Trust Guideline for the Transfusion of Blood and Blood Components in Adults and Children

Document Control:

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Version	Date	Author	Reason/Change
8	24/04/2020	Dr Hamish Lyall and Dr Suzanne Docherty	Reflecting a change in the preparations of FFP and platelets that NHSBT are now producing
8.1	29/12/2020	Dr Hamish Lyall and Dr Suzanne Docherty	NBTC published new indication codes for blood products
8.2	26/06/2023	Dr Suzanne Docherty	Pre-thawed FFP and Octaplas sometimes available Document transferred to new Trust Procedural Document template

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
None	Not applicable

Distribution Control

Printed copies of this document should be considered out of date.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

Consultation

The following were consulted during the development of this document: Hospital Transfusion Team & Hospital Transfusion Committee

Monitoring and Review of Procedural Document

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

Relationship of this document to other procedural documents

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

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1. Introduction

1.1. Rationale

In some situations, blood and blood components are essential and lifesaving. Nevertheless they carry a small infectious risk and can also cause life-threatening reactions in susceptible patients. It is essential to ensure that blood and blood components are only used when required and when no other suitable alternative exists.

1.2. Objective

To ensure that blood and blood components are transfused appropriately to patients; to ensure that patients (where possible) and staff are aware of the risks and benefits of blood component transfusion; to ensure that the reason for transfusion is recorded in the patients' notes; to ensure that alternatives to blood component transfusion (if any) have been considered; to ensure some form of consent for transfusion is recorded.

1.3. Scope

Covers all staff groups who prescribe, provide and administer blood transfusions at Norfolk & Norwich University Hospital (NNUH).

1.4. Glossary

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

Term	Definition
ABO	ABO blood groups
CMV	Cytomegalovirus
Cryo	Cryoprecipitate
ED	Emergency Department
EDTA	Ethylene diamine tetraacetic acid
EPMA	Trust Electronic Medicines Prescribing Administration System
FFP	Fresh frozen plasma
GvHD	Graft versus Host Disease
Hb	Haemoglobin
NNUH	Norfolk & Norwich University Hospital
NICE	National Institute for Clinical Excellence
NHSBT	NHS Blood & Transplant
SaBTO	Safety of Blood, Tissue and Organs
SHOT	Serious Hazards of Transfusion Scheme
TACO	Transfusion-associated circulatory overload
TRALI	Transfusion Associated Lung Injury

2. Responsibilities

It is the responsibility of the Lead Haematology Consultant for Transfusion to review and update this policy

3. General principles of transfusion in adults and children

3.1. Consent for transfusion of blood and blood components

Guidance from the Advisory Committee on the Safety of Blood, Tissue and Organs (SaBTO) (2010) and National Institute for Clinical Excellence (NICE) (2015) recommend:

- Transfusion should be discussed before it occurs with the patient (or their legal guardian)
- The decision to transfuse a patient with blood and/or blood components is made after consideration of the potential risks and benefits and also the alternatives to transfusion; patients should have an option to refuse transfusion
- Patient information leaflets should be given to aid this process
- Valid consent for transfusion should be documented in the patient's case record, including a record of discussion as above
- If patients are unable to consent to transfusion, staff should ensure that the patient's preferences about transfusion if known (including advance directives) are adhered to where possible
- If patients are transfused in an emergency before consent can be given, the reason for transfusion and its risks and benefits should be discussed with the patient retrospectively and documented in the notes; information leaflets should be given
- Staff should ensure that patients are aware on discharge that they have been transfused with a blood product and where appropriate should inform the patient that he/she can no longer be a blood donor patient leaflets: http://hospital.blood.co.uk/patient-services/patient-blood-management/patient-information-leaflets/

3.2. Two sample requirement – avoidance of wrong blood in tube incidents

- The Serious Hazards of Transfusion Scheme (SHOT) records many episodes of "wrong blood in tube" each year which potentially could give rise to an ABO incompatible transfusion. This is where a current patient blood group does not match that stored in the blood bank computer. A further sample will be requested before group-specific blood is issued.
- Some patients do not have previous blood bank records for comparison; in this situation the blood bank will request a second, separately taken and correctly labelled group and screen sample before group-specific blood is issued.

3.3. Administration of blood components

- Transfusions should only be administered by trained staff in accordance with 'Patients receiving a blood transfusion care guidance' (Trust Docs ID: 8094)

3.4. Reactions to blood and blood components

- Despite all care in the transfusion process, reactions will occur to blood and blood components – refer to the (Trust Doc ID: 1281) for investigation and management

- Urgent advice can be obtained from the transfusion dept (2905/2906), the transfusion practitioners (bleep 0852/0663), the laboratory registrar (bleep 0157) or the on-call consultant (ext 6744 or via switchboard)

3.5. Leucodepletion and CMV safety

- Red cells and platelets are leucodepleted which reduces the risk of vCJD transmission and also decreases the risk of febrile transfusion reactions
- Leucodepleted products are CMV safe for the majority of patients and CMV seronegative products are restricted to small groups of patients - refer to guideline (Trust Doc ID: 1287) for the use and requesting of CMV seronegative products

3.6. Irradiated components

- Gamma irradiation/X-ray irradiation of red cells, platelets and other cellular components kills the majority of viable lymphocytes and prevents transfusion associated GVHD - refer to guideline (Trust Docs ID: 1286) for the use and requesting of irradiated blood products.

3.7. Patients with antibodies to red cells

- Multiply transfused patients or women with previous pregnancies may develop alloantibodies to 'foreign' red cell antigens which they lack on their own cells
- Patients may also develop autoantibodies to their own red cell antigens, which can be due to underlying disease such as lymphoma
- Both situations make cross-matching and finding compatible blood more difficult for the transfusion laboratory
- Extra samples, more frequent samples and specialist cross-matching in London may be required
- Please let the laboratory know if blood may be required for patients with antibodies especially before surgery to prevent delays
- In an emergency the nearest match blood will be issued, but red cell survival may be shortened

3.8. Acutely bleeding patient/emergency issue/massive haemorrhage

- A limited number of group O Rh D negative red cells are available for immediate issue
- Further group O Rh D negative or O Rh D positive blood will be issued by the laboratory until the patient's blood group is determined
- Once the blood group is determined, (25 minutes after receipt of a group and screen sample) group specific blood can be issued.
- Once the blood group is determined and the serum screened for antibodies, cross-matched blood can be issued (45 minutes after receipt of a group and screen sample)
- In patients with no previous blood group records, a second sample will be requested by the lab, and should be sent as soon as possible to allow confirmation of blood group

- Please refer to the Trust guideline (Trust Docs ID: 10020) for further advice on management of massive blood loss

3.9. Red cells

Requesting red cells

- Red cells are requested via the WEBICE screens which also give helpful advice about patient samples and for surgical patients whether a group and save sample is adequate or whether blood is required
- Patients should be identified by their wrist band and samples for group and save/crossmatch (6mL EDTA adults/paediatric EDTA) should be labelled at the bed-side with full name, date of birth and hospital number/other unique number; sticky labels should be used with caution and avoided if possible; see above for 2 sample requirement
- A group and save sample will be kept for 1 week before discard; telephone the laboratory if blood is required

Timing of samples for group and screen/cross match - the 3 month rule

- Significant antibodies can form for 3 months following exposure to blood either via transfusion or pregnancy
- Chronically transfused patients without antibody formation may have these timings relaxed by a consultant haematologist

Patient status	**Sample taken**
Current pregnancy	not >7 days before transfusion
Pregnancy within last 3m	not >72h before transfusion
Transfusion within last 3m	not >72h before transfusion
All other patients*	not >7 days before transfusion

* patients with known antibodies may require more time before suitable blood is found for elective transfusions - the laboratory report, available on WebIce, states which patients are suitable for rapid issue and which patients require notice.

3.9.1. Transfusion of red cells in adults

NICE guidance (2015) recommends the following transfusion Hb triggers and targets:

- For patients who do not have major haemorrhage, acute coronary syndrome or transfusion dependant chronic anaemia, a Hb threshold of 70g/l should be considered, aiming for a post transfusion Hb of 70-90g/l
- For patients with acute coronary syndrome a Hb threshold of 80g/l should be considered, aiming for a post transfusion Hb of 80-100g/l
- Patients with transfusion dependent chronic anaemia should have an individualised threshold and transfusion target.
- It is important to avoid transfusion associated circulatory overload (TACO):
- Account should be taken of patient's age, weight, number of units to be transfused and other factors which may predispose to circulatory failure eg cardiac failure, hypoalbuminaemia etc

- Patients at risk of TACO may require increased observation, clinical assessment and diuretic therapy during transfusion
- Transfusing 4mL/kg of red cells (one unit = 280mLs) will give a rise in Hb of 10g/l (wt 70-80kg). Patients with a lower body weight will require less blood.
- Red cells need to be used within 30 minutes of removal from the fridge and the transfusion must be complete within 4 hours of removal. The trust electronic prescribing medicines administration system (EPMA) has default transfusion rates of STAT, 100mL/hr, 150mL/hr and 200mL/hr
- For non-emergency transfusions in patients not at risk of TACO, blood should be prescribed at either 150mL/hr or 200mL/hr.
- For non-emergency transfusions in less fit patients, blood should be written up as 1 unit at 100mL/hr.
- Hb should be checked after every 1-2 units transfused to avoid over-transfusion. Single unit transfusions should be used to avoid exceeding target haemoglobin, with a reassessment of symptoms and signs of anaemia and Hb after each unit, in patients who are not actively bleeding.
- The benefits or not of transfusion should be noted – in many patients with a low but stable Hb, transfusion may be of little clinical benefit

3.9.2. Transfusion of red cells in children

- Children can tolerate lower haemoglobins, so transfusion is rarely required if Hb > 70g/l, and not at all if Hb >100g/l
- Special small volume paediatric packs are available for younger children
- Formula for top-up transfusion in children:

$$\frac{\text{Desired Hb (g/l)} - \text{actual Hb (g/l)} \times \text{weight (kg)} \times 4}{10}$$

- Note that this formula has been updated to reflect the reporting of Hb in g/l (rather than the previous g/dl), which means that the calculation includes a division by 10. As this is a change from previous practice, in order to prevent over-transfusion **it is recommended that clinicians double-check that the final volume calculated is not more than 20 mL/kg for top-up transfusions**.
- Recommended rate of red cell transfusion is 5mL/kg/hr

- A blood giving set should be used or if a syringe used for small volumes and a 170u - 260u filter should be used
- Red cells need to be used within 30 minutes of removal from the fridge and the transfusion must be complete within 4 hours of removal

3.10. Plasma components

3.10.1. Requesting fresh frozen plasma (FFP) and cryoprecipitate (cryo)

- These components are requested via a telephone call to the laboratory and they are also issued as part of the massive transfusion protocol
- FFP and cryo need to be ABO compatible (not identical) – the patient's blood group must be known before issue. Group O FFP should only be given to Group O patients.
- FFP is given according to the patient's weight which the laboratory staff will request before issue – 12-15mL/kg with each unit of FFP being approximately 300mLs – note the volumes involved in adults

Patient weight	Units of FFP (12mL-15mL/kg)
40kg	2 units (600mL)
60kg	3 units (900mL)
80kg	4 units (1200mL)

- Cryo is issued in a fixed adult dose of 2 units, or 5mL/kg in children
- Both FFP and cryo are frozen components and there is usually always a delay of 30 minutes while they are thawed (unused pre-thawed FFP is sometimes available, and can be issued for patients with major haemorrhage for 5 days after thawing)
- Indications for use for FFP and cryo are decreasing – you may want to discuss alternatives with a senior haematologist; indications are listed in Appendix 1.

3.10.2. Transfusion of FFP and cryo in adults and children

- These components are used to replace coagulation factors and need to be used immediately after issue before they deteriorate
- Each unit of FFP should be given at a rate of 10-20mL/kg/hr depending on clinical circumstances. The trust electronic medicines prescribing administration system (EPMA) has default settings of STAT, 500mL/hr, 750 mL/hr and 1000mL/hr
- Each unit of cryo should be given over 30 minutes
- Be aware of reactions such as transfusion associated lung injury (TRALI) and TACO which can occur with plasma products
- The clinical effect of FFP and cryo will decline after 12-24h, so administration may need to be repeated

3.11. Requesting platelets

- Platelets have a very short shelf life of 5-7 days, so only a very limited supply is kept in the hospital
- Platelets need to ABO and Rh D compatible (not identical)
- Platelets may need to be ordered from NHSBT Cambridge, so for routine administration you must plan ahead

- Platelets are requested via a telephone call to the laboratory and are also issued as part of the massive transfusion protocol
- In adults, only one unit of platelets will be issued at a time except in exceptional circumstances; your request may be frequently directed to a senior haematologist who will advise
- In children, the recommended volume is 10-20mL/kg for children < 15kg and one unit for children > 15kg.
- See Appendix 1 for suggested uses
- Note that you are not aiming for a normal platelet count – suggested adequate levels are given in Appendix 1.
- The decision to give a platelet transfusion should take into account the cause of thrombocytopenia. Platelet transfusion is very rarely indicated in cases of autoimmune thrombocytopenia, heparin induced thrombocytopenia, or thrombotic thrombocytopenic purpura.

3.11.1. Transfusion of platelets

- Platelets should be used immediately after issue to prevent deterioration
- Platelets should be given over 30 minutes
- Platelets have caused death/major morbidity due to bacterial contamination – do not use if the unit is discoloured or contains aggregates
- Platelets have also been associated with TRALI
- Discuss severe reactions to platelets with the transfusion laboratory/transfusion practitioners/haematologists

4. Training & Competencies

Training of junior doctors in transfusion is part of their national curriculum. The Trust includes transfusion training in the induction for all clinical staff, and provides a dedicated session for new FY1 doctors in August each year. Transfusion updates are part of the Trust mandatory training, and more in depth training is provided to certain groups of staff e.g. anaesthetists, emergency department (ED) staff and theatre staff. E-learning packages to fulfil mandatory training requirements are available via ESR that have been specifically designed for different staff groups. The Trust's transfusion team provide additional transfusion training as required, to both students and qualified staff, which can be tailored to the individual clinical area needs.

5. Related Documents

Transfusion Reaction Guideline (Trust Doc ID: 1281)

Use of irradiated Blood Products (Trust Docs ID: 1286)

Use of CMV Negative Blood Products (Trust Doc ID: 1287)

Patients receiving a blood transfusion care guidance (Trust Docs ID: 8094)

Massive Upper Gastro-intestinal Haemorrhage (Trust Docs ID: 10020)

Blood Products in Newborn Infants (Trust Docs ID: 1202)

6. References

1. Association of Anaesthetists of Great Britain and Ireland (2016) The use of blood components and their alternatives https://www.aagbi.org/sites/default/files/anae_13489_web_0.pdf
2. British Committee for Standards in Haematology (2012) Guideline on the administration of blood components British Journal of Haematology 28 3-21
3. British Committee for Standards in Haematology (2016) Guidelines for the use of platelet transfusions British Journal of Haematology 176 365-394
4. British Committee for Standards in Haematology (2018) 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 British Journal of Haematology 181 54-67
5. British Committee for Standards in Haematology website www.bcshguidelines.com
6. A National Blood Conservation Strategy for NBTC and NBS. Report from the Working Party on Autologous Transfusion and the Working Party on Alternatives to Transfusion of the NBS Sub-Group on Appropriate Use of Blood (2004) Compiled by Virge James for the NBTC Executive Group
7. British Committee for Standards in Haematology (2016) Guidelines on transfusion for neonates and older children British Journal of Haematology 175 784-828
8. Serious Hazards of Transfusion for Children 2016 www.shot-uk.org
9. Platelet transfusion: principles, risks, alternatives and best practice 2012 NCA Platelet working group http://hospital.blood.co.uk/
10. Consent advice from SABTO
11. https://www.transfusionguidelines.org/transfusion-practice/consent-for-blood-transfusion-1
12. Patient advice leaflets: http://hospital.blood.co.uk/patient-services/patient-blood-management/patient-information-leaflets/
13. Handbook of Transfusion Medicine 5th Edition. United Kingdom Blood Services.
14. NICE guideline NG24 November 2015: Blood transfusion

7. Monitoring Compliance

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
Incident reporting related to the requesting and authorising of blood and blood components	Continuously monitored	Blood Transfusion team	Hospital Transfusion Committee	Monthly
Decision to transfuse is made in line with Trust and National indications	Participation in the NHSBT National Comparative Audit programme	Transfusion Specialist Nurse/Transfusion Practitioner	Hospital Transfusion Committee	
All staff have completed appropriate training	Periodic review of training compliance	NNUH Mandatory training committee	Hospital Transfusion Team	Bi monthly
Incident reporting related to the requesting and authorising of blood and blood components	Continuously monitored	Blood Transfusion team	Hospital Transfusion Committee	Monthly

8. Appendices

8.1. Appendix 1 Indications for transfusion in adults and children (webICE codes)

(For transfusion in neonates – please consult departmental guidelines - Use of Blood Products in Newborn Infants) (Trust Docs ID: 1202)

The indication codes below have been developed by the National Blood Transfusion Committee as a national system of audit of blood transfusion, and are taken from UK national guidelines for the use of blood components. Each indication has been assigned a code; these are used by clinicians when requesting blood components, or for audit purposes. There is no generic 'transfusion trigger' and the prescribing clinician must take responsibility for ensuring that the clinical condition of the patient is taken into consideration. The indication codes should be taken as a guide only and may vary depending on individual circumstances.

Red Cells

R1 Acute bleeding
Acute blood loss with haemodynamic instability. Refer to massive transfusion protocol. After normovolaemia has been obtained, frequent Hb measurement should be used to guide further transfusion; see suggested thresholds below.

R2 Hb </= 70g/l in a stable patient
Acute anaemia. Use Hb threshold of 70g/L and a target Hb of 7-90g/L to guide red cell transfusion. Follow local/specific protocols for indications such as post- cardiac surgery, traumatic brain injury or acute cerebral ischaemia.

R3 Hb </=80g/L in a patient with cardiovascular disease
Transfuse if Hb <80g/L, with a target Hb 80-100g/L

R4 Chronic transfusion dependent anaemia
Transfuse to maintain Hb that prevents symptoms. Suggest a target Hb of 80g/L initially, and adjust as required. Haemoglobinopathy patients require individual thresholds depending on age and diagnosis.

R5 Radiotherapy maintain Hb >100g/L
There is some evidence for maintaining Hb >100g/L in patients receiving radiotherapy for cervical and possibly other tumours

R6 Exchange transfusion

Transfusion to haemoglobin above 100g/l is rarely required

Fresh frozen Plasma

Dose – 15mL/kg body weight, often equivalent to 4 units in adults.

F1 Major haemorrhage
Early infusion is recommended – 1 unit FFP: 1 unit red cells for trauma and at least 1 unit FFP: 2 units red cells in other major haemorrhage settings. Once bleeding controlled use thresholds below.
F2 PT Ratio/INR >1.5 with bleeding

Clinically significant bleeding without major haemorrhage. FFP required if coagulopathy. Keep PT/APTT ratio of </= 1.5.

F3 PT Ratio/INR >1.5 and pre-procedure
Prophylactic use when coagulation results are abnormal e.g. disseminated intravascular coagulation (DIC) and invasive procedure is planned with risk of significant bleeding.

F4 Liver disease with PT Ratio/INR >2 and pre-procedure
FFP should not be routinely administered to non-bleeding patients, or before invasive procedure if PT ratio/INR is <2.

F5 TTP/plasma exchange

F6 Replacement of single coagulation factor.
Replacement of some single coagulation factor deficiencies where factor concentrate does not exist eg factor V

Cryoprecipitate

Dose – 2 pooled units will increase fibrinogen by approximately 1g/L. Cryoprecipitate is usually used with FFP unless there is an isolated fibrinogen deficiency

C1 Clinically significant bleeding and fibrinogen <1.5g/L (<2g/L in obstetric bleeding)

C2 Fibrinogen <1g/L and pre procedure with a risk of bleeding

C3 Bleeding associated with thrombolytic therapy

C4 Inherited hypofibrinogenaemia, fibrinogen concentrate not available

Platelet Transfusion

Dose – for prophylaxis, 1 adult therapeutic dose. Prior to invasive procedure/to treat bleeding. Consider patient size, previous increments and target count.

Prophylactic platelet transfusion

P1 Plt <10 x 109/L reversible bone marrow failure
Not indicated in chronic bone marrow failure.

P2 Plt 10 – 20 x 109/L sepsis/haemostatic abnormality

Platelets should be transfused if:

P3a Plt <20 x 109/L for central venous line

P3b Plt <40x109/L pre lumbar puncture/spinal anaesthesia

P3c Plt <50x109/L pre liver biopsy/major surgery

P3d Plt <80x109/L pre epidural anaesthesia

P3e Plt <100x109/L pre critical site surgery e.g. CNS

• Transfusion prior to bone marrow biopsy is not required.

Therapeutic use to treat bleeding (WHO bleeding grade ≥2)

P4a Major haemorrhage - Plt <50 x 10*9/L

P4b Empirically in a Major Haemorrhage Pack / Protocol

P4c Critical site bleeding e.g. CNS - Plt < 100 x 10*9/l

P4d Clinically significant bleeding - Plt < 30 x 10*9/l

Specific clinical conditions

P5a DIC pre-procedure or if bleeding.

P5b Primary immune thrombocytopenia (emergency pre-procedure/severe bleeding).

Platelet dysfunction

P6a Consider if critical bleeding on anti-platelet agent

P6b Inherited platelet disorders directed by haemostasis specialist

<u>Prothrombin complex concentrate</u>

Dose should be determined by the situation and INR. Local guidelines should be followed

PCC1 Emergency reversal of VKA for severe bleeding or head injury with suspected intracerebral haemorrhage

PCC2 Emergency reversal of VKA pre-emergency surgery

9. Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Women and Children's Services	**Department**	Blood Transfusion
Name of person completing form	S.DOCHERTY	**Date**	22.08.2023

Equality Area	Potential Negative Impact	Impact Positive Impact	Which groups are affected	Full Impact Assessment Required YES/NO
Race	NONE	NONE	-	NO
Pregnancy & Maternity	NONE	NONE	-	NO
Disability	NONE	NONE	-	NO
Religion and beliefs	NONE	NONE	-	NO
Sex	NONE	NONE	-	NO
Gender reassignment	NONE	NONE	-	NO
Sexual Orientation	NONE	NONE	-	NO
Age	NONE	NONE	-	NO
Marriage & Civil Partnership	NONE	NONE	-	NO
EDS2 – How does this change impact the Equality and Diversity Strategic plan (contact HR or see EDS2 plan)?	No impact			

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

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

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