

**Barnsley Hospital Transfusion Guideline, Version 9.04**

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	<b>4.</b> Stroke Unit, Kendray Hospital
	<b>5.</b> Ward 5, Mount Vernon Hospital
	<b>6.</b> Ward 6, Mount Vernon Hospital

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## 1. Introduction

This document outlines the procedures to be followed by Barnsley Hospital NHS Foundation Trust staff when dealing with blood transfusions. It is crucial that all staff involved in requesting, processing and administering blood transfusions are appropriately trained and aware of the importance of their individual contribution to ensuring patient safety. The first key decision is whether a transfusion is clinically indicated and if its benefits outweigh the potential risks. Once a decision has been made to transfuse blood or blood components it is essential that “the right patient receive the right blood product”. The procedures are designed to prevent fatalities, reduce complications and ensure that blood stocks are used efficiently.

This document and all external guidelines referred to throughout this document are endorsed by the Hospital Transfusion Forum, is based on current national guidelines (British Committee for Standards in Haematology) produced by the Blood Transfusion Taskforce of BCSH in collaboration with the Royal College of Nursing and the Royal College of Surgeons. The document will be reviewed and updated on a regular basis to take into account any clinical and technological developments.

## 2. Roles & Responsibilities

The responsibility to ensure that any blood or blood product given to a patient is the correct unit for that recipient rests solely with the person(s) giving the transfusion who must be a registered nurse or medical practitioner.

A doctor or designated practitioner must request blood and blood products by completing and signing the Transfusion request form. The patient should be asked if they carry a blood group card which may have important information concerning their blood group and antibody status. The blood or blood product must also be correctly written up on a prescription, fluid chart or treatment sheet.

The Blood Transfusion staff must carry out the required grouping, antibody screening and crossmatching as appropriate, except when emergency stocks are used. When flying squad blood or un-crossmatched group compatible blood is transfused, the senior medic assumes responsibility for the transfusion. Full documentation is required to maintain a full audit trail.

The policy has been produced and will be managed by the Hospital Transfusion Team (HTT), including the Consultant in charge of Transfusion, the Transfusion Laboratory Manager and the Transfusion Practitioner(s). Updates and amendments will be sanctioned through HTT in the first instance but also through the Hospital Transfusion Forum (HTF) including wider ratification.

### 2.1 Role of Hospital Transfusion Forum

The Hospital Transfusion Forum is currently chaired by the Head of Transfusion (Consultant Haematologist). It reports directly to the Trust Board. Its objective is to promote good transfusion practice in accordance with national guidelines.

The functions of the Transfusion Committee are:

- promote best practice through local protocols based on national guidelines
- promote appropriate use of blood and blood components
- lead multi-professional audit of the use of blood components within the NHS Trust, focusing on specialities where demand is high, e.g. haemato-oncology and certain surgical specialities

- Promote a Trust wide patient blood management programme and consider alternatives to blood transfusion
- promote the education and training of all clinical and support staff involved in blood transfusion
- have the authority to modify existing blood transfusion protocols and to introduce appropriate changes to practice
- report regularly to local, and through them to national, blood user groups
- consult with local patient representative groups where appropriate
- contribute to the development of clinical governance
- assist and endorse the Hospital Transfusion Team in appropriate rationing in the event of a shortfall in blood supply

## 2.2 Standards and Practice

**Safety - Blood transfusion is potentially hazardous and should only be undertaken when the benefits to the patient outweigh the risks.**

Mistakes occur in:

- The collection or labelling of the cross match sample
- Pre-transfusion checks at the bedside
- The laboratory

Systematic error reporting reduces subsequent error rates. All clinical staff are required to report errors relating to the transfusion process on the DATIX reporting system and their line manager if necessary. The laboratory staff will record incidents onto Q-Pulse.

## 2.3 Key points of Good Transfusion Practice

### 2.3.1 Transfusion should only be given when there is no alternative.

Blood transfusion should be given on the basis of symptoms and risk rather than to achieve target haemoglobin. Avoid transfusion when alternative measures are available (e.g. replace iron, cell salvage etc).

### 2.3.2 Consider a single unit transfusion and reassess the patient's clinical condition

In shock, oxygenate and replace fluids. Red cell transfusion is *not* optimal volume replacement.

The clinician must record the reason for transfusion in the patient's notes. **Verbal consent must be sought and recorded in the notes.** Patients must be made aware of the risks & benefits of transfusion; refer to the current patient information leaflet titled 'Will I need a blood transfusion?' Patients must be aware they have received a transfusion as part of their treatment.

Patients with a low body mass index (BMI) will have a smaller blood volume and require a smaller transfusion to achieve the same increment in Hb. Pre-transfusion clinical assessment should identify patients at increased risk of Transfusion Associated Cardiac Overload (TACO) (the elderly and those with one or more risk factors for TACO – cardiac failure, renal impairment, hypoalbuminaemia, fluid overload).

### 2.3.3 Overnight Transfusion

There are significantly increased risks to transfusing outside core hours **so the transfusion must be clinically ESSENTIAL.** If transfusions need to take place at night the reason for this must be clearly stated in the patient notes. **All non-essential transfusions should be completed by 21:00.**

Nursing staff should be vigilant for complications of transfusion. Staff should ensure Positive Patient Identification, and that the patient is clearly visible and regular

### 3. Product liability and Legal Requirements

Every individual involved in procedures leading to the transfusion of blood and blood products is bound by the Product Liability legislation (Consumer Protection Act, 1987). This demands that clear links be established between each stage in the procedure from collection of the sample to infusion of the blood or blood products. It must be possible to trace each stage, the time at which it occurred, and the individuals who were involved.

### 4. Management of Patients who refuse allogenic blood components

- Jehovah's witnesses are Christians. They refuse blood transfusions as they feel it violates God's law as expressed in a number of biblical passages. (Genesis 9:3, 4. Acts 15:19-21)
- The refusal of non-JW patients is generally based on the fear of transfusion-transmitted infection; the risk should be clearly explained.
- The Trust will ensure the individual's beliefs / preferences are acknowledged and respected and that relevant information is provided for the management of these patients.
- For further details refer to the guidelines for the management of Jehovah's Witness and others who refuse blood available on the hospital SharePoint.

### 5. Collection of Blood Transfusion Samples

- Suitably trained and competency assessed Phlebotomists, Healthcare Assistants, Nursing and Medical Staff may collect samples for pre-transfusion testing.
- Positive patient identification and attention to detail is vital when labelling sample tubes, in order to ensure safe transfusion practice. Inadequate patient identification and/or sample labelling may lead to fatal ABO incompatible transfusions. **The department now has a zero tolerance policy to comply with national recommendations. As a result of this, samples not meeting the sample labelling criteria will not be accepted.**
- **Addressograph labels must not be used to label the sample.**

#### Blood Sampling

- The sample required is 4.9mls of blood in a blue EDTA Sarstedt Blood Transfusion bottle (NHS supply chain product code [KCM 131]) minimum blood for processing is 2ml. Paediatric samples must also be collected in the same tube, a minimum of 0.5 ml is required. Sample bottles **MUST** be in date.
- Samples are retained for a maximum of 14 days within re Fridgerated storage, however they are only serologically viable for a maximum of 7 days (depending on previous transfusion history)
- Patients from pre-assessment must be asked if they have had a blood transfusion between the sample being taken and admission to this hospital. It is essential that Blood Bank is then informed and a fresh sample is sent for group and screen or electronic issue. **Failure to follow these directions can seriously compromise the patient's safety.**
- Blood specimens must **NOT** be obtained from the tubing of an IV set or from a vein in which an IV solution is flowing.

- All inpatients must have a wristband on at the time of sample collection and during the transfusion. Extra care must be taken to positively identify outpatients who do not have wristbands.
- The patient should be asked to state their name and D.O.B and the wristband checked against these details before any samples are taken. The person taking the blood must label the sample in the presence of the patient immediately after taking the sample, with three points of identification. A unique patient identification number (Hospital unit number if present must be given priority), full name & D.O.B. The sample must also be labelled with the date and time the sample was taken, gender, location and signature of the person taking the sample. Samples must be labelled legibly and accurately in ball point pen to avoid washing off or smudging. It is at this stage that most errors occur which may result in a patient receiving an incompatible blood transfusion. Extreme care must always be exercised when taking transfusion-related samples.

Please Note: for Antenatal samples only, if a unique patient identification number is not available, the patients address including postcode can be used as a third identifier following discussion with senior laboratory staff.

#### **A&E Department**

In situations where the identity of the patient is unknown (Unconscious patient and/or Major Accident) a new hospital unit number is issued, which should be merged at a later date with the patients existing hospital unit number. The sample is labelled as Unknown Patient 123 etc. Blood crossmatched for an unknown patient may be transfused later when the patient's identity is known, as long as the original wristband with the original number remains on the patient. A new sample is required if it is removed. In situations where the computer is unavailable A&E numbers are used. Please note the full A&E number must be written on the sample and form.

It is important that the sex of the patient and the approximate age is stated as it may influence the selection of blood and blood products.

#### **Guidelines regarding patients with previous transfusion history**

To ensure that the specimen used for compatibility testing is representative of a patient's current immune status, serological testing should be performed using blood collected no more than 3 days in advance of actual transfusion when the patient has been transfused or pregnant within the preceding 3 months.

Patient transfused	Sample to be taken not more than
Within last 3 months	72 hours before transfusion
Over 3 months ago	Up to 7 days before transfusion

- A formal deviation from the "3 day rule" may be considered for chronically transfused patients with no alloantibodies, following multiple repeated episodes, allowing samples to remain valid for up to 7 days. This principle may be extended to pregnant women with no clinically significant antibodies who require blood on standby for potential obstetric emergencies e.g. placenta praevia; or to cover planned caesarian section within 7 days of sample collection.
- It is recognized that there may be a problem obtaining samples from pregnant women who, for example, are booked for elective caesarian section, but may not arrive in the hospital until shortly before surgery. As immunisation is more likely to occur during the last trimester of pregnancy, samples used for pre-transfusion testing should never be more than 7 days old. Where possible, it is advisable that a sample taken immediately before

transfusion is also available for retrospective testing in the event of a transfusion reaction occurring.

## 6. Completing the Blood Transfusion Request form

The request form must be fully completed by a registered medical staff or a designated and competent senior nurse. It is their responsibility to ensure that any special requirements, e.g. CMV negative, irradiated products, bone marrow transplant or solid organ transplant are communicated to the Blood Bank.

The decision to transfuse must be based on the most recent blood results alongside a thorough clinical assessment of the patient and their individual requirements. The rationale for the decision to transfuse and the specific components to be transfused should be documented in the patient's clinical records. All requests for transfusion must provide a clear, unambiguous reason for transfusion. Terms such as 'Pre-op', 'Anaemia' or 'Low Hb' alone are not acceptable and provide inadequate information for audit purpose.

The details on the request form are important and could have medico-legal implications. The request form and sample should be clearly handwritten. The correct request form must be used. There are three request forms as follows, Antenatal Serology, Neonatal and Blood Transfusion Request Form.

It is vitally important for the previous transfusion history to be detailed on the request form remembering that the patient may have been transfused in other hospitals. Ask the patient for details and check the case notes. The date, time and number of units transfused should be documented. This can be written in the 'Other relevant Information' box.

The request form must contain the following information:-

- Patient details (surname, first name, gender, DOB and patient identification number).
- Ward/Location and Consultant in charge.
- Diagnosis and unambiguous reason for transfusion. Terms such as Anaemia, Pre-op and low Hb are unacceptable.
- "High Risk" sticker if appropriate.
- Previous pregnancies (This can be written in the 'Other relevant Information' box).
- Number and type of blood components required or batch products, including any special requirements. For PCC, please state the patient's weight and INR. For rFVIIa (Novoseven), please state the patient's weight.
- Date and time required (am and pm is not sufficient)
- Signature of person authorising the request

It is important that the Surname (printed) and bleep number of requesting Medic or competent senior nurse is printed legibly, so that any problems that may arise can be discussed with the relevant medical team. Blood Bank staff and the Clinical Haematologist are available for advice if required.

The Blood Bank should be informed directly regarding Urgent samples by phone or bleep 205 (out of hours) and the form should then be labelled "**URGENT**" with an indication of the time and date that blood is required for. The term "ASAP" does not help the laboratory staff to determine priorities.



### **Telephone requests for blood and blood products**

If the Blood Bank holds a viable sample on the patient you will be asked to provide part or all of the following information:

- Your name and position
- Patient's surname, first name, identification number and/or date of birth
- Number and type of blood products required
- Any special requirements
- The time and date required

All requests for blood and blood products must conform to maximum blood order schedule and provide adequate information regarding diagnosis or pending procedures. Blood Transfusion staff will question any inadequate or inappropriate information by contacting the clinical team. All outcomes will be logged to provide full audit trail.

### **Antibody Screening and crossmatching procedures**

A full group and antibody screen is essential in providing blood for the patient. Blood may be electronically issued or serologically crossmatched later depending on individual circumstances.

The following section describes the methods by which blood is made available and how the degree of urgency must be indicated. Excellent communication between the clinician and Blood Bank is vital for patient safety.

- **Routine practice – Group and Antibody Screen**

This is normal procedure for any patient who may require blood. The sample is ABO and RhD typed with an antibody screen performed to detect atypical red cell antibodies, which could result in a delay in the provision of blood. This also ensures that the patient's details are on the blood bank computer to check against any future samples. If clinical staff suspect that blood products may be required, it is advisable that a Group and Screen sample be sent at the earliest opportunity.

- **Routine practice – Group, screen and Electronic Issue of Blood**

This is the normal procedure for patients who require blood or are undergoing surgery that requires blood on standby.

For routine surgical procedures please refer to the Maximum Blood Ordering Schedule (MBOS). Samples should be sent to the laboratory a minimum of 24 hours before surgery – if antibodies are present between 2 and 4 working days will be required, please contact Blood Transfusion for further assistance. Please note that if the patient has had any recent transfusions this may affect sample viability.

Requests for blood, which differ from the MBOS schedule, will require Blood Bank to be informed of the reason. If operations are cancelled the Blood Bank must be informed so that blood can be allocated to other patients.

- **Urgent request for blood – Emergency Issue**

In an emergency, requests can be made by telephone. The Blood Transfusion staff will then give an indication on the products that would be available and the time scale.

- During the core working day the Blood Bank can be contacted by phone. Ext. 2628
- Monday – Friday 08:45 – 20:00hrs.
- Outside of these hours – please bleep 205 Biomedical Scientist for Haematology.

### Life-threatening haemorrhage – Immediate transfusion

For life-threatening situations where the patient is likely to die from exsanguination before blood can be crossmatched, a limited stock of O RhD Negative, K negative blood is available in the issue fridge. Blood bank must be informed if this is required and in general only two units should be issued.

A paediatric flying squad unit is also available. Please contact Blood Transfusion staff as soon as possible if it is thought this unit may be required to ensure the unit is issued in preparation for immediate collection by the clinical staff on their arrival.

## 7. Compatibility testing (Crossmatching)

- Compatibility testing is carried out on patients where either all the rules for electronic issue have not been fulfilled or if the patient has an atypical red cell antibody.
- If red cell antibodies are detected or known to be present in a patient's sample, further tests are required to identify or confirm the antibody. Non-urgent transfusion and surgery may have to be delayed until suitable red cell units are available. Blood bank will inform the clinician or ward if any problems or delays have been identified and whether further samples are required.
- It is necessary to perform compatibility testing for all patients that have a positive antibody screen. In more complex antibody cases the RCI Department of NHS Blood and Transplant (NHSBT), Sheffield will undertake compatibility testing. Blood transfusion staff will advise the clinician or ward on the expected availability of blood in these cases. Blood may be provided as "Suitable" rather than "Compatible" and more care than usual should be taken in transfusing the patient as a reaction may still occur.
- If the patient needs a transfusion urgently before compatible blood can be provided, the risk of transfusing blood must be balanced against the risk of delaying transfusion. The doctor responsible for the patient's care must take full responsibility for the transfusion. If the medical advice is required, the Haematology Medic can be contacted.

## 8. Storage of Blood and Blood Components

- Red cells are stored in a designated refrigerator known as the Stock fridge at 2-6°C. Once issued for a patient, the blood is transferred to the Issue fridge. Both fridges are reserved for the storage of blood and are located in the air-conditioned issue room next to the laboratory.
- FFP, Cryoprecipitate, Methylene blue treated FFP and Octaplas (commercially-available FFP) are kept in the freezer at below -25°C and are thawed immediately prior to use. Once thawed, these products should be used as soon as possible.
- Platelets are not routinely stored in the hospital Blood Bank but are ordered from NHSBT, Sheffield for patients as required. They are then kept in Blood Bank under special storage conditions, which preserve their clinical efficacy. Platelets are stored in the platelet incubator at 22°C. **Platelets must not be refrigerated.** They are issued as an adult or paediatric "therapeutic dose" and must be transfused **immediately** after collection.

- The fridges, freezers and platelet agitator have high and low temperature alarms and also temperature chart recorders which provide 7 day recording. They are monitored by a centralised temperature monitoring system. Any alarms will be monitored and acted upon by the laboratory staff. Alarms are also monitored externally by the current supplier, who will alert laboratory staff and hence provide 24/7 cover. Any problems must be reported to the Blood Transfusion Laboratory immediately. The monitoring system provider are responsible for regular maintenance of the system and records. Blood Transfusion staff perform checks on the alarms and change the charts weekly.
- Issued blood that is not used within 24 hours of the stated time of requirement will automatically be returned to stock. For blood to be held longer, arrangements must be made with the Blood Bank on Ext. 2628.

## 9. Withdrawal of Blood and Blood Components

- Withdrawal of blood and blood products from Blood bank will be performed by a member of staff who has been fully trained and deemed competent to use the Blood Audit and Release System (BARS). *Full procedure available on the hospital share point.*
- It is the responsibility of the ward manager to ensure that staff, who remove blood from the blood bank, are competent to do so. Staff competencies must be revised 2 yearly. The Transfusion Practitioner will inform both staff and department leads prior to access de-activation and provide suitable training as required.
- All staff will receive a personal ID bar code to permit access to BARS. Please ensure that the person collecting the blood product brings the patients transfusion care pathway. If the care pathway is not in use for that location alternative documentation should be available. All documentation should have the 3 patient identifiers present.
- Mount Vernon Hospital general office and the Hospice will arrange transport and send the patient's care pathway complete with full identification sealed in an envelope with a driver. This will be returned in the same way, with the unit of blood packed in a cool box.

### **Transport of Blood Components between hospitals**

Very occasionally, blood is transferred between hospitals, providing medical escort is present with patients requiring emergency specialist treatment. There are now statutory regulations relating to transportation of blood, which include the completion of a 'Blood transfer' form, and the use of an approved insulated carrier box with cool pack inserts. These boxes will store blood safely for 3 hours if unopened. If the requirements have not been fulfilled, the blood is considered hazardous and must not be transfused.

When blood is required for transfer, the **Blood Bank must be informed as soon as possible**. Blood Bank staff will then complete the required documentation, sign out and pack the blood for transit. They will then fax the documentation to the Blood Bank at the receiving hospital and telephone so that procedures will be in place to receive the blood that is being transferred. If known please inform Blood Bank staff the details of the ward/department the patient will be admitted to at the receiving hospital.

On arrival the escort staff must ensure that the receiving hospital Blood Transfusion laboratory is made aware blood is present. This will ensure suitable validated storage is maintained and vein to vein traceability is guaranteed.

## 10. Administering blood and blood products including administration sets and equipment

*Full procedural details available on the “Blood Product” Department page; click on shared documents*

## 11. Monitoring the Transfusion

*Full procedural details available on the “Blood Product” Department page; click on shared documents*

## 12. Advertise effect of transfusion

Blood transfusion has potential risks and any treatment decision must balance the likely benefit against the potential risks for each individual patient. Responsibility for safe transfusion therapy is shared among the manufacturers, who must ensure the safety and efficacy of the product, clinicians, who must prescribe and use transfusion therapy correctly and Blood Bank, who are responsible for the testing and issuing of the components.

Potential transfusion reactions or adverse events can occur with all any blood component transfused – therefore it is essential that all patients be nursed in clinical areas where they can be readily observed and monitored. Transfusions should only take place at night if there is a clearly documented clinical need.

All adverse events of transfusion, including ‘near miss’ events, must be brought to the attention of a senior member of the Blood Bank staff. An NHS Incident Report (IR1/Datix) must be completed and the incident reported to the SABRE (Serious Adverse Blood Reaction or Event) or SHOT (Serious Hazards of Transfusion) if this is deemed necessary.

The Blood Safety and Quality Regulations require that from 8<sup>th</sup> November 2005, all serious adverse events or serious adverse reactions be reported to the MHRA, by blood establishments and hospital blood banks/hospital transfusion teams. SABRE is an online system that allows the drafting, editing, saving, and submissions of notifications and subsequent confirmations of blood related adverse events or reactions.

The Serious Hazards of Transfusion System (SHOT) is a national, confidential, voluntary Haemovigilance scheme for reporting serious adverse events relating to transfusion of blood components. Any incident or “near miss” should be reported to the Blood Bank who will then report the case to the Medicines and Healthcare products Regulatory Agency and SHOT where necessary. All transfusion accidents or errors are also reviewed by the Hospital Transfusion Committee with the objective of identifying any problems relating to procedures or training which can be rectified for the safety of patients.

### **Alerting of potential transfusion reaction**

- When determining whether to investigate a suspected transfusion reaction, clinical advice should be sought. Use the flowchart below to ascertain whether laboratory serology investigation is required. Note that isolated urticarial reaction and/or temperature rises of

$\leq 2^{\circ}\text{C}$  above baseline (not exceeding  $39^{\circ}\text{C}$ ) with no other symptoms do not require further laboratory investigation.

<b>Moderate</b>	<b>Mild</b>
↓	↓
<b>STOP the transfusion</b> <ul style="list-style-type: none"><li>• Inform medical staff immediately</li><li>• Review underlying condition and transfusion history</li><li>• Instruct clinical staff to complete Transfusion reaction form <b>SOP-HAE-BB-F-D-177</b></li><li>• Commence Laboratory investigation using form <b>SOP-HAE-BB-F-D-178</b></li><li>• Instruct Clinical staff to complete DATIX clinical incident</li></ul>	<ul style="list-style-type: none"><li>• Continue transfusion (slow rate if required)</li><li>• Consider symptomatic treatment</li><li>• If condition resolves, clinical staff to document in notes but no further action required.</li><li>• If condition DOES NOT resolve or worsens, stop the transfusion and Instruct clinical staff to complete Transfusion reaction form <b>SOP-HAE-BB-F-D-177</b></li><li>• Proceed as per moderate reaction</li></ul>

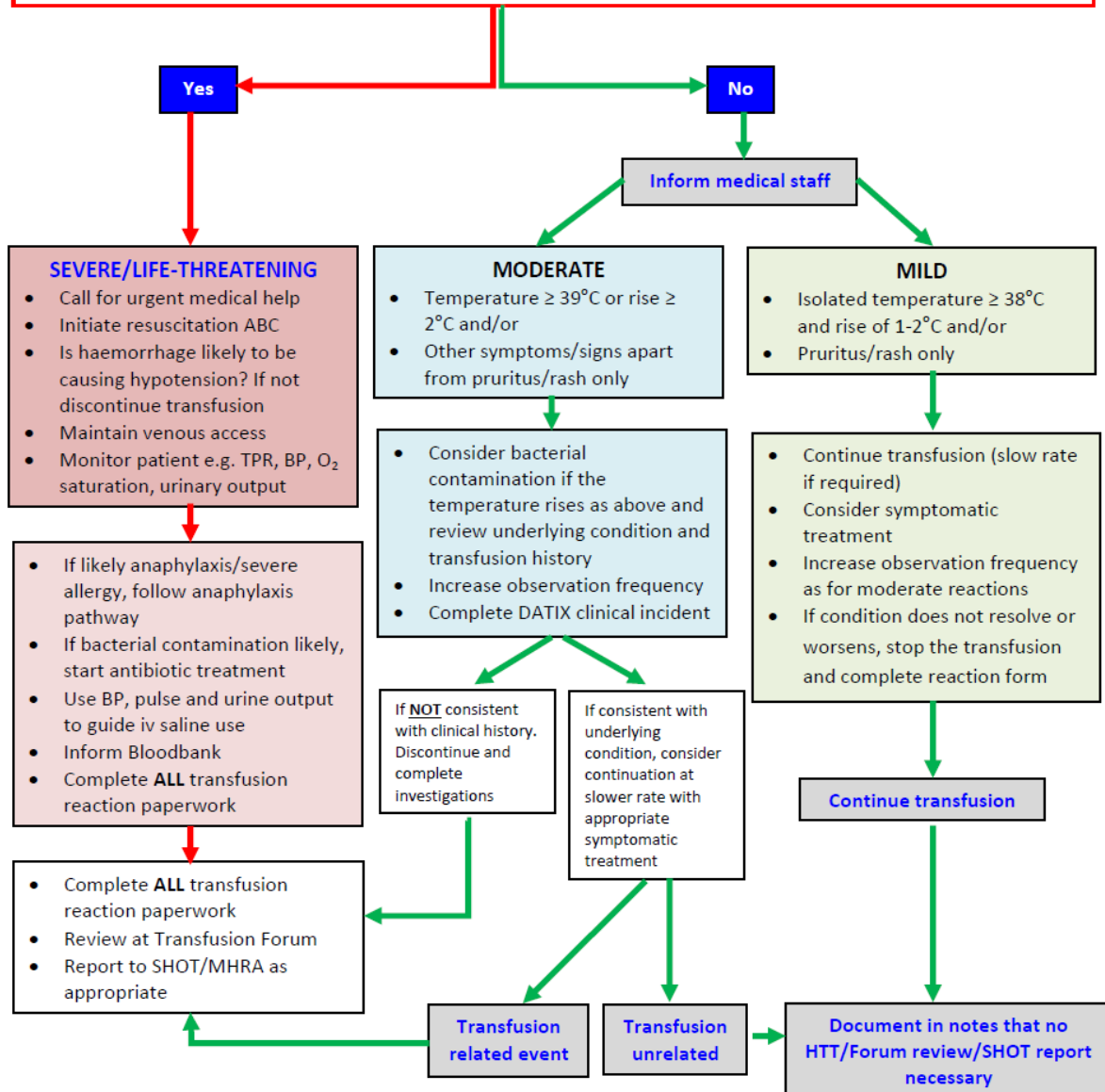
- Ward staff **MUST** inform the attending medic who in turn should report to the consultant Haematologist if the incident requires clinical advice.

**PATIENT EXHIBITING POSSIBLE FEATURES OF AN ACUTE TRANSFUSION REACTION, WHICH MAY INCLUDE:**

Fever, chills, rigors, tachycardia, hyper- or hypotension, collapse, flushing, urticarial, pain (bone, muscle, chest, abdominal), respiratory distress, nausea, general malaise.

**STOP THE TRANSFUSION:** undertake rapid clinical assessment, check patient ID, visually assess unit.

Is there evidence of Life-threatening Airway and/or Breathing and/or Circulatory problems and/or wrong blood given and/or evidence of contaminated unit?



**Acute, possible life-threatening physiological reactions to a transfused blood component include:**

• Acute Transfusion Reaction

Reactions occurring at any time up to 24 hours following a transfusion of blood or components, **excluding** cases of acute reactions due to incorrect component being transfused, haemolytic reactions, transfusion-related acute lung injury (TRALI), transfusion-related circulatory overload (TACO), Transfusion Associated Dyspnoea (TAD) or those due to bacterial contamination of the component. These could include: Isolated Febrile, Minor Allergy to Anaphylaxis.

- Acute Haemolytic Transfusion Reaction (intravascular haemolysis)

**Acute** HTRs are defined as fever and other symptoms / signs of haemolysis within 24 hours of transfusion; confirmed by one or more of the following in: a fall of Hb, rise in LDH, positive DAT and positive crossmatch.

- Delayed Haemolytic Transfusion Reactions

**Delayed** HTRs are defined as fever and other symptoms / signs of haemolysis more than 24 hours after transfusion; confirmed by one or more of: a fall in Hb or failure of increment, rise in bilirubin, positive DAT and positive crossmatch not detectable pre-transfusion. Simple serological reactions (development of antibody without positive DAT or development of haemolysis) are excluded.

- Post Transfusion Purpura

Thrombocytopenia arising 5-12 days following transfusion of red cells, associated with the presence in the patient of alloantibodies directed against the HPA (Human Platelet Antigen) systems.

- Transfusion-associated Graft-versus-Host disease

Characterised by fever, rash, liver dysfunction, diarrhoea, pancytopenia and bone marrow hypoplasia occurring less than 30 days after transfusion. The condition is due to engraftment and clonal expansion of viable donor lymphocytes in a susceptible host.

- Transfusion Associated Circulatory fluid Overload (TACO)

Any four of the following occurring within six hours of transfusion: Acute respiratory distress, tachycardia, increased blood pressure, acute or worsening pulmonary oedema, or evidence of positive fluid balance.

- Transfusion Associated Dyspnea (TAD)

TAD is characterized by respiratory distress within 24 hours of transfusion that does not meet the criteria of TRALI, TACO, or allergic reaction. Respiratory distress should not be explained by the patient's underlying condition.

- Transfusion-related acute lung injury (TRALI)

Acute dyspnoea with hypoxia and bilateral pulmonary infiltrates during or within six hours of transfusion. Many of the serious adverse events that occur during transfusion of blood and blood components are generally unpredictable.

- Transfusion Transmitted Infection (TTI)

Cases of bacterial transmission from blood components, where cultures from the patient's blood match cultures from the component bag and/or from the donor. Transmissions of viruses, whether routinely tested for by the blood services or not. Transmissions of other agents such as prions, protozoa and filaria.

***In addition to the adverse events already listed the following are also considered to be adverse events and so blood bank must be informed. These may include:***

- Wrong Blood Transfused (Incorrect or Inappropriate Blood Component Transfused)

All reported episodes where a patient was transfused with a blood component or plasma component which was intended for another patient.

- Special Requirements Not Met (Incorrect or Inappropriate Blood Component Transfused)

Transfusion of blood of inappropriate specification or that did not meet the patient's special requirements. e.g. failure to provide CMV negative components, irradiated components or blood of

incorrect phenotype. Also failure to provide the correct component to patients born after 01.01.1996.

- Unnecessary or Inappropriate transfusions

These are cases in which the intended transfusion is carried out, and the component itself is suitable for transfusion and for the patient, but where the decision making is faulty. There are also cases where a transfusion of blood or a blood component was clinically indicated but was not undertaken. Including: Prescription of components that are not required, or where another component or therapy would have been more clinically appropriate, incorrect dose or rate, or failure to transfuse and under transfusion

- Handling and Storage Errors

Unsafe transfusion where there were handling or storage errors such as a component out of temperature control, or delay in completion of transfusion.

- RBRP (Right Blood Right Patient)

Incidents that involve labelling errors or component administration with incorrect or missing details

- Near Miss

A near miss is an error or deviation from standard procedures or policies that is discovered before the start of the transfusion and that could have led to a wrongful transfusion or to a reaction in a recipient.

***Additional events although reporting not essential to SHOT:***

- Alloimmunisation

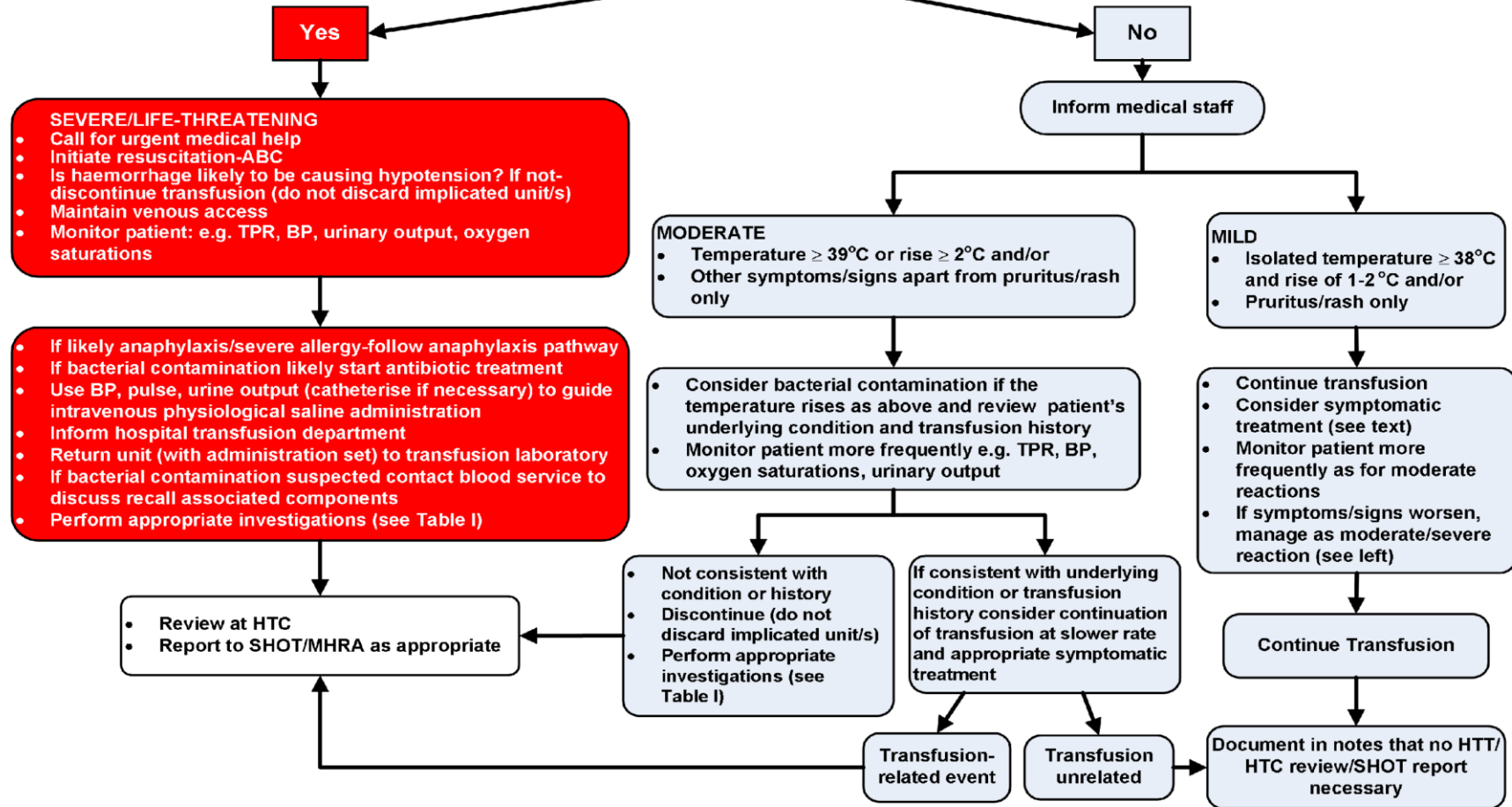
Alloimmunisation occurs when, after a transfusion, there is demonstration of clinically significant antibodies against red blood cells which were previously absent (as far as is known) and when there are no clinical or laboratory signs of haemolysis.

Development of an antibody with positive DAT or development of haemolysis is excluded



**Patient exhibiting possible features of an acute transfusion reaction, which may include:**  
 Fever, chills, rigors, tachycardia, hyper- or hypotension, collapse, flushing, urticaria, pain (bone, muscle, chest, abdominal), respiratory distress, nausea, general malaise

**STOP THE TRANSFUSION-undertake rapid clinical assessment, check patient ID/blood compatibility label, visually assess unit**  
**Evidence of:**  
**Life-threatening Airway and/or Breathing and/or Circulatory problems and/or wrong blood given and/or evidence of contaminated unit**



### 13. Red Blood Cells

The reason for each transfusion must be recorded in the case notes. Patients should not be transfused to achieve a 'normal' Haemoglobin. The decision to transfuse should always be made on an individual patient basis taking into consideration all appropriate blood results, the patient's clinical presentation and their individual requirements.

#### Transfusion triggers

The table below is designed to help decide when a transfusion is appropriate and to minimise unnecessary exposure to transfusion but it is accepted that clinical judgement will play an essential part in deciding whether to transfuse.

Anaemia	Transfusion indicated
Hb 20 – 50 g/l	RBC transfusion is generally indicated However, some patients with chronic anaemia may be asymptomatic and the cause of the anaemia should be investigated and treated if possible.
Hb 50 – 70 g/l	Critical care patients -RBC transfusion is likely indicated Chronic anaemia – transfusion may be indicated but should be treated as above Post-op anaemia – RBC transfusion is only indicated if clinically symptomatic
Hb 70 – 80 g/l Research demonstrate many patient benefits from maintaining a 'restrictive threshold' (BMJ 2015)	RBC transfusion may be necessary especially in patients with significant co-morbidities and are clinically symptomatic. Including critical care cases.

Single unit administration is part of the Patient Blood Management (PBM) initiatives: evidence based patient centred strategy to improve patient's outcomes whilst ensuring that every unit of blood transfused is appropriate

As standard practice, single unit transfusions if deemed appropriate should be applied to **all stable non bleeding patients**. One unit of red cells should be prescribed and transfused in non-bleeding patients, the patient should then be clinically reassess along with a further blood count to determine if a further transfusion is needed.

## 14. Fresh Frozen Plasma

Fresh Frozen Plasma is available as single donor units (approximately 200ml) from NHSBT and from Octapharma as solvent/detergent treated virally-inactivated plasma in 200ml packs called Octaplas. FFP contains high levels of all coagulation proteins including labile factors V & VIII.

Calculations for one Adult Therapeutic Dose FFP		
Patients Wt (kg)	FFP dose - Volume / units	
	12mls/kg	Approximate units FFP
up to 60 kg	720 mls	<b>3</b>
61 - 65 kg	780 mls	<b>3</b>
66 - 70 kg	840 mls	<b>3</b>
71 - 75 kg	900 mls	<b>4</b>
76 - 80 kg	960 mls	<b>4</b>
81 - 85 kg	1020 mls	<b>4</b>
86 - 90 kg	1080 mls	<b>4</b>
91 - 95 kg	1140 mls	<b>4</b>
100+ kg	1200 mls	<b>5</b>

Volume of FFP in a unit is variable, mean FFP volume is 271mls (rounded up to 275mls for ease of calculation)

Clinical indications for FFP (usually at a dose of 12-15ml/Kg) include:

- Replacement of single coagulation factor deficiency where specific factor concentrate is unavailable.
- Multiple coagulation factor deficiencies and disseminated intravascular coagulation (DIC).
- Immediate reversal of warfarin effect if prothrombin complex concentrate (PCC) is unavailable.
- Thrombotic Thrombocytopenic Purpura. (TTP)
- Haemostatic defects associated with liver disease if bleeding or for invasive procedures.
- Clinically abnormal haemostatic following massive blood transfusion or major surgery (see section 20).
- Treatment of angio-oedema due to C1 inhibitor deficiency if specific concentrate is unavailable.

FFP is generally not indicated for:

- Vitamin K deficiency in neonates or patients on ITU.
- Reversal of prolonged international normalised ratio (INR) in the absence of bleeding.
- As replacement fluid in plasma exchange procedures – except for TTP.

Contraindications for the use of FFP.

- FFP should never be used as a volume expander in hypovolaemia.
- Plasma components should not be used routinely in patients with known hypersensitivity to plasma, for example IgA deficient patients with anti-IgA antibodies.

The clinical indication for the use of FFP should be written into the medical notes so that it can be subjected to Clinical Audit.

Requests for FFP may be referred to a Haematologist, and if agreed, a transfusion request form should be sent to the Blood Bank. A sample is required if the blood group is not known. The FFP provided will be ABO group compatible. FFP will be thawed and should be transfused as soon as possible after thawing. In certain circumstances FFP may be stored in the issue fridge for up to 24 hours. It must not be stored in a refrigerator at ward level.

The UK Department of Health have recommended that FFP given to neonates and individuals born on or after 01.01.1996 should be obtained from an area free of BSE and subjected to pathogen-reduction procedures. Methylene Blue FFP (MBFFP) is therefore available for neonates and paediatrics.

Octaplas may be issued as an alternative to Methylene Blue FFP. Octaplas is solvent detergent (SD) treated pooled plasma sourced outside the UK. This product is supplied in 200ml bags and will generally be issued for paediatric cases, pregnant women and severely immunosuppressed patients.

For more in-depth information please refer to the Guidelines for the use of Fresh Frozen Plasma and Cryoprecipitate is available on the hospital SharePoint.

## 15. Cryoprecipitate

Cryoprecipitate should be given if the fibrinogen level is < 1g/l and /or DIC has been diagnosed with severe bleeding. (Initial dose for an adult is typically 2 pooled units, with each unit containing 3-6g fibrinogen in a 200-500ml volume)

Cryoprecipitate will be thawed and should be transfused immediately within 4 hours. Infusion should not take more than 30 minutes. Once thawed cryoprecipitate should be stored at room temperature and **NOT** in the Blood Bank fridge at 4°C.

Other indications for use of cryoprecipitate may include: -

- DIC when measured fibrinogen <1g/l
- Fibrinogen replacement therapy for congenital deficiency/dysfunctional states

Neonatal and Paediatric Methylene Blue Cryoprecipitate is also available from NHSBT and should be used for all patients born on or after 01.01.1996.

For more in-depth information please refer to the Guidelines for the use of Fresh Frozen Plasma and Cryoprecipitate is available on the hospital SharePoint.

## 16. Platelets

Platelets are prepared by pooling single donations or by platelet-pheresis of donors. They have a limited shelf life of 7 days (maximum). The risk of serious bacterial infections and TRALI must always be considered when transfusing platelets

Platelets are indicated in the treatment of non-immune thrombocytopenic bleeding. The dose and indication should be discussed with a Haematologist. The efficacy of transfusion can be measured by a platelet count 1 hour after transfusion (a full blood count obtained 15 minutes after the completion of a platelet transfusion can be effective as demonstrating incrementation to platelet transfusions)

A blood transfusion request form must be completed and sent to the Blood Bank. A sample is required if the blood group is not known.

- If Rh (D) positive platelets are transfused to Rh (D) negative females of childbearing age, they should receive anti-D immunoglobulin (250iu) to prevent the small number of red cells causing red cell immunisation.
- Platelets should be administered using a special giving set. The unit should be examined prior to transfusion for damage and possible leaks and evidence of unusual colour, turbidity and flocculation which might suggest bacterial contamination
- Occasionally reactions can occur and these can be treated with hydrocortisone 100 mg. IV and chlorpheniramine 10 mg. IV (adult doses).
- If there is no clinical response or no platelet increment, it may be necessary to use HLA matched platelets (discuss with Haematologist).

For more in-depth information please refer to the Guidelines for the use of Platelet Transfusion available on the hospital SharePoint

DIAGNOSIS	PLATELETS INDICATED	COMMENT
Bone marrow failure Leukaemia	Yes	Active bleeding associated with low platelets although spontaneous haemorrhage is unlikely if platelets > 10
Surgery	Yes	Maintain platelets >50 Plt count should be checked post transfusion to ensure threshold is reached
Platelet function disorders	Rarely	
Massive transfusion	Yes	Maintain platelets >50 Multiple trauma/CNS injuries maintain >100
DIC	Yes	If bleeding maintain platelets >50 Not indicated if no blood loss
Auto immune thrombocytopenia	Rarely	Only indicated if life-threatening haemorrhage involving GIT or GU bleed into CNS
NAIT - Neonatal allo immune thrombocytopenia	Yes	Transfuse compatible platelets asap HLA 1a neg, HPA 5b neg plts will be effective in 95% cases
PTP – Post transfusion purpura	Rarely	Give high dose IVIg – platelets are ineffective but may be used in severe bleeds
<b>CONTRAINDICATIONS</b>		
Chronic stable thrombocytopenia	NO	Best avoided if platelets >10
TTP – Thrombotic Thrombocytopenic Purpura	NO	
HIT – Heparin Induced Thrombocytopenia	NO	

## 17. Albumin

- Albumin is supplied as 4.5 or 5% Human Albumin Solution (HAS) or 20% HAS, otherwise known as Salt poor albumin (SPA).
- 4.5 or 5% HAS can be used for acute blood volume replacement in shock, burns, plasmapheresis and for patients with low albumin. 20% HAS (or SPA) is hyper-oncotic and will expand the plasma volume. It is used in hypo-proteinaemic patients with fluid overload e.g., in renal and liver disease. It is important to monitor circulatory status during infusion.

Refer to Sharepoint for further information.

## 18. Immunoglobulin

Immunoglobulin preparations are made by cold ethanol fractionation of pools of human plasma. Some preparations, which have high titre IgG specific antibodies, are available - Anti-D, Tetanus, Measles, Hepatitis B, Varicella Zoster, Human rabies, CMV and Rubella.

- Anti-D is obtained from Blood Bank but all the other Ig preparations may be obtained from Pharmacy. Anti D is only issued if a group and antibody screen has been received. All these preparations are generally given intra-muscularly (Rhophylac can be given intravenously if required in response to a large TPH).

## 19. Other Blood Products

### 19.1 Antithrombin III

- Antithrombin III deficiency is a rare hereditary disorder that generally comes to light when a patient suffers recurrent venous thrombosis and pulmonary embolism. Inheritance is usually autosomal dominant, though a few recessive cases have been noted. These patients are treated with anticoagulants or, more rarely, with antithrombin concentrate.
- An increasing number of plasma products are becoming available. Their use needs to be discussed with a Haematologist.

### 19.2 Recombinant Activated Factor VIIa (rVIIa – NovoSeven)

- The Bloodbank does not routinely stock rVIIa.
- Recombinant activated factor VII may be requested on the advice of the Consultant Haematologist.
- The use of rVIIa is not recommended in the management of major haemorrhage unless as part of a clinical trial.
- Detailed preparation and administration guidance will be distributed with the product by the Transfusion laboratory staff at the time of issue.

### 19.3 Prothrombin Complex Concentrate (PCC) - Beriplex

- Prothrombin Complex Concentrate (Beriplex) is indicated in treating haemorrhages caused by a congenital or acquired deficiency of Factors II,VII, IX and X and emergency/overdose situations during oral anticoagulant treatment.
- Detailed preparation and administration guidance will be distributed with the product by the Transfusion laboratory staff at the time of issue.

**Bleeding and perioperative prophylaxis of bleedings during vitamin K antagonist treatment:**  
 Dosage depends on the pre treatment INR and the targeted INR.

**Dose is based on body weight up to but not exceeding 100 kg.**

For patients weighing more than 100 kg, the maximum single dose (IU of Factor IX) should therefore not exceed:

- 2500 IU for an INR of 2.0 – 3.9
- 3500 IU for an INR of 4.0 – 6.0
- 5000 IU for an INR of > 6.0.

Beriplex® P/N Dose recommendations <sup>1</sup>			
Initial INR	2.0 - 3.9	4.0 - 6.0	> 6.0
Approximate dose (ml/kg body weight)	1	1.4	2
Approximate dose IU (factor IX)/kg body weight	25	35	50

**Patients taking Novel Oral AntiCoagulants (NOAC) drugs such as apixaban, rivaroxaban, dabigatran**

Beriplex administration under these circumstances should be based on the advice of the consultant haematologist **ONLY**. A suggested dose should be 50iu/kg and should be given **WITHOUT** referral to INR value which can often be misleading.

Beriplex P/N Dose recommendations (for patients taking NOACs ONLY)	
Dosing regime for treatment of patients taking Apixaban, Rivaroxaban, Dabigatran or Edoxaban.	50 IU/kg

## 20. Special requirements for blood and blood components

### 20.1 Irradiated Blood components

Cellular blood products contain leucocytes, which can cause Graft versus Host disease in a recipient with marked immunodeficiency.

Irradiated blood products are required for the following cases: -

- Bone Marrow transplant recipients.
- Intra-uterine transfusion.
- Congenital or acquired immuno-deficiency state (e.g. SCID).
- Patients receiving blood from first-degree relatives.
- Neonatal exchange transfusion.
- Hodgkin's Disease
- Purine analogue drugs- Fludarabine, cladribine and deoxycoformicin
- Patients receiving the immunosuppressive agent alemtuzmab (anti-CD52)

Blood products, which have been irradiated, have a red label, which changes colour to black when exposed to radiation (see below). If a patient requires Irradiated blood components and the unit has

a label indicating **NOT** Irradiated, please **DO NOT** commence the transfusion and contact the bloodbank immediately.



## 20.2 CMV Negative Blood components

### Indications for transfusion of CMV negative products.

- CMV seronegative red cell and platelet components should be provided for intra-uterine transfusions and for neonates (i.e. up to 28 days post expected date of delivery).

All paediatric blood packs and other cellular blood components intended for neonates should be provided as CMV seronegative.

- CMV seronegative red cell and platelet components should be provided for elective transfusions during pregnancy (not during delivery).

If, in an emergency situation, it is not possible to provide CMV negative blood products, leucodepleted products of unknown serostatus may be used.

### Contraindications

- No relevant literature was found that supported the use of CMV seronegative blood for immunodeficient patients.

These patients should receive leucodepleted blood.

- CMV seronegative red cells and platelets may be replaced with leucodepleted blood components post haemopoietic stem cell transplantation, for all patient groups including seronegative donor/seronegative recipients.

Patients requiring transfusions who may require a transplant in the future may also safely be transfused with leucodepleted products (e.g. seronegative leukaemia or thalassaemia patients).

However, CMV PCR monitoring should become common practice and be considered for all patients (even CMV negative/negative patients) to allow early detection of any possible CMV infection (whether transfusion-transmitted or otherwise acquired).

For further information please refer to the Special Requirement Policy on Ward 24 & Chemotherapy Unit available on the to Chemotherapy Service website.



### 20.3 Hepatitis E Virus (HEV) Negative Blood components

The hepatitis E virus (HEV) is found throughout the world in both humans and animals, especially pigs. The most common route of infection in the UK is from eating raw or undercooked meat (particularly pork products) and shellfish; however, HEV can be transmitted via blood transfusion and solid organ transplantation.

Incidence of HEV in the UK has been increasing considerably since 2011. A study carried out in 2012/13 showed that approximately 1 in 3000 blood donors in the south of England had HEV at the time of donation.

While the risk of HEV to the general population is negligible, the Advisory Committee on the Safety of Blood, Tissues and Organs (SaBTO) has now recommended that certain patient groups who are immunocompromised/immunosuppressed should receive HEV negative blood components. Unlike screening for cytomegalovirus (CMV), this recommendation is being applied to both cellular components (i.e. red cells, platelets and granulocytes) and plasma components (fresh frozen plasma and cryoprecipitate). All HEV negative blood components manufactured by NHSBT, from UK donations, will be labelled 'NEG: HEV'.

#### Which patients need to receive HEV negative blood components?

- Patients awaiting solid organ transplant (SOT) – from 3 months prior to date of planned elective SOT or from the date of listing.
- Patients who have had SOT – for as long as the patient is taking immunosuppressants.
- Patients with acute leukaemia – from diagnosis (unless/until a decision is made not to proceed with stem cell transplant).
- Patients awaiting allogeneic stem cell transplant – from 3 months prior to the date of planned transplant and up to 6 months following transplant, or for as long as the patient is immunosuppressed.

As of May 2017, all blood components issued by NHSBT will be HEV screened

### 21. Haematological Management of Major Haemorrhage

While there are arbitrary definitions of massive blood loss, e.g:

- loss of one blood volume within a 24-h period
- 50% blood volume loss within 3 h
- loss of 150 ml/min

However these may be difficult to apply in the acute situation. Indeed, standard definitions are not particularly helpful because they are retrospective. It may not be straight forward to readily determine that major haemorrhage is occurring, for example post-partum; but early recognition of significant blood loss, ideally before major increments in pulse rate and falls in blood pressure, will allow prompt action to pre-empt shock.

A pragmatic clinically based definition is **“bleeding which leads to a systolic blood pressure of less than 90 mm Hg or a Heart rate of more than 110 beats per minute”**.

Appropriate management must include early detection of the bleeding source followed by prompt measures to minimise blood loss, restore tissue perfusion and oxygenation to achieve haemodynamic stability by:

- Treating any surgical source of bleeding and further resuscitation after stopping the bleeding
- Correcting coagulopathy by early use of blood component therapy.
- Hypotension resuscitation, aiming to maintain the systolic BP no more than 90mmhg until the bleeding has stopped. (Although this is not appropriate in patients with associated head injuries when the systolic should be maintained >90mmhg throughout)

The management of a patient with major haemorrhage has 3 elements:

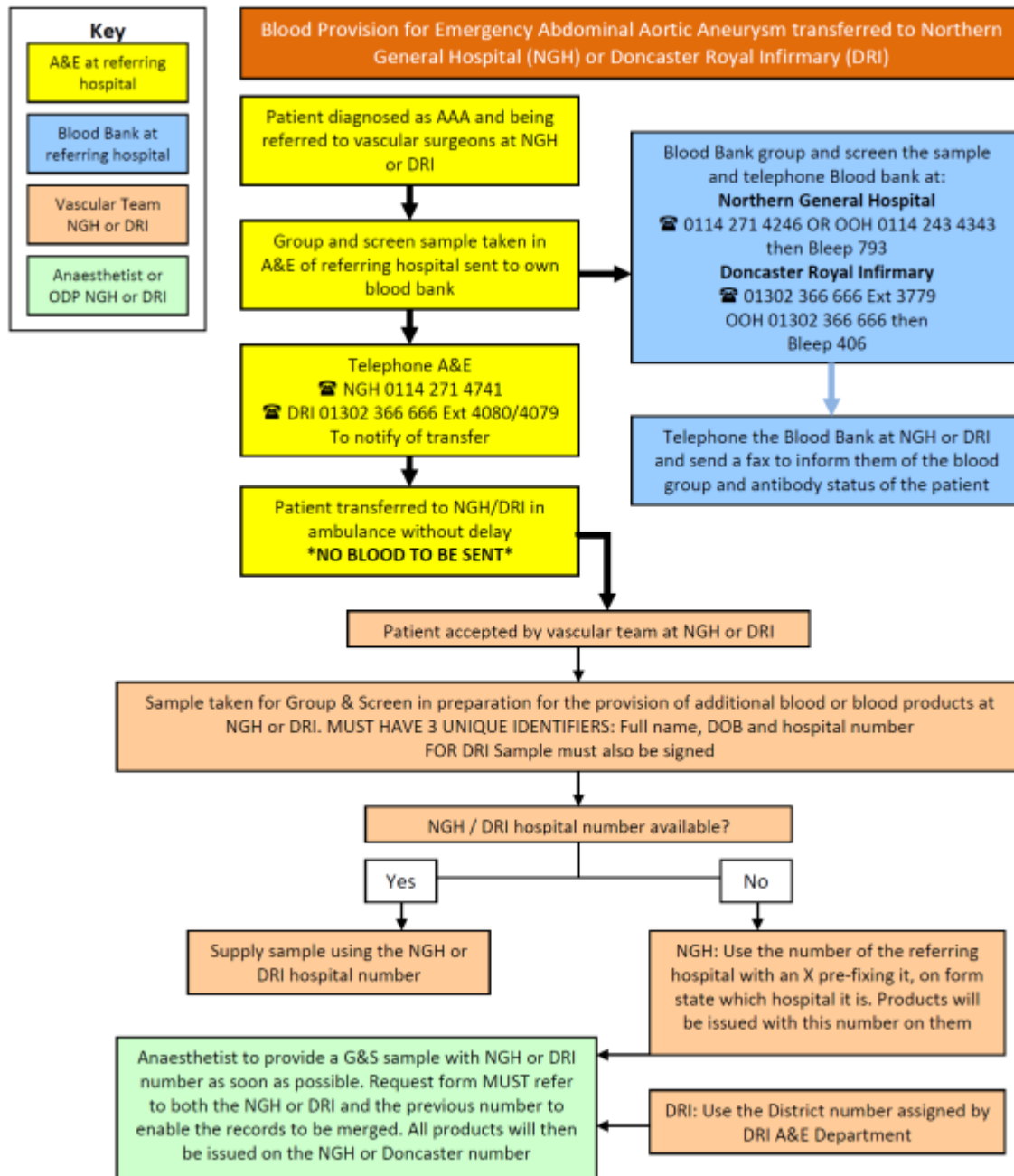
- Assessment and resuscitation following advanced life support principles,
- Arrest or control of bleeding (use of surgical, radiological and endoscopic techniques),
- Haemostatic including transfusion support.

*Full procedural details available on the "Blood Product" Department page; click on shared documents*

## 21.1 Management of Massive Blood Loss Guideline Overview

Goal	Procedure	Comments
<b>Restore circulating volume</b>	<ul style="list-style-type: none"> <li>Insert wide-bore peripheral cannulae</li> <li>Maintain hypotension resuscitation, aiming to maintain the systolic BP &gt;80 mmhg and urine output 30 ml h<sup>-1</sup></li> </ul>	<ul style="list-style-type: none"> <li>➤ 14 G or larger</li> <li>➤ Monitor central venous pressure</li> <li>➤ Blood loss is often underestimated</li> <li>➤ Keep patient warm</li> </ul>
<b>Contact key personnel</b>	<ul style="list-style-type: none"> <li>Clinician in charge, On call anaesthetist</li> <li>Blood Transfusion Department &amp; On call Consultant Haematologist</li> </ul>	<ul style="list-style-type: none"> <li>➤ Nominated coordinator should take responsibility for communication and documentation.</li> </ul>
<b>Arrest bleeding</b>	<ul style="list-style-type: none"> <li>Early surgical or obstetric intervention</li> <li>Interventional radiology</li> </ul>	
<b>Request laboratory investigations</b>	<ul style="list-style-type: none"> <li>FBC, PT, APTT, fibrinogen; blood-transfusion sample, biochemical profile, blood or pulse oximetry</li> <li>Ensure correct sample identity</li> <li>Repeat FBC, PT, APTT, fibrinogen every 30-60 minutes</li> <li>Repeat after blood component infusion</li> </ul>	<ul style="list-style-type: none"> <li>➤ Take samples at earliest opportunity but DO NOT wait for results before commencing component resuscitation.</li> <li>➤ Misidentification is commonest transfusion risk</li> <li>➤ May need to give components before results available.</li> </ul>
<b>Request suitable red cells</b>	<ul style="list-style-type: none"> <li>Uncrossmatched group O RhD negative used in extreme emergency, however MAXIMUM of 2 units advised</li> <li>When blood group known, Electronic issue of blood may be available</li> <li>If irregular antibodies present, full manual crossmatch will be performed (or referral to NHSBT)</li> <li>When time permits use blood warmer and/or rapid infusion device</li> </ul>	<ul style="list-style-type: none"> <li>➤ RhD positive is acceptable if patient is male or postmenopausal female</li> <li>➤ Trigger Hb 80-90 g/dl with a target &lt;100 g/dl</li> <li>➤ Emergency O Negative rbc's available within 5 minutes of request.</li> <li>➤ Xmatched rbc's available usually within 45 minutes of receipt of G&amp;S sample.</li> <li>➤ Blood warmer indicated if flow rate &gt;50 ml kg<sup>-1</sup> h<sup>-1</sup> in adult</li> </ul>
<b>Request platelets</b>	<ul style="list-style-type: none"> <li>Allow for delivery time from NHSBT</li> <li>Anticipate platelet count &lt;50x10<sup>9</sup> litre<sup>-1</sup> after 2 x blood volume replacement</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Target platelet count:</b></li> <li>➤ &gt;100x10<sup>9</sup> litre for multiple/CNS trauma or if platelet function abnormal</li> <li>➤ &gt;50x10<sup>9</sup> litre for other situations</li> </ul>
<b>Request FFP (12-15 ml kg<sup>-1</sup> body weight)</b>	<ul style="list-style-type: none"> <li>Aim for PT and APTT &lt;1.5 x control mean</li> <li>Allow for 20 min thawing time</li> </ul>	<ul style="list-style-type: none"> <li>➤ PT and APTT &gt;1.5 x control mean correlations with increased surgical bleeding</li> </ul>
<b>Request cryoprecipitate (1-2 packs)</b>	<ul style="list-style-type: none"> <li>Replaces fibrinogen and factor VII</li> <li>Aim for fibrinogen 2g /l</li> <li>Allow for delivery time plus 20 min thawing time</li> </ul>	<ul style="list-style-type: none"> <li>➤ Fibrinogen &lt;0.5 strongly associated with microvascular bleeding</li> </ul>
<b>Suspect DIC</b>	<ul style="list-style-type: none"> <li>Treat underlying cause if possible</li> </ul>	<ul style="list-style-type: none"> <li>➤ Stock hypothermia, acidosis leading to risk of DIC (Mortality high)</li> </ul>
<b>Consider additional non-conventional treatments; Tranexamic acid &amp; Calcium</b>	<ul style="list-style-type: none"> <li>Available from Blood Transfusion Department</li> <li>Available in critical care areas only</li> </ul>	<ul style="list-style-type: none"> <li>➤ Use with caution if evidence of established disseminated intravascular coagulation.</li> <li>➤ Contraindicated in patients with subarachnoid haemorrhage</li> </ul>

22. Treatment pathway for patients with suspected Abdominal Aortic Aneurysm



## 23. Antenatal Screening Service

### 23.1 Haemolytic Disease of the Newborn

- Haemolytic disease of the newborn (HDN) occurs when the mother has IgG antibodies in her circulation that cross the placenta and bind with foetal red cells bearing the appropriate antigen. The red cells will then be destroyed in the foetal or neonatal reticuloendothelial system (extra vascular haemolysis). This may lead to the development of anaemia in the foetus or neonate and neonatal hyperbilirubinaemia. In severe cases the foetus may die *in utero* due to heart failure as a result of the severe anaemia (hydrops fetalis). The neonate is also at risk of neurological damage due to the high bilirubin level.
- The mother may develop antibodies as a result of previous pregnancy during which foetal red cells bearing the paternal antigens have crossed the placenta and caused alloimmunisation. Alternatively, the antibodies may be due to previous transfusion.
- The most important cause of HDN is antibody to the Rh D antigen (anti-D). This antibody develops in Rh D negative women who have carried an Rh positive foetus. The first baby is rarely affected but subsequent pregnancies represent a secondary immunisation, which can result in higher antibody levels and affected babies.

### 23.2 Screening for pregnancies at risk of HDN

- At booking every pregnant woman should have samples sent for the determination of ABO and Rh D group and testing for alloantibodies. (4.9 ml blood in a blue EDTA blood transfusion bottle and request form, labelled as in Section 5 and 6)
- Antenatal patients with anti-D, anti-c or anti-Kell present (which carry the greatest risk of severe HDN) should be tested every 4 weeks up to 28 weeks and every 2 weeks from 28 weeks until delivery.
- Antenatal patients with other antibodies present and all Rh (D) Negative patients should be tested at 28 weeks and samples taken from mum and baby at delivery.
- Antenatal patients who have had previously antibodies demonstrated or unidentified antibodies detected should have samples repeated throughout the pregnancy. Blood bank staff will advise and issue a report with a suitable comment.
- All other patients should be retested at 28 weeks.
- If clinically significant antibodies are detected in pregnancy, specialist advice should be requested. Sheffield NHSBT will undertake specialist antibody investigations and perform titres when indicated.

### 23.3 Prevention of HDN and the use of Rh D Immunoglobulin (Anti-D)

- Anti-D is an intramuscular or intravenous immunoglobulin with a specific concentration of anti-D. It is prepared from male donors who have volunteered to become immunised by exposure to Rh D positive cells. Anti-D is administered to Rh D negative women who may have been exposed to Rh D positive foetal red cells via a trans placental haemorrhage. The anti-D prevents active immunisation and the production of allo anti-D in the patient.
- If any doubt about gestation or any other problems (abdominal pain or heavy/intermittent bleeding) refer to EPAU or ward 14 for assessment and inform Blood Bank.
- Guidelines for the administration of Anti-D in pregnancy, in Rhesus Negative women.

Pregnancy less than 20 weeks

Situation	Kleihauer	Anti-D indicated	Dose (IU)
Threatened miscarriage under 12 weeks if a viable pregnancy continues	No	No	
Spontaneous complete abortion <12 weeks with no surgical intervention	No	No	
Threatened abortion 12-20 weeks	No	Yes	250 IU*
Abortion/Miscarriage/Evacuation/RPOC <20 weeks	No	Yes	250 IU*
Bleed PV and/or Abdo Pain 12-20 weeks	No	Yes	250 IU*
TOP (Medical or surgical) <20 weeks	No	Yes	250 IU*
Abdo injury <20 weeks	No	Yes	250 IU*
Ectopic pregnancy	No	Yes	250 IU*
Amniocentesis <20 weeks	No	Yes	250 IU*
Recurrent bleed pv/abdo pain 12-20 weeks <b>Request a sample to check anti-D level – give further anti-D if weak or not detectable</b>	No	Yes	250 IU* may last up to 6 weeks

\*A Minimum dose of 250iu should be provided as indicated above. It is acceptable to administer a larger Anti-D immunoglobulin dose as directed by the department and dependent on local stock holding.

Pregnancy over 20 weeks

Situation	Kleihauer	Anti-D indicated	Dose (IU)
Recurrent bleed pv/abdo pain >20 weeks <b>Request a sample to check anti-D level – give further anti-D if weak or not detectable</b>	Yes	Yes	1500 IU may last up to 6 weeks
APH, ECV >20 weeks	Yes	Yes	1500 IU
Abdo injury/fall/RTA >20 weeks	Yes	Yes	1500 IU
IUFD > 20 weeks (Kleihauer Negative)	Yes	Yes	1500 IU
Delivery of Rh(D) Positive baby	Yes	Yes	1500 IU

- Anti-D should be given within 72 hours of the sensitising event. In certain circumstances anti-D may be indicated after 72 hours although it may not be as effective. It can be issued up to 10 days after the sensitising event in certain circumstances. All information must be fully documented including reasons for delay, clinic attendances, DNA etc.
- When anti-D is issued post TOP or any other event requiring anti-D prophylaxis, a group and screen should have been processed previously but the request card may not have a doctor's signature In this case inform Blood bank anti-D is required. The prescription chart signed by the medic should be brought to Blood Bank when the anti-D is collected and checked by BMS staff before issue.
- After 20 weeks any possible sensitising events should also be followed by a Kleihauer test that will determine the volume of foetal red cells in the maternal circulation. It may be necessary to give a bigger dose of anti-D if the foetal cell volume exceeds 12 ml. Samples required - 1 x 4.9ml blue EDTA bottle for group, antibody screen and 1 x 4.9ml red EDTA bottle for Kleihauer testing.
- At 28 - 30 weeks prophylactic anti-D 1500 IU is recommended for all Rhesus negative women. To cover hidden transplacental haemorrhage (TPH), Routine Antenatal Anti-D Prophylaxis (RAADP) should be offered to all non-sensitised Rhesus (D) negative women.

Prophylaxis does not exclude the need for further Anti-D if any of the sensitising events listed above should occur.

- In the event of recurrent PV bleeds, the anti-D may cover the patient for up to 6 weeks. Advice will be given by Blood Transfusion staff if further anti-D is required in this period.
- Post delivery samples are obtained from both mother and baby. A full group and antibody screen is performed on the mother's sample and a Group and Direct Antiglobulin Test (DAT) on the baby's sample. If the baby's blood group is RhD positive a Kleihauer test will usually be performed before anti-D is issued.

Occasionally anti-D may be issued before the Kleihauer test is performed to prevent the patient from unnecessary discomfort or delay. Please contact the Blood Transfusion department in this situation. However, if after testing the FMH is greater than 12ml, the patient will have to be recalled for further anti-D.

#### Post Delivery Samples:

- **Mother** – 1 x 4.9ml blue EDTA bottle for group, antibody screen and 1 x 4.9ml red EDTA bottle for Kleihauer testing.
- **Baby** – 1 x 4.5ml blue EDTA bottle for group and DAT (cord blood). (Please note for babies where cord blood is unobtainable a small venous sample should be obtained. The blue transfusion bottle should still be used but a small amount (0.5ml) in the bottle will be sufficient).

All samples and request forms must be labelled as section (5) and (6).

### 23.4 Routine Antenatal Anti-D Prophylaxis (RAADP)

Despite the administration of anti-D prophylaxis, around 1.5% of women in the UK still develop anti-D. This is partly due to the spontaneous passage of foetal red cells across the placenta, particularly in the third trimester.

Prophylactic anti-D is now issued to all RhD negative pregnant women following recommendations from the Royal College of Obstetricians and Gynaecologists and publication of the NICE Guidelines 2002. The Guidelines recommend that Routine Antenatal Anti-D Prophylaxis (RAADP) be offered to all non-sensitised Rh-D negative pregnant women. The clinician (obstetrician, midwife or GP) responsible for the antenatal care should fully discuss RAADP and the options available so that the women can make an informed choice.

Situations where RAADP might not be necessary or cost effective are as follows:-

- The woman has opted to be sterilised after the birth of the baby
- The woman is certain that she will not have another child after the current pregnancy.
- The father of the child is known to be RhD negative

The difference between RAADP and anti-D given because of an event should clearly be explained to the women. The use of RAADP should not be affected by whether anti-D has been administered for a potentially sensitising event. Potentially sensitising events occurring around the time of routine prophylaxis may still require additional doses of anti-D following a Kleihauer test.

### 24. Transfusion of Neonates

- Red cell and platelet components must be CMV negative, K Negative, HbS Negative, HEV Negative and haemolysin free. Because of the small blood volume of the newborn infant

(80ml/kg), blood may be supplied in small volume packs (approx. 40-50mls). The number of donor exposures should be kept to a minimum.

- On the first occasion, a Group and Direct Antiglobulin Test are performed on the infant's sample. The mother must have had a Group and Antibody Screen performed at delivery or within 7 days of delivery.
- If no antibodies are present in the maternal sample and the baby's DAT is negative, subsequent top up transfusions do not require further samples from the baby until he/she is 4 months old but a request card with details of mother and baby is required each time.
- If antibodies are present in the maternal sample or the baby's DAT is positive, a full crossmatch against maternal plasma is required for each transfusion request for the baby until he/she is 4 months old. A request card with details of mother and baby is required each time.

Where an **exchange** transfusion is necessary the Blood Bank must be informed before delivery so that blood can be provided.

Neonatal red cell exchange transfusion is usually 80-200mL/kg (i.e. 1-2 blood volumes).

Red cells for exchange transfusion should be:

- Group O (or ABO compatible with maternal and neonatal plasma), Rh D negative (or Rh D identical with neonate); negative for red cell antigens to which the mother has antibodies: IAT cross-match compatible with maternal plasma.
- Plasma reduced (Hct 0.50 – 0.55)
- Used within 5 days of collection
- Free from clinically significant antibodies including high-titre anti-A and anti-B
- CMV antibody negative
- HbS screen negative
- HEV negative
- Gamma irradiated if possible in all cases if time permits, and essential if the infant has had previous IUT, if cellular immune deficient, or if transfused from first or second-degree relative. Used within 24 hours of irradiation. Red cells in additive solution are not recommended for exchange, but have been shown to be safe in cardiac surgery.

Exchange transfusions are generally carried out for hyperbilirubinaemia and/or anaemia, mainly due to haemolytic disease of the newborn (HDN). Blood can be given via a blood warmer. Exchange transfusions have a high incidence of adverse effects and should only be carried out under the supervision of experienced personnel.



## 25. NHSBT – Available Blood Components

Component	Volume	Storage temp °C	Shelf life	Remarks
Red cells		4 ± 2	35 days	PCV 55-75%
Red cells - SAGM	280-420ml	4 ± 2	35 days	PCV 50-70% Red cells suspended in a licensed optimal additive solution, SAGM. Some will be supplied as buffy coat reduced (<1.2x10 <sup>9</sup> wbc/unit)
Pooled Platelet concentrate	150-300ml	22 ± 2	7 days	Contains >240 x 10 <sup>9</sup> platelets/pack, <0.1 x 10 <sup>9</sup> wbc/pack. Store with constant agitation
Platelet conc apheresis	150-400ml	22 ± 2	7 days	Contains >240 x 10 <sup>9</sup> platelets/pack, <0.8 x 10 <sup>9</sup> wbc/pack. Store with constant agitation HLA matched units and/or leucodepleted available on request
FFP	100ml 300ml	-25 to -40	2 year	Contains >0.7 iu/ml FVIIIc. Maximum delay between thawing and use is 4 hours at ambient temperature or 24 hours at 4°C. Refreeze forbidden
FFP Cryodepleted	170ml	-25 to -40	2 year	Contains reduced FVIII, VWF, fibrinogen and FXIII. Maximum delay between thawing and use is 4 hours at ambient temperature. Refreeze forbidden
Cryoprecipitate	120ml-200ml	-25 to -40	2 year	Contains >70iu VIIIc/unit, >140mg/unit fibrinogen Maximum delay between thawing and use is 4 hours at ambient temperature. Refreeze forbidden
Neonatal red cells for exchange transfusion	220-340ml	4 ± 2	35 days	PVC 50-70% Group O Negative, CMV negative, haemolysin free, HbS negative, HEV negative, <5 x 10 <sup>9</sup> wbc/unit
Neonatal red cells for top up transfusion	6 aliquots of 70-100ml	4 ± 2	35 days	PCV 50-70% GROUP O Negative, CMV negative, haemolysin free, HbS negative, HEV negative, <5 x 10 <sup>9</sup> wbc/unit
Neonatal platelets	Whole unit or 12 aliquots of 50ml	22 ± 2	5 days	From apheresis donors CMV negative, haemolysin free, HbS negative, HEV negative, <5 x 10 <sup>9</sup> wbc/unit. Split into 4 aliquots containing 60 x 10 <sup>9</sup> platelets in 50 ml plasma upon request

## 26. Maximum Blood Ordering Schedule (MBOS)

The list below gives the menu of various surgical procedures and the appropriate blood transfusion provisions. Departures from this menu will only be made following discussion with Blood Transfusion laboratory staff. This schedule is relevant for patients that are haemodynamically stable. The actual provision required is dependant on the patient's clinical condition and haemoglobin result prior to the procedure.

General Surgery	
AP Resection	2 Units
Colonic resection	Group & Antibody Screen
Colostomy/ Closure of Colostomy	Group & Antibody Screen
Exploration CBD	Group & Antibody Screen
Gastrectomy	2 Units
Incisional Hernia repair	Group & Antibody Screen
Ileostomy – open closure	Group & Antibody Screen
Laparotomy	Group & Antibody Screen
Laposcopic Surgery	Group & Antibody Screen
Mastectomy	Group & Antibody Screen
Rectal Resection	2 Units
Reversal of Hartmanns	Group & Antibody Screen
Splenectomy	2 Units
Thyroidectomy	Group & Antibody Screen
Obstetrics and Gynaecology	
Caesarean section	Group & Antibody Screen
Colposuspension	Group & Antibody Screen
Cone biopsy	Group & Antibody Screen
Ectopic pregnancy	Group & Antibody Screen
Manual Removal of Placenta	Group & Antibody Screen
Myomectomy	2 Units
Hysterectomy	Group & Antibody Screen
Placenta Praevia for LSCS	2 Units
Repairs - PFR, posterior	Group & Antibody Screen
Termination of pregnancy	Group & Antibody Screen
Orthopaedics	
All primary joint replacements	Group & Antibody Screen
Fractured neck of femur	Group & Antibody Screen
Nailing/plating (Open – no tourniquet)	Group & Antibody Screen
Open reduction	Group & Antibody Screen
ORIF (with tourniquet)	Group & Antibody Screen
Osteotomy	Group & Antibody Screen
Revision/Bilateral THR	2 Units
Revision/Bilateral TKR	Group & Antibody Screen
Urology	
TURP/TURT	Group & Antibody Screen

## 27. Emergency Plan, Management of Blood Shortages

### Introduction

The objective of the NHSBT working with hospitals is to ensure that those patients who need blood can receive a transfusion regardless of their geographical location. As part of the NHS Emergency Planning Process the development of a contingency plan to ensure the effective use of available blood when blood stocks have fallen to very low levels will be critical to ensuring transfusion support remains available for patients who most need it.

The Department of Health (2004) has recommended all Trusts should establish an Emergency Blood Management Group (EBM). This group will be required to formulate arrangements to manage the appropriate use of blood and to keep contact with the NHSBT for updates of the situation nationally.

This policy has been compiled to ensure that Barnsley Hospital NHS Foundation Trust can respond in a timely and organised manner to national shortages.

The primary aims of this policy are:

- Rescheduling of elective surgery requiring transfusion
- Re-evaluating all other non emergency transfusions

### Policy

Emergency Blood Management Group Membership:

- Medical Director (Chair)
- Clinical head of Service Medicine
- Clinical head of Service Surgery
- Clinical head of Service Orthopaedics
- Nursing Director
- Critical Care Lead Anaesthetist
- Chair of Hospital Transfusion Committee
- Blood Transfusion Manager
- Specialist Practitioner for Transfusions
- Consultant Haematologist
- General Manager Medicine
- General Manager Surgery
- General Manager Women's Services

In a national blood shortage the NHSBT will activate the Emergency Plan by notifying the Blood Transfusion Manager.

- The Blood Transfusion Manager will immediately notify the Chair of the EBM, who will convene an emergency meeting.
- The EBM must ensure that communication lines are identified internally for activation of any actions.
- Blood Transfusion Manager will remain first contact for the NHSBT.

The EBM will be required to formulate arrangements to manage blood in each of the following operational phases:

- **Green – Normal Circumstances**
- **Amber – Reduced availability of blood for a short or prolonged period**
- **Red – Severe, prolonged shortages**

- The NHSBT will expect hospitals to reduce their stock levels at Amber and Red phases. The Blood Transfusion Manager will be informed what these required levels are at first contact.
- To simplify the management of patients during the emergency – three broad patient categories have been defined by the Department of Health
- Amber for short period, we the EBM group will have to consider cessation of category 3 patients. Amber for prolonged period category 2 & 3 should be considered. In Red – only category 1 patients should be considered.
- The NHSBT will continually monitor blood usage nationally throughout the shortage

Category 1	Category 2	Category 3
<b>Resuscitation</b> Resuscitation of life threatening/ ongoing blood loss including trauma		
<b>Surgical Support</b> Emergency surgery* including cardiac and vascular surgery** and organ transplantation. Cancer surgery (probably curative)	<b>Surgery/Obstetrics</b> Cancer surgery (palliative). Symptomatic but no life threatening post-operative or post partum anaemia. Urgent *** (but not emergency) surgery	<b>Surgery</b> Elective surgery which is likely to require donor blood support (patients with > 20% chance of needing 2 or more units of blood)
<b>Non-Surgical anaemia's</b> Life threatening anaemia including patients requiring in-utero support and high dependency care/SCBU. Stem cell transplantation or chemotherapy**** Severe bone marrow failure. Thalassaemias (but consider lower threshold) Sickle cell disease crisis affecting organs. Sickle cell patients aged <16 with past history of CVI	<b>Non-surgical anaemia's</b> Symptomatic but not life threatening anaemia.	

\* Emergency – patient likely to die within 24 hours without surgery

\*\* With the exception of poor risk aortic aneurysm patient who rarely survive but who may require large volumes of blood

\*\*\* Urgent – patient likely to have major morbidity if surgery not carried out

\*\*\*\* Planned stem cell transplant or chemotherapy should be deferred if possible

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