underpin policy statements, guidelines and procedures.
It is the responsibility of the UHL Hospital Transfusion team to commission the review.

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline applies to all staff involved in the process of obtaining blood samples for transfusion purposes.

2. GUIDELINE STANDARDS AND PROCEDURES

This guideline is based on the current national guidelines published by the British Committee for Standards in Haematology (BCSH).

2.1 Process for taking blood samples for group and save or cross match

2.1.1 Only medical staff can complete the transfusion request form.

2.1.2 **Exceptionally**, blood transfusion request forms may be completed by a professionally registered nurse or midwife providing they have been formally trained and assessed as competent by a member of the UHL Transfusion team, and only then to request a G+S only. Any requests for blood components can only be made by medical staff, with the exception given in section 4.7, Pg 6 of this document. This individual is accountable for ensuring that he/she is fully aware of the patient's clinical history so as to correctly specify all special requirements eg irradiated/CMV neg blood components. The indications for CMV negative and irradiated blood components are summarised on the reverse of the Group and Save/Cross match form and the ICP and are detailed in Appendix 10.

2.1.3 The Blood Component Request Form ('crossmatch' form either electronic form on Nervecentre (in development), or paper copy), must be completed to include the following information, using an addressograph label on the paper form where possible, for the patient information:

- Patient's Surname.
- Patient's Forenames (initials not sufficient).
- Patient's Date of Birth (age not sufficient).
- Patient's NHS number or Hospital number.
- Patient's Gender.

} Addressograph label

- Special Requirements.
- Patient's Location.
- Consultant in charge of the patient.
- Time and date of request.
- Time and date the blood component is required.
- Relevant clinical indication for transfusion (or select correct indication code from drop down menus in electronic form on ICE) (unqualified terms such as anaemia or low Hb are not acceptable).
- Name and signature of doctor filling in the request form.
- Transfusion history and atypical antibodies (if known).

Note: 1 Blood component request forms for UNIDENTIFIED patients must contain a unique PATIENT IDENTIFICATION NUMBER, GENDER and approximate AGE. This information must also be present on the patient's wristband (Trust Ref.B43/2007)

2.1.4 All G+S and Cross-match samples must be obtained using the electronic BloodTrack system which will print patient specific labels to attach to the sample tubes. Each BloodTrack barcode is unique to the individual and identifies them as the user for any transaction undertaken. **Barcodes must not be shared**. Only where BloodTrack is not operational can a sample be handwritten, and you must liaise with the lab regarding this.

2.1.5 Without exception, all patients (inpatients and outpatients) must be wearing an identification wristband at the time of taking "Group and Save" or "cross match" samples. If for any reason the wristband is removed, it is the responsibility of the person who removed it to replace it before any further intervention is carried out. Where this is not possible, the individual carrying out the task must ensure that Positive Patient Identification is carried out, and the wristband checked and replaced before continuing.

2.1.6 Where possible, addressograph labels should be used on the request forms but **never** on the sample tubes.

2.1.7 If request forms are not fully completed and/or samples labelled incorrectly, they will NOT be processed. The requesting clinician or the clinician responsible for the patient will be notified accordingly.

2.1.8 **The fully completed request form must be taken to the patient and used in the process of positive patient identification (PPI)**. In order to obtain PPI, the patient must be asked to state their full name and date of birth and this information must be checked and corroborated with the patients ID band. The information on the ID band plus the unique hospital identifying number must then be checked against the request form.

2.1.9 If the patient is unable to confirm identification details, then two members of staff (as defined in Appendix 2, 2.2.2) should confirm identity using the identification wrist band and request form (paper form or e request).
In the event of a major incident where several patients of an unknown identity may be admitted to ED, then the procedures for identifying patients are set out in the UHL Major Incident Policy (Trust Ref: B44/2017).

2.1.10 Only one patient should be bled at a time to minimise the risk of error.

2.2 Two Sample rule

2.2.1 In the absence of an historical blood group (this can be checked on ICE), two EDTA samples are currently required for Group and Save/cross match. Where a patient requires 2 samples to be taken to meet the 2 sample rule, these samples must be collected over two separate phlebotomy episodes. Each sample must be accompanied by a separate request form. Where possible the 2 samples should be taken by two different individuals, this is to ensure that positive patient identification is carried out each time the sample is taken.

2.2.2 Where only one sample is available and the requirement for blood is urgent, group O Neg Red Cells will be issued.

2.2.3 For neonates and infants under the age of 4 months, a sample is required from the baby and the mother on the initial request only.

For further information on Neonatal and Paediatric transfusions please refer to Appendix 17

2.3 Labelling of patient blood samples

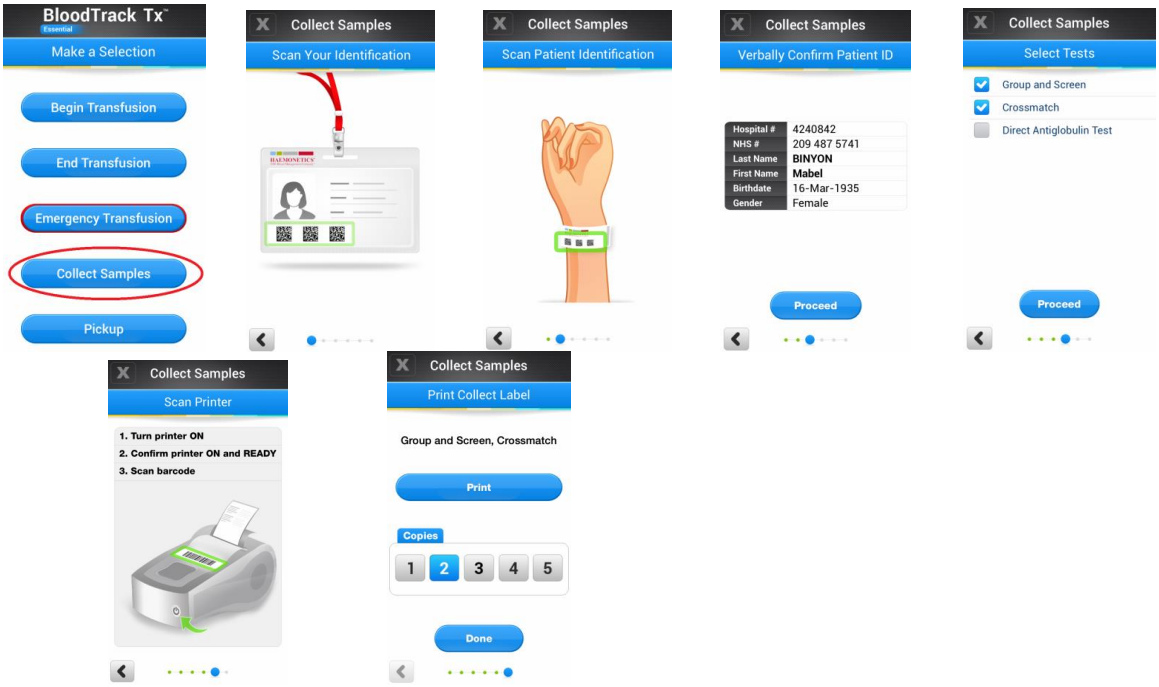
2.3.1 Check the expiry date of the sample tube prior to taking the blood sample. Any samples received in the transfusion laboratory in expired tubes will be rejected.

2.3.2 The member of staff taking the blood must personally label the sample tubes at the patient's side using the electronic BloodTrack system to generate a unique label for the sample tube, by scanning the barcode on the patient's wristband.

2.3.3 Sample tubes must never be pre-labelled.

2.3.4 Wristbands must never be printed in advance of first contact with the patient, and should only be printed after positively establishing the patient's identity by asking the patient (see 'Guideline for Checking Patient Demographic Details' Trust Reference B10/2014) and then selecting the right patient from the hospitals Patient Administration System to print the wrist band. Once a wristband is printed, it must be immediately and securely applied to the patient's wrist (where this is not possible, it must be applied either to an ankle, or if in theatres, to the patient's ET tube), ensuring **no pre-printed wrist band is left lying around on a work station or loosely clipped to patient's notes**.

2.4 Obtaining a blood transfusion sample using BloodTrack TX:



2.5 Timing of sample collection

2.5.1 In the absence of a recent transfusion or pregnancy within the last 3 months, samples may be taken up to 3 months prior to plan transfusion. Samples are then valid for 72 hours from the start of transfusion.

2.5.2 If the event of a transfusion or pregnancy within the last 3 months, samples should be taken no more than 72 hours in advance of transfusion being administered.

3. KEY WORDS

2 SAMPLE RULE, BLOODTRACK TX, REQUEST, SPECIAL REQUIREMENTS, GROUP AND SCREEN/SAVE, CROSS MATCH.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead:** **Dr H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline applies to all staff involved in the process of administering blood components to patients requiring transfusion.

NB: this guideline does not apply to batch products eg. Human Albumin Solution (HAS), Octaplas etc

2. GUIDELINE STANDARDS AND PROCEDURES

This guideline is based on the current national guidelines published by the British Committee for Standards in Haematology (BCSH).

2.1 When preparing to administer a transfusion and prior to authorising the collection of the blood component from storage, ensure that the following have been checked;

- the patency of your patient's cannula;
- the prescription;
- that your patient has given written consent;
- pre-transfusion observations;
- the special requirements/TACO checklist has been fully completed;

2.2 Process for administration and traceability of blood and blood components

All blood component administration must be carried out using the electronic BloodTrack Tx system. Each BloodTrack barcode is unique to the individual and identifies them as the user for any transaction undertaken. **Barcodes must not be shared.**

2.2.1 Blood components must only be administered by a registered healthcare professional who is trained and assessed as competent in both transfusion and IV administration of drugs in accordance with the UHL Transfusion Training Policy for Clinical and Support Staff (Trust Ref. B39/2010) and has completed the UHL transfusion e-learning modules within the last 2 years.

2.2.2 The following members of staff are authorised to administer the prescribed blood or blood components with the above proviso:

- Doctor
- Registered nurse
- Registered midwife
- Registered operating department practitioner (ODP)
- Perfusionist

2.2.3 Immediately before setting up the transfusion, the healthcare professional must perform the final administration check at the patient's bedside. The alert and conscious patient must be positively identified by asking his/her full name and date of birth, and crosschecking with the information on the patient ID band and blood component tag. Without exception, all patients (inpatients and outpatients) must be wearing an identification wristband at the time of transfusion. If for any reason the wristband is removed, it is the responsibility of the person who removed it to replace it before any further intervention is carried out.

2.2.4 The compatibility tag and the label on the blood pack must also be checked and found identical with regard to the blood pack number and the component type.

2.2.5 The need for any diuretic and/or special requirement such as irradiation and/or CMV-negative blood must also be checked on the blood transfusion ICP.

2.2.6 Ensure ALL equipment is taken to the patient's bedside. This should include the blood component, ICP, drip stand, blood component giving set and the BloodTrack Tx scanner.

2.2.7 The label on the blood component pack must be checked for the EXPIRY DATE prior to commencement of transfusion to ensure the transfusion of blood component is completed before it's expiry date and time.

2.2.8 The expiry date of red cells and platelets is at midnight on the expiry date stated on the blood component pack. The transfusion of FFP and Cryoprecipitate must be completed within 4 hours of thawing time stated on the component pack. If however, **thawed FFP** is not transfused, it must be returned to the laboratory within 30 minutes of being removed from controlled storage. Once returned, FFP accepted by Blood Transfusion Laboratory may be stored in the Blood Bank fridge for a subsequent issue within 5 days of the initial thawing time. Pre -thawed FFP if not used within the initial 24 hours of thawing for an MH event, can be issued in other emergency scenarios. Cryoprecipitate, once thawed must be transfused within 4 hours, or will be wasted as it is not viable beyond this.

2.2.9 Red cells must be ABO compatible with the recipient and should be RhD matched to the recipient. If the blood group of red cells units and the blood group of the patient are not identical and the sticker shown in the section below is not on the compatibility report, DO NOT START TRANSFUSION, AND IMMEDIATELY CONTACT BLOOD TRANSFUSION LABORATORY FOR ADVICE.

2.2.10 Occasionally the blood group of red cells, platelets, FFP and cryoprecipitate may not be identical to the patient's blood group. Units may be issued by the blood transfusion laboratory with the following stickers where products with alternative blood group are issued **(if in doubt contact the Blood Transfusion Laboratory).**

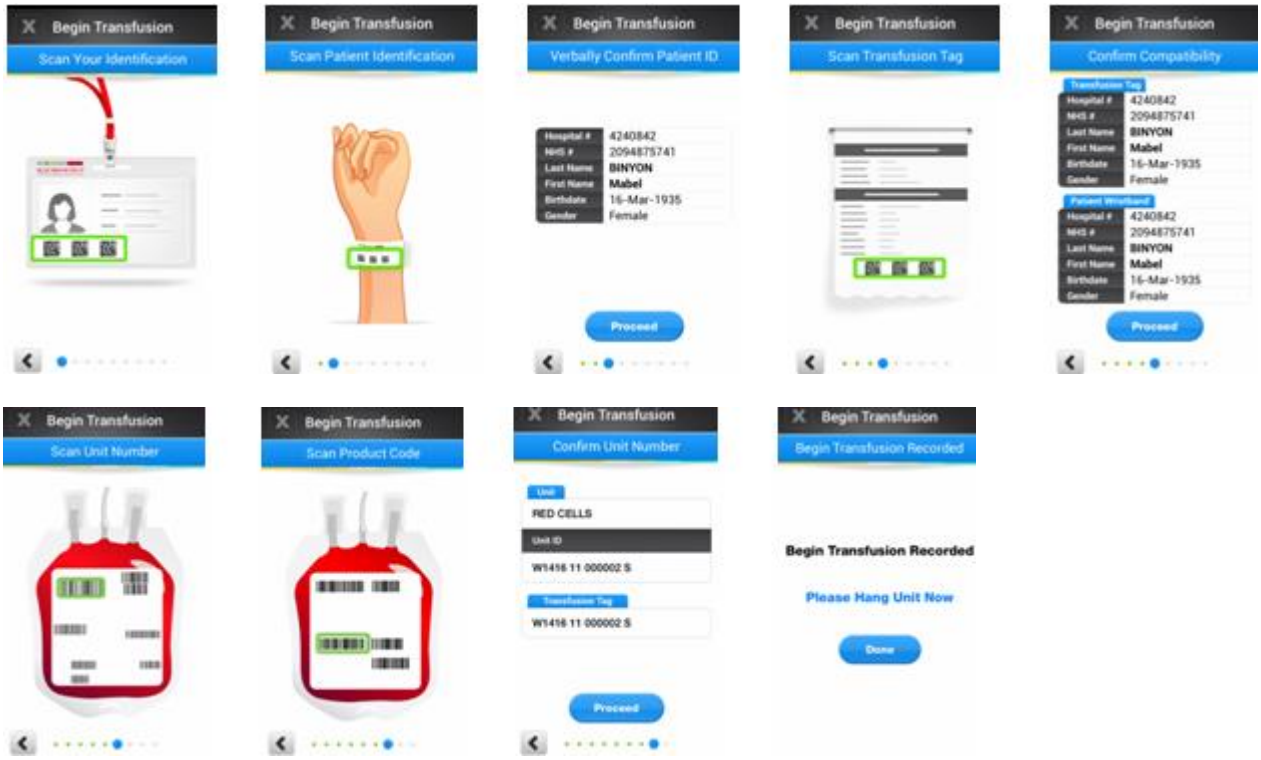
Blood group of the patient is different to that of the donor. However, the product is suitable for transfusion to this patient.

2.2.11 Any blood component removed from controlled storage which **is wholly unused**, must be returned to the transfusion laboratory within 30 minutes of initial removal in order to avoid unnecessary wastage. Blood components which are wholly unused and have been out of controlled storage for more than 30 minutes must be returned to the transfusion laboratory in order for the fate to be appropriately documented as required by UK law (BSQR No.50 2005).

2.2.12 **For routine transfusion:** Any changes to the patients details must be notified to the transfusion laboratory. A fresh sample must be submitted, against which further blood components will be issued. In these circumstances, clinical staff must ensure that the patients wristband and any corresponding documentation/addressograph labels are also amended/removed to reflect the change, thus ensuring that the right patient receives the right blood, avoiding the risk of a potentially fatal incompatible transfusion. Maintaining the patients record accurately also ensures that there will be no unnecessary delays in the provision of blood components when required.

2.3 Using Electronic BloodTrack

2.3.1 When the HCP has carried out their own positive patient identification checks at the patients side and is satisfied that they have the right blood for the right patient, the BloodTrack scanner must be used to verify the patients ID in order to commence the transfusion.



2.3.2 All Transfusions must be ended using the BloodTrack TX system. This task may be completed by an HCP other than the individual who commenced the transfusion.

2.3.3 The Trust are legally obliged to demonstrate 100% traceability of all blood components issued to patients. As well as verifying your own positive patient identification check, BloodTrack also maintains the traceability of all blood components issued to patients, it achieves this by recording the administration of the blood component in real time and is fully auditable.

2.3.4 In the event of a network failure, immediately before setting up the transfusion two healthcare professionals - one of whom must be assessed as competent to administer blood components – must, independently of each other, perform the final administration check at the patients bedside as detailed above (section 2.2.3) and both HCP's must sign the ICP where indicated.

It is absolutely essential that both members of staff carrying out the bedside check are vigilant and that one does not rely upon the other to be rigorous.

2.3.5 The flow rate must be adjusted according to the prescription.

2.3.6 After completion of the transfusion procedure, the ICP along with any additional observation chart used for monitoring transfusion must be filed in patient's case notes as a permanent record.

2.3.7 Partial transfusions, however small, should be recorded as transfused and be documented accordingly.

2.3.8 The same bedside check procedure is required for each subsequent unit of blood.

2.4 General instructions

2.4.1 Drugs must NOT be added to blood components under any circumstances.

2.4.2 Blood component packs should be visually inspected prior to transfusion for integrity of the pack, evidence of any leaks at the ports and seams and for the presence of clots or other contraindications such as platelets clumping or abnormal colour change. If any of these apply the component must not be used and clinical staff should contact the blood bank for further instructions.

2.4.3 The transfusion of a unit of red cells should be completed within 4 hours of removal from the controlled temperature environment.

2.4.4 Transfusion of platelets should be commenced immediately upon their receipt and are usually transfused within 30 min to 1 hour. Transfusion must be completed within 4 hours of them leaving the controlled storage environment.

NOTE: Platelets are kept at room temperature and **must never be placed in a fridge**

2.4.5 Blood components can be administered through peripheral intravenous cannula or most central venous access devices (according to manufacturer's specifications). The size of the peripheral cannula depends on the size and integrity of the vein and the speed at which the blood component is to be transfused. Consideration should be given to using a larger gauge cannua where possible, particularly if transfusion is being administered through an infusion pump or a pressure device. NB: Peripherally inserted long central catheters (PICC lines) with narrow lumen diameter may lead to slower flow rates.

2.4.6 The blood giving set must be changed after two units of the same blood/blood component, after 8 hours, or if the filter is found to be blocked, whichever occurs first. All blood components should be transfused using a bionector/needlefree hub (refer to the UHL IV Policy, Trust Ref: B25/2010)

2.4.7 Blood/blood components must not be transfused through a giving set which was used for the infusion of other intravenous fluids or a different type of blood component. It is **not** necessary to prime the giving set with 0.9% Normal Saline; the giving set should be primed with the blood component only.

2.4.8 All blood components should be administered using a blood component administration set which incorporates 170-200 micron filter.

2.4.9 Platelet concentrates should not be transfused through administration sets which have already been used to administer other blood components.

2.4.10 If an electronic pump is to be used for the transfusion of blood/blood component, the person administering blood must ensure that such infusion pumps have been approved and validated by the UHL Hospital Transfusion Team for the transfusion of blood components. Consider appropriate size of cannula for high flow infusion pumps.

2.4.11 Generally, it is **not necessary to warm blood before transfusion**. However, there are specific indications for warming blood and these include

- At flow rate of greater than 50 ml/kg/hour in adults.
- At flow rate of greater than 15 ml/kg/hour in children.
- When transfusing patients with clinically significant cold agglutinins (Cold Haemagglutinin Disease).
- When performing exchange transfusions.
- Active peri-operative warming techniques may be necessary for some patients during anaesthesia. If blood warming is considered essential, then it must be achieved using approved blood warming apparatus.

IMPORTANT: Blood must only be warmed using approved and validated blood warming equipment with built in thermostat and an audible alarm.

Blood warming sets should not be routinely flushed with 0.9% Normal Saline solution but exceptions can be made if using High Flow Sets where the priming volumes exceed 65mls.

Blood must never be warmed on radiators, in warm/hot water, in microwaves or other heating equipment not specifically designed for this purpose. Failure to comply with this requirement is likely to result in severe red cell haemolysis with potentially lethal consequences.

2.4.12 An indication of whether or not the transfusion achieved the desired effect (either post transfusion increment or improvement in the patient symptoms) and details of any reaction to the transfusion should be documented in the patient record.

2.4.13 Overnight transfusions should be avoided **whenever possible**, for reasons of patient safety.

2.4.14 Once transfusion is set up, the patient must not leave the ward or clinical area without a registered HCP escort; the transfusion must not simply be discontinued and resumed afterwards as this could increase the risk of a serious infective complication.

2.4.15 Always wear gloves when handling blood components. Administration of blood components is governed by the use of ANTT (Aseptic Non-Touch Technique).

2.5 Monitoring of patient during transfusion

2.5.1 Baseline vital signs i.e. Pulse, blood pressure, respiratory rate, o_2 sats and temperature must be checked **within an hour <u>before</u> the collection** of the Blood Component from the Blood Fridge; then again between 15 to 20 minutes after the start of transfusion, 60 minutes after the start of transfusion, and on completion of the transfusion of each unit. These observations apply for EACH UNIT of blood or blood component. This information must be recorded in the transfusion module of e-Obs or if not available, on the UHL Blood Transfusion ICP.

2.5.2 It should be noted that the above requirements for clinical observations are an absolute minimum. There will be situations where more frequent observations are necessary e.g. unconscious or heavily sedated patients and patients with heart failure, these should be recorded on a separate observations chart which is clearly timed and dated. This can then be attached to the ICP.

2.5.3 Most serious transfusion reactions tend to occur within the first 15 to 20 minutes of starting a new blood or blood component unit and the patient must therefore receive very close visual observation during this time. Watch the patient closely for any of the following symptoms or signs:

- Shivering
- Flushing
- Shortness of breath
- Pain in the chest, back, loin or extremities
- Pain or burning sensation at the drip site
- A feeling of apprehension or “something wrong”
- Unexplained drop in blood pressure
- Collapse
- A rise in temperature of 1.5^{o}C or more from the baseline observations
- Skin rash or urticaria
- Anaphylaxis
- Haemoglobinuria
- Bleeding from venepuncture sites
- Non-specific deterioration in the patient’s condition

2.5.4 Inpatients should be observed for late reactions during the subsequent 24 hours. Day case and short-stay transfusion patients should be warned about the possibility of late adverse reaction(s) and a relevant contact number supplied.

IMPORTANT:

If the patient shows any of the above signs or symptoms transfusion must immediately be stopped and the giving set disconnected from the cannula. Medical staff responsible for the patient must be contacted immediately. The cannula end of the giving set should be sealed with an appropriate bung. The giving set must ***not*** *be disconnected from the blood component pack. The cannula should be kept patent with a slow running drip of Sodium Chloride 0.9% until medical staff have reviewed the patient.*

2.5.5 The patients should be made aware of the importance of reporting any unusual symptoms to their health care professional

2.5.6 The management of severe transfusion reactions should be discussed with the senior haematology medical staff.

NOTE: Appendix 14 describes investigation and management of transfusion reactions.

2.5.7 All suspected transfusion reactions must be recorded in the patient's notes and a Datix completed by clinical staff

2.5.8 The blood transfusion laboratory must be notified of all adverse reactions to transfusion of blood or blood components.

2.5.9 Following discussion with laboratory staff the unit of blood component, with attached giving set must be returned to the blood transfusion laboratory for further investigation. Please note that when returning a blood component with the attached giving set a sterile bung must be used to prevent spillage and contamination.

NOTE: The algorithm for management of transfusion reaction can be found within the Blood Transfusion Integrated Care Pathway and in Appendix 14 of this document.

2.6 Reporting adverse events

2.6.1 The UK Blood Safety and Quality Regulations (2005, as amended) make it a legal requirement that all serious blood related adverse reactions and events are reported to the MHRA within 7 days. It is therefore mandatory for health care professionals to immediately report such reactions or events to the blood transfusion laboratory who will then report these to the MHRA.

2.6.2 A Datix incident form must be completed. This includes 'near miss' episodes involving procedural errors that were detected in time to prevent a serious complication of blood transfusion.

2.6.3 Transfusion incidents are investigated by the HTT and reported periodically to the HTC. The HTT review incident trends and formulate action plans where appropriate.

2.7 Disposal of used blood packs and blood giving sets

2.7.1 On completion of an uncomplicated transfusion the empty packs must be retained in a designated area on each ward/theatre for at least 24 hours.
All used blood component packs must be placed in a red transport bag or equivalent for disposal of clinical waste. This bag must be sealed, labelled with the patient name and the date of transfusion and then placed in a transfusion specific Daniels (Danny) bin. When the Danny bin is filled to capacity it should be retained in the clinical area for 24 hours following placement of the last empty pack before sealing.

If a transfusion is completed in theatre, the empty packs must accompany the patient to the ward. This will make it possible to investigate any adverse event that may have been attributed to blood transfusion. After 24 hours, the bags should be disposed of as per the Waste Management Policy (Trust Ref. A15/2002).

2.7.2 Once all units have been transfused, there is no need to disconnect the giving set from the final transfused unit upon completion of the transfusion episode; the empty bag with giving set still attached should be disposed of into the Danny bin, as 2.7.1 above

2.7.3 For partially transfused units, the giving set must remain attached, sealed using an appropriate bung and discarded as per the clinical waste policy, unless disconnected due to suspected transfusion reaction. These must be returned to blood bank for further investigation.

2.7.4 It is not necessary to flush the giving set/blood warmer with Sodium Chloride 0.9% solution following transfusion. The giving set should be disconnected and the IV access flushed with a bolus of Sodium Chloride 0.9% solution

3. KEY WORDS

Special requirements, BloodTrack TX, Positive Patient Identification, ICP, administration.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead:** **Dr. H. Qureshi**
Details of Changes made during review: **Addition of TACO checklist pre-transfusion** **Guidance on size of cannula for transfusion purposes** **FFP viability increased to 5 days post thaw if stored correctly** **Return of wholly unused blood components to ensure traceability/fate is correctly documented**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline is intended for adult patients only. A separate guideline is available for children and neonates (see Appendix 17).

These guidelines are aimed at clinical staff responsible for making a decision to transfuse red cells for transfusion.

2. GUIDELINE STANDARDS AND PROCEDURES

The information contained in these guidelines is based on national guidelines published by the British Committee for Standards in Haematology (2008) and The Association of Anaesthetists of Great Britain and Ireland (2001). Management of *Anaemia* and Red Cell Transfusion in Adult *Critically Ill Patients* (2012).

2.1 General principles

There is no universal trigger for red cell transfusion. The decision to transfuse a patient should be based on haemoglobin level and a careful clinical assessment, indicating that transfusion is necessary to save life or prevent major morbidity.

2.1.1 Decision to transfuse should be based on a careful assessment of patient's clinical state and haemoglobin.

2.1.2 Haemoglobin must be reviewed after each single unit and before further units are transfused

2.1.3 Blood transfusion must be justified as essential to prevent major morbidity or mortality.

2.1.4 Alternatives to allogeneic red cells should be considered where appropriate.

2.1.5 Document precise indication for transfusion in case notes.

2.1.6 Risks and benefits of transfusion should be explained to patients and their written consent obtained. Using the stickers provided on the ICP, this should be clearly documented on a standard UHL consent form and subsequently filed in case notes, or alternatively via Concentric.

2.1.7 Patients should be offered an NHSBT information leaflet (the leaflets are available in all clinical areas and further supplies can be obtained from the blood transfusion laboratory).

2.1.8 Preoperative assessment should include diagnosis and treatment of iron deficiency anaemia (Eg: with iron supplements)

2.1.9 The following table 1 summarises current local guidelines for all indications of red cell transfusions.

Table 1

Haemoglobin	Instructions
Acute bleeding - Acute blood loss with haemodynamic instability.	After normovolaemia has been achieved/maintained, frequent measurement of Hb (including by near patient testing) should be used to guide the use of red cell transfusion.
Hb ≤ 70g/L stable patient - Acute anaemia anticipated.	Consider a Hb threshold of 70g/l and a target Hb of 70-90g/l
Hb ≤ 80g/L stable patient and acute coronary syndrome	Use an Hb threshold of 80g/l and a target Hb of 80-100g/l.
Chronic transfusion-dependent anaemia	Transfuse to maintain an Hb which prevents symptoms. Suggest an Hb threshold of 80g/l initially and adjust as required. Haemoglobinopathy patients require individualised Hb thresholds depending on age and diagnosis.
Radiotherapy maintain Hb ≥ 100g/L	There is some evidence for maintaining an Hb of 100g/l in patients receiving radiotherapy for cervical and possibly other tumours
Exchange transfusion	

3 Indications for the use of red cell transfusion

To treat acute blood loss:

3.1 Assessment of acute blood loss

It is often difficult to estimate the amount of blood loss in this situation. Reference to the following table (Basket et al 1990) may be useful for clinical assessment.

In acute blood loss, crystalloids and/or colloids may be sufficient to replace up to 20% blood volume (effects of hypovolaemia vs. anaemia).

- **15% loss** (750 ml in adult) – crystalloids only may be sufficient unless pre-existing anaemia or cardio-respiratory compromise, or further blood loss anticipated.
- **15-30% loss** (800–1500ml in an adult) – crystalloids or synthetic colloids. Need for red cell transfusion unlikely unless pre-existing anaemia or cardio-respiratory compromise or further blood loss anticipated.
- **30-40% loss** (1500–2000ml) – rapid volume replacement with crystalloids or synthetic colloids – red cell transfusion will probably be required.
- **>40% blood loss** – refer to protocol for management of massive haemorrhage. Fresh Frozen Plasma, cryoprecipitate and / or platelets may be necessary to correct coagulation abnormalities.

Inform the blood transfusion laboratory of the degree of urgency.

See Table 2 for a classification of hypovolaemic shock according to percentage blood loss, and the associated clinical signs (Baskett 1990):

Table 2

	Class I	Class II	Class III	Class IV
Blood loss Percentage: Volume (ml):	<15 % 750 ml	15-30 % 800-1500 ml	30-40 % 1500-2000 ml	>40 % >2000 ml
Blood pressure Systolic: Diastolic:	Unchanged Unchanged	Normal Raised	Reduced Reduced	Very low Unrecordable
Pulse (beats/min):	Slight Tachycardia	100-120	120 (Thready)	>120 (Very thready)
Capillary refill:	Normal	Slow (>2s)	Slow (>2s)	Undetectable
Respiratory rate:	Normal	Normal	Tachypnoea (>20/min)	Tachypnoea (>20/min)
Urinary flow rate (ml/h):	>30	20-30	10-20	0-10
Extremities:	Colour normal	Pale	Pale	Pale and cold
Complexion :	Normal	Pale	Pale	Ashen
Mental state:	Alert	Anxious or aggressive	Anxious, aggressive, or drowsy	Drowsy, confused, or unconscious

3.1.1 Peri-operative transfusion

Wherever possible, the objective should be to manage the patient so that transfusion of allogeneic blood is not required.

Pre-operative considerations:

3.1.2 The Optimal Surgical Blood Order Schedule – OSBOS (Trust Ref: B18/2010) should be used for patients undergoing surgery that would normally require blood transfusion.

Patients should have a full blood count and group & antibody screen performed when placed on the waiting list for elective surgical procedure that is likely to require red cell transfusion

3.1.3 All preoperative patients undergoing elective surgeries with high bleeding risk should have their hemoglobin (Hb) levels assessed. Female patients with Hb <120 g/L and male patients with Hb <130 g/L should be referred to the Patient Blood Management Clinic for preoperative anaemia optimisation.

3.1.4 Aspirin or other anti-platelet therapy should be stoppedin a timely manner pre-operatively where possible; medical staff should make this decision based on a thorough clinical assessment as some patients may need to continue treatment of this kind for specific co-morbidities.

3.1.5 Pro-active management of anticoagulated patients; refer to the Anticoagulation Bridging Therapy for Elective Surgery and Procedures UHL Guideline (Trust Ref: B30/2016)

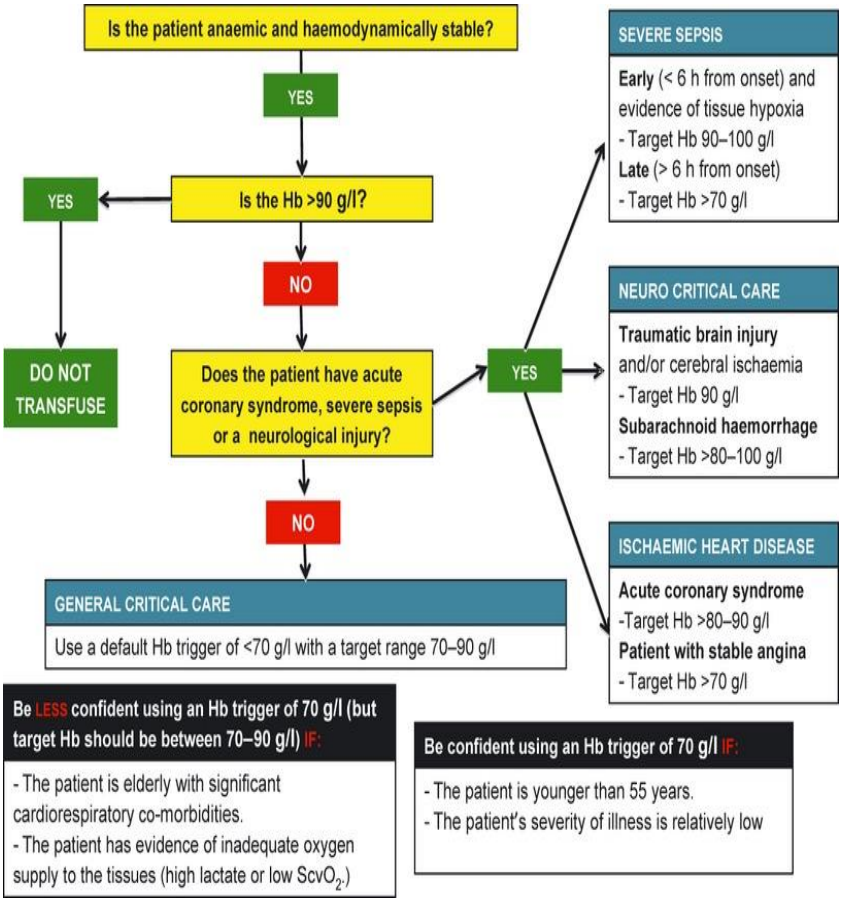
3.1.6 Consider alternatives to allogeneic blood wherever appropriate.

3.1.7 Consider Peri-operative red cell salvage where relevant (if patient is likely to lose enough blood to warrant a transfusion). The cell salvage machines are available in theatres at all three sites and the majority of ODPs have been trained in their use. See appendices 15 and 16 for more detailed information.

3.1.8 Anaemia in critical care

Over-transfusion may increase mortality in this group. Please refer to image below to guide transfusion:

Image 1 : A suggested approach to transfusion in critical care is summarised



3.1.9 Chronic anaemia

- In patients without significant symptoms of anaemia, avoid transfusion and establish underlying cause.
- Investigate and treat haematinic deficiency.
- Consider erythropoietin (e.g. in anaemia associated with chronic renal failure).

3.1.10 Anaemia associated with malignancy

Currently, there is no consensus on transfusion triggers in patients with anaemia associated with haematological or non-haematological malignancy. In patients with haematological malignancy, the majority practice in the UK is aimed at maintaining Hb levels around 90-100 g/L.

3. KEY WORDS

Anaemia, Bleeding, Haemoglobin, OSBOS, Iron

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title): Dr H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Addition of table for transfusing in Critical Care**	

1. INTRODUCTION AND WHO THIS GUIDELINE APPLIES TO

The purpose of this guideline is to give clear instructions to clinical staff responsible for the prescription, administration and issue of platelets for transfusion to adult patients only, there is a separate guideline for platelet transfusions in paediatric and neonatal patients (see Appendix 17 Section 2.5.)

2. GUIDELINE STANDARDS AND PROCEDURES

This guideline is based on the current national guidelines published by the British Committee for Standards in Haematology (BCSH use of platelet transfusions 2016, Peri-operative management of anticoagulation and antiplatelet therapy 2016, the assessment and management of bleeding risk prior to invasive procedures 2024).

As with other blood components, transfusion of Platelets must be prescribed and fully documented on the Blood Transfusion Integrated Care Pathway (ICP).

Prophylactic platelet transfusions are indicated for patients with thrombocytopenia who are awaiting invasive procedures with high risk of bleeding, while therapeutic platelet transfusions are indicated for patients with thrombocytopenia who have active bleeding.

The classification of platelet transfusion into either ‘therapeutic’, to treat bleeding, or ‘prophylactic’, to prevent bleeding, was based on the modified World Health Organization (WHO) bleeding score (Table 1).

Table I. Modified World Health Organization bleeding score (Stanworth *et al*, 2013a).

Grade	Type of bleeding
Grade 1	• Petechiae/purpura that is localized to 1 or 2 dependent sites, or is sparse/non-confluent • Oropharyngeal bleeding, epistaxis <30 min duration
Grade 2	• Melaena, haematemesis, haemoptysis, fresh blood in stool, musculoskeletal bleeding, or soft tissue bleeding not requiring red cell transfusion within 24 h of onset and without haemodynamic instability • Profuse epistaxis or oropharyngeal bleeding >30 min • Symptomatic oral blood blisters, i.e. bleeding or causing major discomfort • Multiple bruises, each >2 cm or any one >10 cm • Petechiae/purpura that is diffuse • Visible blood in urine • Abnormal bleeding from invasive or procedure sites • Unexpected vaginal bleeding saturating more than 2 pads with blood in a 24-h period • Bleeding in cavity fluids evident macroscopically • Retinal hemorrhage without visual impairment
Grade 3	• Bleeding requiring red cell transfusion specifically for support of bleeding within 24 h of onset and without haemodynamic instability • Bleeding in body cavity fluids grossly visible • Cerebral bleeding noted on computed tomography (CT) without neurological signs and symptoms
Grade 4	• Debilitating bleeding including retinal bleeding and visual impairment* • Non-fatal cerebral bleeding with neurological signs and symptoms • Bleeding associated with haemodynamic instability (hypotension, >30 mmHg change in systolic or diastolic blood pressure) • Fatal bleeding from any source

*Visual impairment is defined as a field deficit, and patients with suspected visual impairment require an ophthalmological consultation.

2.1 Prophylactic platelet transfusions

Prophylactic platelet transfusion is currently a standard practice for patients with bone marrow failure (due to bone marrow disease, cytotoxic therapy or irradiation).

2.1.1 Prophylactic transfusion of platelets to patients with Thrombocytopenia because of reversible Bone Marrow Failure where recovery is anticipated:

2.1.1.1 Platelet count <10 x 10^9/L in reversible bone marrow failure.

Give prophylactic platelet transfusions (platelet transfusions to patients who do not have clinically significant bleeding [WHO grade 0 or 1] and do not require a procedure) to patients with reversible bone marrow failure receiving intensive chemotherapy or undergoing allogeneic haematopoietic stem cell transplantation (HSCT) to maintain a platelet count at or above 10 x 10^9/L.

Use one adult dose (one unit) routinely for prophylactic platelet transfusions.

Consider not giving prophylactic platelet transfusions to well patients with no evidence of bleeding who have had an autologous stem cell transplant.

Consider increasing the threshold for prophylactic platelet transfusion to between 10 and 20 x 10^9/L in patients have additional risk factors for bleeding. Individual review is required.

2.1.1.2 Prophylactic Transfusion of Platelets to Patients with thrombocytopenia because of Chronic Bone Marrow Failure, where recovery is not anticipated.

Use a 'no prophylactic platelet transfusion' strategy for asymptomatic patients with chronic bone marrow failure.

Consider prophylactic platelet transfusions to patients with chronic bone marrow failure receiving intensive treatment.

Manage patients with chronic bleeding of WHO grade 2 or above individually, according to the severity of their symptoms and signs. Consider a strategy of prophylaxis (e.g. twice a week)

2.1.1.3 Prophylactic Transfusion of Platelets to other patient group.

Use the platelet count thresholds for reversible bone marrow failure as a general guide for prophylactic platelet transfusion in patients with critical illness in the absence of bleeding or planned procedures.

2.1.2 Prophylactic Platelet Transfusion prior to procedures or surgery

Whenever possible use a procedure/equipment associated with the lowest bleeding risk. Apply local measures, such as compression, to reduce the risk of bleeding post-procedure.

Do not give platelet transfusions routinely prior to:

- Bone marrow aspirate or trephine biopsy
- In the presence of haemorrhagic symptoms or significant coagulopathy platelet transfusion can be considered.
- Peripherally inserted central catheters (PICCs)
- Traction removal of tunnelled CVCs
- Cataract surgery

Consider performing the following procedures above the platelet count threshold indicated

- Venous central lines (both tunnelled and un-tunnelled), inserted by experienced staff using ultrasound guidance techniques, when the platelet count is >20 x 10^9 /l.
- Lumbar puncture when the platelet count is ≥40 x 10^9 /l.
- Insertion/removal of epidural catheter when the platelet count is ≥80 x 10^9/l.
- Major surgery – when the platelet count is >50 x 10^9 /l
- Minor surgery – when the platelet count is >30 x 10^9 /l
- Neurosurgery or ophthalmic surgery involving the posterior segment of the eye when the platelet count is >100 x 10^9 /l
- Percutaneous liver biopsy when the platelet count is >50 x 10^9 /l Consider trans-jugular biopsy if the platelet count is below this level
- Percutaneous renal biopsy - when the platelet count is >50 x 10^9 /l

Prior to renal biopsy ensure potential risk factors for bleeding are corrected: anaemia (iron and erythropoietin), uraemia (dialysis).

If renal biopsy is urgent consider desmopressin (DDAVP) pre-procedure or oestrogen if time allows.

Avoid platelet transfusion in renal failure because infused platelets will acquire a dysfunction similar to the patients' own platelets and platelet transfusion may result in allo-immunisation.

- If platelet transfusion is necessary to raise platelet count to cover an invasive procedure, it must not be assumed that the platelet count will rise just because platelet transfusions are given.
- A preoperative platelet count should always be checked to ensure that the following thresholds have been reached.

2.2 Therapeutic Platelet Transfusions

In severe bleeding, maintain the platelet count above 50 x 10^9 /l. Consider empirical use for the initial management of major haemorrhage

In patients with multiple trauma, traumatic brain injury or spontaneous intracerebral haemorrhage, maintain the platelet count above 100 x 10^9 /l

In patients with bleeding that is not considered severe or life-threatening, consider platelet transfusion if the platelet count is below 30 x 10^9 /l

2.3 Massive transfusion

- If platelet count is <80 x 10^9 /l give 1 ATD of platelets; give 2 ATD of platelets if platelet count is <30 x 10^9 /l
- Please refer to the UHL massive haemorrhage protocol.

2.4 Platelet Function Disorders

Patients with platelet function disorders rarely need platelet transfusions.
However, acquired causes of platelet dysfunction can exacerbate bleeding in patients who already have impaired haemostasis.

The following recommendations (grade C, level IV) are for the management of bleeding or for prophylaxis before invasive procedures for patients with a known or suspected platelet function disorder.

- Withdraw drugs known to have anti-platelet activity.

- Correct any underlying condition known to be associated with platelet dysfunction, if possible.
- Correct the haematocrit to > 0·30 l/l in patients with renal failure, either with the use of recombinant erythropoietin or red cell transfusion.
- Consider the use of DDAVP (1-deamino-8-D-arginine vasopressin, desmopressin) in patients with inherited dysfunction defects, such as storage pool disease.
- Consider the use of DDAVP or cryoprecipitate in patients with uraemia.
- Use platelet transfusions where the above methods are not appropriate or are ineffective.
- Recombinant factor VIIa, has been shown to be effective in the management of bleeding and for prophylaxis before surgery in patients with Glanzmann's thrombasthenia

2.4.1 Congenital

For first line treatment or prevention of bleeding, consider recombinant factor VIIa (rFVIIa) in Glanzmann thrombasthenia and tranexamic acid (TXA) plus desmopressin in other congenital platelet function disorders.

If pharmaceutical therapies are contraindicated, ineffective or if there is high risk of bleeding, consider transfusion of platelets. In Glanzmann thrombasthenia, consider human leucocyte antigen (HLA)-matched platelets.

2.4.2 Acquired

- Use general haemostatic measures to treat bleeding in patients during treatment with aspirin, P2Y12 antagonists or glycoprotein IIa/IIIb inhibitors. If necessary, consider drug cessation and reversal of the effect of coprescribed anticoagulants.

- Use TXA to counteract the effect of anti-platelet agents when a risk/benefit assessment would support this

- Consider the use of platelet transfusion as an additional measure to those suggested above for critical bleeding

- Consider platelet transfusion to prevent bleeding in severe thrombocytopenia (platelet count < 10x 10^9 /l) caused by abciximab

- For urgent low bleeding risk surgery in patients on anti-platelet agents routine platelet transfusion should not be given.

- For urgent high-bleeding risk surgery in patients on antiplatelet agents
    - Given the uncertain net benefit of platelet transfusion, consider the use of pre-operative intravenous tranexamic acid.
    - If, despite tranexamic acid, there is excessive peri-or post-op bleeding, or if the bleeding risk is perceived to be very high, consider infusion of 2 pools of donor platelets. This may improve haemostasis if given at least two hours after the last dose of aspirin though even higher doses of donor platelets 12–24 h after the last dose of clopidogrel may have a lesser effect

2.5 Disseminated intravascular coagulation (DIC)

- Platelet transfusions are a part of the management of acute DIC, where there is bleeding associated with thrombocytopenia, in addition to management of the underlying disorder and coagulation factor replacement.
- Frequent estimation of the platelet count and coagulation screening tests should be carried out.

- Aim to maintain the platelet count > 50 × 10^9/l, as in massive blood loss
- In chronic DIC, or in the absence of bleeding, platelet transfusions should not be given merely to correct a low platelet count.

2.6 Cardiopulmonary bypass (CPB)

- Where possible, consider stopping anti-platelet drugs at least a week pre-op in patients attending for elective surgical revascularisation.
- Where it is not safe or possible to discontinue anti-platelet drugs before surgery, consider using aprotonin.
- Microvascular bleeding, as indicated by continued oozing from surgical incisions and venous cannulation sites, may occur as a consequence of either thrombocytopenia (usually platelet counts < 50 × 10^9/l) or acquired (transient, reversible) platelet dysfunction due to CPB.
- The use of the Thromboelastography (TEG - Rotem) and platelet function tests using multiplate should be carried out whenever possible to guide clinical decision for prescribing platelet transfusion.
- The use of platelet transfusion should be reserved for those patients who are experiencing excessive postoperative bleeding and in whom a surgical cause has been excluded.
- There is no indication for prophylactic transfusion of platelets in patients undergoing CPB.

2.7 Neonatal alloimmune thrombocytopenia (NAIT)

- The optimal approach to the postnatal management of NAIT suspected on clinical grounds is to transfuse compatible platelets as soon as possible, as delay in the provision of effective treatment may result in an increased risk of severe haemorrhage.
- It is not necessary to wait for laboratory confirmation of the diagnosis.
- The transfusion of human platelet antigen (HPA)-1a-negative, HPA-5b-negative platelet concentrates will result in least delay in providing treatment and will be effective in around 95% of cases of NAIT.
- If there is no response to HPA-1a negative, HPA-5b negative platelet concentrates, or if the HPA incompatibility is known to be for HPAs other than HPA-1a or HPA-5b, consideration should be given to the use of a platelet concentrate prepared from the mother. Such concentrates should be gamma irradiated and washed, in order to minimize the transfusion of maternal platelet allo-antibodies that may otherwise prolong the neonatal thrombocytopenia.
- Intravenous immunoglobulin infusion for the postnatal management of NAIT is effective in 75% of cases but increase in platelet count is delayed for 24−48 h, during which time the infant remains at risk of intracranial haemorrhage. HPA 1 a- and 5b-negative platelets should be transfused without undue delay.

2.8 Post-transfusion purpura

- High-dose intravenous immunoglobulin (total dose of 2 g/kg in divided doses given over a period of 2 to 3 days) is the current treatment of choice and has 85% response rate.
- High dose (2 or more adult doses) platelet transfusions may be required to control severe bleeding before there has been a response to high-dose intravenous immunoglobulins.
- There is no evidence that platelet concentrates from HPA-1a-negative platelets are more effective than those from random donors in the acute thrombocytopenic phase, and the dose of platelets may be more important than the type of the donor platelets. It is not known whether random transfusions in the acute phase prolong the duration or severity of thrombocytopenia.

2.9 Autoimmune thrombocytopenia (ITP)

Platelet transfusions are generally *ineffective in ITP* and are reserved for patients with severe bleeding from the gastrointestinal or genitourinary tracts, bleeding into the central nervous system or other sites associated with severe thrombocytopenia.

In these situations, intravenous methylprednisolone 500 mg to 1 g (adult dose) and / or high dose IV immunoglobulins (1 g/Kg body weight /day for 2 days) should be given at the same time to maximize the chances of stopping the haemorrhage and raising the platelet count.

Do not use prophylactic platelet transfusions in patients with autoimmune thrombocytopenia.

Only use platelet transfusion prior to a procedure or surgery when other treatment has failed and/or the intervention is urgent. Usual threshold counts may be unachievable or unnecessary and individual case review is required.

Give therapeutic platelet transfusions (more than one dose) to treat serious bleeding. In ITP, consider co-administration of intravenous immunoglobulin in addition to the platelet transfusion.

2.10 Contraindications

In patients with thrombotic microangiopathies Ex TTP and HIT platelet transfusions are contraindicated as this can worsen the clinical outcome unless there is severe treat life-threatening bleeding associated with thrombocytopenia**.**

2.11 Administration and rate of transfusion

- When Platelets are given prophylactically to adults, it is recommended that one adult therapeutic dose (ATD) is given. This should increase the platelet count by at least 20-40x10^9/l.
- An FBC must be taken within an hour of completion of the transfusion in order to assess the efficacy of the transfusion.
- When platelets are given therapeutically to treat active bleeding, a larger dose of platelets maybe indicated, the dose and frequency of administration depends on the individual circumstances.
- Platelets must be administered immediately on delivery to the clinical area. Delay in administration increases the risk of transfusion reaction.
- It is recommended that platelet concentrate is administered over a 30 minute period (BCSH, 1992, 1999, 2009) in an adult, through a standard blood administration set or platelet administration set. Do not give through a set that has already been used for red cells.

2.12 Risks from platelet transfusions

Platelet transfusions have been associated with all types of blood transfusion Reactions.

- It is acceptable to use ABO incompatible platelets to reduce wastage. Units tested and negative for high titre haemagglutinins and non-group O platelets are associated with a lower risk of haemolysis. Pooled platelets suspended in PAS would also be expected to reduce this risk.
- RhD negative girls or women of childbearing potential should receive RhD negative platelets. If unavailable, RhD positive platelets can be given with anti-D prophylaxis.

- For RhD negative boys under 18 years of age, those who already have anti-D antibodies and transfusion-dependant adults, the platelets of choice are RhD negative. RhD positive

platelets should be given if RhD negative platelets are unavailable or to prevent wastage of RhD positive components. Anti-D prophylaxis is not required

- In patients with a history of allergic transfusion reactions, apart from mild, use platelets suspended in PAS. If reactions continue or are severe, washed platelets (resuspended in 100% PAS) may be required.

- All clinical areas where platelet transfusions are administered should have access to guidance on the investigation and management of acute transfusion reactions to blood and blood components.

2.13 Platelet refractoriness

Causes for platelet refractoriness are mainly immune and non-immune. Non-immune conditions, such as consumptive coagulopathy, sepsis and splenomegaly, are recognised as the most common cause of platelet refractoriness, accounting for approximately 80% of cases. Allo-immune refractoriness in a patient with thrombocytopenia due to bone marrow failure was defined as a 10-min to 1-h increment of less than 5 $\times 10^9$/l on 2 consecutive occasions, using ABO identical platelets and in the absence of predominantly non-immunological factors.

- ABO matched platelets should be used when available to maximise increments.

- Patients with hypo-proliferative thrombocytopenia who are refractory to platelet transfusions solely due to non-immune factors should not receive HLA-selected platelet transfusion.

- Patients with hypo-proliferative thrombocytopenia who are refractory to platelet transfusions and have class I HLA antibodies should receive class I HLA-selected platelet transfusion.

- Patients with hypo-proliferative thrombocytopenia who continue to be refractory to HLA-selected platelet transfusions and have HPA antibodies should receive HPA selected platelet transfusion

3. KEY WORDS

Therapeutic, Prophylactic, Thrombocytopaenia, Platelets,

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

The purpose of these guidelines is to assist clinical decisions about the transfusion of Fresh Frozen Plasma (FFP) and Cryoprecipitate. It is targeted to all clinical staff responsible for the prescription, administration and issue of these products.

The indications for the transfusion of Fresh Frozen Plasma (FFP) and Cryoprecipitate are very limited. The risks of transmitting infections are similar to those of other blood components but when transfused they can have unpredictable results which include anaphylaxis, transfusion related acute lung injury (TRALI) and haemolysis from transfused antibodies to blood group antigens, especially A and B.

As with other blood components, transfusion of FFP must be prescribed and fully documented on the Blood Transfusion ICP.

2. GUIDELINE STANDARDS AND PROCEDURES

Clinical indications for the use of FFP and Cryoprecipitate

2.1 Major haemorrhage

In the trauma setting transfuse empirically in a 1:1 ratio with red cells. Other settings give FFP in at least a 1:2 unit ratio with red cells until results from coagulation monitoring are available.
Once bleeding is controlled, further FFP should be guided by abnormalities in PT and APTT. Keep PT/APTT ratio of <1.5 x mean normal or by the use of viscoelastic haemostatic assays in a near-patient testing

2.1.1 Multiple coagulation factor deficiencies; disseminated intravascular coagulation (DIC)

- FFP and platelets are indicated when there are demonstrable multi-factor deficiencies (e.g. DIC) *associated with severe bleeding*. Aim to maintain platelet count >50 and INR and APTT ratios <1.5.
- Cryoprecipitate is indicated if the plasma fibrinogen is less than 1.5 g/L, AND if the patient is bleeding.
- FFP is NOT indicated in DIC with no evidence of bleeding – there is NO evidence that prophylactic replacement regimes prevent DIC or reduce transfusion requirements in these situations.
- FFP is NOT indicated for volume replacement.

2.1.2 Thrombotic thrombocytopenic purpura (TTP)

- Single to 1.5x volume plasma exchange should commence as soon as possible within 6 - 8 hours of first presentation.
- Refer to BSH Guideline on the diagnosis and management of thrombocytopenic purpura and other thrombotic microangiopathies (2012).

2.1.3 Reversal of warfarin effect

- FFP is **NOT** the first line treatment of choice where a rapid reversal of anticoagulation with warfarin (or other Coumarin derivatives) is required to control severe, life threatening haemorrhage.

- FFP Should **NOT** be used for reversal of warfarin anticoagulation in the absence of bleeding.
- FFP should only be considered for the reversal of Warfarin where either the patient is bleeding or requires emergency surgery and the first line treatment, Prothrombin Complex Concentrate (Beriplex or Octaplex) is contraindicated (See PCC Clinicians Pack – Trust Ref: C265/2016).
- If FFP needs to be administered in these situations where PCC (Octaplex / Beriplex) is contraindicated, Vit K 5 mg should also be administered by slow intravenous route.

2.1.4 Vitamin K deficiency in intensive care (ICU)

- Prolonged clotting times in ICU patients should be corrected with vitamin K (e.g. 5mg by slow intravenous injection) where appropriate.

- FFP is **NOT** routinely indicated in this situation.

2.1.5 Liver disease

- There is no evidence to support routine use of FFP in patients with chronic liver disease, in the absence of bleeding associated with significant abnormal coagulation parameters i.e. INR >1.5 and/or APTT ratio >1.5. Prophylactic use of FFP is therefore not routinely indicated in these patients.
- There is no evidence that prophylactic use of FFP reduces the risk of severity of bleeding during or following invasive procedures in patients with chronic liver disease.
- FFP may be only administered as part of the management of active bleeding in patients with liver disease and significant coagulopathy.

2.2 Dosage

- The volume of FFP in each pack is stated on the label (usually 270-280 ml in Adult pack).
- The recommended dose is 10-15 ml/kg – may need to be repeated after 4-6 hours if bleeding continues or more frequently in patients with massive haemorrhage. The repeat doses should be guided by coagulation tests.
- Cryoprecipitate: Single adult dose contains 10 individual donor units in a single pack. Paediatric dose is 1 unit per 5-7 Kg body weight. A single dose should raise plasma fibrinogen level by 1 g/L.
- Dosage and frequency of administration should be guided by Point of Care Thromboelastography (TEG) or laboratory coagulation parameters wherever possible

2.3 FFP is also NOT indicated in the following:

2.3.1 Hypovolaemia: Fresh-frozen plasma should never be used as a simple volume replacement in adults or in children. Crystalloids are safer, cheaper and more readily available.

2.3.2 Reversal of prolonged INR in the absence of bleeding: There is no justification for using FFP to reverse a prolonged INR in the absence of bleeding.

2.4 Clinical indications for the use Cryoprecipitate

2.4.1 Clinically significant bleeding and fibrinogen <1.5g/L (<2g/L in obstetric bleeding)
2.4.2 Fibrinogen <1g/L and pre-procedure, with a risk of bleeding
2.4.3 Bleeding associated with thrombolytic therapy
2.4.4 Inherited hypofibrinogenaemia - fibrinogen concentrate not available

2.5 Types of FFP

There are 2 types of FFP available in the UK:

- Standard FFP for adults (from UK donors)
- Solvent detergent-treated FFP (which is currently mainly used for plasma exchange in Thrombotic Thrombocytopenic Purpura (TTP) and Haemolytic Uraemic Syndrome (HUS)

2.5.1 Administration guidelines for FFP and Cryo

A single unit of FFP or Cryoprecipitate can be administered over 30mins to 1 hour, Cryo cannot be placed in a blood fridge post thaw, but must remain at room temperature and be completed within 4 hours of leaving controlled storage.

3. KEY WORDS

Disseminated Intravascular Coagulopathy (DIC), Warfarin Reversal, Plasma Exchange, Prothrombin Complex Concentrate

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline is for clinical staff involved in the prescribing of and/or administration of blood components

2. GUIDELINE STANDARDS AND PROCEDURES

2.1.1 Human albumin is available in two different formulations:

- 250ml and 500ml bottles of 5 % solution
- 100ml bottles of 20% solution

2.1.2 All enquiries regarding albumin solutions must be directed to the Blood Transfusion Laboratory.

2.1.3 Except for certain high user wards (special arrangements will be made with these wards), albumin will only be issued on a named patient basis upon receipt of correctly completed request form.

2.1.4 All issued albumin will need to be collected from the blood bank.

2.1.5 Ensure stock of Human Albumin is ringfenced for;

- Major aortic surgery and cardiac transplant.
- Paediatric patients - used peri-liver transplant to manage protein loss associated with high drain losses, cirrhotic children hospitalised with significant portal hypertension and ascites, nephrotic range proteinuria, extracorporeal therapies and gene and cell therapies.
- Plasma exchange for renal vasculitis.

2.1.6 Albumin solutions may be stored for short periods on the ward or theatre providing the storage temperature is not exceeded (+2^{o}C to +25^{o}C).

2.1.7 Albumin solutions are made from pooled Human Plasma (blood product); transfusions need to be monitored and supervised as per Hospital Transfusion Policy.

2.1.8 The reason for transfusion must be documented in the patient's notes.

2.1.9 All intact, unopened products should be promptly returned to blood bank to ensure that the required, monitored storage conditions are maintained. When issued on a named patient basis, wholly unused albumin with intact seals, must be returned to transfusion laboratory within 48 hours, othwerise it will be wasted and cross-charged to the requesting department.

2.1.10 Albumin must not be used in standard fluid therapy.

NOTE: Use only for the patient prescribed. Do NOT use for other patients, as the Blood Transfusion laboratory must be able to trace the batch number of product to individual patient. Failure to comply is a CRIMINAL OFFENCE.

2.2 Administration and rate

REMEMBER: Albumin is a human derivative and therefore carries many potential risks.

2.2.1 Human Albumin Solution (HAS) is dispensed on a named patient basis.

2.2.2 Documentation of its use and corresponding batch numbers etc must be strictly upheld. It is given as an intravenous infusion and administered at room temperature. It must be administered using a standard blood giving set at the rate specified by the prescribing clinician.

2.2.3 The administration of 20% solutions of albumin requires more frequent patient monitoring with hourly observations of pulse, blood pressure and respiratory rate.

2.2.4 Plasma volume replacement – crystalloid solutions are safe and effective for resuscitation in traumatic and haemorrhagic shock. Colloid solutions may help to maintain haemodynamic stability when vascular permeability is increased; however albumin has no specific benefit over colloid solutions but is much more expensive.

2.2.5 There is no evidence that the administration of albumin reduces the risk of death in critically ill patients with hypovolaemia, burns, or hypoalbuminaemia. A low plasma albumin is indicative of a poor prognosis, but raising it by albumin infusion does not improve the outcome.

NO OTHER MEDICATION OR SUBSTANCE(S) SHOULD BE ADDED TO HAS.

2.2.6 Unless otherwise prescribed, HAS is given by intravenous infusion at a rate of:

20% HAS 1 – 2 ml per minute (60 – 120ml/hr and must not exceed 2ml/min)

5% HAS 5ml per minute (300ml/hr)

In severe cases this may be increased to 1,000ml/hr

For patients undergoing plasma exchange the rate may be increased to 1,800ml/hr

2.2.7 HAS must be administered using electronic BloodTrack to ensure real-time traceability.

Disposal of empty glass Albumin bottles

Any bottles with residual unused product and / or empty glass bottles must be disposed of in a rigid sharps container/transfusion specific Daniels bin.

3. KEY WORDS

Human Albumin Solution (HAS),

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Addition of 250ml bottles of HAS?** **Use of EBT to administer HAS/removal of orange cards**	

1 INTRODUCTION AND WHO THE GUIDELINE APPLIES TO

This guideline applies to all staff who have received training and successfully completed a competency assessment to access the BloodTrack-controlled blood fridges within UHL, and specifically to those who have a Haemobank/Smart Fridge in their department. It provides guidance for the dual functionality as both a Haemobank and a Smart Fridge. This guideline should be used in conjunction with the HELM e-learning modules 'BloodTrack Haemobank Smart Fridge for qualified staff' and 'BloodTrack Haemobank Smart Fridge for non-qualified staff.'

The Haemobank may contain **cross-matched** blood components, **emergency** red cells, AND **uncross-matched** red cells. The Haemobank which is connected to the lab LIMS system, can remotely issue (RI) red cells on demand; RI is the selection and electronic issue of compatible red cell units from an electronically-controlled blood refrigerator located outside of the transfusion laboratory, usually within the cinical areas.

The Haemobank is connected to an integrated computer kiosk from which only trained and authorised users in the clinical area can label electronically issued units on demand for a specific patient.

GUIDELINE STANDARDS AND PROCEDURES

2.1 Locations of Haemobanks/Smart Blood Fridges and capacity therein:

- PICU, LRI, Level 5 Kensington Building - 80 units maximum
- Outside CICU/Theatres GGH, Level 1 - 80 units maximum
- Delivery Suite Theatre Recovery Room, LGH, Ground floor - 20 units maximum

2.2 Smartfridge functionality:

For Adult Patients: When an adult patient needs a transfusion, a user trained and authorised to access the Haemobank Smartfridge functionality attends the HaemoBank and first scans their own unique BloodTrack QR code, then as instructed, scans the pick-up slip created from the correct patients wristband (in situ). The BloodTrack software communicates with the Laboratory Information Management System (LIMS) to determine ABO-Rh group and eligibility of the patient for electronic cross-match; (no known significant antibodies, no requirement for irradiated components etc); the BloodTrack software selects an appropriate unit and an electronic crossmatch is performed by the LIMS. The individual drawer containing the blood component will unlock and illuminate alerting the user to it's specific location, this can then be safely removed, checked and scanned by the authorised user. The Haemobank will print a label for the unit which MUST be checked and secured directly to the removed unit without delay. The unit and attached label are then scanned at the Haemobank and taken directly to the correct patient for immediate transfusion.

2.2.2 For Paediatric/Neonatal Patients: When a paediatric/neonatal patient needs a transfusion, the clinical staff must contact the lab who will release a compatible unit remotely. Staff must specify whether they require an adult or a paedi pack.

LRI Lab 16605 GGH Lab 13577 LGH Lab 14564

Any unlabelled unit removed from the fridge must be checked, labelled AND SCANNED by the user BEFORE leaving the Haemobank/Smart Fridge.

2.2.3 Where the remote electronic cross-match and issue functionality not yet enabled and thus being used as a Standard Blood Fridge: When a patient needs a transfusion, an authorised user attends the HaemoBank and scans their unique user barcode and, when directed, the pick-up slip created from the correct patients wristband (in situ). The Haemobank identifies a cross-matched unit for the patient and will unlock and illuminate the individual drawer containing it. The authorised user can then access the drawer, remove the unit, closing it securely after removal. The unit is then checked by the user and scanned at the kiosk to verify it and to complete the transaction. This ensures that the correct unit has been selected for the correct patient, and that traceability is maintained by logging the exact movements of the blood unit. The unit is then taken directly to the correct patient for immediate transfusion.

2.3 General Instructions

2.3.1 Only trained and authorised users can access the Haemobank/Smart Fridge

2.3.2 The authorised user is responsible for checking that the blood component is correctly labelled before leaving the area

2.3.3 If a blood component is selected and the drawer within the Haemobank illuminates, the transaction must be completed. If the blood component has been selected in error, continue with the transaction as directed above, then immediately return the component to storage using the option to 'return' on the Haemobank menu and following the instructions carefully. This ensures full traceability and correct storage of the component.

2.3.4 A unit which has been allocated and removed for a specific patient, can be returned to the Haemobank within 30 minutes if no longer required, but will only be available for this patient if required again. DO NOT REMOVE THE PATIENT LABEL APPLIED IN THIS EVENT.

2.3.5 The contents of the Haemobank can be checked without opening the fridge; Select 'check fridge contents' on the main menu. DO NOT access the fridge using patient data in order to check the contents, this action will render the selected unit unusable, which could potentially result in delays if/when this component is required for transfusion.

2.3.6 If blood is required for a patient during system 'downtime', the smartfridge will not be able to issue cross-matched blood. At such times, a request for blood components must be sent to the lab who will issue the blood for the patient.

3. KEY WORDS

Haemobank, Smart Fridge, LIMS**CONTACT AND REVIEW DETAILS**	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **New Appendix**	

1 INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline applies to medical and nursing staff. It provides guidance for the use of Prothrombin Complex Concentrate (PCC) for the reversal of an anticoagulant overdose.

PCC is the recommended emergency treatment for the immediate reversal of over-anticoagulation with warfarin or other coumarin derivative. PCC is an emergency treatment and thus, once the decision has been made to give it, it must be given within 30 minutes.

2 GUIDELINE STANDARDS AND PROCEDURES

2.1 Reversal of Warfarin in life threatening haemorrhage

2.1.1 The Prothrombin Complex Concentrate (PCC), (Octaplex or Beriplex), is available from Blood Transfusion Laboratory at LRI, LGH and GGH for immediate reversal of oral anticoagulation with Warfarin or other Coumarin derivatives in patients with intracranial haemorrhage or other life threatening bleeding. The use of Fresh Frozen Plasma (FFP) is unsatisfactory in this situation as it does not achieve immediate and complete reversal of anticoagulation.

2.1.2 Intravenous vitamin K (5 mg to 10 mg) will be necessary in addition to Prothrombin Complex Concentrate.

For further information see UHL PCC Clinicians Pack (Trust Ref: C265/2016).

For administration guidelines, enter **Octaplex** into the search engine on Medusa

3. KEY WORDS

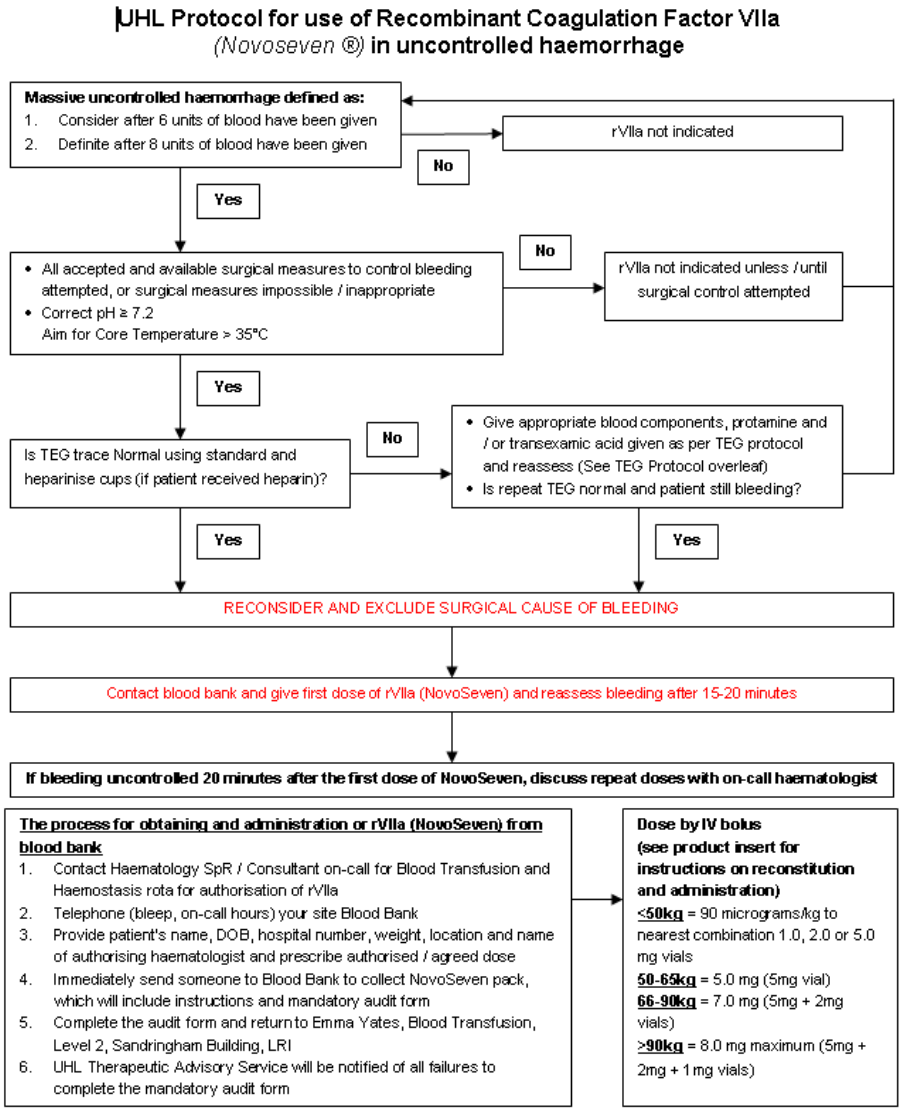
Prothrombin Complex Concentrate (PCC), Coumarin Derivative, Anti-Coagulation, Vitamin K, Beriplex, Octaplex

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Removal of instruction to go via Haem SpR to authorise; no longer a requirement**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This protocol is for use by those medical staff caring for specific patients at risk of uncontrolled haemorrhage.

2. GUIDELINE STANDARDS AND PROCEDURES



Cautions: Recent thrombosis, high risk (e.g. PE, MI, thrombotic stroke in last 6 months; prosthetic heart valve), history of significant thrombophilia

Please note that there has been an important change in the Novoseven SPC (Summary of Product Characteristics). In view of the significant risk (approx. 5%) of major and potentially fatal thrombotic events associated with the use of Novoseven, the manufacturers now clearly advise against using this drug for unlicensed indications, including its use in acquired coagulopathy of trauma or major surgery.

This places the onus of justifiable use entirely on the prescribing clinician, who will need to consider risks versus benefits and, wherever possible, inform patient / relatives of the significant risk (approx. 5%) of major, potentially fatal, thrombotic complications associated with its use. If in doubt, please discuss with the on call consultant haematologist.

For the same reasons Novoseven must not be used concurrently with other potentially thrombogenic factor concentrates such as Beriplex or Octaplex.

3. KEY WORDS

Recombinant, haemorrhage, Novoseven.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Transfusion-associated graft-versus-host disease (TA-GvHD) is a rare but usually fatal complication following transfusion of lymphocyte-containing blood components.

When allogeneic lymphocytes remain viable, they are able to engraft in the transfused recipient and attack and reject the host tissue because of the immunological differences between recipient and donor tissues. The risk associated with an individual transfusion depends on the number and viability of contaminating lymphocytes, the susceptibility of the patient's immune system to their engraftment and the degree of immunological (HLA) disparity between donor and patient.

At present the major technology for preventing TA-GvHD is irradiation of blood components to inactivate residual lymphocytes.

The objective of this guideline is to provide clinicians with information when the use of irradiated blood components is appropriate. It is broadly based on the British Committee for Standards in Haematology (BCSH) guidelines (2020), the American Association of Blood Banks (AABB) recommendations and the European Blood and Marrow Transplantation handbook (European School of Haematology, revised edition 2008).

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Clinical indications for Irradiated blood components

Table 1 below summarises where irradiated blood components should be used.

Table 1

Clinical category	Recommended duration of gamma irradiated blood component therapy
Recipients of allogeneic bone marrow and PBSC transplant	Irradiated components should be continued until all of the following criteria are met: 1. >6 months have elapsed since the transplant date 2. The lymphocyte count is >1.0 x 10^9/l 3. The patient is free of active chronic GvHD 4. The patient is off all immunosuppression
Allogeneic bone marrow or PBSC donors	From 7 days before harvest until completion of harvest.
Recipients of autologous bone marrow and PBSC transplants	From 7 days before harvest until the harvest is complete and then from 7 days before transplant till 3 months post transplant. Patients receiving Total Body Irradiation (TBI) should continue to receive

	irradiated blood components for 6 months post transplant.
Chimeric antigen receptor T-cell (CAR-T) therapy	Patients (adult and paediatric) undergoing peripheral blood lymphocyte collections for future CAR-T cell re-infusion should receive irradiated cellular blood components for 7 days prior to and during the harvest Irradiated blood components should continue to be used until 3 months following CAR-T cell infusion unless conditioning, disease or previous treatment determine indefinite duration, e.g. previous diagnosis of HL or previous purine analogue treatment
Hodgkin's Lymphoma (any stage)	Continue indefinitely
Recipients of Fludarabine, Clofarabine, Cladribine, Nelarabine, Deoxycoformycin (DCF, Pentostatin), Bendomustine, Campath (Alemtuzumab) and anti-Thymocyte Globulin (ATG)	Continue indefinitely If Fludarabine given as part of BM/PBSC transplant conditioning regimen, the duration for irradiated blood requirement should be as for post-autologous or allogeneic BMT categories above.
Intrauterine transfusions (IUT) of red cells or platelets	Start at first IUT and continue to irradiate any red cell or platelet transfusions until 6 months EDD of age (including top up transfusions). Transfuse blood component within 24 hours of irradiation.
All exchange transfusions for neonates and infants	Continue until 6 months of age. Transfuse blood component within 24 hours of irradiation.
HLA Matched platelets and red cell, platelets or granulocyte donations from first or second degree relatives	On all occasions
Granulocytes	On all occasions. Transfuse immediately after irradiation.
Congenital immunodeficiency states 1. Severe combined immunodeficiency (SCID) 2. All severe congenital T lymphocyte immunodeficiency syndromes with significant quantitative or qualitative T lymphocyte deficiency 3. Di George syndrome and CHARGE syndrome 4. Wiskott Aldrich syndrome 5. Congenital Familial Haemophagocytic lymphohistiocytosis (HLH) 6. Reticular dysgenesis 7. Cellular immunodeficiency states, otherwise unclassified	Start from the time a diagnosis is suspected. Once the diagnosis is confirmed, continue indefinitely.

8. Immunodeficiency with eosinophilia (Omenn's syndrome) 9. Ataxia telangiectasia 10. Adenosine deaminase deficiency 11. Purine nucleoside phosphorylase deficiency 12.MHC class I or II deficiency 13. Leucocyte adhesion deficiency	

2.2 Communication with the blood transfusion laboratory

2.2.1 The blood transfusion laboratory will issue irradiated cellular blood components once it has been notified of a clinical indication, using the notification form below. The form contains a peel-off sticker to attach to the patient's medical notes, advising of the requirement for CMV Neg and/or Irradiated components.

NOTE: If the blood transfusion laboratory is not notified of this requirement, it has no means of knowing that irradiated components are required.

2.2.2 Once notified, the blood transfusion laboratory will continue to provide gamma irradiated cellular blood components throughout the specified duration of the need to transfuse irradiated components.

2.2.3 In the case of recipients of allogeneic bone marrow or PBSC transplants, the blood transfusion laboratory will continue to provide irradiated blood components until a transplant consultant has given a clear instruction that irradiation is no longer required.

2.2.4 The ultimate responsibility to notify blood transfusion laboratory of an indication for gamma irradiation of blood components lies with the clinician. The blood transfusion laboratory must be notified of this requirement by completing a blood bank request form with the appropriate clinical details.

NOTE: For haematology and oncology patients (adults and children) who require irradiated and /or CMV Neg blood components the clinician must notify the blood transfusion laboratory of this requirement using the form of notification of patient requiring CMV Neg and irradiated blood components (for example of form see page 42). These forms are available in all paediatric patients' haematology and oncology clinical areas and only need to be completed initially. When the patient is first diagnosed however, the requirements of CMV Neg and Irradiated blood must also be indicated on G&S or cross match request forms for each blood transfusion request.

2.2.5 A clinician who is either:

signing the first prescription for Fludarabine, Cladribine, Clofarabine, Nelarabine, Bendomustine, Deoxycofromycin, anti-Thymocyte Globulin (ATG) or Campath (Alemtuzumab) for any patient, or signing a subsequent prescription where it is not clear from patients notes that blood bank has previously been notified,

or

attending a patient with new diagnosis of Hodgkin's disease or a congenital immunodeficiency state or other clinical categories specified in this document, must ensure that:

- the blood transfusion laboratory is notified as soon as possible, and
- the patient (parent where appropriate) has been made aware of this requirement

and is provided with an information leaflet (published by National Blood Service and available through hospital transfusion team).
- All requests for irradiated red cells or platelets must be clearly specified on blood bank request form as well as on the ICP.

2.2.6 The bone marrow transplant/ CAR-T coordinator must:

- hand a copy of the patient's transplant protocol to the blood bank in advance of commencing conditioning therapy, and
- notify the blood bank of all planned BM/PBSC harvests at least 7 days in advance of scheduled procedure.
- On receipt of such notification, the blood transfusion laboratory must immediately make a permanent entry in its records.

2.2.7 Clinical staff responsible for administering blood must carefully check the blood components label and the ICP to ensure compliance with the required specification.

2.2.8 As an additional safety measure and for the purpose of regular audit:

- The Pharmacy department send weekly reports to Blood Transfusion department on all patients who have received Fludarabine, Cladribine, Clofarabine, Nelarabine, Deoxycoformycin (DCF, Pentostatin), Anti Thymocyte Globulin (ATG/ALG) and Campath (Alemtuzumab)
- Once weekly the Transfusion department receive minutes from the Lymphoma MDT database and identify all new Hodgkin's disease patients.

3. UHL GUIDELINE FOR THE USE OF CMV SERONEGATIVE BLOOD COMPONENTS

Introduction / Scope

The objective of this guideline is to provide clinicians with evidence based guidance for current clinical indications for the use of cytomegalovirus (CMV) negative blood components. The information contained in this guideline is based on the national guidelines published by the British Committee for Standards in Haematology and the American Association of Blood Banks, and reflects the recent position statement published by the UK Department of Health *Advisory Committee on the Safety of Blood Tissues and Organs (**SaBTO**), in March 2012.*

Transfusion Transmissible CMV (TT-CMV) can cause severe and potentially fatal CMV disease in certain at-risk patients. Those at risk include; neonates, recipients of intrauterine transfusions and women receiving planned transfusions during the course of pregnancy (not labour and/or post delivery). The risk of TT-CMV has been reported to be as high as 30-40% in susceptible individuals receiving CMV-unscreened and non-leucodepleted blood. In the UK all blood components are leucodepleted at source. Leucodepletion alone has been shown to greatly reduce the risk of TT-CMV. While some European and North American HSC transplant centres now consider leucodepletion to be an acceptable alternative to CMV-seronegative blood components (the reported residual risk of TT-CMV being approximately 1-3 % with either approach), this view is not widely accepted and most authorities in this country regard CMV seronegative blood components to be superior to leucodepleted components. It would appear logical that combining these two strategies would further reduce the residual risk of TT-CMV.

3.1 Indications for CMV-seronegative blood components

Patients in the following clinical categories should receive CMV Seronegative blood components unless the clinical urgency is such that provision of CMV Seronegative blood is likely to cause unacceptable delay.

- Neonates or infant up to 28 days old. For premature neonates, count 28 days cut off from their expected date of delivery
- All Intrauterine transfusions
- Planned transfusions during pregnancy, wherever clinically possible (Not necessary during or post-delivery)
- Granulocyte components should continue to be provided as CMV seronegative for CMV seronegative patients.

The above groups of patients should receive CMV seronegative blood components, unless the clinical urgency is such that provision of CMV negative blood/components is likely to cause unacceptable delay. If clinical urgency makes it impossible to source / provide CMV negative blood components for these patients, the patient's clinical team should be made aware that CMV unscreened, leucodepleted blood is considered CMV- safe and is clinically acceptable in urgent / emergency cases where appropriate CMV negative blood components are not immediately available.

CMV negative blood components are not required for any other patient categories, **including newly diagnosed or suspected leukemic patients.**

Refer to Consultant Haematologist if problems.

3.2 Notification to blood transfusion laboratory of the need to transfuse CMV-seronegative blood components: communication and documentation

- The responsibility to notify the blood transfusion laboratory of a need to transfuse CMV negative blood lies with the clinician who must specify CMV Seronegative transfusion on the blood request form and the ICP for all transfusion episodes. The notification form can be found below.
- Once notified, the blood transfusion laboratory must immediately make a permanent entry in its records.
- Clinical staff responsible for administering blood must carefully check the blood components label and the prescription chart to ensure compliance with the required specification before commencing transfusion.

NOTIFICATION TO BLOOD TRANSFUSION DEPARTMENT OF PATIENTS WHO REQUIRE CMV NEGATIVE / IRRADIATED BLOOD COMPONENTS

PLEASE

1. **FULLY COMPLETE ALL PARTS OF BOTH THE FORM AND LABEL.**
2. **PEEL OFF THE LABEL AND PUT ON INSIDE COVER OF PATIENTS NOTES.**
3. **SEND THE COMPLETED FORM TO BLOOD TRANSFUSION WITHOUT DELAY**

PATIENT'S NAME	
HOSPITAL NUMBER	
DATE OF BIRTH	

CMV Negative components required **YES** ☐ **NO** ☐

PATIENT'S CMV STATUS **Positive / Negative / Pending**
Donors CMV Status **Positive / Negative / Pending**

IRRADIATED components required **YES** ☐ **NO** ☐

Please specify clinical indication for above requirement(s):
……

SIGNED …….. **DATE ……..**

PRINT NAME ……. **GRADE ……..**

CMV/Irradiated blood products requirements

Patient's Name……
Hosp Number: …….. DOB……...
Irradiated **Yes / No**
CMV Negative **Yes / No**
Reason……
Signed……Date……
Print Name……..

For lab use only
Entered into patient's Winpath
By
Date

Peel off sticker and place in Patient notes

4. KEY WORDS

Irradiation, Cytomegalovirus, CMV, Congenital Immunodeficiency, TA GVHD (Transfusion Associated Graft Versus Host Disease)

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **CMV Indications changed** **Info removed - Irradiation card no longer issued by NHSBT**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Blood Transfusion carries potential risks and some of the risks may be serious or even potentially life threatening. The Department of Health's Better Blood Transfusion 3 circular (HSC 2007/001) requires NHS trusts to implement a number of actions to improve appropriate use of blood and safety of Blood Transfusion. One of these actions is to ensure patients are well informed of the risks and benefits of Blood Transfusion and that this is clearly documented in patients' case notes; anecdotal experience suggests that nationally, patients are rarely given adequate information about risks and benefits of transfusion, and where this information is provided, its quality and content is variable.

Written consent for Blood Transfusion is included in the Blood Transfusion Integrated Care Pathway within UHL. The consent page provides guidance on the process of obtaining written consent, and the two peel-off stickers included, contain the risks and benefits associated with Blood Transfusion. Each risk has a check box which should be ticked as the risk is explained. The peel off stickers should then be pasted on the Standard UHL Consent form; top copy to be filed in the case notes and bottom copy to be handed to the patient.

Patients should be offered a written NHSBT information leaflet on Blood Transfusion, in addition to verbal information given during the process of obtaining written consent. These leaflets can be obtained from any of three blood transfusion laboratories or by contacting one of the Transfusion Practitioners. Parent information leaflets are available for neonates and younger children. Children's information leaflets are also available for older children.

Wherever possible, consent for transfuion should be obtained electronically via Consentric.

This Guideline applies to all Health Care Professionals caring for patients requiring transfusions.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Notes for obtaining informed, written consent for blood transfusion (Adults):

2.1.1 Patients receiving regular or multiple Blood Transfusions:

Patients requiring regular Blood Tranfusions will only need to be consented once initially. Such patients are likely to include:

- Haematology patients (adult and paediatric)
- Oncology patients (adult and paediatric)
- Gastroenterology patients on regular blood tranfusion support for recurrent GI bleeding

All other patients requiring occasional transfusion will need to be consented once during each admission.

2.1.2 Clear instructions on how to obtain written consent for blood transfusion can be found on the back page of the blood transfusion Integrated Care Pathway, located in all clinical areas.

2.2 Notes for obtaining informed, written consent for blood transfusion (Neonates and young children):

Parents/ guardians will need to provide written consent/Assent. Documentation in the form of the Neonatal Blood Transfusion Assent Form can be found in the clinical area. Appropriate patient / parent information leaflets should be offered.

2.3 Emergency transfusion in unconscious patients or those who are unable to give informed consent:

As applies to any other emergency treatment or procedure, it is not possible to obtain patient's written consent in these situations. Clinicians will however need to document this fact in patient's case notes, and sign in the designated space on the front page of the ICP.

2.4 Emergency transfusion in conscious patients

In emergency situations it may not be possible to take informed written consent. The clinicians should, where possible, verbally inform patients/parents and document this discussion (retrospectively) in the case notes, and sign in the designated space on the front page of the ICP.

2.5 Consent for patients undergoing planned surgery:

The majority of patients who undergo planned surgery do not require Blood Transfusion. However patients undergoing procedures which require either 'Group & Save' or 'Cross Match' (See UHL Optimal Surgical Blood Ordering Schedule Trust Ref: B18/2010), will need to be consented for the likelihood of requiring Blood Transfusion during or after surgery. These patients should be consented for Blood Transfusion at the same time as they are consented for the surgical procedure. Simply ticking the blood transfusion box on the standard consent form is insufficient as this does not provide any evidence of the specific risks and benefits of Blood Transfusion having been explained to patients.

2.6 Consent for patients undergoing emergency surgery:

Occasionally, in life threatening emergency situation, patients may need to be immediately taken to theatre and the time may not allow for informed written consent to be obtained. It is likely that in such cases there would have been no time to take other routine consents such as consent for surgical procedure etc. In these cases the reason for not obtaining consent should be clearly documented in case notes.

3. KEY WORDS

Consent, Assent, Risks and Benefits, Integrated Care Pathway

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Implementation of Concentric (electronic consent form)**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

This guideline is aimed at Clinicians who are responsible for making the decision to administer Emergency O Negative and/or Group Specific red cells

Blood transfusion laboratory must be immediately informed of the degree of urgency and anticipated blood component requirement.

Uncrossmatched, O-Negative blood must only be used when there is life threatening blood loss and where the degree of urgency allows no time to wait for the arrival of group specific or cross-matched blood from the blood transfusion laboratory.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1.1 Group specific blood can normally be made available for collection from the blood transfusion laboratory within 20 minutes of receiving patient's blood sample.

2.1.2 Crossmatched blood can be made available for collection within an hour of the receipt of samples; **unless atypical antibodies are detected** when further laboratory tests will be necessary, involving further delay.

2.1.3 Crossmatched or group specific blood must be used in preference to O-Negative blood whenever possible.

2.2 Units of uncrossmatched, O-Negative blood are available for use in extreme emergency, in each of the following UHL blood bank refrigerators:

2.2.1 Leicester Royal Infirmary (LRI)

- Blood bank refrigerator, Level 2, Sandringham Building (2 units).
- Blood bank refrigerator in the Maternity unit (2 units).
- Haemobank Level 5 Kensington Building (4 units)
- Blood bank refrigerator in Central Operating Department (2 units).
- Blood bank refrigerator in A&E (4 units).

2.2.2 Glenfield Hospital (GH)

- Main blood bank refrigerator in Pathology (4 units).
- Blood Bank refrigerator/Haemobank outside CICU (4 units)

2.2.3 Leicester General Hospital (LGH)

- Main blood bank refrigerator in Pathology (4 units).
- Haemobank in Maternity Unit (2 units).

2.3 On admission the patient must be fitted with a wristband with all patient identity details, or if the patient is unidentified, then the unique identity number and gender must be used. These details should be quoted on requests for urgent blood. To avoid confusion continue to use this unique idenfier throughout an MHP call and notify Blood Bank of the correct identity once the MH call has been stood down.

2.4 Electronic BloodTrack (emergency transfusion option on main menu) must be used for the administration of emergency O neg units in order to attribute specific units to the patient in real time. Where EBT cannot be used, the enclosed form supplied with each emergency O negative unit must be accurately and fully completed then immediately returned to Blood

Bank. This information should also be recorded in the patient's notes (a peel off label is provided on the form).

2.5 Exceptionally, when EBT can't be used, refer to section 2.3.4 in Appendix 2 for bedside checking procedure.

NOTE: It is a legal requirement to ensure traceability of blood from donor to recipient.

Extra care should be taken to monitor the patient closely to detect any evidence of acute reactions.

3. KEY WORDS

O Negative, uncrossmatched blood, group specific blood, traceability.

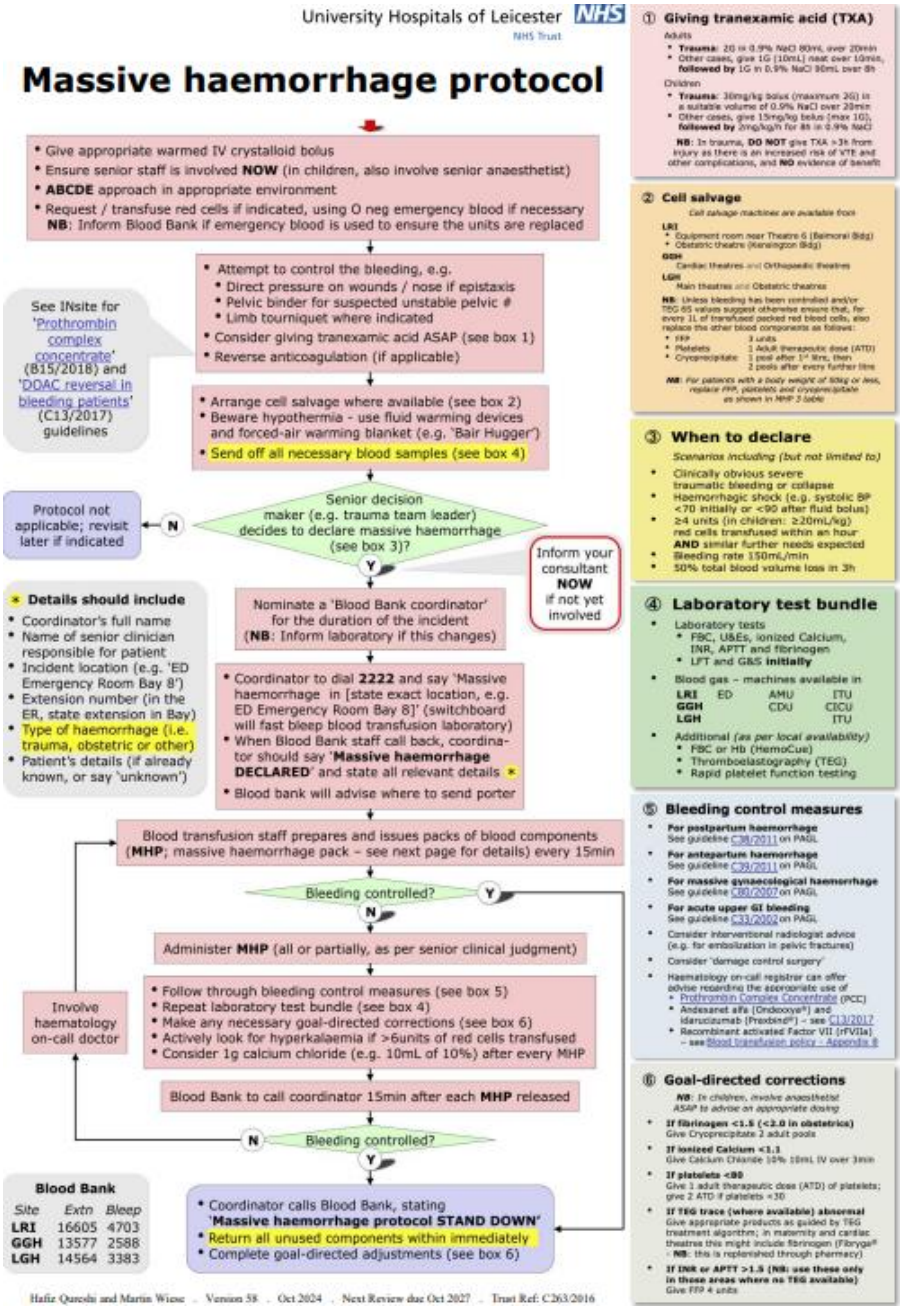
CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Qureshi	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Haemobank**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

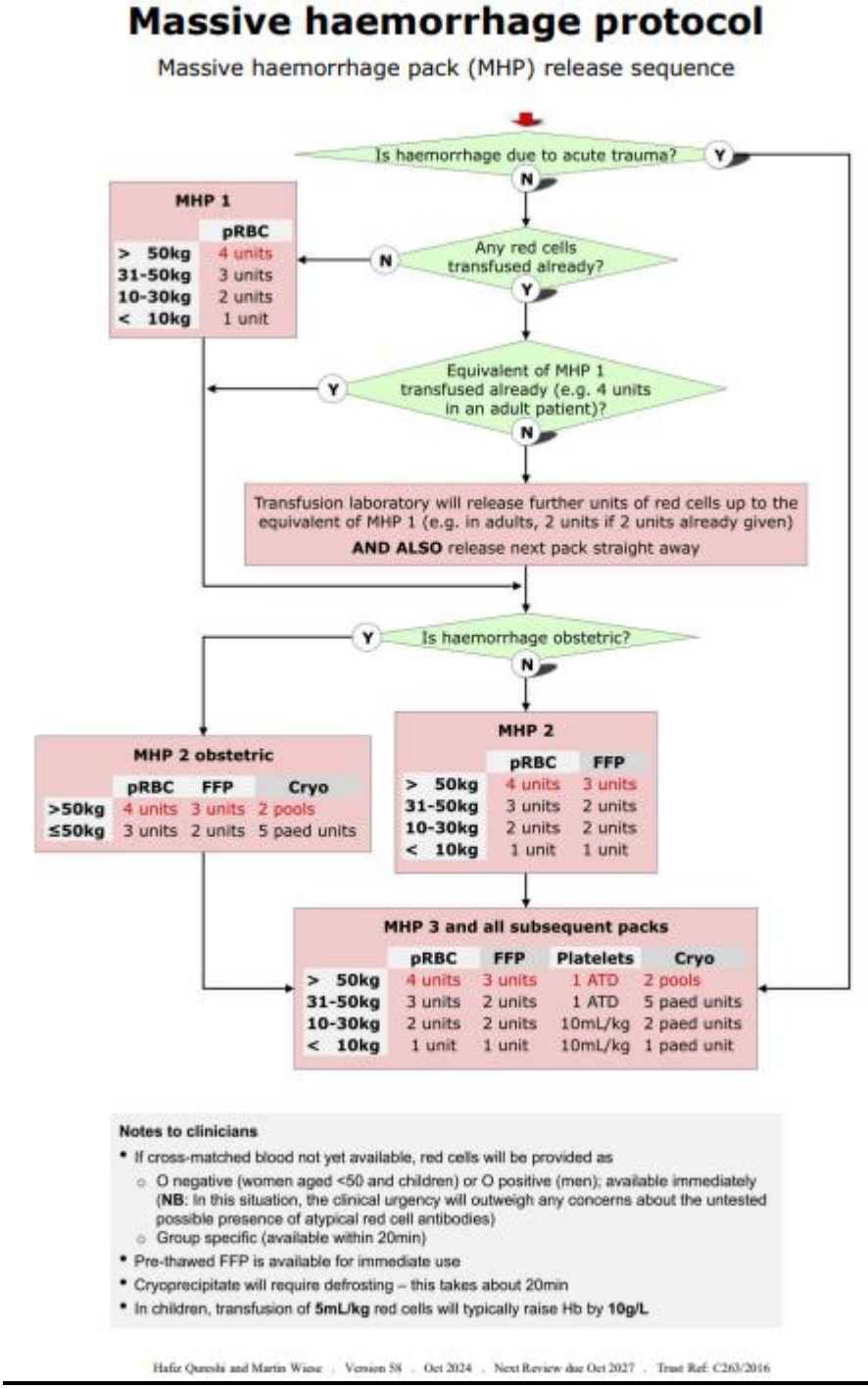
Massive Haemorrhage is quantified as >50% of total blood volume lost in 3 hours, TBV <24 hours, or a rate of blood loss of 150 mls/min. The clinician should activate this protocol if 4 or more units of red cells have been transfused within an hour and similar further transfusions are anticipated.

This guideline applies to all clinical staff. See also, Postpartum Haemorrhage – a Guideline for Management (Trust Ref: B36/2008)

2. GUIDELINE STANDARDS AND PROCEDURES



Massive haemorrhage pack (MHP) release sequence



3. KEY WORDS

Massive Haemmorhage, MHP,

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) **Dr Martin Weise**	**Executive Lead** **Dr Hafiz Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

A reaction to the transfusion of blood products may be mild, moderate or severe/life threatening e.g. a haemolytic reaction due to ABO incompatibility, or sepsis because of bacterial contaminated blood/blood components. Adequate management depends on the likely nature of a transfusion reaction. It will be frequently necessary to seek specialist advice from senior haematology medical staff.

NB: In all cases of suspected transfusion reaction, the blood transfusion laboratory must be informed.

This guideline applies to all staff who are responsible for patients during and after a transfusion of blood/blood components.

1.1 Summary of key recommendations from BSH guidelines 2023 for the Investigation and Management of Acute Transfusion Reactions

Summary of Key Recommendations
Recognition of acute transfusion reactions (ATR)
Initial treatment of ATR is not dependent on classification but should be directed by symptoms and signs. Treatment of severe reactions should not be delayed until the results of investigations are available.
All patients should be transfused in clinical areas where they can be directly observed and where staffs are trained in the administration of blood components and the management of transfused patients, including the emergency treatment of anaphylaxis.
The recognition and immediate management of ATR should be incorporated into local transfusion policies and there should be mandatory transfusion training requirements for all clinical and laboratory staff involved in the transfusion process.
Patients should be asked to report symptoms which develop following completion of the transfusion.
Immediate management of ATR
If a patient develops new symptoms or signs during a transfusion, this should be stopped temporarily but venous access should be maintained. Identification details should be checked between the patient, their identity band and the compatibility label of the blood component. The component should be inspected visually and the patient should be assessed with standard observations.
For patients with mild reactions, such as a temperature rise of 1–2°C leading to pyrexia ≥38°C but <39°C, **and/or** pruritus or rash but **without** other features, the transfusion may be continued with appropriate treatment and direct observation.
Patients with mild isolated febrile reactions may be treated with oral paracetamol (500–1000 mg in adults). Patients with mild allergic reactions may be managed by slowing the transfusion and treatment with an antihistamine. Corticosteroids should not be used routinely.
Anaphylaxis should be treated with intramuscular adrenaline (epinephrine). Patients who are thrombocytopenic or who have deranged coagulation should also receive intramuscular adrenaline if they have an anaphylactic reaction.
If a patient being transfused for haemorrhage develops hypotension, careful clinical risk assessment is required. If the hypotension is caused by haemorrhage, continuation of the transfusion may be life-saving. In contrast, if the blood component is considered the most likely cause of hypotension, the transfusion must be stopped or switched to an alternative component and appropriate management and investigation commenced.

If a patient develops sustained febrile symptoms or signs of moderate severity (temperature ≥39°C **or** a rise of ≥2°C **and/or** systemic symptoms such as chills, rigors, myalgia, nausea or vomiting), bacterial contamination or a haemolytic reaction should be considered.

Diagnostic investigations

In all moderate and severe transfusion reactions, standard investigations including full blood count, renal and liver enzymes should be performed. Patients with respiratory symptoms not due to allergy should also have a chest X-ray.

If febrile symptoms of moderate severity are sustained, implicated units should be returned to the laboratory for further investigation and the blood service contacted immediately so that associated components from the implicated donation can be withdrawn if appropriate. Samples should be taken for repeat compatibility testing and culture and urine assessed for haemoglobin.

Patients who have experienced anaphylactic reactions or recurrent severe febrile/inflammatory reactions within the first 15 min should have IgA levels measured. Patients with IgA deficiency diagnosed after an ATR should be discussed with an expert in transfusion medicine regarding future management.

In an ATR with only allergic features, repeat compatibility testing is not required.

In the absence of platelet transfusion refractoriness or acute post-transfusion thrombocytopenia or leucopenia, investigation of the patient with ATR for leucocyte, platelet or neutrophil-specific antibodies is not indicated.

Patients with respiratory symptoms not caused by anaphylaxis or allergy should have investigations for left atrial hypertension (e.g. echocardiography and pre- and post-transfusion NT-Pro BNP) to help distinguish the type of pulmonary complication to assist diagnosis and haemovigilance reporting.

Subsequent management of the patient

Patients who have experienced an anaphylactic reaction should be discussed with an allergist or immunologist if there is uncertainty about the causative agent (e.g. if other drugs were administered at the same time as the transfusion).

For patients with recurrent febrile reactions, we recommend a trial of premedication with oral paracetamol given 1 h before the reaction is anticipated (or non-steroidal anti-inflammatory drugs in patients with predominant chills or rigors—but an assessment of the risks of medication against the severity of reaction should be made in each case). Patients who continue to have recurrent moderate or severe febrile reactions despite premedication should have a trial of washed blood components (i.e. red cells and platelets). There is no role for prophylactic antihistamine or corticosteroids in the absence of allergic symptoms.

For recurrent mild allergic reactions, there is no evidence to support routine prophylaxis with antihistamines or corticosteroids. Alternative causes such as allergy to drugs or latex gloves should be excluded.

For patients with recurrent moderate or severe allergic reactions, options for further transfusion include:

- If prior reactions were to apheresis platelets, consider pooled platelets (suspended in platelet additive solution).
- Consider antihistamine prophylaxis (although the evidence for efficacy is low, the risks are also low).
- Routine prophylaxis with corticosteroids is not recommended.
- Transfusion of washed red cells or platelets
- The use of pooled solvent–detergent-treated fresh frozen plasma (FFP) when there are recurrent allergic reactions to FFP in patients undergoing plasma exchange.
- If further transfusion is urgent and withholding blood is a greater risk, transfuse standard components under direct monitoring in a clinical area with resuscitation facilities.

Patients with confirmed IgA deficiency (IgA <0.07 g/L):

- with a history of significant allergy/ anaphylaxis reaction to blood components should receive washed components for elective transfusion but life-saving transfusion should not be delayed if these are not immediately available. The patient must be monitored closely for an acute reaction.
- with no history of blood transfusion reactions should receive standard components with a higher frequency of monitoring. Those with a history of allergy/anaphylaxis in other settings should be discussed with a transfusion medicine or clinical immunology or allergy

specialist if time allows.
Reporting of ATR
All transfusion reactions should be reviewed within the hospital. All transfusion reactions except mild febrile and/or allergic reactions must be reported to appropriate regulatory and haemovigilance organisations.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Haemolytic transfusion reaction

"Haemolytic transfusion reaction is one in which signs of increased red cell destruction are produced as a result of transfusion."

Haemolytic transfusion reactions can be two types; acute (AHTR) and delayed (DHTR).

2.1.1 Acute haemolytic reaction

"This may be caused by the transfusion of incompatible red cells, bacterial contaminated or thermally damaged blood."

Incompatible red cells react with the patient's own anti-A or anti-B, activating complement, causing intravascular haemolysis and disseminated intravascular coagulation (DIC). Transfusion of ABO incompatible blood almost always arises from errors in labelling and from inadequate pre transfusion bedside checks. The chances of ABO incompatibility are about 1 in 3. The reaction is usually most severe when group A red cells are given to a group O patient. In a patient, only a few mls may be needed to cause a severe reaction within minutes of commencing transfusion. In an unconscious patient some of the symptoms will not be evident.

2.1.2 Clinical features of a haemolytic reaction

- Fever, chills or rigor.
- Tachycardia.
- Hypotension and circulatory collapse.
- Severe pain at drip site.
- Pain in back or chest.
- Dyspnoea.
- Haemoglobinaemia.
- Acute oliguria, renal failure and collapse.
- Disseminated intravascular coagulation (DIC).

2.1.3 Management

- Stop the transfusion without delay.
- Resuscitate the patient.
- Seek advice from Consultant Haematologist, Intensive Care Specialist and Renal Physician.
- Return all blood packs and the drip set to the Blood Transfusion Laboratory. Take samples for:
  - FBC
  - LFTs
  - RFTs

  (Standard Investigations)
  - Coagulation screen
  - Haptoglobin
  - LDH
  - Blood culture

- Re-group, antibody screen, direct anti-human globulin test, repeat cross-matching and, if necessary, for further units to be cross-matched
- Assessment of urine for haemoglobin

- Treat DIC.
- Maintain a strict fluid balance sheet.

2.2 Delayed haemolysis

The titre of an antibody in a recipient's plasma may be too low to be detected in the pre-transfusion tests. However, if incompatible red cells are transfused, a secondary response may be provoked. A few days after transfusion there is a rapid increase in antibody with consequent destruction of transfused red cells.

2.2.1 Clinical features

- Fever (not always present).
- Fall in haemoglobin level.
- Jaundice (often not before day 5 post-transfusion and can be as late as day 10).
- Haemoglobinuria (a mean of 8 days post-transfusion).

2.2.2 Management

- Take samples for:
  - FBC
  - LFT
  - Haptoglobin
  - LDH
  - Retic count
  - Direct Antiglobulin Test (Coombs test)
  - Antibody screening
    - Inform Blood Transfusion Laboratory staff and discuss with senior haematology medical staff.

2.3 Febrile Non-Haemolytic Transfusion Reactions (FNHTR)

Febrile reactions are often caused by cytokines in blood components or patient antibodies to donor leucocyte antigens. These often occur during the transfusion and there are no clinical signs other than a rise in temperature and non-specific accompaniments of any pyrexia. FNHTRs are now seen relatively less frequently because of universal leucodepletion of blood components. FNHTRs are unpleasant but not life threatening. Paracetamol is often all that is required.

However, it is important to remember that a mild febrile reaction may be the early stages of an acute haemolytic transfusion reaction caused by incompatible or bacterial contaminated blood. If a patient becomes unwell or hypotensive, transfusion must not be restarted and blood transfusion laboratory must be informed who will arrange the return of the blood component pack and additional blood samples from patient for necessary serological and microbiological investigations.

Categorisation and management of FNHTR please refer to the algorithm for managing a suspected transfusion reaction below on page 64.

2.4 Allergic Reactions

Caused by antibodies in the patient to infused plasma proteins or infusion of allergens, which react, with patient's IgE antibodies; more likely to occur with platelets and plasma than red cell concentrates.

2.4.1 Clinical features (within minutes of the transfusion)

- Urticaria.
- Itching.

Symptoms usually subside if the transfusion is slowed and antihistamine (e.g. Chlorphenamine 10mg i.v.) is given by slow injection. Hydrocortisone 100mg i.v. may also be used. Corticosteroids should not be used routinely.

2.5 Anaphylaxis

This is a very rare but life-threatening complication. The onset is rapid and often dramatic. Immediate action is required. In some cases this is associated with antibodies against IgA in patients who have severe IgA deficiency. Antibodies to other plasma proteins may be implicated in other cases.

2.5.1 Management :

Discontinue transfusion.

- Maintain airway and give oxygen (40-100%).
- Give Adrenaline (For adults and children over 12 years, administer IM adrenaline: 0.5 mL of 1:1000 adrenaline (500 µg) For children between 6 and 12 years, give 0.3 mL of 1:1000 IM adrenaline (300 µg). For children less than 6 years, give 0.15 mL of 1:1000 IM adrenaline (150 µg). Anterolateral aspect of the middle third of the thigh.
- Attach patient to cardiac monitor.
- If no response repeat IM adrenalin after 5 min
- IV fluid bolus (Crystalloid, Adults 500-1000 ml, Children 10ml/kg)
- Hydrocortisone 100-200 mg intravenously should be given to prevent later recurrence or biphasic reaction.
- Nebulised Salbutamol +/- IV Aminophylline infusion may be necessary for persistent bronchospasm.
- Chlorphenamine 10 to 20 mg IV over at least 5 minutes.
- Promptly seek advice from intensive care physician and Consultant Haematologist.
- Inform the Blood Transfusion Laboratory.
- Under no circumstances should transfusion be restarted.

2.5.2 Investigations

If severe allergy/anaphylaxis suspected, consider measurement of serial mast cell tryptase (plain tube) (immediate, 1–2 h and 24 h)

Serum IgA levels in patients who have severe allergic transfusion reactions.

2.5.3 Future transfusions

Washed cellular blood components or selected blood components from IgA deficient donors may be needed for future transfusion.

For further information please follow the local anaphylaxis management Protocol and refer to the the algorithm for managing a suspected transfusion reaction below on page 64.

2.6 Septic Shock

Although this complication is extremely rare with a reported incidence of two cases per million blood components transfused, the mortality remains very high. This is caused by bacterial contamination of blood/blood components. Inspection of the implicated unit is important as discoloration or abnormal particles are suggestive of contamination.

2.6.1 Clinical features

- Usually acute with rapid onset.
- Fever, chills and rigors.
- Hypotension.
- Tachycardia.
- Collapse.

2.6.2 Management includes

- Discontinuation of transfusion.
- Promptly seek advice from Consultant Haematologist, microbiologist and intensive care physician, as rapid intensive care support is likely to be required.
- Blood cultures. from a peripheral vein and any central lines (if available) should be performed
- Immediate resuscitation with intravenous fluids and Broad Spectrum IV antibiotics.
- Inform the Blood Transfusion Laboratory Immediately
- The component should be sealed and transported to the transfusion laboratory as soon as possible for microbiological investigations**.**

2.7 Transfusion Related Acute Lung Injury (TRALI)

This rare but life-threatening complication manifests as features of non-cardiogenic pulmonary oedema, either during or soon after transfusion.
The cause is usually donor plasma that contains antibodies to the patient's leucocytes and is a serious condition with a high mortality rate.

2.7.1 Clinical features include

- Dyspnoea
- Hypoxia
- Non-productive cough
- Mild fever
- Interstitial shadowing on chest x-ray

2.7.2 Management

- Stop transfusion
- Management is that of acute respiratory distress syndrome with prompt respiratory support
- Immediately seek advice from senior haematology medical staff and ITU physician

2.8 Transfusion Associated Circulatory Overload (TACO)

This can occur when correcting chronic anaemia in elderly patients, or those with pre-existing cardiac disease. It is also a risk in Paediatric and Neonatal transfusion. All patients must be assessed for the risk of TACO prior to transfusion. The following may be important risk factors for TACO:

- CCF?
- Moderate to severe aortic stenosis?
- Moderate to severe left ventricular dysfunction?
- Pulmonary/peripheral oedema?
- Undiagnosed respiratory symptoms?
- Significantly positive fluid balance?
- Significant renal impairment?
- Low body weight?

2.8.1 Clinical features

- Dyspnoea.
- Tachycardia.
- Hypotension.

2.8.2 Management

- Stop the transfusion.
- Give furosemide 40mg IV (or appropriate dose in paediatric patients) in the first instance.
- Arrange chest X-ray and ECG.
- ECHO
- NT-Pro BNP

Refer to the algorithm for investigation and management of pulmonary complications of transfusion without allergic cause (Page 65)

2.9 Late Complications of Transfusion

2.9.1 Iron overload

Transfusion dependent patients receiving red cells over a long period become overloaded with iron. Chelation therapy with Desferrioxamine or Deferasirox may be indicated. Such patients should be referred to a haematologist.

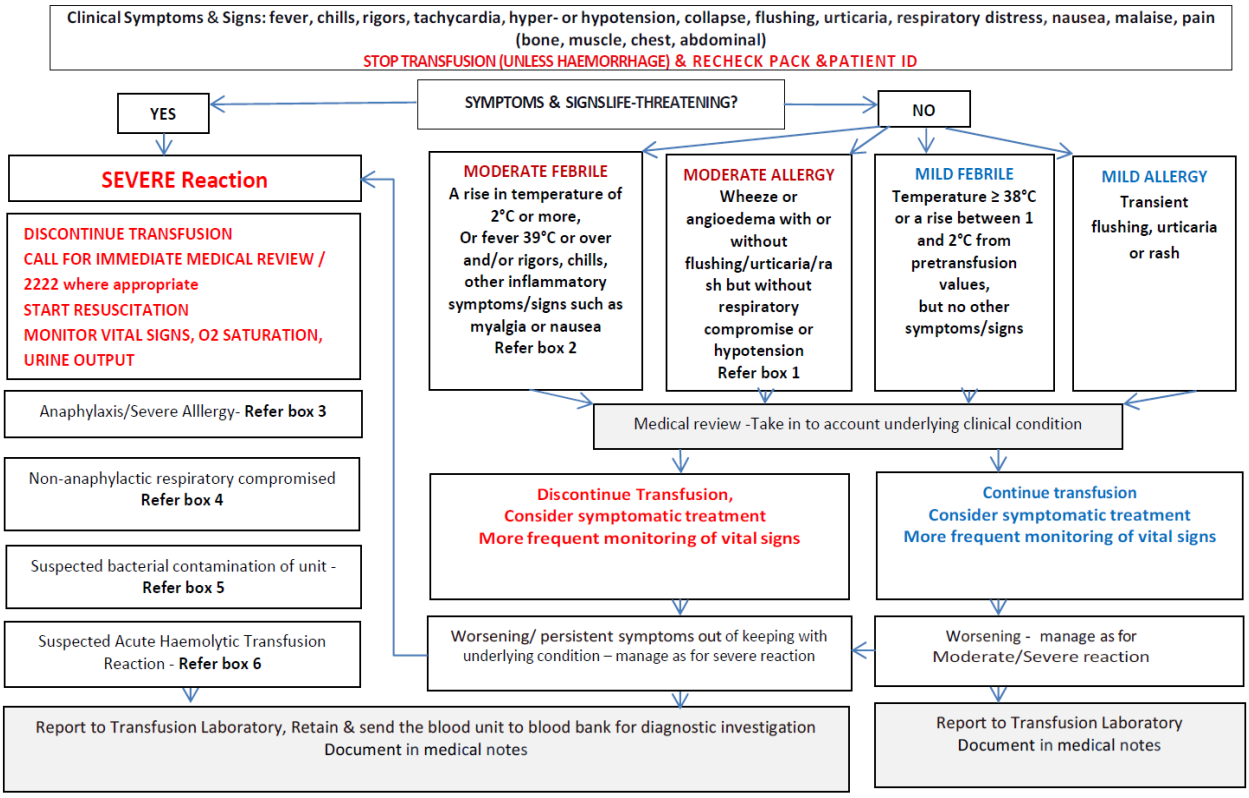
2.9.2 Graft versus host disease (GvHD)

This is a rare but often fatal complication of transfusion caused by viable T-lymphocytes transfused with the different cellular blood components. Immunodeficient patients e.g. recipients of an allogeneic bone marrow transplant, foetal intrauterine transfusions, patients with Hodgkin's disease, patients undergoing specific chemotherapy including fludarabine, cladribine, clofarabine, campath (alemtuzumab), Deoxycoformycin (DCF, Pentostatin), Nelarabine or AntiThymocyte Globulin (ATG) and patients with suspected or confirmed congenital cellular immune deficiency such as DiGeorge Syndrome are at risk of this disease. It has also occurred in immunologically normal patients after transfusion of a first or second degree relative's blood (from shared HLA haplotypes). It is prevented by irradiation of cellular blood components given to patients at risk (refer to appendix 10 for further details of irradiated blood components)

2.9.3 Post-transfusion purpura (PTP)

PTP is a rare but potentially life threatening complication of red cell or platelet transfusion, most often seen in female patients. It is caused by platelet-specific alloantibodies. Typically 5-9 days after transfusion the patient develops an extremely low platelet count with bleeding. Refer to a Consultant Haematologist for treatment advice. High dose IV Immunoglobulin is the treatment of choice. Plasma exchange may be required. If platelet transfusion is required, platelets compatible with the patient's antibody should be considered where relevant. Likewise any red cell transfusions should be from donors negative for the implicated platelet antigen.

Algorithm for the Investigation and Management of Suspected Transfusion Reactions



BOX-1: SYMPOTOMATIC ALLERGIC REACTION?

Chlorphenamine slow IV
monitor the patient more frequently.
In case of a mild allergic Transfusion reaction if the transfusion was continued, the transfusion time must not exceed 4 hours from leaving storage

BOX-2: FEBRILE TRANSFUSION REACTION?

Give the right dose of paracetamol
If Fever (≥2°C rise or ≥39°C), and/or chills, rigors, myalgia, nausea or vomiting and/or loin pain or If febrile reaction sustained,
Check the labels on the compatibility tag match with the wristband and the component
Send following,
Standard investigations (FBC, LFT, RFT)
Return unit to laboratory
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Lactate
Coagulation screen
Assessment of urine for haemoglobin
Blood cultures from patient

BOX-3: SUSPECTED ANAPHYLAXIS?

Manage as per local anaphylaxis guideline
For adults and children over 12 years, administer IM adrenaline: 0.5 mL of 1:1000 adrenaline (500 µg)
For children between 6 and 12 years, give 0.3 mL of 1:1000 IM adrenaline (300 µg).
For children less than 6 years, give 0.15 mL of 1:1000 IM adrenaline (150 µg).
Adrenaline is repeated, if necessary, at 5-minute intervals according to blood pressure, pulse and respiratory function under the direction of appropriately trained clinicians.

Supportive care of anaphylaxis includes the following:
Rapid fluid challenge if needed
Administration of 10 mg of chlorphenamine IM or by slow intravenous (IV) injection *following initial resuscitation* if there are also skin symptoms NOTE: THIS IS ADULT DOSE.
CONSULT BNFC for appropriate PAEDIATRIC DOSE.
If the patient has continuing symptoms of asthma or wheeze, inhaled or intravenous bronchodilator therapy should be considered
If severe allergy/anaphylaxis suspected, consider measurement of serial mast cell tryptase (plain tube) (immediate, 1–2 h and 24 h)

BOX-4: PULMONARY COMPLICATIONS OF TRANSFUSION WITHOUT ALLERGIC CAUSE

Ensure the airway is patent and high-flow oxygen therapy started while urgent medical assessment is obtained.

Initial investigation should include chest X-ray and oxygen saturation, NT-Pro-BNP, Echo
If the patient has features of pulmonary oedema (Hypertension, Tachycardia, Raised JVP/MAP Enlarged cardiac shadow in CXR, Peripheral oedema, New/or worsening cardiac failure on Echo)
Managed as TACO - Consider Frusemide IV.

If pulmonary oedema is absent, review again for possible non transfusion causes/Anaphylaxis

If no other causes present consider TRALI/TAD
Manage with prompt respiratory support

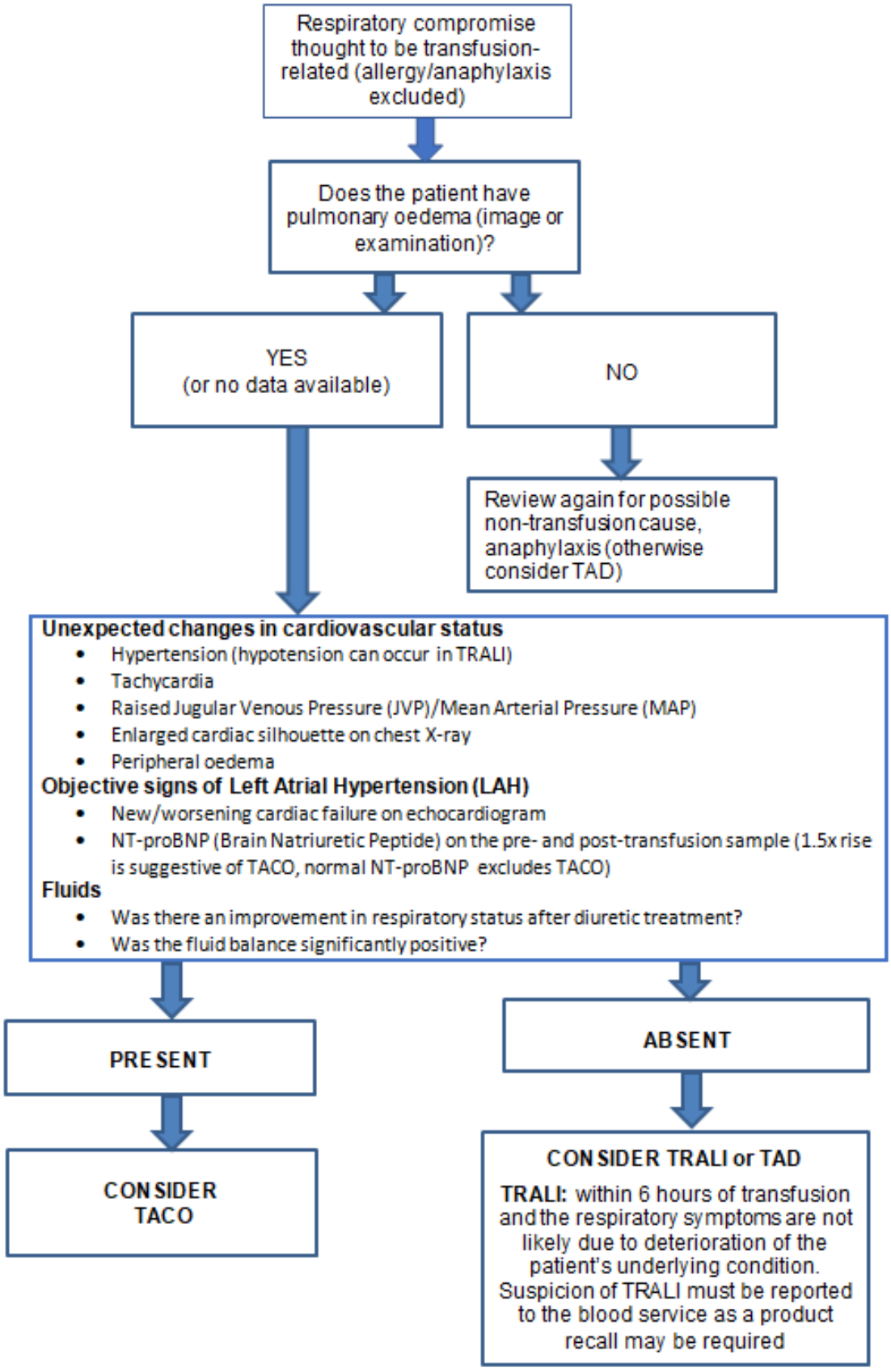
BOX-5: BACTERIAL SEPSIS?

Blood cultures from a peripheral vein and any central lines should be performed.
IMMEDIATELY Commence broad spectrum IV Antibiotic (Seek Microbiology advice if necessary)
Commence O2 and fluid when indicated
Monitor urine output
The component should be sealed and transported to the transfusion laboratory as soon as possible
Seek Haematological advice when needed
Investigations to be done
Standard investigations (FBC, LFT, RFT)
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Lactate
Coagulation screen
Assessment of urine for haemoglobin
Blood cultures from patient

BOX-6: SUSPECTED ACUTE HAEMOLYTIC TRANSFUSION REACTION/ABO INCOMPATIBILITY?

Stop the transfusion without delay.
Commence slow IV saline infusion
Inform the Transfusion department immediately
Monitor urine output/catheterise
Maintain output (> 1ml/kg per hour)
Give Furosemide if urine output falling in consultation with a renal registrar
Treat DIC with appropriate blood components
Return the remaining blood component with giving set still attached to the transfusion laboratory
Seek Haematological advice immediately
Investigations to be done
Standard investigations (FBC, LFT, RFT)
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Coagulation screen
Assessment of urine for haemoglobin
Lactate

ALGORITHM FOR INVESTIGATION AND MANAGEMENT OF PULMONARY COMPLICATIONS OF TRANSFUSION WITHOUT ALLERGIC CAUSE



1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Whilst allogeneic (donated) blood is an essential adjunct to health care, it is a limited resource, increasingly expensive and can present a source of risk for patients, in particular the risk of "wrong blood" incidents as reported by the Serious Hazards of Transfusion steering group. The Patient Blood Management team (NHSBT) recommended that effective alternatives to allogeneic blood transfusion are explored, including appropriate use of autologous blood transfusion techniques such as Intra operative Cell Salvage (ICS).

This guideline applies to all staff who have successfully undertaken the UHL Cell Salvage Training Programme.

This guideline **does not** relate to the use of unwashed postoperative autologous blood collected from wound drains.

NOTE: This guideline should be used in conjunction with Appendix 16, UHL Guidelines for the Use of Intra-operative Cell Salvage in Obstetrics.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Prescribing responsibilities

Salvaged blood must be prescribed by the medical staff on the UHL Trust transfusion prescription/ICP form. Pre transfusion checks are mandatory in accordance with the Trust transfusion policy for positive patient identification.

2.2 Labelling responsibilities

The re-infusion bag must be labelled with the Green Autologous Transfusion labels supplied by the machine manufacturers, this should be done before processing the collected blood. (i.e. if "collection only" system has been used initially, attach a green label to the reservoir with the start time of collection.)

The green label must include the following details listed below and must be handwritten:

- full name
- date of birth
- hospital number
- collection start date and time
- expiry date and time **(6 hours from commencement of collection)**
- name of the person carrying out the procedure
- the volume of packed cells prepared for re-infusion must also be recorded.

Addressograph labels MUST NOT be used because of the known associated risks of using a wrong patient's label.

2.3 Individual responsibilities

2.3.1 Use of cell salvage should be discussed with the patient in advance (where possible) and this must be documented on the anaesthetic chart or in the patient notes.

2.3.2 Individual staff should ensure that they are adequately trained and competent in the use of the ICS system and understand their individual responsibilities according to their area of work, i.e. operator, anaesthetics, scrub, recovery and ward staff. Individual staff should ensure they are adequately trained and competent in the use of ICS in each of the specialities they work in.

2.3.3 The cell salvage operator must be named for each individual case. The operator must complete the specific training required and been LCAT assessed and competent in the use of cell salvage.

2.3.4 Unregistered staff will only be able to set up the collection set after completing specific training to their staff group and having been LCAT assessed and subsequently deemed competent in cell salvage collection. If processing of salvaged blood is required a registered member of staff will need to be called.

2.3.5 The responsible medical officer must be named for each individual case and should be familiar with the clinical aspects of cell salvage.

2.4 Documentation responsibilities

Staff should ensure that documentation (including all appropriate labelling) accurately reflects the ICS process. The documentation record should include:

2.4.1 The ICS patient record form.

2.4.2 For each individual case the bar-code data for the patient, CS operator, surgeon, anaesthetist, procedure and disposables used must be scanned into the machine using the bar code scanner attached to each machine. (This includes collection only cases)

2.4.3 At the time of re-infusion of the salvaged blood, the peel off section on the autologous transfusion label should be completed and attached in the appropriate place in the patients' clinical records or ICP.

2.4.4 If citrate is unavailable, heparin saline anticoagulant (30000 IU/L) can be used. This needs to be labelled at the start of the procedure.

2.4.5 Bedside pre-transfusion checks (patient observations) should be performed and recorded during autologous blood re-infusion in the same way as for the transfusion of allogeneic blood.

2.4.6 Additional observations are at the discretion of the clinical staff based on an individual patient assessment.

2.4.7 Adverse incidents should be documented in the patients' clinical records, a Datix completed and reported to the Transfusion Practitioners as per UHL incident reporting procedure.

2.5 Procedures and situations which are considered suitable for ICS (This is not an exhaustive list)

2.5.1 Vascular Surgery, Trauma & Orthopaedics

- Open aortic aneurysm repair - (elective and emergency)
- Splenic/liver trauma
- Spinal surgery
- Revision hip replacement
- Pelvic and femoral fractures
- (In primary hip and knee replacement it may be better to consider post operative drainage systems in selected cases, such as a Jehovah's Witness patient)

2.5.2 Urology

- Radical cystectomy
- Radical prostatectomy
- Nephrectomy
- Pelvic clearance

2.5.3 General Surgery

- Abdominal/thoracic trauma
- Emergency laparotomy

2.5.4 Cardiac

All major procedures (post-op drainage may be of use if mediastinal drainage is of high volume)

2.5.5 Obstetric Emergency Use:

Major obstetric haemorrhage at caesarean section, laparotomy for postpartum haemorrhage genital tract trauma, etc.

Elective Obstetric Use:
Anticipated haemorrhage at caesarean section, e.g. placenta praevia/accreta, large fibroid uterus, etc.

2.5.6 Gynaecology

All major procedures e.g. pelvic clearance.

2.5.7 Head and Neck

Major procedures

2.5.8 Jehovah's Witnesses

Consideration should also be given to post-op (or any patient refusing a drainage and re-infusion where indicated blood transfusion) All surgical procedures where blood loss is expected to have an impact (A Closed Circuit set-up can be set up if requested by the patient)

Maximum benefit of cell salvage can be gained by capture of emergency cases which often require large volume blood component support.

2.6 General instructions

- Strict sterility must be maintained at all times.
- Salvaged cells should be re-infused within six hours of the commencement of collection, in order to minimize the risk of infection.
- Blood filters: not required as a routine (*see 2.8.4 and 2.8.5 below*).
- Ensure wash fluid used with processing of blood is isotonic (0.9%) Intravenous saline only, this also includes any wash used at the operation site.
- Ensure anticoagulant solutions are stored separately from fluids for intravenous infusion
- Cell salvage of blood from swabs is only recommended in certain cases and when scrub staff have experience of the technique
- Beware of dilutional coagulopathy and anaemia with large volume losses. Measure haematocrit / haemoglobin / coagulation profile during the procedure.
- Bear in mind that salvaged blood will not have been screened for viruses and take standard precautions.
- Salvaged blood must never under any circumstances be stored in a blood fridge; salvaged blood should be kept with the patient.
- Cell Salvage in Obstetric Cases should only be performed by multidisciplinary teams who develop regular experience of intra-operative blood cell salvage.
  (NICE guidelines Nov 2005)
- Suction tips should be single lumen, wide bore and ideally not less than 4mm diameter, to ensure minimum cell damage.

2.7 Contraindications

2.7.1 Contamination of the surgical field with faeces, urine.
2.7.2 Infection at the site of the wound
2.7.3 Patients with Sickle Cell Disease

2.8 Special considerations

2.8.1 The presence of Amniotic Fluid in the operative field (see 2.8.4).
2.8.2 The presence in the operative field of malignant tumours with the potential for metastatic spread (see 2.8.4 and 2.8.5).
2.8.3 For patients with sickle cell trait, cell salvage can be undertaken, however staff need to be aware of the potential risk of the cells to sickle.
2.8.4 UHL guidelines now recommend against routine use of leucocyte filter in obstetrics or in malignancy in view of the clinical risks associated with the use of such filters (see section 2.12.2).
2.8.5 Intra-operative cell salvage is now increasingly used in patients with malignancy although there is still controversy in view of the possibility that intra-operative cell salvage may encourage metastatic spread of malignant cells present in the surgical field. In many cases, the clinical benefits of intra-

operative cell salvage may outweigh this risk which remains theoretical and unquantifiable. The routine use of leucocyte filter is no longer recommended (see section 2.12.2)

2.9 Cautions

2.9.1 In general, use of intra-operative cell salvage is not recommended if the surgical field contains any of the following:

- Betadine / Chlorhexidine
- Hydrogen peroxide
- Alcohol
- Distilled water
- Antibiotics not for parenteral use.
- Fibrin adhesives

2.9.2 AVOID aspirating the following into the collection set:

Topical clotting agents (e.g. collagen, thrombin), bone cement

It is possible to avoid this issue by using two sets of working suction apparatus – one to the cell salvage collection reservoir and the other to unsterile collection for disposal.

2.10 Conditions for use

Use of intra operative cell salvage is a clinical decision and each case should be considered individually. Whilst it is expected that these guidelines are adhered to, there may be individual circumstances where the risk benefit ratio for using intra-operative cell salvage may be considered to be in the best interests of a patient, and a senior clinician may decide to proceed outside these guidelines.

2.11 Indications for use

Unless specifically contraindicated, (see section 2.7) **cell salvage collection should be set up for all procedures where blood transfusion is likely.**

For patients in the following categories ICS collection should be set up routinely:-

- low Hb or increased risk factors for bleeding.
- multiple antibodies or rare blood types.
- objections to receiving allogeneic (donor blood).

2.12 Guide for staff reporting adverse events and reactions relating to Cell Salvage at UHL

Reporting an incident

All adverse events and reactions relating to the use of intra operative cell salvage (see table 1) must be reported on Datix as a transfusion incident. Lab staff will subsequently complete a SHOT Cell Salvage incident form.

2.12.1 What needs to be reported

Table 1

Category	What to report
Operator error	Patient identification error – Incorrect blood component transfused (IBCT)
	Equipment not assembled correctly to include both collection and processing equipment.
	Incorrect dilution of heparinised saline
	Inadequate anticoagulation – clotting in reservoir
	Non IV Saline used for the wash.
	Contraindicated substances aspirated into the collection reservoir.
	Reinfusion bag not labelled for the patient – either ICS or Post-op cell salvage (PCS) Time exceeded for collection and/or reinfusion for either ICS or PCS PCS system not assembled correctly Incorrect swab washing Contraindicated procedure eg. Infected hip
Category	What to Report
Machine/System Failure	Any stoppage of the machine where the operator has not made the decision to halt the procedure Reinfusion bag falls off (PCS)
Category	What to Report
Clinical Events	Air embolism Fat embolism Signs of acute haemolytic transfusion reaction – pyrexia, rigors etc Hypotensive episode upon reinfusion of processed red cells – not related to hypovolaemia Bacterial contamination Anaphylaxis or other allergic reaction Other – please state

2.12.2 Revised UHL guidance on the use of Leucocyte filters for re-infusion of salvaged blood:

In view of the risk of severe hypotension and possibly cardiac arrest associated with the use of leucocyte filters, a formal risk assessment has been undertaken within UHL regarding the use of such filters during intra-operative cell salvage in pregnancy, and in the presence of malignancy.

The agreed UHL guidance now warns against routine use of leucocyte filters for cell salvage in general, and against concurrent use of a pressure device in particular.

When using intra-operative cell salvage in Obstetrics, consideration should be given to using two suctions to remove amniotic fluid and meconium via a separate suction to waste. This should be considered on an individual patient basis taking into account:

- The amount of amniotic fluid expected
- The stage at which massive haemorrhage is expected
- Patient factors e.g. religious beliefs, presence of antibodies limiting the use of donor blood etc

There is evidence that cell salvage machines remove virtually all amniotic fluid contaminants when used on a quality wash cycle, hence the **use of the quality wash cycle is mandatory in all but exceptional circumstances** (e.g. uncontrollable massive haemorrhage in a JW patient).

2.13 Quality assurance

Each machine will have a sample of blood from the re-infusion bag tested at three monthly intervals to ensure the blood for re-infusion has a Hct of >50%.
If the Hct should fall below this level it indicates a malfunction of the machine and will be taken out of the clinical area until the machine has been checked and the fault rectified. All quality assurance records for each machine will be monitored and held by the Transfusion Team.

2.14 Record keeping

A patient record form (mjc/cellsalvform01/september2010) must be completed for all procedures involving cell salvage, including collection only cases – this is the shared responsibility of the anaesthetist and the cell salvage operator.

The original of the patient record form (white form) for all cases where salvaged blood has been processed for re-infusion will be filed in the patient's notes. A copy of the patient record form (pink form) will be stored in the file with each machine.

For cases where collection only has taken place there is no need for a copy to be placed in the patients notes, just place the original form in the file with the machine.

3. KEY WORDS

Cell Salvage, Leuco-depletion, Jehovah's Witness

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Mr. M. J. Chambers	**Executive Lead** **Dr. H. Qureshi**

Details of Changes made during review:

1. Patient Blood Management replaced The Health Service Circular *Better blood transfusion.*

2.4 -2.1.3 - For Fresenius CATS Smart machine.

-2.1.8 - Reported to TP's and Datix completed.

2.5 – Removed 'in primary hip and knee' etc

2.5.3 – Not regularly used for Liver surgery. ?Remove

2.5.8 – JW's closed circuit only on request

2.6 – Blood filters – Not required as routine

Isotonic 0.9% **Intravenous** saline used

NICE guidelines are still up to date

2.12.2 – What needs to be reported – New table taken from SHOT guidelines on Cell Salvage Action Group

2.13 – Hct can be measured with new processing disposable kit.

UHL GUIDELINE FOR THE USE OF INTRA-OPERATIVE CELL SALVAGE IN OBSTETRICS

University Hospitals of Leicester NHS
NHS Trust

Appendix 16

Written and endorsed by Helen Brooks – Consultant Anaesthetist and Malcolm Chambers – Transfusion Practitioner

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Intra operative cell salvage is a technique that involves the collection of a person's own (autologous) blood from the surgical field, its processing using specialised cell salvage equipment and re-infusion back to the same person.

These guidelines set out the way in which intra-operative cell salvage is implemented in Obstetric cases across the UHL Trust. They apply to all staff who have successfully undertaken the UHL Cell Salvage Training Programme.

NOTE: This guideline should be used in conjunction with Appendix 15, UHL Guidelines for the use of Intra-operative Cell Salvage

2. GUIDELINE STANDARDS AND PROCEDURES

Cell salvage should only be performed by multidisciplinary teams who develop regular experience of intra-operative blood cell salvage.

The decision to use cell salvaged blood should be made by the senior members of the clinical team caring for the woman. This decision should take into account the requirement for blood transfusion and the risks/benefits of using cell salvaged blood rather than allogeneic transfusion. It must only be used by staff who have successfully completed the UHL Cell Salvage Training Programme.

Cell salvage should be considered in the following circumstances for caesarean section or post-partum procedures:

1. Where major haemorrhage is on-going or anticipated
2. The woman has signed an advance directive refusing autologous blood products
3. For all emergency sections where time and staffing allows.

The setting up of cell salvage must not detract from either maternal resuscitation and care, or the need to expedite delivery of the baby

2.1 Pre-operative counselling

In elective cases the use of cell salvage should be explained to the woman and the risks and benefits of both cell salvaged blood and allogeneic transfusion explained.
In emergency cases verbal consent should be obtained prior to the infusion of salvaged blood and the risks and benefits explained as appropriate

2.2 Set up

Under normal circumstances the collection reservoir and patient suction line only needs to be set up. The processing unit can then be set up as needed. Occasionally the whole circuit will be required to be set up on continuity but women should be advised that this takes time and may not always be possible.

Two suction systems may be used but is not essential:

1) Cell salvage suction
2) Normal surgical suction – 'waste' suction

The cell salvage suction should be used from the beginning of the case to salvage blood. The 'waste' suction may be used to remove meconium and frank amniotic fluid.

If there is significant bleeding then the cell salvage suction should be used accepting that some amniotic fluid may be mixed with the blood.

Amniotic fluid should be eliminated by the quality wash cycle programme (Fresenius CATS Plus).

A second cell salvage suction should be set up in haemorrhage situations

2.3 Processing

The decision to use cell salvaged blood should be made by the senior members of the medical team caring for the woman. This decision should take into account the requirement for blood transfusion and the risks/benefits of using cell salvaged blood rather than allogeneic transfusion.

1) The **salvaged blood must be processed using the 'quality' wash cycle** programme unless in exceptional circumstances (such as major haemorrhage) when a consultant anaesthetist may decide to use the emergency wash programme.
2) Leucocyte filters are no longer recommended in view of the associated risk of severe hypotension. The agreed UHL guidance now warns against routine use of leucocyte filters for cell salvage in general, and against concurrent use of a pressure device in particular. (see section 2.12.2 in Appendix 15)
3) In cases of continuing haemorrhage where clinicians are sure that all amniotic fluid, membranes etc have been removed consideration to using emergency wash cycles and pressurising blood through normal blood giving sets may be considered.
4) A patient record form must be completed – this is the shared responsibility of the anaesthetist and the cell salvage operator.
5) A Kleihauer should be performed on Rh-D negative women and prophylactic anti-D given if the baby is Rh-D positive, and where the woman does not have history of immune antiD antibody. The blood sample for Kleihauer test should be taken approximately 30 minutes after the re-infusion of salvaged blood is completed, and a minimum of 1,500 units anti-D administered (pending the need for any further anti-D as determined by subsequent Fetal Red Cell Quantitation (FMH).

3. KEY WORDS

Cell Salvage, Haemorrhage, Leucocyte Depletion, Amniotic Fluid

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr. H. Brookes/Mr. M. J. Chambers	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Transfusion of infants and neonates presents some unique considerations not only in relation to product specification and transfusion procedures but also the fact that there are special hazards of transfusion in this age group.

The information herein is aimed at all Healthcare Professionals undertaking any aspect of a Paediatric and/or Neonatal transfusion episode. It provides information and detailed instructions for transfusion practice in children and neonates. It should however be followed in conjunction with the main UHL Blood Transfusion policy.

These guidelines are based on the Transfusion Guidelines for Neonates and Older Children published by the British Committee on Standards in Haematology (2016).

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Special requirements

All red cells and platelets for transfusion are leucodepleted. There are specific indications for the use of CMV-seronegative blood components and/or gamma irradiated cellular blood components, which are summarised in Appendix 10. Children with special requirements must have this clearly indicated, and signed by the consultant, on the inside front cover of their medical notes. Notification of any special requirements must also be made to blood bank by the child's clinical team using the form provided highlighted in Appendix 10. For each subsequent G+S or Cross-match the special requirements section on the request form must be fully completed. Prior to prescribing blood components the special requirements section on the ICP must be completed in full and any special requirements indicated on the prescription.

2.2 Blood sampling

Obtaining a Blood Sample from a neonate in particular must be given careful consideration. Due to the circulating volume, the quantity and frequency of blood taken must be kept to a minimum and excessive/unnecessary sampling should be avoided.

2.3 Sample Requirements for G+S and or Cross-Match:

- ***Neonates*** - <4months of age require a 1.2ml EDTA sample (together with maternal samples; at first presentation only)
- ***Children ≥ 4 months but <10kg*** - require a 4.9ml EDTA sample for G+S or Cross-match
- ***Children ≥ 10kg*** – require a 7.5ml EDTA sample for G+S or Cross-match

2.4 Indication for red cell transfusion

The indications for red cell transfusion will be according to the specific, local guidelines in use in the unit caring for the child. A haemoglobin concentration on its own is not adequate reason to transfuse (or not to transfuse). The indication for transfusion must be clearly documented in the patients' medical notes; similarly it is important to document any benefit the transfusion made to the patients' clinical outcome.

Whilst the beneficial effect of transfusion or lack there may be known empirically at the time the patient is being managed, it is not always evident in the medical notes.

2.4.1 Red cell transfusion thresholds in neonates

The new BCSH Transfusion Guidelines for Neonates suggest the transfusion thresholds summarized in the following table.

Summary of BCSH recommendations for neonatal top-up transfusions

Postnatal age	**Suggested transfusion threshold Hb (g/l)**		
	Ventilated	**On oxygen/ NIPPV**	**Off oxygen**
First 24 h	<120	<120	<100
≤ week 1 (d 1–7)	<120	<100	<100
week 2 (d 8–14)	<100	<95	<75
≥ week 3 (d 15 onwards)	<100	<85	<75

2.4.2 Red cell transfusion thresholds in infants and older children

Red cell transfusions will be given to maintain the haemoglobin above 70g/l. Clinical discretion may be used to maintain a higher threshold depending on the symptoms, diagnosis and clinical scenario.

2.4.3 Calculation of red cell transfusion volume and rate of transfusion

For neonates and children <40kg:

TYPICAL DOSE – 15ml/kg OR

$$Volume\ to\ transfuse\ (\text{ml}) = \frac{\text{Desired Hb (g/l)-Actual Hb (g/l)} \times \text{Weight (kg)} \times \text{Factor}}{10}$$

Factors between 3 and 5 have been recommended. It is reasonable to use a factor of 4 in order to avoid over-transfusion but this should be assessed on an individual patient basis.

If the calculation gives a volume larger than one unit (average 280ml) use only a single unit and then reassess the patient and haemoglobin.

For children ≥40kg: One adult unit should be transfused, then the patient and haemoglobin reassessed.

Final volume transfused must be <20ml/kg

Transfusion should be adminstred at a rate of 5ml/kg/hr and should be completed whithin four hours.

2.5 Platelet transfusions

2.5.1 Indication

Platelet transfusions are indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. However platelet transfusions are not indicated in all causes of thrombocytopenia and may be contraindicated in certain conditions. The need for platelet transfusion in an individual child will depend on the cause of the thrombocytopenia, the presence and risks of bleeding and the necessity of any invasive procedures. Transfusion will be further guided according to the relevant guidelines in use in the unit caring for the child.

2.5.2 Platelet transfusion thresholds in neonates.

For neonates with severe thrombocytopenia (platelet count below 25 × 109/L) platelet transfusions should be administered in addition to treating the underlying cause of the thrombocytopenia.

For non-bleeding neonates platelet transfusions should not be routinely administered if platelet count is ≥ 25 × 10^9/L.

Summary of BCSH recommendations for thresholds of platelet count for neonatal platelet transfusions

Platelet count (× 10^9/l)	**Indication for platelet transfusion**
<25	Neonates with no bleeding (including neonates with NAIT if no bleeding and no family history of ICH)
<50	Neonates with bleeding, current coagulopathy, before surgery, or infants with NAIT if previously affected sibling with ICH
<100	Neonates with major bleeding or requiring major surgery (e.g. neurosurgery)

2.5.3 Platelet thresholds in infants and older children

For stable infants and children, prophylactic platelet transfusions should be administered when the platelet count is below 10 × 10^9 /l, excluding patients with immune thrombocytopenia, thrombotic thrombocytopenic purpura/haemolytic uraemic syndrome and heparin-induced thrombocytopenia who should only be transfused with platelets for life-threatening bleeding.

Summary of BCSH recommendations for thresholds of platelet count for platelet transfusion in children

Platelet count (× 10^9/l)	**Clinical situation to trigger platelet transfusion**
<10	Irrespective of signs of haemorrhage (excluding ITP, TTP/HUS, HIT)
<20	Severe mucositis Sepsis Laboratory evidence of DIC in the absence of bleeding

	Risk of bleeding due to a local tumour infiltration Insertion of a non-tunnelled central venous line
<40	Prior to lumbar puncture
<50	Moderate haemorrhage (e.g. gastrointestinal bleeding) including bleeding in association with DIC Surgery, unless minor (except at critical sites)including tunnelled central venous line insertion
<75–100	Major haemorrhage or significant post-operative bleeding (e.g. post cardiac surgery) Surgery at critical sites: central nervous system including eyes

2.5.4 Calculation of Platelet transfusion volume and rate of transfusion for neonates, infants and older children.

Calculation of requirements

Dose:

- Body weight <15kg 10-20ml/kg
- Body weight >15kg 1 single apheresis pack

For children from 1 year of age, either standard apheresis or pooled platelets may be used.

It is recommended that platelets be administered over a 30 to 60 minute period. In the paediatric setting, this approximates to a rate of 10-20ml/kg/hour. Increased rates of administration, especially in neonates, may lead to vasodilatation and hypotension.

2.6 Fresh Frozen (FFP) Plasma and Cryoprecipitate

FFP and cryoprecipitate are indicated when there are demonstrable multiple or single coagulation factor deficiencies and these may be administered either therapeutically for the management of bleeding or prophylactically.

2.6.1 Neonatal FFP and cryoprecipitate

There is no evidence to support the routine use of FFP to try to correct abnormalities of the coagulation screen alone in non-bleeding neonates and FFP should not be used for simple volume replacement or routinely for prevention of IVH.

FFP may be of benefit in neonates with clinically significant bleeding (including massive blood loss) or prior to invasive procedures with a risk of significant bleeding, and who have an abnormal coagulation profile, defined as a PT or APTT significantly above the normal gestational and postnatal age-related reference range (taking into account local reference ranges where available)

FFP is appropriate for the early management of severe hereditary protein C deficiency but should not be used in preference to protein C concentrate if this is available.

FFP should be used for the management of severe hereditary protein S deficiency.

Indication for cryoprecipitate transfusion for correcting low fibrinogen is the same in neonates as in children (see Section 2.6.2). Cryoprecipitate may also be indicated in neonatal cardiac surgery and major haemorrhage.

2.6.2 Fresh frozen plasma (FFP) and cryoprecipitate Transfusions to infants and children

Prophylactic FFP should not be administered to non-bleeding children with minor prolongation of the prothrombin time (PT) /activated partial thromboplastin time (APTT) including prior to surgery, although it may be considered for surgery to critical sites.

Prophylactic cryoprecipitate should not be routinely administered to non-bleeding children with decreased fibrinogen including prior to surgery. It may be considered for fibrinogen <1 g/l for surgery at risk of significant bleeding or to critical sites.

FFP may be beneficial in children with DIC who have a significant coagulopathy (PT/APTT >1·5 times midpoint of normal range or fibrinogen <1·0 g/l) associated with clinically significant bleeding or prior to invasive procedures .
Cryoprecipitate may be given if the fibrinogen is <1·0g/l despite FFP, or in conjunction with FFP for very low or rapidly falling fibrinogen.

FFP should not be used for urgent warfarin reversal unless four factor prothrombin complex concentrate is unavailable .

Plasma exchange with SD FFP is indicated for TTP and some forms of atypical HUS. SD FFP infusion (in the acute phase) and intermediate purity Factor VIII (e.g. BPL 8Y) can be used to treat congenital TTP.

FFP should not be used in the management of inherited factor deficiencies other than in a few exceptional circumstances where specific factor concentrates (Ex: Factor V deficiency) are not available.

Cryoprecipitate should only be used for congenital hypofibrinogenaemia only when fibrinogen concentrate is unavailable

NOTE: Requests for FFP and Cryoprecipitate must be made via the haematology medical staff and indications for use can be discussed.

2.6.3 Calculation of FFP/Cryoprecipitate transfusion volume and rate of transfusion for neoantes, infants and older children.

FFP Dose - 15 – 20 ml/kg
Cryoprecipitate - 5-10 ml/kg,
Rate of FFP or Cryoprecipitate transfusion – 5-10 ml/kg/h

Note: FFP and cryoprecipitate are thawed in blood bank. They cannot be re-frozen once thawed. Transfusion of FFP and/or cryoprecipitate must be commenced as soon after thawing as possible and completed within 4 hours.

2.7 Vitamin K

2.7.1 Indication

Vitamin K is required for normal function of factors II, VII, IX and X.
In Vitamin K deficient coagulopathy without bleeding give IV Vitamin K.
Vitamin K deficient coagulopathy with bleeding give IV Vitamin K & FFP.

2.7.2 Dose

300 micrograms/kg (max 10mg) single dose, repeat as necessary
Response within 30 – 120 minutes

2.8 Human Albumin Solution (HAS)

2.8.1 Indication

Albumin is a blood product and issued via the Blood Transfusion Laboratory on a named patient basis.

There are specific indications for the use of human albumin solution, which will be according to the policy of the specialist unit caring for the patient.

2.8.2 Calculation of requirements

- 20% HAS 2 – 5ml/kg
- 5% HAS 10 – 20ml/kg

For information relating to the rate of infusion, please refer to Appendix 6

2.9 Immunoglobulin

Refer to IV drug monograph for the individual named product for administration guidance

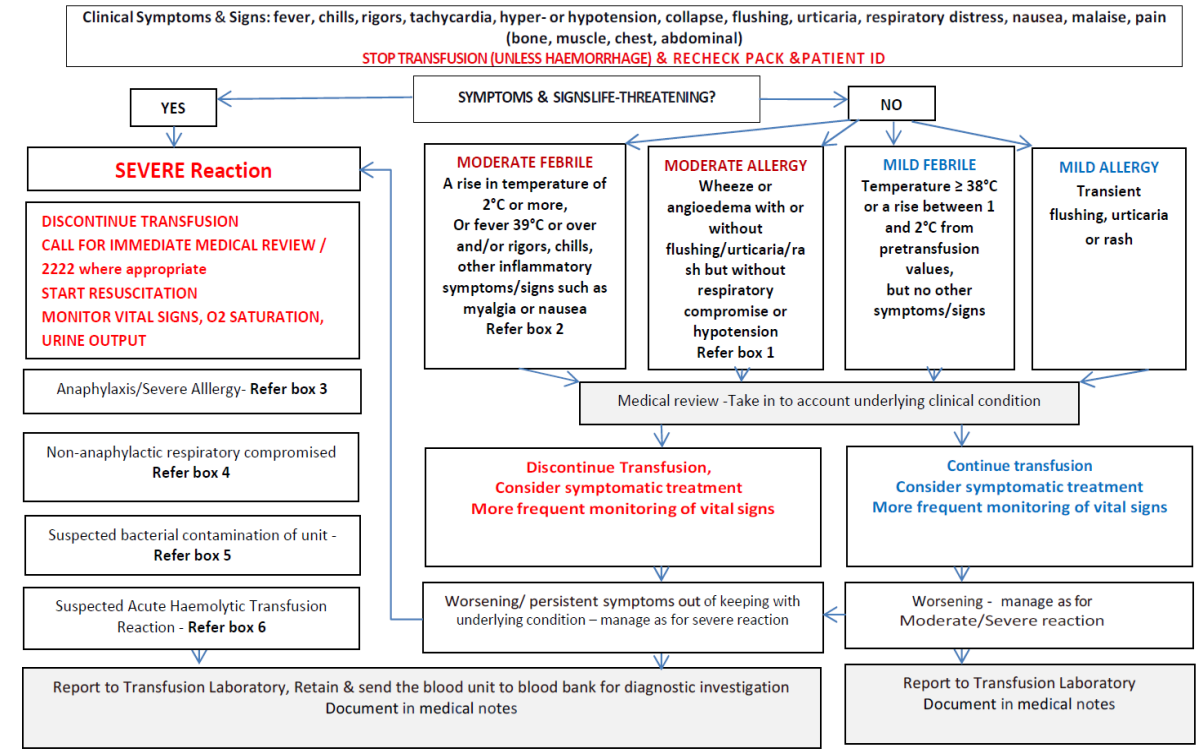
2.10 Adverse events including 'near miss' events

All adverse incidents and 'near miss' events must be reported as per UHL Policy for the Management of Patient and Staff Safety (Trust Ref. A10/2002).

2.11 Investigation and management of transfusion reactions

Transfusion reactions are discussed at length in Appendix 14. However, for more detailed information about Anaphylaxis go directly to UHL Childrens' Medical Guideline (Trust Ref. C34/2015).

Algorithm for the Investigation and Management of Suspected Transfusion Reactions



BOX-1: SYMPOTOMATIC ALLERGIC REACTION?

Chlorphenamine slow IV
monitor the patient more frequently.
In case of a mild allergic Transfusion reaction if the transfusion was continued, the transfusion time must not exceed 4 hours from leaving storage

BOX-2: FEBRILE TRANSFUSION REACTION?

Give the right dose of paracetamol
If Fever (≥2°C rise or ≥39°C), and/or chills, rigors, myalgia, nausea or vomiting and/or loin pain or If febrile reaction sustained,
Check the labels on the compatibility tag match with the wristband and the component
Send following,
Standard investigations (FBC, LFT, RFT)
Return unit to laboratory
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Lactate
Coagulation screen
Assessment of urine for haemoglobin
Blood cultures from patient

BOX-3: SUSPECTED ANAPHYLAXIS?

Manage as per local anaphylaxis guideline
For adults and children over 12 years, administer IM adrenaline: 0.5 mL of 1:1000 adrenaline (500 µg)
For children between 6 and 12 years, give 0.3 mL of 1:1000 IM adrenaline (300 µg).
For children less than 6 years, give 0.15 mL of 1:1000 IM adrenaline (150 µg).
Adrenaline is repeated, if necessary, at 5-minute intervals according to blood pressure, pulse and respiratory function under the direction of appropriately trained clinicians.

Supportive care of anaphylaxis includes the following:
Rapid fluid challenge if needed
Administration of 10 mg of chlorphenamine IM or by slow intravenous (IV) injection *following initial resuscitation* if there are also skin symptoms NOTE: THIS IS ADULT DOSE. CONSULT BNFC for appropriate PAEDIATRIC DOSE.
If the patient has continuing symptoms of asthma or wheeze, inhaled or intravenous bronchodilator therapy should be considered
If severe allergy/anaphylaxis suspected, consider measurement of serial mast cell tryptase (plain tube) (immediate, 1–2 h and 24 h)

BOX-4: PULMONARY COMPLICATIONS OF TRANSFUSION WITHOUT ALLERGIC CAUSE

Ensure the airway is patent and high-flow oxygen therapy started while urgent medical assessment is obtained.

Initial investigation should include chest X-ray and oxygen saturation, NT-Pro-BNP, Echo
If the patient has features of pulmonary oedema (Hypertension, Tachycardia, Raised JVP/MAP Enlarged cardiac shadow in CXR, Peripheral oedema, New/or worsening cardiac failure on Echo)
Managed as TACO - Consider Frusemide IV.

If pulmonary oedema is absent, review again for possible non transfusion causes/Anaphylaxis

If no other causes present consider TRALI/TAD
Manage with prompt respiratory support

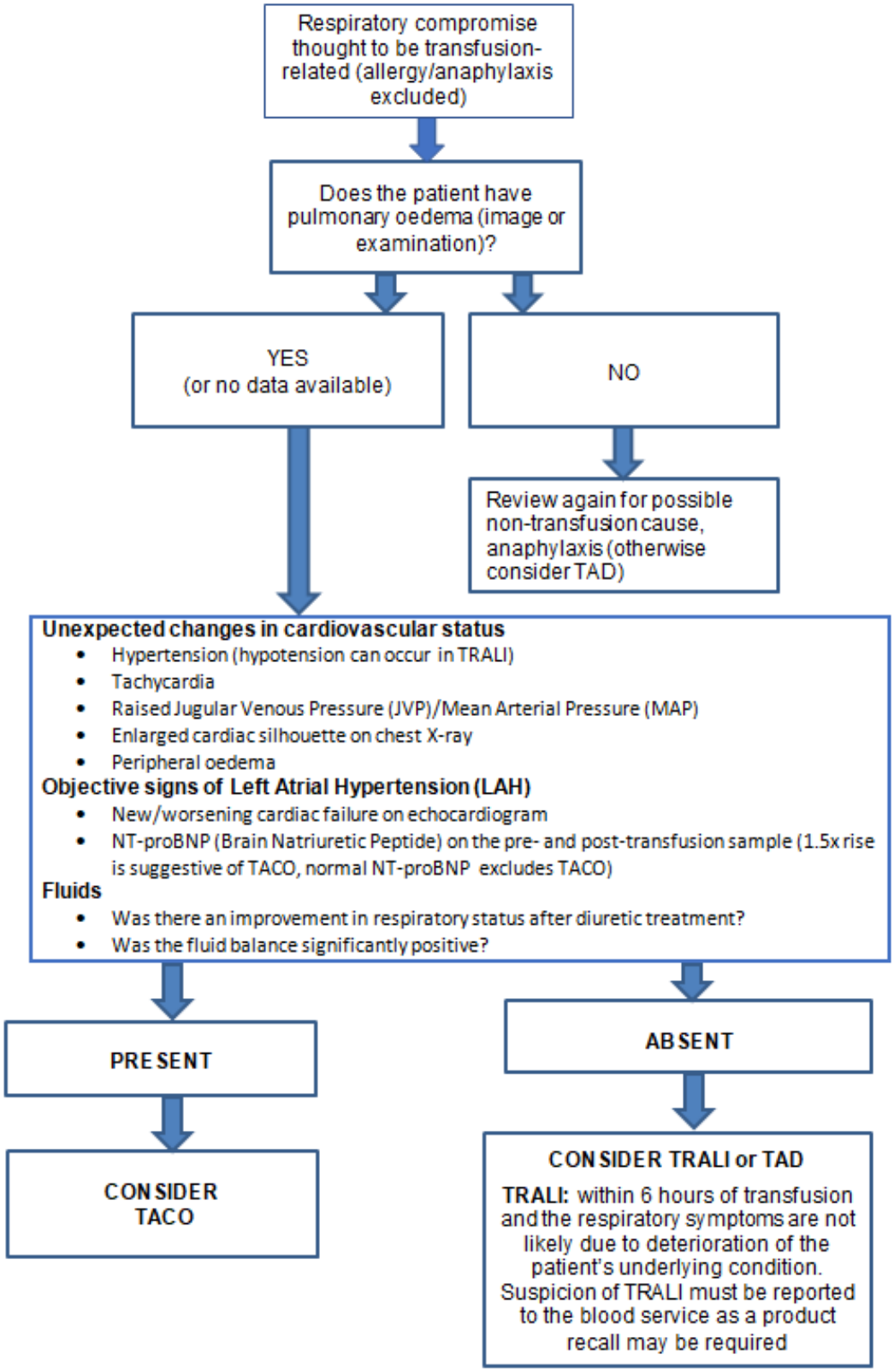
BOX-5: BACTERIAL SEPSIS?

Blood cultures from a peripheral vein and any central lines should be performed.
IMMEDIATELY Commence broad spectrum IV Antibiotic (Seek Microbiology advice if necessary)
Commence O2 and fluid when indicated
Monitor urine output
The component should be sealed and transported to the transfusion laboratory as soon as possible
Seek Haematological advice when needed
Investigations to be done
Standard investigations (FBC, LFT, RFT)
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Lactate
Coagulation screen
Assessment of urine for haemoglobin
Blood cultures from patient

BOX-6: SUSPECTED ACUTE HAEMOLYTIC TRANSFUSION REACTION/ABO INCOMPATIBILITY?

Stop the transfusion without delay.
Commence slow IV saline infusion
Inform the Transfusion department immediately
Monitor urine output/catheterise
Maintain output (> 1ml/kg per hour)
Give Furosemide if urine output falling in consultation with a renal registrar
Treat DIC with appropriate blood components
Return the remaining blood component with giving set still attached to the transfusion laboratory
Seek Haematological advice immediately
Investigations to be done
Standard investigations (FBC, LFT, RFT)
Take samples for repeat compatibility testing and DAT
Haptoglobin, LDH
Coagulation screen
Assessment of urine for haemoglobin
Lactate

ALGORITHM FOR INVESTIGATION AND MANAGEMENT OF PULMONARY COMPLICATIONS OF TRANSFUSION WITHOUT ALLERGIC CAUSE



3. KEY WORDS

Special Requirements, Dosage, Immunoglobulins, Paediatrics, Neonates.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr S Gunawardene	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **New algorithm**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

Patients with renal disease are particularly vulnerable with regard to fluid overload and therefore require careful assessment of their fluid status. Whilst there is a need to correct anaemia, it is also vital that renal and transplant patients have a thorough and accurate clinical assessment of their fluid status prior to the prescribing and administration of blood and blood products and consideration must be given to the patient's ongoing fluid management.

The information herein is aimed at all Healthcare Professionals undertaking the care of patients within renal and transplant services within UHL. It should however be followed in conjunction with the main UHL Blood Transfusion policy.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Administration of blood during haemodialysis or haemofiltration

2.1.1 Prescribing of blood transfusions

- Blood transfusions for haemodialysis and haemofiltration patients should always be given whilst the patient is on haemodialysis or haemofiltration unless otherwise prescribed by medical staff during which, the harmful effects of the associated volume and potassium load can be rectified (Daugirdas & Ing 2001).
- All blood transfusions for patients on haemodialysis or haemofiltration should be prescribed by medical staff.
- Registered nursing staff must ensure that the additional fluid gain caused by the transfusion is calculated into the overall prescribed weight loss for that dialysis treatment.

2.1.2 Administration of blood during haemodialysis or haemofiltration

- A blood administration set must be used for the transfusion as the filter in the bubble trap of the dialysis machine is not sufficient to stop small clots passing through.
- A maximum of one unit of blood can be transfused over an hour on haemodialysis or haemofiltration. Unless otherwise prescribed, a patient can receive a maximum of 2 units of packed cells during a 4-hour haemodialysis treatment.
- Prior to the commencement of the blood transfusion, the standard patient identification checks for transfusion of blood components should be performed as per UHL policy.
- The patient's baseline temperature, respiration, pulse, blood pressure and O_2 sats must be checked before requesting the collection of the blood component and within an hour of the transfusion commencing. If vital signs are within the patient's 'normal limits' and there are no other concerns, the transfusion can begin.
- Blood must be administered by intermittent bolus doses only. AT NO TIME SHOULD THE TRANSFUSION BE LEFT TO INFUSE UNATTENDED.
- The volume of blood administered as a bolus can be measured using the blood pump of the haemodialysis machine.

For example:

- To infuse 100mls of blood as a bolus, ensure the blood pump speed is set at 200mls/min, clamp the arterial line from the patient and open fully the roller clamp on the blood giving set for 30 seconds. The patient will receive 100mls of blood. Adjust the calculation accordingly if the blood pump speed is slower or faster.
- To start the transfusion, the first bolus of blood should be 50mls. Observation for the patient's reaction to the blood should be measured in the usual way, i.e. recording patient's temperature, pulse and blood pressure prior to each bolus and observing for transfusion reactions.
- It the patient's temperature, respiration, pulse and blood pressure are satisfactory and there are no signs of transfusion reactions or fluid overload, the transfusion can continue with the bolus dose increasing to 100mls every 15 minutes. This procedure is repeated with the second unit of blood.
- In the event of a severe reaction, transfusion must be discontinued immediately in line with UHL policy
- Medical staff responsible for the patient must also be contacted immediately in line with UHL policy.

2.2 Administration of blood during peritoneal dialysis (ambulatory or continuous cycling)

2.2.1 Prescribing of blood transfusions

- In all cases, patients receiving peritoneal dialysis must have their fluid status assessed and dialysis treatment regime prescribed accordingly by medical staff prior to the administration of a blood transfusion. This will enable the fluid removal needed to allow for the volume of blood to be transfused.
- All blood transfusion for patients on peritoneal dialysis should be prescribed by medical staff in accordance with UHL policy

2.2.2 Administration of blood to patients on Peritoneal Dialysis

- The patient's baseline temperature, respiration, pulse and blood pressure must be checked before requesting the collection of the blood component and within an hour of the transfusion commencing. If vital signs are within the patient's 'normal limits' and there are no other concerns, the transfusion can begin.
- The patient's temperature, respiration, pulse and blood pressure must be checked every 15 minutes for the first hour of the transfusion. If vital signs are within normal limits, the patient's temperature, pulse, respiration and blood pressure can be recorded hourly until the unit of packed cells is completed.
- For every subsequent unit of packed cells that is administered, the frequency of the recordings of temperature, respiration, pulse and blood pressure must follow the same pattern: i.e. every 15 minutes for the first hour, and hourly thereafter until the unit of packed cells is complete.
- In the event of a severe reaction, transfusion must be discontinued immediately in accordance with UHL policy. Medical staff responsible for the patient must also be contacted immediately in line with UHL policy.

2.2.3 Renal Transplant

- Careful consideration should be made when transfusing patients undergoing renal transplant, as every transfusion is a potentially sensitising event.
- Transfusion is not usually considered unless the Hb <7 (except if the patient will undergo a procedure that requires a higher Hb or has underlying ischaemic heart disease; clarification must be sought from the patient's transplant consultant.)

3. KEY WORDS

Haemodialysis, Haemofiltration, Fluid Balance, Peritoneal Dialysis.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Mrs. J. Bayes/ Mr. M. Deighton	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review: **Addition of instruction pertinent to transfusions for renal transplant patients.**	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

The purpose of this guideline is to provide health professional staff with instructions for inter-hospital transfer of patients whilst receiving blood transfusion.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 Transfer of patients whilst receiving blood transfusion between hospitals within the Trust

2.1.1 If a patient has to be transferred from one hospital to another within the Trust while transfusion is in progress, a registered nurse or midwife, or a member of medical staff must remain with the patient until transfer is complete.

2.1.2 The registered nurse or midwife responsible for the patient must inform the technical staff in their blood transfusion laboratory giving full details of the transfer.

2.1.3 The Blood Transfusion laboratory will arrange urgent transportation of unused blood components to appropriate blood bank refrigerator making sure that the blood component packs are transported in controlled storage conditions. This procedure ensures safe transfer of blood components and must be discussed with blood transfusion laboratory staff for all movement of blood between hospitals. The expiry time for the transfer box must be checked prior to use.

2.1.4 The Blood Transfusion laboratory receiving the blood components will notify the responsible registered nurse or midwife on the destination ward/theatre of the availability of patient-specific blood components.

2.2 Transfer of blood with a patient to a hospital outside the Trust (see Appendix 20)

The ward **must not** send blood outside the Trust without informing Blood Transfusion laboratory. The Blood Transfusion laboratory needs to know where it is sent so they can inform the receiving hospital and provide accompanying documentation. The Blood Transfusion Laboratory will package the blood appropriately and make it available to the ward for transport with the patient.

2.3 Receipt of blood with a patient from a hospital outside the Trust (see Appendix 20)

All blood products received with a patient from outside of the Trust must be processed through the Blood Transfusion Laboratory to be correctly documented and integrity checked before use. **Contact blood bank immediately on patient's arrival**. Be aware there is a time limit on transport. The blood must be received by Blood Transfusion within the time limit or it will have to be wasted.

3. KEY WORDS

Transfer, Blood Transfusion Laboratory, Controlled Storage

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title)	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	

1. INTRODUCTION AND WHO GUIDELINE APPLIES TO

1.1 The purpose of this guideline is to help ensure the following:

1.1.1 Blood is only transferred in the appropriate clinical scenario

1.1.2 Blood is transported and packaged in accordance with validated procedures to ensure quality and safety.

1.1.3 The transfer of blood is correctly documented to maintain proof of the cold chain of blood storage.

1.1.4 Vein-to-vein traceability is maintained.

1.1.5 The roles and responsibility of the dispatching and receiving hospitals are clearly defined.

1.1.6 Transport of blood is optimally managed by transfer from one transfusion laboratory to another transfusion laboratory.

1.1.7 Wastage of blood is minimised.

2. GUIDELINE STANDARDS AND PROCEDURES

2.1 The need to transfer blood with a patient should be a rare occurrence in modern practice, but two scenarios were considered to be an exception:

2.1.1 Blood allocated to a specific patient who was actively bleeding and in whom the risk of transfer to a specialist unit was considered appropriate. Such patients would require a medical and/or nursing escort.

2.1.2 Patients being transferred who have special transfusion requirements such as complex phenotyped blood, irradiated blood or HLA matched platelets. However, these blood components should be transferred directly to the laboratory in the receiving hospital.

2.2 Procedure for the Dispatching Hospital laboratory

2.2.1 Initial Documentation

Complete Forms 1 and 2 (PR2308) for all blood / blood components accompanying the patient outside of UHL.

2.3 Blood / blood components transferred to a satellite Blood Bank

2.3.1 Identify the allocated/issued blood/blood components for a named patient using the forms identified in **2.2.1**

2.4 Blood / blood component packaging and final documentation (For Blood Transfusion Laboratory Staff)

2.4.1 Complete the transfer documentation and attach a record of the unit donation numbers & prepare the transit box, packaging material & labels.

2.4.2 Place the blood/blood components IMMEDIATELY BEFORE dispatch in a transit box surrounded by cool packs that have been equilibrated to the appropriate

storage temperature. Put the cool packs on the bottom and sides of the box as well as on the top.

2.4.3 Ensure there is no free air space in the transit box.

2.4.4 Ensure the correct document is place in the transfer box and retain a copy.

2.4.5 Replace the transit box lid and seal using appropriate ties.

2.4.6 Complete and attach a dispatch label to the transit box.

2.5 Dispatch of blood / blood components

On dispatch contact the receiving hospital to inform of dispatch. Outside normal hours contact the Biomedical Scientist (BMS) on call in the laboratory in each hospital.

Information must be provided on time of dispatch, mode of transport, estimated time of arrival and the number and type of units dispatched. Patient identification should also be provided.

2.6 Procedure for the receiving hospital when components taken immediately to the clinical area

Nursing staff should notify blood transfusion of any blood/blood components that arrive with the patient to the clinical area. Blood transfusion staff will then advise further.

2.7 Procedure for the receiving hospital when components taken immediately to the laboratory

2.7.1 The receiving Blood Transfusion Laboratory should document the time of delivery and where applicable notify the clinical area.

2.7.2 On arrival the transit box should be checked for integrity, examine the storage conditions, verify the units and complete the transfer documentation.

2.7.3 Transfer the units to suitable storage conditions.

2.7.4 The receiving Blood Transfusion Laboratory must ensure the transferred units are entered into stock. This includes any that are disposed of due to poor storage conditions to ensure full traceability.

2.7.5 The receiving Blood Transfusion Laboratory must notify the transferring hospital of the fate of the units which should include units transfused to the patient, disposal and units entered into stock.

3. KEY WORDS

Transfer, Cold Chain, Traceability, Transit Box

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title)	**Executive Lead** **Dr. H. Qureshi**
Details of Changes made during review:	