Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust

Blood Transfusion Policy

Blood Components, Blood Products and Transfusion Reactions

This procedural document supersedes: PAT/T 2 v.6 – Blood Transfusion Policy

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Approved by:	Hospital Transfusion Committee
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Target Audience:	Trust wide; all staff involved in the transfusion process

Amendment Form

Version	Date Issued	Brief Summary of Changes	Author
Version 1	25 June 2021	• This is a new procedural document, please read in full.	Gill Bell – Chief Biomedical Scientist Transfusion

Contents

1. INTRODUCTION

Errors in the requesting, supply and administration of blood lead to significant risks to patients.

Errors either in the collection or labelling of the sample for blood grouping and compatibility testing, or in the laboratory, or to failure of the final pre-transfusion checks account for a number of patient deaths in the UK each year.

Variation in the practice of the administration of blood is remains increasingly evident from audit, both local and national and from the annual Serious Hazards of Transfusion (SHOT) reports. Consequently the Trust is committed to the use of competency assessment of all staff involved in the transfusion process.

The Blood Safety and Quality Regulations (BSQR SI 2005 No.50 as amended) define blood components as a therapeutic constituent of blood (red blood cells, platelets, fresh-frozen plasma (FFP), cryoprecipitate or granulocytes), whereas blood products are derived from the whole blood or plasma [e.g. OctaplasLG and anti-D immunoglobulin) and are classed as medicinal products.

2. PURPOSE

This policy is based on recognised guidelines and provides the Trust with local procedures for the ordering and administration of blood products and the management of transfused patients.

3. DUTIES AND RESPONSIBILITIES

The member of staff responsible for the care and monitoring of the patient during the transfusion must be a nurse holding current registration of the NMC Professional Register as a Registered General Nurse (RGN), Registered Sick Children's Nurse (RSCN), a Registered Midwife (RM) or a doctor.
They must take charge of the patient during the transfusion and be responsible for ensuring that all care and monitoring of the patient is performed.

- All staff involved in the transfusion process must be aware of this policy.
- All staff involved in the transfusion process should understand their role and responsibilities.
- Role specific training requirements must be met; the competencies are mandatory.
- Ensure transfusion is appropriate and alternatives have been explored.
- All transfusion documentation must be completed.

- Recognise and manage transfusion reactions.
- Always report untoward transfusion events / reactions to Blood Bank and by Datix.
- Recognition of Massive Haemorrhage; activate the Massive Haemorrhage protocol.

4. PROCEDURE

- Blood products must be prescribed on blood prescription sheet **WPR26564**.
- When a unit of blood is transfused to a patient the sticker from the blood tag must be signed by two nursing or medical staff one with responsibility for the actual administration of the blood. The start and finish time must be recorded and the sticker attached to the prescription sheet. The tear off tag must have the "patient identity confirmed by:" box filled in and then this tag must be returned to Blood Bank immediately.
- It is extremely important that the units of blood are transfused in expiry date order. Some units of blood will have a shorter expiry time and must be used before other units; some of the requested units may indeed not be needed and can then be returned and used for other patients. Blood products must not be removed from the Blood Bank until you are ready to start the transfusion, the pre-transfusion checks must have been performed and ensure that the patient has adequate venous access.
- Transfusion of should be commenced within 30 minutes of collection. If after the blood is collected a problem arises which prevents immediate transfusion, the unit must be returned to the Blood Bank within 30 minutes of collection and Blood Bank staff informed. There have been instances of blood being left on the ward for hours and having to be discarded. Such wastage of this valuable resource must be avoided.
- Each unit of blood should be used within four hours of removal from the blood fridge. It is essential that medical / nursing staff check that the drip is running satisfactorily; and if it isn't, that this is rectified in order that the unit of blood may be given within the required time.
- Recognise trigger and activate pathway for management of massive haemorrhage; if you need emergency uncrossmatched i.e. Emergency group O blood or group specific where possible) you need to consider activating the Massive Haemorrhage protocol. Communication with the Blood Bank is essential to ensure blood products are made available as quickly as possible.

Patients Lacking Capacity:

Sometimes it will be necessary to provide care and treatment to patients who lack the capacity to make decisions related to the content of this policy. In these instances staff must treat the patient in accordance with the Mental Capacity Act 2005 (MCA 2005).

- A person lacking capacity should not be treated in a manner which can be seen as discriminatory.
- Any act done for, or any decision made on behalf of a patient who lacks capacity must be done, or made, in the persons Best Interest.
- Further information can be found in the MCA policy, and the Code of Practice, both available on the Extranet.

There is no single definition of Best Interest. Best Interest is *determined on an individual basis. All factors relevant to the decision must be taken into account, family and friends should be consulted, and the decision should be in the Best interest of the individual. Please see S5 of the MCA code of practice for further information.*

4.1. Giving Sets

- Adhere to strict aseptic techniques when handling blood or blood components.
- Blood products should be transfused through a sterile giving set designed for the procedure.
- Filter size; 170 – 200 micron filter is required.

4.2 Cannula

A 20 gauge cannula is the minimum size required for transfusion in an adult. The size of cannula chosen can affect the speed at which the blood can be transfused.

4.3. Drugs

- Drugs must never be added to blood products under any circumstances.
- Drugs should not be administered through the same cannula when transfusion of blood or blood products is in progress.

4.4. Observations

Observations should be undertaken for every unit transfused. Minimum monitoring of the patient should include:

- **Regular visual observation of the patient** – this is often the best way of assessing the condition of the patient during transfusion. Transfusions should be given in clinical areas

where patients can be readily observed by members of the clinical staff, patients should be able to alert staff if they experience any adverse effects.

- **Pre Transfusion Checks** – this should include: pulse (P), blood pressure (BP), temperature (T), respiratory rate (RR) and O2 saturation. To be taken no more than 60 minutes before starting transfusion.
- **Vital Signs** - A complete set of vital signs should be taken 15 minutes after the start of each component transfusion for all patients. Note: For a stable patient repeat vital signs at the halfway mark.
- **Rapid Transfusions** - More frequent observations may be required for certain patient's e.g. in cases of rapid transfusion, or patients who are unable to complain of symptoms which would raise suspicion of a developing transfusion reaction.
- **Possible Transfusion Reaction** - If the patient shows signs or symptoms of a possible transfusion reaction, the vital signs should be monitored immediately, recorded, and appropriate action taken. Vital signs must continue to be monitored every 5 - 15 minutes depending on severity of reaction and until the possible reaction has resolved.
- **Unconscious patients** - Unconscious patients are more difficult to monitor for signs of transfusion reactions and therefore it is recommended routine observation patterns should continue.
- **Post Transfusion Checks** - Post transfusion observations should be taken and recorded **not more than 60 minutes** after the end of the component transfusion. Patients should be observed during the subsequent 24 hours for or, if discharged, counselled about the possibility of late adverse reactions. Clinical areas should ensure that systems are in place to ensure patients have 24 hour access to clinical advice.
- **Blood Tag** - The start and finish time of the transfusion **must** be recorded on the peel off sticker from the blood tag which is attached to the blood prescription sheet (WPR26564).

4.5. Completion of Transfusion

Upon completion of a transfusion the clinical areas must ensure:

- If a further blood component unit is prescribed repeat the administration/identity check with each unit.
- If no further units are prescribed remove the blood administration set and dispose of bag and tubing.
- Ensure all transfusion documentation is completed and the tag is returned immediately to Blood Bank.
- Return any unused blood products immediately to Blood Bank.

Documentation in Patients Notes:

Full documentation of transfusions is **mandatory** and **a legal requirement**.

A permanent record of the transfusion must be held in the patient's medical notes, including the following:

- A complete record of the transfusion on the blood prescription sheet (WPR26564), with the following information: start and finish time of the transfusion on the blood prescription sheet.
- The indication for the transfusion. The type and number of blood products used.
- The efficacy/ outcome/ benefit of this transfusion must be recorded in the patient's notes.
- The occurrence and management of any adverse effect.
- The peel off sticker from the blood tag must be attached to the prescription sheet.
- The sheets used for nursing observations during the transfusion.

Documentation to be returned to Blood Bank:

- The return of the tags is **mandatory** and **a legal requirement**.
- The completed detachable blood tag must be returned to Blood Bank immediately following transfusion to enable full traceability and ensure the Trust fulfils its legal requirements as defined by BSQR 2005.

4.6. Disposal of Blood Bags

Check! Is the blood tag still attached to the bag? If so remove and return the completed tag to Blood Bank.

On completion of the transfusion the empty bag and tubing should be disposed using one of the following containers following the anatomical or offensive waste route:

Yellow bin with red lid.


Yellow bag with black stripes


Orange bag.

Following Massive Transfusions on Ward Areas:

If 10 to 20 products (red cell, platelets, FFP or Cryoprecipitate) are transfused in an emergency situation then all bags to be disposed of in the anatomical waste stream i.e. **yellow bin with red lid.**

4.7. TRANSFUSION OF RED CELLS

Red Cells (RBC) in Additive Solution, Leucodepleted (220-340mL)

Key Recommendations:

- Typically red cells are transfused over 2-3 hours – this can be quicker in an emergency situation.

- After each single-unit red blood cell transfusion, clinically reassess and check haemoglobin levels, and give further transfusions if needed.
- Alternatives to transfusion should be offered to patients if clinically appropriate.
- If special requirements are needed for red cell transfusion i.e. HLA matched, irradiated, antigen negative products for patients with antibodies etc. then Blood Bank must be informed immediately to ensure any delays in providing products are kept to a minimum.
- **Blood products should only be administered after appropriate verbal/written consent is obtained and an information leaflet is provided to the patient.**

4.7.1. Indications for Use

Red cell transfusions are required to increase the oxygen carrying capacity of the blood by raising the haemoglobin concentration of patients with acute or chronic anaemia and avoid tissue hypoxia.

Single-unit red blood cell transfusions are recommended [National Institute for Health and Care Excellence (NICE), 2015] for adults (or equivalent volumes calculated based on body weight for children or adults with low body weight) who do not have active bleeding, with further clinical assessment to determine whether additional transfusion is required.

- Transfusion should only be used when the benefits outweigh the risks and there are no appropriate alternatives. Results of laboratory tests are not the sole deciding factor for transfusion.
- Transfusion decisions should be based on clinical assessment underpinned by evidence-based clinical guidelines.
- Not all anaemic patients need transfusion, there is no universal 'transfusion trigger' and alternate options i.e. intravenous/oral iron, EPO etc. should be considered where possible.
- The clinical guideline Investigation and Management of Anaemia within DBTH is available on intranet. See the following link:
  Clinical Guideline: Investigation and Management of Anaemia within DBTH
- 'Top up' transfusions should only be carried out during core hours and not during the night unless the patient is actively bleeding.

4.7.2. Red Cell Selection for ABO group

Recipient's group	O	A	B	AB
1st choice	O	A	B	AB
2nd choice	-	O	O	A or B
3rd choice	-	-	-	O

4.7.3. Rh D Red Cell Selection

- Red cells of the correct Rh D type should be used.
- Recipients with preformed anti-D antibodies should receive RhD negative red cells.
- In an emergency, females of child bearing age, if the Rh group is unknown, should receive RhD negative red cells.

4.7.4. Administration of Red Cells

- Electronic infusion pumps may damage blood cells and should not be used for administration of red cells unless the manufacturers have verified them as safe to use for this purpose, staff have been trained in their use and all maintenance requirements are met.
- To prevent bacterial growth a new giving set **must** be used after 12 hours or after 3 units whichever is earlier. Some giving sets may be issued with different instructions, if the usage life of a giving set is shorter always follow the manufacturer's instructions.
- Start the transfusion as soon as the unit is received from Blood Bank.
- Each unit of blood **must** be used within four hours of leaving a temperature controlled environment i.e. blood bank fridge or a validated, blood bank cool box.
- Typically red cells are transfused over 2-3 hours – this can be quicker in an emergency situation.
- Washing through the remainder of the blood in the line with Sodium Chloride 0.9% is not recommended.
- All blood products are leucocyte depleted.
- All blood products produced by NHSBT are HEV negative.
- Red cells ate typically supplied as packed red cells in additive solution (SAGM).
- Red cells can be irradiated, HLA matched, HT, K, Hb S or CMV negative for specific patient groups. Blood Bank **must** be notified of any special requirements as there may be a time delay on these products.
- Drugs must not be added to blood products under any circumstances.

4.7.5. Blood Warmers

- Blood should **only** be warmed using a specifically designed **regularly maintained and calibrated** commercial device with a visible thermometer and audible warning following manufacturer's instructions.
- A blood warmer is indicated:
    - At flow rates of >50mL kg^{-1} h^{-1} in adults.
    - At flow rates of >15ml kg^{-1} h^{-1} in children.
    - For exchange transfusions.
    - For patients with clinically significant cold agglutinins.

4.8. TRANSFUSION OF PLATELETS

Platelets (PLT) Apheresis or Pooled, Leucodepleted (150-400mL)

Key Recommendations:

- Platelets can be requested by any clinical staff members if the cause of thrombocytopenia known and targets as below. If there is no clear diagnosis or a request does not meet the criteria below please contact the Haematology consultants for advice.

- One standard adult therapeutic dose (ATD) is either one apheresis donation pack or a pool derived from four buffy coats from whole blood donations.

- A new, clean standard blood or platelet giving set should be used for the administration of platelets (not one previously used to transfuse blood).

- Platelets should be transfused stat or over a maximum of 30 minutes.

- Platelets require pre-ordering where possible due to the short shelf-life of the product.

- If Rh D positive Platelets have to be given in a clinical emergency where a delay in waiting for RhD negative platelets would increase risk to the patient, prophylactic anti-D immunoglobulin must be given at a dose of 500 IU immediately, by intramuscular injection, after platelet transfusion to all females of child-bearing potential.

- **Blood products should only be administered after appropriate verbal/written consent is obtained and an information leaflet is provided to the patient.**

4.8.1. Indications for Use

Platelets should be used for the prevention and treatment of bleeding due to thrombocytopenia or platelet function defects – **BSH Guidelines**: *Guidelines for the use of platelet transfusions, 2016.*

Indication	Transfusion indicated threshold ($x10^9$/L)
Pre-central venous catheter (CVC) excluding PICC line	**20**
Pre-lumbar puncture	**40**
Pre-percutaneous liver biopsy	**50**
Pre-major surgery	**50**
Pre-epidural anaesthesia, insertion and removal	**80**
Pre-neurosurgery or ophthalmic surgery involving the posterior segment of the eye	**100**
Severe bleeding	**50**
Multiple trauma, brain or eye injury, spontaneous intracerebral haemorrhage	**100**
Bleeding (WHO grade 2 or greater) but not severe	**30**
Chemotherapy induced thrombocytopenia with neutropenic sepsis	**20**
Chemotherapy induced thrombocytopenia without neutropenic sepsis	**10**
Disseminated intravascular bleeding	**Use pre-procedure/ therapeutic threshold as guideline**
Platelet function defect	**Discuss with Consultant Haematologist**
Immune thrombocytopenia (ITP/HIT/TTP/PTP)	**Discuss with Consultant Haematologist**

4.8.2. Dosage

One standard adult therapeutic dose (ATD) is either one apheresis donation pack or a pool derived from four buffy coats from whole blood donations. Larger doses are required in acute bleeding, non-immune refractoriness, DIC and AITP.

4.8.3.. Platelet Selection for ABO group

Recipient's ABO group	ABO group of Platelets	
O	First choice	O
	Second choice	A or B
A	First choice	A
	Second choice	AB *(if readily available)*
	Third choice	B* or O*
B	First choice	B
	Second choice	AB *(if readily available)*
	Third choice	A* or O*
AB	First choice	AB
	Second choice	A* or B*
	Third choice	O*

* components tested negative for 'high-titre' anti-A and/or anti-B should be used here.

4.8.4. Administration of Platelets

- A standard blood or platelet giving set should be used for the administration of platelets.
- Platelets should be transfused through a new, clean standard blood or platelet giving set (not one already used for blood).
- Platelet components must not be placed in a refrigerator.
- Start infusion as soon as the pack is received from the Blood Bank.
- Infuse stat or maximum time 30 minutes in an adult.
- In paediatrics infuse over 60 minutes via the designated pump (unless specifically directed otherwise in emergency situations).
- Children under the age of 16 should whenever possible receive apheresis platelets rather than pooled platelets.
- All requests for platelets must be authorised by the on-call consultant haematologist and the name of the authorising haematology consultant stated clearly on the form for audit purposes. (Unless Massive Haemorrhage Protocol activated.)

- Platelets can be irradiated, HLA matched, HT or CMV negative for specific patient groups. Blood Bank must be notified of any special requirements as there may be a delay in providing those products.
- All blood products produced by NHSBT are HEV negative.

4.8.5. Rh D Negative Female of Child Bearing Age

- If Rh D positive Platelets have to be given in a clinical emergency where a delay in waiting for RhD negative platelets would increase risk to the patient, prophylactic anti-D immunoglobulin must be given at a dose of 500 IU immediately, by intramuscular injection, after platelet transfusion.
- This 500 IU dose is enough to cover five successive adult therapeutic doses of RhD positive platelets over a period of up to six weeks.
- Nevertheless, if a unit of RhD positive platelets has been given and followed by anti-D prophylaxis, and if further treatment with platelet concentrates is required, RhD negative platelets are still preferred and recommended.

4.8.6. HLA and HPA Selected Platelets

These can be selected from platelets in stock or donors may be asked to donate platelets for an individual case following discussion with a consultant in NHSBT AT Sheffield. HPA selected platelets are stocked in Filton, Tooting, Barnsley and Manchester. 24hrs notice is required.

Specific Clinical Indication for HLA/HPA Selected Platelets:

Indication for HLA/HPA selected platelets is prophylaxis or treatment of bleeding in thrombocytopenic patients, who are refractory to pooled / apheresis platelets due to HLA or HPA alloimmunisation. Note: HLA selected platelet concentrates will be irradiated by NHSBT prior to issue.
NHSBT requires feedback on patient platelet increments (using the form issued with the platelets) to assess how well the platelets have been matched and inform future selection for the patient.

4.9 TRANSFUSION OF PLASMA PRODUCTS INLCLUDING FRESH FROZEN PLASMA AND CRYOPRECIPITATE

Fresh Frozen Plasma (FFP) Leucodepleted (200-340mL)

Cryoprecipitate (Cryo) Pooled, Leucodepleted (100-300mL)

Key Recommendations:

- These products have no cellular content and therefore do not need to be irradiated or selected as Cytomegalovirus (CMV) sero-negative.
- In an emergency it is important to factor the thawing time of these frozen products into the availability of the component (usually 20-30 minutes).
- Once thawed these products cannot be re-frozen.
- Once thawed, standard FFP may be stored at 4°C ± 2°C in an approved temperature-controlled blood storage refrigerator before administration to a patient as long as the infusion is completed within 24 hours of thawing.
- Once thawed, cryoprecipitate must not be refrozen and should be used immediately. If delay is unavoidable, the component should be stored at ambient temperature and used within 4 hours. Never store in a fridge.
- The typical infusion rate is 10-20mL/ kg/hr.
- All blood products produced by NHSBT are HEV negative.
- Group O plasma should only be given to group O patients.
- Fresh frozen plasma and cryoprecipitate of any RhD group may be transfused. If RhD positive plasma is given to an RhD negative individual, no anti-D prophylaxis is required.
- **FFP should NEVER be used as circulating volume replacement.**
- PT and APTT do not reflect the true haemostatic status of patients with advanced liver disease. There is no good evidence to endorse the use of prophylactic FFP for correction of abnormal clotting tests in non-bleeding patients prior to interventions.
- All requests for plasma products must be authorised by the on-call consultant haematologist and the name of the authorising haematology consultant stated clearly on the form for audit purposes.

4.9.1. Indications for Use

FFP:

- Massive haemorrhage according to protocol.
- Single factor deficiency for which no virus safe fractionated product is available. At the moment only applies to Factor V deficiency.
- DIC and bleeding or pre procedure to correct coagulation factors.

- **TTP – for plasma exchange use Octaplas.**

Use of FFP in Patients with Liver Disease:

- PT and APTT do not reflect the true haemostatic status of patients with advanced liver disease. Abnormalities of PT and APTT need to be interpreted with caution in these patients.
- There is no good evidence to endorse the use of prophylactic FFP for correction of abnormal clotting tests in non-bleeding patients prior to interventions such as elective variceal banding. But it is treating clinician's decision to use FFP for these indications in liver disease.
- The impact of commonly used doses of FFP to correct clotting results, or to reduce the bleeding risk, is very limited, particularly when the PT ratio or INR are between 1·5–1·9.
- We recommend the BSH (British society of Haematology) guidelines that state prophylactic transfusion of FFP and cryoprecipitate is not given in low bleeding risk procedures, such as paracentesis.
- There is no good evidence to support a role for prophylactic FFP to reduce the risk of bleeding from percutaneous liver biopsy. An alternative procedure with a lower bleeding risk, (e.g. transjugular liver biopsy), should be considered instead.

Do Not Transfuse FFP If:

- Isolated prolonged APTT with no obvious cause – seek advice from Consultant Haematologist on call.
- To reverse Warfarin (Please use Vitamin K and/or Beriplex).
- In intensive care for Vitamin K deficiency.

Cryoprecipitate:

Cryoprecipitate contains concentrated Factor VIII:C, von Willebrand factor, fibrinogen, Factor XIII, and fibronectin and is produced by further processing of Fresh Frozen Plasma (FFP). Clinically it is used to replace fibrinogen.

Clinical indications for use of cryoprecipitate in adults:

- Clinically significant bleeding and a fibrinogen level <1.5g/L (<2g/L in obstetric bleeding).
- Fibrinogen level is <1g/L and pre-procedure.
- Bleeding associated with thrombolytic therapy.
- Inherited hypofibrinogenaemia where fibrinogen concentrate is not available.

4.9.2. Plasma Product Selection

ABO group identical plasma products should be given whenever possible; if not possible, plasma products of a different ABO group may be acceptable as guided in the blood group selection tables below.

ABO compatibility for plasma components is different to that of red cells and **group O Cryoprecipitate MUST only be given to group O recipients.**

D group compatibility

FFP and Cryoprecipitate do NOT need to be matched for D group. D positive plasma components may be given to any D negative individual and no anti-D prophylaxis need be given in this situation. The EU Blood Directive currently requires that the RhD group is stated on the label.

FFP

FFP units must be high-titre negative (HT-) for anti-A/anti-B

Recipient Group	O	A	B	AB
1st Choice	O	A	B	AB
2nd Choice	A	B	A	A
3rd Choice	B	AB	AB	B
4th Choice	AB			
Blood group selection for MB FFP and HT untested/positive FFP				
1st Choice	O	A	B	AB
2nd Choice	A	AB	AB	A[1]
3rd Choice	B	B[1]	A[1]	B[1]
4th Choice	AB			
[1]Only suitable for emergency use in adults MB FFP units are not tested for HT- for anti-A/anti-B. Group compatible MBFFP should be used wherever possible.				

Cryoprecipitate

Recipient Group	O	A	B	AB
1st Choice	O	A	B	[2]AB
2nd Choice	A	[1]B	[1]A	[1]A
3rd Choice	B	-	-	[1]B

[1]Suitable for use in adults if negative for high titre anti-A/anti-B (labelled HT-)
[2]Small numbers of Group AB cryo may be available on request but this item is not routinely stocked

Blood group selection for MB Cryoprecipitate

Recipient Group	O	A	B	AB
1st Choice	O	A	B	AB
2nd Choice	A	AB	AB	A[3]
3rd Choice	B	B[3]	A[3]	B[3]

MB Cryoprecipitate is not tested for HT anti-A/anti-B. Group compatible plasma should be used wherever possible
[3]Non-compatible groups should only be used in emergencies when compatible groups are not available. Group AB MB cryoprecipitate is haemolysin free and suitable for patients of any ABO group but is in limited supply

4.9.3. Administration of Plasma Products

- Start infusion as soon as the pack is received from Blood Bank.
- Filter size; 170 – 200 micron filter is required (blood giving set).
- The typical infusion rate is 10-20mL/ kg/hr, but this may vary depending on the patient's condition.

4.9.4. Dosage

FFP Dosage:

In non-bleeding patients, the recommended starting dose of FFP is 15mL per kg of body weight. This equates to approximately 1L (four units) of FFP for an 'average' 70kg patient: heavier patients may require more units (but caution should be used in obese patients) and lighter patients fewer units.

In major haemorrhage, FFP should be used as part of initial resuscitation in at least a 1 unit: 2 unit ratio with red cells, until results from coagulation monitoring are available. Once bleeding is under control, further FFP should be guided by laboratory tests (transfusion trigger of PT and/or APTT >1·5 times normal) at a dose of 15-20mL/kg.

Cryoprecipitate Dosage:

Pooled units are more commonly used to treat adult patients.
The adult therapeutic dose is two pooled units, or one single unit per 5-10kg body weight, dependant on the degree of fibrinogen deficiency.

4.9.5. Prothrombin Complex Concentrate (PCC)

- Prothrombin Complex Concentrate (PCC) e.g. Beriplex is used for the rapid reversal of warfarin and DOACs therapy. The formulary is available on the intranet or see link below

  Formulary Guidance for the Use of Human Prothrombin Complex - Beriplex

- Out of hours PCC is located in A&E, Pharmacy emergency store
  Please see Bridging/reversal of anticoagulation guidelines for further information.

4.9.6. OctaplasLG®

- 200 mL bag of solution for infusion containing 9-14 g of ABO-blood group specific human plasma proteins (45-70 mg/mL).
- OctaplasLG®contains human plasma proteins, and is a pharmaceutically licensed, proven alternative to fresh-frozen plasma.

Clinical Indications:

Main Use here at DBTH is therapeutic plasma exchange procedures (PEX):

- Therapeutic plasma exchange procedures (PEX), including those in thrombotic thrombocytopenic purpura (TTP) recommend the use of octaplasLG® not FFP.

Dosage:

- In **TTP or plasma exchange (PEX)** for other indication the patient's whole plasma volume (2.5-3 litres) should be replaced with octaplasLG® For therapeutic PEX procedures seek advice of a haematologist.

Group Selection:

Administration of octaplasLG® must be based on ABO blood group compatibility. For plasma exchange select the patient's own ABO group or blood group AB; this can be regarded as universal plasma since it can be given to all patients regardless of blood group.

Group O OctaplasLG® MUST only be given to O recipients.

***** Only suitable for emergency use in adults if unit is tested and found to negative for high titre ABO antibodies.

Recipient group	**O**	**A**	**B**	**AB**
1st choice	O	A	B	AB
2nd choice	AB	AB	AB	A*
3rd choice	A	B*	A*	B*
4th choice	B	-	-	-

Administration:

OctaplasLG® must be administered by intravenous infusion after thawing using an infusion set with a filter (blood giving set). Due to risk of citrate toxicity, infuse at a rate ≤1 mL octaplasLG®/kg/min.

Contraindications:

IgA deficiency with documented antibodies against IgA. Hypersensitivity to the active substance, excipients or residues from the manufacturing process. Severe protein S deficiency.

4.10. TRANSFUSION OF GRANULOCYTES

Granulocytes, Pooled in Additive Solution/Plasma Mix, Irradiated (175-250mL)

Key Recommendations:

- All requests for Granulocytes must be approved by a Consultant Haematologist and a NHSBT Consultant.
- A standard adult dose is two pools (derived from 20 donations), providing a dose of around 2 x 10^{10} which is considered to be an effective daily dose. Children should receive 10-20mL/kg (usually 1 pool).

- Granulocytes have a short shelf life of ~24 hours and consideration should be taken when ordering the product.
- Each pool contains approximately 2.5 adult doses of platelets thus reducing platelet transfusion requirements.
- Do not use a Pump to administer granulocytes. Typically granulocytes are transfused over 1-2 hours.
- Pooled Granulocytes can only be supplied Tuesday to Saturday during normal working weeks. They are not routinely available on Sundays, Mondays, Bank Holidays and the day after a Bank Holiday. If a Bank Holiday follows a standard working day (for example Good Friday) or follows a day with a high intake of blood donations, NHSBT may be able to manufacture a pooled granulocyte. Production cannot be guaranteed and availability will be advised on a case by case basis.

4.10.1. Indications for Use

Granulocyte transfusions can be used as supportive therapy in patients with (or who are at high risk of developing) life-threatening bacterial or fungal infection secondary to neutropenia caused by bone marrow failure or neutrophil dysfunction. Their use is not without the risk of significant adverse effects. Careful assessment of the relative risks versus benefits should therefore be undertaken before prescribing these components. Requests must be discussed with a Consultant Haematologist and a NHSBT Consultant.

4.10.2. Granulocyte Selection for ABO group

Recipient's group	O	A	B	AB
1st choice	O	A	O HT neg	A HT neg
2nd choice		O HT neg		

N.B. Group AB or B pooled granulocytes are not available. If granulocytes are not ABO group specific (e.g. group O for a group B recipient) they should be high titre (HT) negative. This may present availability issues requiring clinical input. D positive granulocyte pools should not be given to D negative females of childbearing age or any patient with anti-D blood group antibodies unless advised to do so in a life-threatening emergency on the advice of a NHSBT consultant.

4.10.3. Storage and Handling of Granulocytes

Granulocytes are irradiated prior to issue and expire at midnight following the day of donation. Storage is at 22 ± 2 ºC without agitation.

4.10.4. Administration of Granulocytes

- Do not use a Pump to administer granulocytes.
- Pooled Granulocytes are derived from the buffy coat layer of whole blood donations. They are manufactured by pooling 10 packs of 'Leucocytes, Buffy Coat' removing red cells and plasma, re-suspending in SSP+ (platelet additive solution) and the plasma from one of the male donors.
- A standard adult dose is two pools (derived from 20 donations), providing a dose of around 2 x 10^{10} which is considered to be an effective daily dose. Children should receive 10-20mL/kg (usually 1 pool).
- Granulocytes should undergo the same compatibility testing as red cells. They should be ABO, D and crossmatch compatible with any red cell antibodies detected in the recipient.
- CMV negative recipients should receive only CMV negative granulocytes
- Each pool contains approximately 2.5 adult doses of platelets thus reducing platelet transfusion requirements
- Pooled Granulocytes can only be supplied Tuesday to Saturday during normal working weeks. They are not routinely available on Sundays, Mondays, Bank Holidays and the day after a Bank Holiday.
- Granulocytes MUST be irradiated to prevent transfusion associated graft versus host disease
- Granulocytes should be transfused over 1-2 hours.

4.12. THE USE OF ANTI-D IMMUNOGLOBULIN (INCLUDING FETOMATERNAL HAEMORRHAGE (FMH) TESTING)

Key Recommendations:

- Following potentially sensitising events, anti-D Ig should be administered as soon as possible and always within 72 h of the event. If, exceptionally, this deadline has not been met some protection may be offered if anti-D Ig is given up to 10 days after the sensitising event
- In pregnancies <12 weeks gestation, anti-D Ig prophylaxis is only indicated following ectopic pregnancy, molar pregnancy, therapeutic termination of pregnancy and in cases of uterine bleeding where this is repeated, heavy or associated with abdominal pain. A dose of 250 IU should be administered. A test for fetomaternal haemorrhage (FMH) is not required.
- For potentially sensitising events between 12 and 20 weeks gestation, a dose of 500 IU should be administered within 72 h of the event. A test for FMH is not required.
- For potentially sensitising events after 20 weeks gestation, an anti-D Ig dose of 500 IU should be administered within 72 h of the event. A test for FMH is required.

- All D negative pregnant women who have not been previously sensitised should be offered routine antenatal prophylaxis with anti-D Ig (RAADP) with a single dose of 1500 IU at 28 weeks.
- It is important that the 28-week sample for blood group and antibody screen is taken prior to the first routine prophylactic anti-D Ig injection being given.
- Routine Antenatal Anti-D Ig Prophylaxis (RAADP) should be regarded as a separate entity and administered regardless of, and in addition to, any anti-D Ig that may have been given for a potentially sensitising event.
- Following birth, ABO and Rh D typing should be performed on cord blood and if the baby is confirmed to be D positive, all D negative, previously non-sensitised, women should be offered at least 500 IU of anti-D Ig within 72 h following delivery. Maternal samples should be tested for FMH and additional dose(s) given as guided by FMH tests.
- In the event of an intrauterine death (IUD), where no sample can be obtained from the baby, an appropriate dose of prophylactic anti-D Ig should be administered to D negative, previously non-sensitised women within 72 h of the *diagnosis of IUD*, irrespective of the time of subsequent delivery.
- Auditable records of issue and administration should be maintained to allow full traceability of anti-D immunoglobulin
- Where anti-D is detected in a blood sample from a pregnant woman, further history should be taken and investigation undertaken to establish whether this is immune or passive. The outcome will inform clinical decisions regarding Anti-D prophylaxis and antenatal follow-up. If no clear conclusion can be reached as to the origin of the anti-D, then prophylaxis should continue to be administered in accordance with guidelines for D negative women who have not formed immune anti-D.

4.12.1. Anti-D Immunoglobulin

Anti-D Ig is used as immunoprophylaxis to prevent sensitisation to the D antigen during pregnancy or at delivery for the prevention of haemolytic disease of the fetus and newborn (HDN). Pregnant D negative women with no immune anti-D should be offered prophylactic anti-D Ig for potentially sensitising events listed below. A dose of anti-D Ig appropriate to the gestation, see dose required below, should be administered within 72 h of a potentially sensitising event. However if, exceptionally, this deadline cannot be met, some protection may still be offered if anti-D Ig is given up to 10 days after the sensitising event.

4.12.2. Potentially sensitising events in pregnancy

- Amniocentesis, chorionic villus biopsy and cordocentesis
- Antepartum haemorrhage/Uterine (PV) bleeding in pregnancy
- External cephalic version
- Abdominal trauma (sharp/blunt, open/closed)

- Ectopic pregnancy
- Evacuation of molar pregnancy
- Intrauterine death and stillbirth
- *In-utero* therapeutic interventions (transfusion, surgery, insertion of shunts, laser)
- Miscarriage, threatened miscarriage
- Therapeutic termination of pregnancy
- Delivery – normal, instrumental or Caesarean section
- Intra-operative cell salvage

4.12.3. Sensitising events in pregnancies of less than 12 weeks of gestation

- A maternal blood group and antibody screen should be performed to determine or confirm the Rh D group and check for the presence of immune anti-D.
- Women with anomalous Rh D typing results should be treated as D negative until confirmatory testing is completed.
- A test for fetomaternal haemorrhage (FMH) is NOT required.
- In cases of spontaneous complete miscarriage confirmed by scan where the uterus is not instrumented, or where mild painless vaginal (PV) bleeding occurs before 12 weeks, prophylactic anti-D immunoglobulin is not necessary because the risk of FMH and hence maternal exposure to the D antigen is negligible.
- In cases of therapeutic termination of pregnancy, whether by surgical or medical methods, and regardless of gestational age, previously non-sensitised D negative women should receive a dose of 500 IU prophylactic anti-D Ig within 72 h of the event.
- There is a significant potential for sensitisation in cases of ectopic pregnancy. A dose of 500 IU anti-D Ig should be administered to all cases of ectopic pregnancy in previously non-sensitised, D negative women regardless of the mode of management.
- There is significant potential for sensitisation in cases of molar pregnancy. A dose of 500 IU anti-D Ig should be administered to all cases of molar pregnancy in previously non-sensitised, D negative women.

4.12.4. Sensitising events in pregnancies of 12 weeks to less than 20 weeks of gestation

- A maternal blood group and antibody screen should be performed to determine or confirm the Rh D group and check for the presence of immune anti-D.
- If anti-D is identified, further history should be obtained and investigation undertaken to determine whether this is immune or passive (as a result of previous injection of anti-D Ig).
- If no clear conclusion can be reached as to the origin of the anti-D detected, then the woman should continue to be offered anti-D prophylaxis on the assumption that it may be passive.

- Women with indeterminate Rh D typing results should be treated as *D negative* until confirmatory testing is completed.
- A test for FMH is NOT required before 20 weeks gestation.
- For any potentially sensitising event listed above, confirmed D negative, previously non-sensitised, women should receive a dose of 500 IU anti-D Ig within 72 h of the event.
- D negative women presenting with continual uterine bleeding between 12 and 20 weeks gestation should be given a dose of 500 IU anti-D Ig, at a minimum of 6 weekly intervals.

4.12.5. Sensitising events in pregnancies of 20 weeks of gestation to term

- A maternal blood group and antibody screen should be performed to determine or confirm the Rh D group and check for the presence of immune anti-D.
- If anti-D is identified, further history should be obtained and investigation undertaken to determine whether this is immune or passive (as a result of previous injection of anti-D Ig).
- If no clear conclusion can be reached as to the origin of the anti-D detected, then the woman should continue to be offered anti-D prophylaxis on the assumption that it may be passive.
- Women with indeterminate Rh D typing results should be treated as *D negative* until confirmatory testing is completed.
- A FMH test is required to detect fetal cells in the maternal circulation and, if present, to estimate the volume of FMH to allow calculation of additional anti-D doses required to clear the fetal cells.
- If FMH >4 mL is detected, follow-up samples are required at 48 h following an intravenous (IV) dose of anti-D or 72 h following an intramuscular (IM) dose to check for clearance of fetal cells
- For any potentially sensitising event listed above, confirmed D negative, previously non-sensitised, women should receive a dose of 500 IU anti-D Ig within 72 h of the event.
- A dose of 500 IU anti-D Ig should be administered within 72 h for any potentially sensitising events regardless of whether the woman has already received RAADP at 28 weeks.
- Additional dose(s) of anti-D Ig will be necessary if the volume of FMH exceeds 4mL which is that covered by a 500 IU anti-D Ig dose. A follow-up blood sample should be taken at 48 h following each IV dose of anti-D and 72 h following each IM dose of anti-D to check if fetal cells have cleared.
- In the event of continual uterine bleeding which is clinically judged to represent the same sensitising event, with no features suggestive of a new presentation or a significant change in the pattern or severity of bleeding, such as the presence of abdominal pain or another clinical presentation, a dose of 500 IU anti-D Ig should be given at six weekly intervals. In the event of further intermittent uterine bleeding, estimation of FMH should be carried out at two weekly intervals.
- If the two weekly FMH test shows the presence of fetal cells, additional anti-D Ig should be administered to cover the volume of FMH. The additional dose should be calculated as 125

IU if administered IM or 100 IU if administered IV for each mL of fetal red cells detected (minimum 500IU).

- The additional dose should be offered regardless of the presence or absence of passive anti-D in maternal plasma, and FMH should be retested after 48 h if anti-D Ig has been given IV, or 72 h if given IM.
- If new symptoms develop suggestive of a sensitising event in addition to continual uterine bleeding (e.g. abdominal pain associated with a significant change in the pattern or severity of bleeding) then it should be managed as an additional sensitising event with an appropriate additional dose of anti-D and estimation of FMH. Each new sensitising event should be managed with an appropriate additional dose of anti-D Ig regardless of the timing or dose of anti-D Ig administered for a previous event.

4.12.6. Routine antenatal anti-D prophylaxis (RAADP)

RAADP should be offered to all D negative, non -sensitised, pregnant women.

- A sample should be taken for the routine antenatal 28-week blood group and antibody screen testing in pregnancy, before RAADP is given.
- If anti-D is identified in this sample, further investigations should be undertaken to determine whether this is immune or passive (i.e. previous administration of anti-D Ig).
- If no clear conclusion can be reached as to the origin of the anti-D detected, then the woman should continue to be offered anti-D Ig prophylaxis, and should continue to be monitored monthly until 28 weeks gestation and fortnightly thereafter.
- A single dose of anti-D Ig, 1500 IU should be administered at 28 weeks prior to the 28-week blood group and antibody screen sample being taken.
- Use of routine *antenatal* anti-D Ig prophylaxis should not be affected by previous anti-D Ig prophylaxis administered for a sensitising event earlier in the same pregnancy.

4.12.7. Estimation of Fetomaternal Haemorrhage (FMH)

A test for FMH estimation should be undertaken:

- On D negative women, following delivery of a D positive baby.
- Following all potentially sensitising events in D negative women after 20 weeks gestation

A test for FMH is NOT required:

- When the sensitising event is before 20 weeks because the fetal blood volume is insufficient to exceed that covered by the minimum anti-D immunoglobulin dose in standard use.
- When the fetus/baby is known to be D negative.
- When the woman is D positive

4.12.8. Sample requirements for FMH at delivery

Maternal sample: 1 x 4ml EDTA lavender top sample and 1 x 6mL EDTA pink top sample

Baby sample: 1 x 4ml EDTA lavender top sample and 1 x 6mL EDTA pink top sample.

Following delivery, a cord blood sample should be taken from the baby of a D negative woman to establish the ABO and D group. The sample should be taken with a syringe and needle from an umbilical cord blood vessel wherever possible. If cord blood is unavailable, then consideration should be given to obtaining another sample for blood grouping. If this is not possible, then it should be assumed that the baby is D positive for the purposes of FMH determination, and administration of anti-D immunoglobulin prophylaxis.

4.12.9. Sample requirements for FMH during pregnancy (after 20 weeks of gestation)

Maternal sample: A 4ml EDTA lavender top sample AND a 6mL EDTA pink top sample

4.13. REPORTING OF SERIOUS ADVERSE EVENTS AND REACTIONS FOLLOWING OR DURING TRANSFUSION

Key Recommendations:

- Initial clinical assessment seeks to quickly identify those patients with serious or life threatening reactions so that immediate treatment/resuscitation can be initiated.
- Initial treatment of an Acute Transfusion Reaction (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.
- Patients with mild isolated febrile reactions may be treated with oral paracetamol (500-1000mg in adults). Patients with mild allergic reactions may be managed by slowing the transfusion and treatment with an antihistamine.
- Patients should be asked to report symptoms which develop within 24 hours of completion of the transfusion.

4.13.1. Initial Clinical Assessment

Initial clinical assessment seeks to quickly identify those patients with serious or life threatening

reactions so that immediate treatment/resuscitation can be initiated.
Additional information and references are provided at the end of this document:

- ***Figure 1*** shows the guideline on the investigation and management of acute transfusion reactions Prepared by the BCSH Blood Transfusion Task Force.
- ***Figure 2*** is a practical guide to the recognition of suspected acute transfusion reaction.
- ***Figure 3****:* Comparison of TRALI and TACO
- **Figure 4:** Detailed symptoms and signs of acute transfusion reactions

4.13.2. Immediate management of ATR

If a patient develops new symptoms or signs during a transfusion, this should be stopped temporarily, but venous access maintained. Identification details should be checked between the patient, their identity band and the compatibility label of the blood component. Perform visual inspection of the component and assess the patient with standard observations.

Initial treatment of an Acute Transfusion Reaction (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.

Patients should be asked to report symptoms which develop within 24 hours of completion of the transfusion.

4.13.3. Mild Adverse Reactions

For patients with mild reactions, such as pyrexia (temperature of **> 38 oC and** a rise of 1-2oC), and/or pruritus or rash **but without** other features, the transfusion may be continued with appropriate treatment and direct observation.

- If at any time a transfusion reaction is suspected, the doctor in charge of the patient should be contacted by the nurse responsible for the patient during the transfusion and should review the patient promptly.

- Any adverse events should be recorded in the patient's notes and logged on the blood prescription sheet (WPR26563).

- It is the doctor's responsibility to ensure the adverse reaction is reported to Blood Bank.

- It is the responsibility of Blood Bank staff to report the event to senior Blood Bank staff or the Transfusion Practitioner to enable external reporting to SABRE (Serious Adverse Blood Reactions and Events) and/ or SHOT if appropriate.

Patients with mild isolated febrile reactions may be treated with oral paracetamol (500-1000mg in adults). Patients with mild allergic reactions may be managed by slowing the

transfusion and treatment with an antihistamine.

Standard observations

The patient s pulse rate, blood pressure, temperature and respiratory rate should be monitored and abnormal clinical features such as fever, rashes or angioedema frequently assessed. A patient who has experienced a transfusion reaction should be observed directly until the clinical picture has improved.

4.13.4. Severe Adverse Reactions

Management is guided by rapid assessment of symptoms, clinical signs and severity of the reaction.

- The transfusion must be stopped **immediately**.
- The blood administration set should be changed and venous access maintained using Sodium Chloride 0.9% running slowly to keep the vein open.
- The patients physician **must** be informed
- A Consultant Haematologist **must** be informed.
- The reaction should be reported **immediately** to the **Blood Bank**, who will issue a Transfusion Reaction Investigation sheet. Follow the instructions carefully, complete the sheet and return to Blood Bank as instructed along with any remaining blood products which may have been involved in the reaction.
- The vital signs should be monitored immediately, recorded, and appropriate action taken. Vital signs must continue to be monitored every 5 - 15 minutes depending on severity of reaction and until the possible reaction has resolved.
- The volume and colour of any urine passed should be recorded in the patient's notes.

Anaphylaxis

Anaphylaxis should be treated with intramuscular adrenaline (epinephrine) according to UKRC guidelines. Patients who are thrombocytopenic or who have deranged coagulation should also receive intramuscular adrenaline if they have an anaphylactic reaction

Hypotension

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.

Febrile symptoms of moderate severity

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

4.13.5. Investigation of a Suspected Severe Transfusion Reaction

- The completed form and samples should be sent **immediately** to the Blood Bank with the Blood Product bag/s and giving set.
- Samples required are group & save, FBC, U/E, LFT, coagulation screen, blood cultures.
- Blood Bank will complete all of the required laboratory investigations and report the findings back to the requesting location as soon as they are available.
- No further transfusion of units currently cross-matched should be undertaken until the Blood Bank investigations are complete – this may be mitigated by the Consultant Haematologist depending on circumstances

Documentation of Severe Adverse Events / Reactions

- Any adverse events should be recorded in the patient's notes and logged on the blood prescription sheet (WPR26564).
- Report via DatixWeb.
- All adverse events related to blood / blood product transfusion will be reviewed by the Hospital Transfusion Committee.
- Serious adverse events should be reported to the MHRA via SABRE (Serious Adverse Blood Reactions and Events) and to SHOT (Serious Hazards of Transfusion) via the Blood Bank.
- Suspected cases of transfusion-transmitted infection / TRALI should be reported immediately to the local Transfusion Centre via the Blood Bank.

Figure 1: Guideline on the investigation and management of acute transfusion reactions prepared by the BCSH Blood Transfusion Task Force

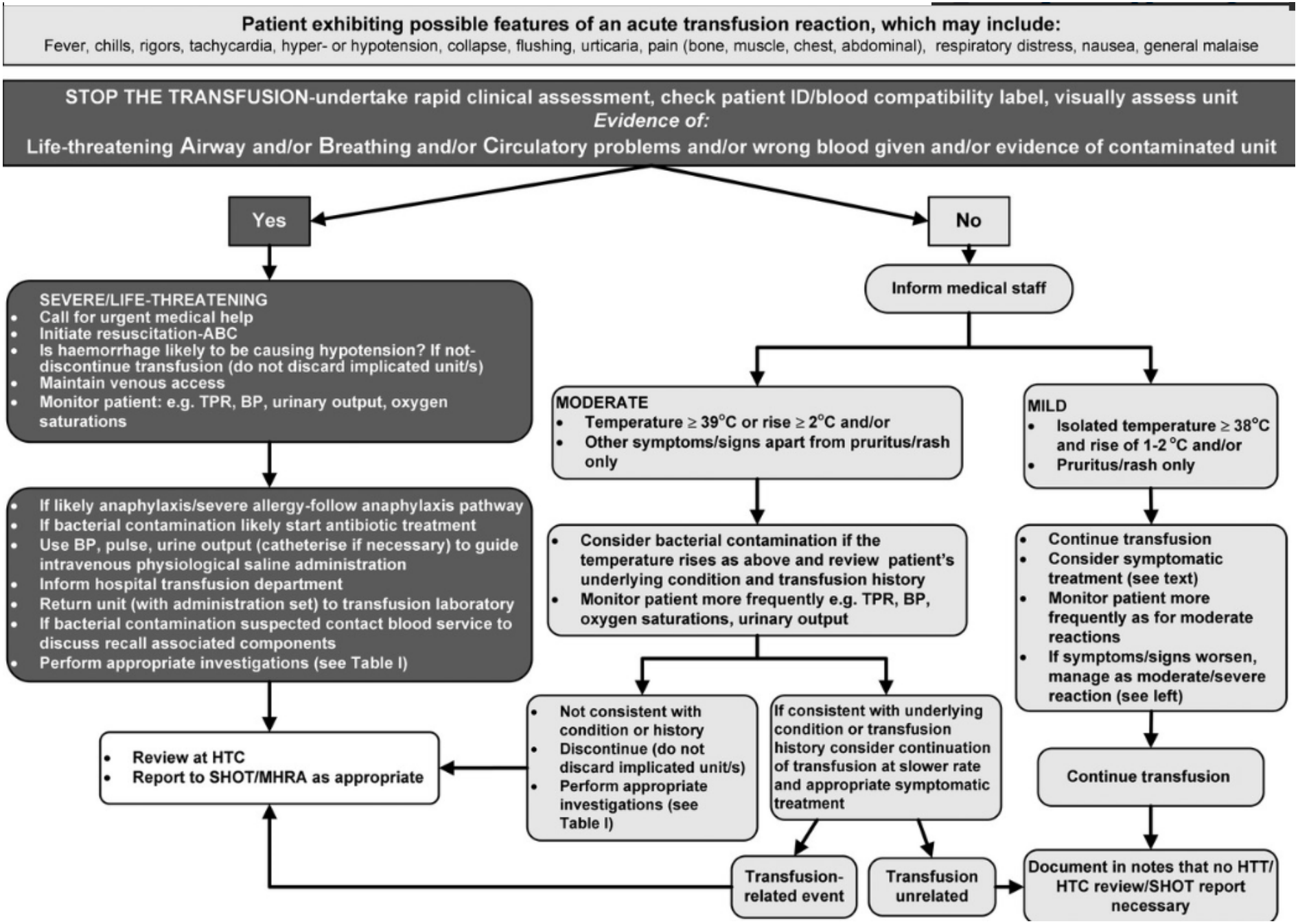

Figure 2: ISBT/IHN classification and recognition of suspected acute transfusion reactions.

	1 = Mild	2 = Moderate	3 = Severe
Febrile type reaction	A temperature ≥ 38 °C and a rise between 1and 2°C from pretransfusion values, but no other symptoms/signs	A rise in temperature of 2°C or more, or fever 39 °C or over and/or rigors, chills, other inflammatory symptoms/signs such as myalgia or nausea which precipitate stopping the transfusion	A rise in temperature of 2°C or more, and/or rigors, chills, or fever 39 °C or over, or other inflammatory symptoms/signs such as myalgia or nausea which precipitate stopping the transfusion, prompt medical review AND/OR directly results in, or prolongs hospital stay.
Allergic type reaction	Transient flushing, urticaria or rash	Wheeze or angioedema with or without flushing/urticaria/rash but without respiratory compromise or hypotension	Bronchospasm, stridor, angioedema or circulatory problems which require urgent medical intervention AND/OR, directly result in or prolong hospital stay, or **Anaphylaxis** (severe, life-threatening, generalised or systemic hypersensitivity reaction with rapidly developing airway and/or breathing and/or circulation problems, usually associated with skin and mucosal changes
Reaction with both allergic and febrile features	Features of mild febrile **and** mild allergic reactions	Features of both allergic and febrile reactions, at least one of which is in the moderate category.	Features of both allergic and febrile reactions, at least one of which is in the severe category.
Hypotensive reaction		Isolated fall in systolic blood pressure of 30 mm or more occurring during or within one hour of completing transfusion **and** a systolic blood pressure 80 mm. or less in the absence of allergic or anaphylactic symptoms. No/minor intervention required.	Hypotension, as previously defined, leading to shock (e.g., acidaemia, impairment of vital organ function) without allergic or inflammatory symptoms. Urgent medical intervention required.

Figure 3: Comparison of TRALI and TACO

	TRALI	TACO
Patient characteristics	More frequently reported in haematology and surgical patients	May occur at any age, but characteristically age > 70
Type of component	Usually plasma or platelets	Any
Speed of onset	During or within 6 hours of transfusion, usually within 2 hours.	Defined as occurring within 6 hours of transfusion
Oxygen saturation	Reduced	Reduced
Blood pressure	Often reduced	Often raised
JVP	Normal	Raised
Temperature	Often raised	Usually unchanged
CXR findings	Often suggestive of pulmonary oedema with normal heart size: may be a "whiteout"	Cardiomegaly, signs of pulmonary oedema
Echo findings	Normal	Abnormal
Pulmonary wedge pressure	Low	Raised
Full blood count	May be fall in neutrophils and monocytes followed by neutrophil leucocytosis	No specific changes
Response to fluid load	Improves	Worsens
Response to diuretics	Worsens	Improves

Figure 4: Detailed symptoms and signs of acute transfusion reactions

Fever and related symptoms or signs

Although characteristic of FNHTR, pyrexia and other symptoms or signs of an inflammatory response (myalgia, malaise, nausea, chills or rigors) may also occur in acute haemolysis, TRALI and bacterial transfusion-transmitted infection (TTI).

Transfusion can often be continued in patients with mild FNHTR but differentiation from other causes is not always straightforward. Life-threatening haemolysis due to ABO incompatibility is unlikely if the correct unit of blood has been given. Acute haemolysis due to other antibodies may occasionally present with immediate clinical features suggesting a severe or moderate febrile reaction during the transfusion, with signs of haemolysis appearing later. TRALI can be reasonably excluded if the patient has no respiratory symptoms. The possibility of bacterial TTI should always be considered as early appropriate treatment is life-saving. Several authors report this to be more likely if the rise in temperature is 2ºC or more .In the 16 confirmed reports of bacterial TTI to SHOT between 2005 and 2010, all patients had symptoms or signs in addition to pyrexia and, in the five cases where a specific temperature was stated this was either 39ºC or

above or associated with a rise of greater than 2ºC.

Inspection of the implicated unit is important as discolouration or abnormal particles are suggestive of contamination

Skin lesions and rashes

Urticaria is commonly seen with allergic reactions but other types of skin change may occur, such as maculopapular rashes, erythema or flushing. In some transfusion reactions there is no visible rash but itching is reported by the patient.

Angio-oedema

This describes localized, non-pitting, oedema of the subcutaneous or submucosal tissues and usually indicates an allergic reaction. The eyelids and mouth are most often affected, less commonly throat and tongue. If angio-oedema occurs, the transfusion must be stopped immediately and the patient promptly assessed and treated.

Dyspnoea

Shortness of breath is a non-specific symptom and successful management relies on careful clinical examination supported by the results of investigations such as radiology and measurement of oxygen saturation/blood gases. Possible causes include allergy, TRALI, TACO and TAD. Stridor and wheeze suggest an allergic reaction but also occur in patients with TACO and have been reported once, associated with chills and rigors, in bacterial TTI.

Pulmonary oedema with clinical signs of basal crackles and radiological evidence suggest a diagnosis of TACO or TRALI and helps exclude allergy. Low oxygen saturation is not diagnostic of a specific condition, although it gives information on severity. The possibility that clinical features are related to the patient s underlying illness must be kept in mind.

Anaphylaxis

The UK Resuscitation Council advises that a precise definition of anaphylaxis is not important for emergency treatment. An anaphylactic reaction involves a severe, life-threatening, generalised or systemic hypersensitivity reaction characterised by rapidly developing airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes.

Hypotension

This is defined as a drop in systolic and/or diastolic blood pressure of greater than 30 mm Hg. It is a common and non-specific feature of acute haemolysis, severe allergic reaction, bacterial contamination or TRALI. It occurs rarely as an isolated finding and some cases have

been attributed to the generation of bradykinin and angiotensin when blood components were exposed to the charged surface of leucoreduction filters. Patients taking ACE inhibitors and those with a genetic defect which prevents bradykinin breakdown were most at risk. In addition hypotension may be associated with the patient's underlying condition, especially haemorrhage, so careful clinical risk assessment is required when deciding to stop the transfusion for this indication.

Bleeding diathesis of acute onset

This is highly suggestive of disseminated intravascular coagulation (DIC) especially when there is oozing from wounds or intravenous line insertion sites. It is most likely in severe acute haemolysis (especially ABO incompatibility) or bacterial contamination and is an alert that the transfusion must be stopped immediately and rapid clinical assessment undertaken.

Tingling around the face and lips

This is a recognised herald symptom of angioedema but may also occur in patients who are hyperventilating or during a plasma or red cell exchange procedure with citrate anticoagulant due to a fall in ionised calcium.

Pain

Patients with febrile reactions often complain of generalised muscular and bone aches, probably due to release of inflammatory cytokines. Acute haemolytic reactions, particularly those due to ABO incompatibility, may be characterised by pain at the infusion site, abdomen, chest and loins. Chest pain can also be an occasional feature of anaphylactic reactions, possibly due to myocardial ischemia.

Severe Anxiety

This is often reported in serious transfusion reactions. A feeling of impending doom has been described in acute haemolysis and bacterial transfusion-transmitted infection and should always initiate urgent review of the patient. However, mild anxiety is common in patients being transfused, especially for the first time.

4.14. TRANSFER OF BLOOD PRODUCTS WITH PATIENTS

Key Recommendations:

- Blood products are not routinely transferred with patients except for in extremely urgent cases.
- It is encouraged to transfuse the patient prior to transfer where possible.

- When the patient is received at their location a sample should be sent to Blood Bank in that location so blood can be provided as and when needed with minimum delay.
- Blood products should only be packaged up by laboratory staff in a verified transport box.

4.14.1. Overview of Transfer of Blood Products

Blood is **not** routinely crossmatched and provided for transfer with patients, blood products will only be transferred for use in transit in **extremely urgent cases** such as an ECMO transfer.

When blood is transferred with a patient, the Trust remains legally responsibility for full traceability of the blood products we provide for the patient.

The escort team must include members of staff competent in transfusion and treatment of transfusion complications including anaphylaxis.

4.14.2. Transfer from Bassetlaw (BDGH) to Doncaster (DRI)

- The transfer team must contact BDGH Blood Bank; during the working day phone extension 572452, out of hours bleep the on-call Haematology BMS via switchboard.
- The transfer team must ensure Blood Bank have received a request to package blood for transfer. If blood is not already crossmatched, immediately despatch a sample and/or request form to BDGH Blood Bank.
- Blood products can only be packaged by Blood Bank staff in validated blood transit boxes with appropriate transfer documentation.
- Blood will not be sent to DRI separately from the patient.
- The transfer team have responsibility for ensuring full traceability of any blood products used in transit i.e. all tags must be completed and returned to Blood Bank.
- The transfer team must complete all accompanying transfusion related paperwork including the blood tags and ensure that all the paperwork is sent to Blood Bank at the receiving site.
- Any unused units and/or the blood transit box must be taken directly to Blood Bank at the receiving site.

4.14.3. Transfer from Mexborough to Doncaster (DRI)

- The transfer team must contact the on-site laboratory on ext 649196 and DRI Blood Bank; during the working day phone ext 644044, out of hours bleep the on-call Haematology BMS via switchboard.

- The transfer team must ensure crossmatched blood is available for transfer.
- Blood products can only be packaged by authorised staff in validated blood transit boxes with appropriate transfer documentation.
- The transfer team have responsibility for ensuring full traceability of any blood products used in transit.
- The transfer team must complete all accompanying transfusion related paperwork including the blood tags and ensure that all the paperwork is sent to Blood Bank at the receiving site.
- Any unused units and/or the blood transit box must be taken directly to Blood Bank at the receiving site.

4.14.4. Transfers to Hospitals outside the Trust

- The transfer team must contact Blood Bank during the working day, out of hours bleep the on-call Haematology BMS via switchboard.
- The transfer team must ensure Blood Bank have received a request to package blood for transfer. If blood is not already crossmatched, immediately despatch a sample and/or request form to Blood Bank.
- Blood products can only be packaged by Blood Bank staff in validated blood transit boxes with appropriate transfer documentation.
- Blood will not be sent to the receiving hospital separately from the patient.
- The transfer team have responsibility for ensuring full traceability of any blood products used in transit.
- The transfer team must complete all accompanying transfusion related paperwork including the blood tags and ensure that all the paperwork is returned to Blood Bank at the sending site.
- Any unused units and/or the blood transit box must be taken directly to Blood Bank at the receiving site.

5. TRAINING/ SUPPORT

Role specific competencies are in place. Staff must have the relevant competencies to perform a transfusion related task / procedure e.g. venepucture, collection of blood products, administration of blood products and prescribing blood products. Competencies are recorded on OLM. Advice regarding the relevant competencies is available from the Transfusion Practitioner.

6. MONITORING COMPLIANCE WITH THE PROCEDURAL DOCUMENT

- The Hospital Transfusion Team will ensure that systematic audit and review of the transfusion process is undertaken and will report outcomes to the Hospital

Transfusion Committee.

- This will include participation in the programme for national comparative audit of blood transfusion as well as local and regional audits.

- The Hospital Transfusion Committee will review all serious adverse transfusion events / reactions which must be notified direct to blood bank staff in addition to the Trust's incident reporting system; Datix.

7. DEFINITIONS

All defined within the document.

8. EQUALITY IMPACT ASSESSMENT

The Trust aims to design and implement services, policies and measures that meet the diverse needs of our service, population and workforce, ensuring that none are disadvantaged over others. Our objectives and responsibilities relating to equality and diversity are outlined within our equality schemes. When considering the needs and assessing the impact of a procedural document any discriminatory factors must be identified.

An Equality Impact Assessment (EIA) has been conducted on this procedural document in line with the principles of the Equality Analysis Policy (CORP/EMP 27) and the Fair Treatment for All Policy (CORP/EMP 4).

The purpose of the EIA is to minimise and if possible remove any disproportionate impact on employees on the grounds of race, sex, disability, age, sexual orientation or religious belief. No detriment was identified. (See Appendix 1)

9. ASSOCIATED TRUST PROCEDURAL DOCUMENTS

- PAT/PA 19 Mental Capacity Act 2005 Policy and Guidance, including Deprivation of Liberty Safeguards (DoLS)

- PAT/PA 28 Privacy and Dignity Policy

- PAT/PS 7 Patient Identification Policy

- PAT/PA 2 Consent to Examination or Treatment Policy

- PAT/PA 24 Transfer of Patients and their Records

10. DATA PROTECTION

Any personal data processing associated with this policy will be carried out under 'Current data protection legislation' as in the Data Protection Act 2018 and the UK General Data Protection Regulation (GDPR) 2021.

For further information on data processing carried out by the trust, please refer to our Privacy Notices and other information which you can find on the trust website: https://www.dbth.nhs.uk/about-us/our-publications/information-governance/

11. REFERENCES

This policy is written in accordance with the following guidelines and policies: **BSH Guidelines**

- Use of Platelet Transfusions 2016
- Haematological Management of Major Haemorrhage 2015
- Use of Anti-D Immunoglobin for the Prevention of Haemolytic Disease of the Fetus and Newborn 2014
- Management of Anaemia and Red Cell Transfusion in Adult Critically Ill Patients 2012
- Pre-transfusion Compatibility Procedures in Blood Transfusion Laboratories 2012
- Investigation and Management of Acute Transfusion Reactions 2012
- Use of Irradiated Blood Components 2020
- Administration of Blood Components 2017
- The Estimation of Fetomaternal Haemorrhage 2009
- Spectrum of Fresh-Frozen Plasma and Cryoprecipitate products 2018

APPENDIX 1 – EQUALITY IMPACT ASSESSMENT - PART 1 INITIAL SCREENING

Service/Function/Policy/Project/ Strategy	**Division**	**Assessor (s)**	**New or Existing Service or Policy?**	**Date of Assessment**
Blood Transfusion Policy – Blood Components, Blood Products and Transfusion Reactions	Pathology	Gill Bell	New Policy	14.06.2021

1) Who is responsible for this policy? Name of Division/Directorate: Pathology

2) Describe the purpose of the service / function / policy / project/ strategy? The policy provides the Trust with local procedures for pre-administration of blood products.

3) Are there any associated objectives? Legislation, targets national expectation, standards – Yes compliance with BSQR 2005, BSH & NICE guidelines.

4) What factors contribute or detract from achieving intended outcomes? Lack of compliance

5) Does the policy have an impact in terms of age, race, disability, gender, gender reassignment, sexual orientation, marriage/civil partnership, maternity/pregnancy and religion/belief? No

. **If yes, please describe current or planned activities to address the impact** [e.g. Monitoring, consultation]

6) Is there any scope for new measures which would promote equality? [any actions to be taken

7) Are any of the following groups adversely affected by the policy?

Protected Characteristics	**Affected?**	**Impact**
a) Age	No	
b) Disability	No	
c) Gender	No	
d) Gender Reassignment	No	
e) Marriage/Civil Partnership	No	
f) Maternity/Pregnancy	No	
g) Race	No	
h) Religion/Belief	No	
i) Sexual Orientation	No	

8) Provide the Equality Rating of the service / function /policy / project / strategy – tick (✓) outcome box

Outcome 1 ✓	**Outcome 2**	**Outcome 3**	**Outcome 4**	

If you have rated the policy as having an outcome of 2, 3 or 4, it is necessary to carry out a detailed assessment and complete a* **Detailed Equality Analysis form - see CORP/EMP 27.

Date for next review: June 2024

Checked by: Atchuta Bobbili **Date: 14.06.2021**