Imperial College Healthcare NHS Trust

Blood Transfusion

Transfusion awareness and safety for doctors

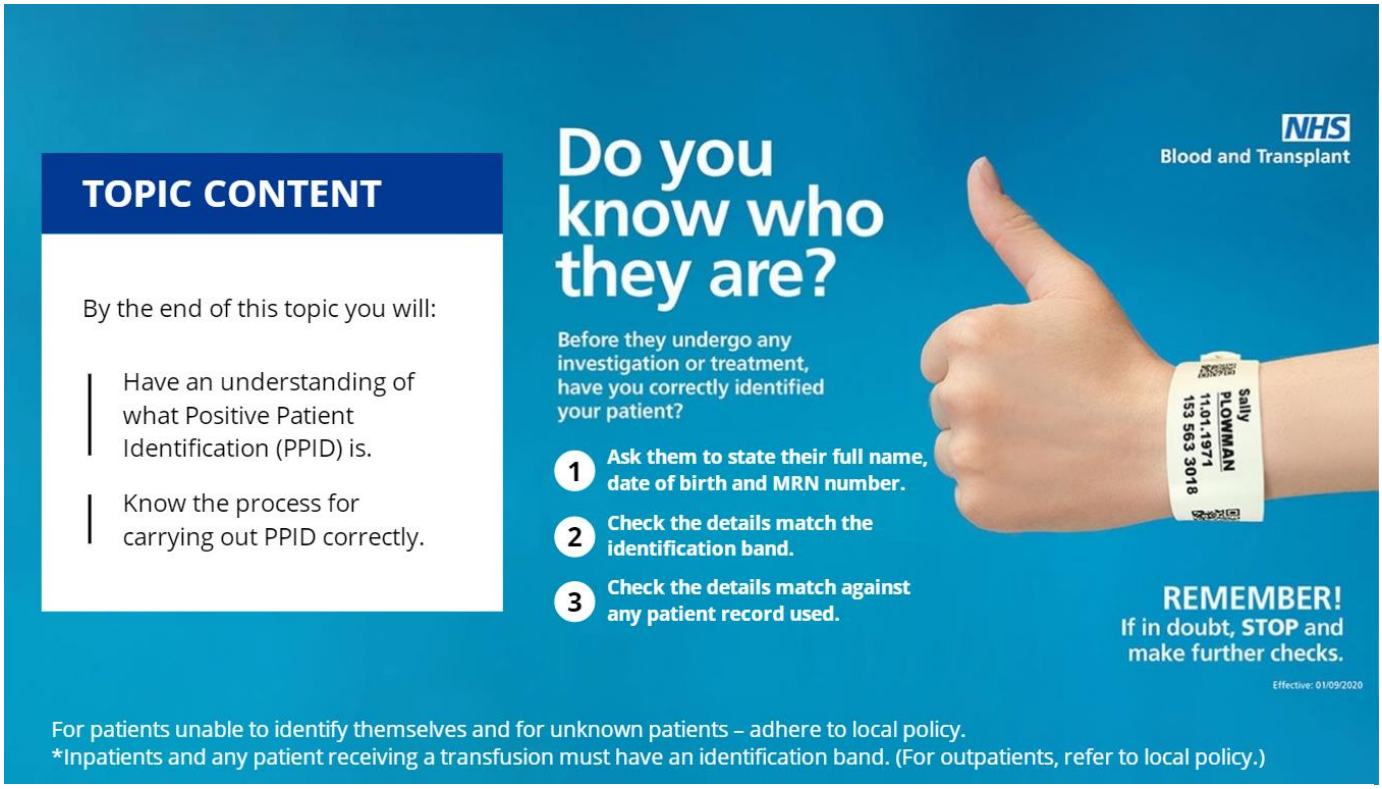
Study Guide

Content

The aim of this topic is to provide an understanding of:

1. Positive patient identification
2. The decision to transfuse and consent
3. Requesting transfusion and samples required pre-transfusion
4. Blood components and products available: indications and prescription
5. Alternatives to transfusion
6. Major haemorrhage
7. Transfusion reactions
8. Patients who refuse transfusion

Section 1: Positive patient identification



POSITIVE PATIENT IDENTIFICATION (PPID)

PPID (asking the patient to state their full name (first name and surname), date of birth and Hospital number (MRN) and matching this information against the patient's identification wristband and any other patient record) is essential at every stage of the transfusion process, for example:

Clinically assessing the patient	Are you assessing the right patient with the right blood results?
Blood sampling	Are you taking the right blood sample from the right patient and labelling the sample with the right patient details? Labelling the sample with another patient's details is a **wrong blood in tube** incident, which could result in an ABO-incompatible transfusion.
Collection of the blood component	Is the right unit of blood being collected for the right patient?
Blood administration	Is the right patient receiving the right blood?

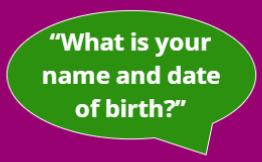
Identifying the patient: step 1

Ask the patient to tell you their full name, date of birth and either their address, Hospital number and/or NHS number.

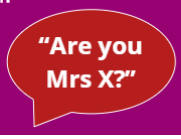
Check that this is compatible with the patient identification wristband or, in the case of patients not wearing an identification wristband (e.g. outpatients), confirm the patient's details against their electronic or manual record.

For sampling, ask the patient to positively identify themselves against the blood specimen labels, or the Cerner request form, for Group and Screen.

Remember to ask open questions that need more than a **yes** or **no** answer, for example:



Rather than:



Identifying the patient: step 2

If the patient is unable to tell you their name, e.g. they are unconscious or a paediatric patient, refer to the identification wristband and, if possible, verify the information by asking a relative, carer, guardian or representative, or another member of the clinical staff who knows the patient.

Special care must be taken in identification where communication is difficult, for example as a result of language issues, sensory deficits or limited consciousness.

If the patient is unable to communicate in a language that can be understood by the admitting team, a health advocate or interpreter must be used wherever possible.

If it is not possible to obtain the services of a healthcare advocate, a relative, carer, guardian or representative can interpret for the patient; however, particular care must be taken in identification.

Please see the Trust's Positive Patient Identification Policy for further information.

ACTIONS WHICH CAN HELP PREVENT ERRORS

Ask the patient an open question.

Relatives, carers or guardians can assist in identification.

Do not accept a patient pointing to a name above the bed when asked their name.

All checks performed must be Independent: **I check, U check; not We check**.

Never pre-label the specimen tube before taking the blood sample.

Only label samples that **you** have collected.

Never take samples from more than one person at a time. Concentrate on one patient, one request, one sample.

Always identify the patient before taking specimens.

Never label samples or check medication or blood components away from the patient's bedside.

Remember that the patient's identity is the most important part of the checking procedure. Correct identification prevents the wrong treatment being given.

If you are interrupted or distracted, restart the identification process.

EXAMPLE INCIDENT: RESULTING FROM INCORRECT PPID

A patient sample was taken but the blood group was found to be inconsistent with the historical details on the transfusion laboratory system. The patient's historical group was O negative and the current sample grouped as A positive.

On investigation it was found that:

- The patient was bled for a Group and Screen – the unlabelled sample was taken to the nurses desk, as the printer was not working.
- An incorrect form was collected from the printer and the details were not checked.
- The sample was labelled with the details from the form.

Cause:

- Failure to perform PPID.
- The sample was labelled away from the patient's bedside.
- The sample was labelled from the information on a form and not from the patient's wristband.

Labelling the sample with another patient's details results in a wrong blood in tube incident, which could result in an ABO-incompatible transfusion.

Section 2: The decision to transfuse and consent

INTRODUCTION TO THE TRUST TRANSFUSION SERVICE

The Trust Transfusion Team (TTT) is responsible for the safety of the transfusion process.

The TTT has consultant haematologists, transfusion practitioners and transfusion laboratory managers.

There is always a haematologist available for advice on transfusion matters, including out of hours and at weekends.

There are three transfusion laboratories at ICHNT and requests for transfusion tests and for blood components should go to the local laboratory.

Please refer to Trust's Transfusion Policy for contact details.

WHY TRANSFUSE?

Blood transfusion has a vital role within modern medical practice:

- Supporting and facilitating other treatments (e.g. surgery, myeloablative chemotherapy).
- As life-saving treatment on its own (e.g. major haemorrhage).

Compared with many medical and surgical procedures, modern blood transfusion is very safe.

However, blood transfusion is not without risks and adverse reactions, transfusion-related morbidity and mortality do still occur.

The annual SHOT report highlights the serious adverse events and reactions related to transfusion including the near misses:

- Overall, preventable errors account for most of the reported serious adverse events and reactions (including near misses).
- Ongoing improvement is required in both clinical areas and transfusion laboratories to reduce errors.

Click here to visit the SHOT website.

COMMON TRANSFUSION-RELATED ERRORS WITHIN OUR TRUST

Common transfusion-related errors identified within our Trust include:

1. Patient misidentification.
2. Transfusion Associated Circulatory Overload (TACO).
3. Wrong component transfused.
4. Special requirement not met.
5. Wrong blood in tube (WBIT).
6. Not informing the transfusion laboratory when the transfusion is not required.

A formal pre-transfusion risk assessment for **Transfusion Associated Circulatory Overload** (TACO). should be undertaken whenever possible for all patients receiving blood transfusion (especially if older than 50 years or weighing less than 50kg) and mitigating actions taken, as TACO is the most commonly reported cause of transfusion-related mortality and major morbidity.

KEY SHOT MESSAGES

SHOT

- Year after year human errors account for more than 85% of all reported incidents.
- At each step in the transfusion process, do not assume that errors have not been made in previous steps. Verify each step, particularly patient identification.
- An increasing proportion of blood components are given to older medical patients with comorbidities.
- Physicians need to understand and manage the risks of transfusion and know about the alternative treatment approaches for anaemia.
- Resource allocation is critical: inadequate staffing, lack of training and poor supervision are all likely to be associated with an increased risk of error.
- Emergency transfusion saves lives. Don't delay. Don't let the patient bleed to death or die from anaemia.
- A culture of accountability (as distinct from blame) is integral to the prevention of mistakes.
- Root cause analyses of all adverse incidents should be thorough and must identify system-related and human factors so that appropriate actions can be instituted.

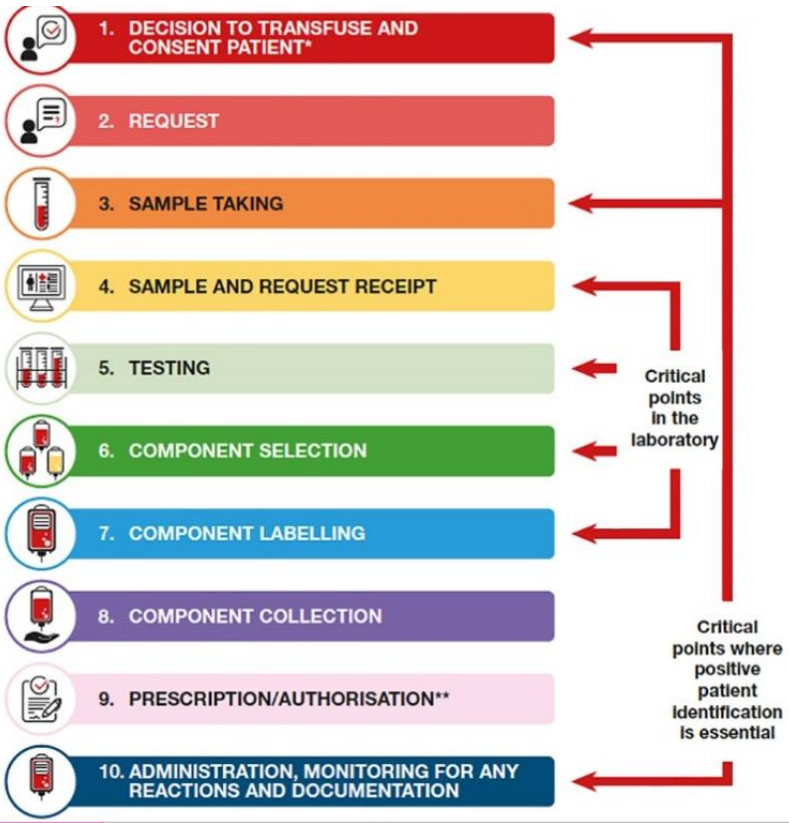
THE TRANSFUSION PROCESS

Patient safety **must** be the primary focus.

The transfusion process crosses several professional groups and involves many individuals. There are at least 10 steps between taking a pre-transfusion sample, to the recipient receiving their transfusion and the completion of the transfusion; with each step there is the potential for error.

The transfusion of ABO-incompatible blood components is classed as a **Never Event**, i.e. unacceptable and is preventable.

At every stage of the blood administration process the key elements are Positive Patient Identification (PPID), excellent communication and good documentation.



*Note that the pre-transfusion sample may have been taken in advance (e.g. pre-op) while the decision to transfuse is made at a later date.

**Once the decision to transfuse has been made, the prescription/authorisation may be written at variable times during the sequence but must be checked at the final stage.

Staff are encouraged to use the SHOT Safe Transfusion Checklist with every transfusion episode.

Misidentification of patients is a significant cause of avoidable harm. Patient identification must be verified effectively and accurately at every step in the transfusion pathway. All staff must be aware of the importance of correct patient identification and this must be confirmed in accordance with local policies.

DECIDING TO TRANSFUSE

The decision to transfuse a patient should only be made after careful consideration. The benefits of transfusion must be weighed against the potential risks of transfusion, and alternatives to transfusion should always be considered.

Questions to ask before proceeding with transfusion:

- Why is the transfusion required? What is the underlying cause? Is the patient symptomatic?
- What is the threshold for transfusion? Is there evidence to support a particular threshold?
- What is the target for transfusion? Is there evidence to support a particular threshold?
- Are there any contraindications or cautions to transfusion?
- Are there any alternative or adjunctive treatments? May differ depending on the underlying cause.

In order to answer these questions, you need to have an understanding of the blood components (including special requirements) and blood products available and why we use them.

We will cover this later in the topic.

Below is a copy of the SHOT: A-E Decision Tree and a reminder of the key dependencies for safe transfusion.

Your decision to transfuse should be based on **individual** clinical assessment.

The SHOT: A-E Decision Tree

A
Assess patient
Any avoidable blood loss
(frequent, unnecessary tests/interventions)

B
Blood results (all) reviewed including trends – valid and reliable?
Best treatment option—is transfusion the best treatment option? If yes, what components needed, how many, what order and any specific requirements needed?

C
Consent/Communication (adequate patient information—both verbal and written) to patients and where appropriate to families and carers
Correctable factors to be addressed like bleeding, haematinic deficiency

D
Do not forget other measures (vitamin K, tranexamic acid, cell salvage, etc)
Do not hesitate to question colleagues regarding decisions made and ask for rationale
Do not forget to document in patient's notes and in discharge summaries

E
Ensure timely communications to laboratory- need to be clear, concise and accurate
Ensure all relevant transfusion checklists including TACO risk assessment and actions arising thereafter have been completed
Evidence based decisions made weighing risks, benefits and options available
Ensure patient receives adequate post transfusion information if transfusion given as a day case

Key dependencies for safe transfusion.

*PBM – Multidisciplinary, evidenced-based approach to optimising the care of patients who may require blood transfusion to ensure that they receive the best treatment and avoidable, inappropriate use of blood is reduced.

Blood transfusion should be APPROPRIATE, SAFE and EFFECTIVE

Relies on:

- **Patient blood management (PBM)***
- **Appropriate staff training**
- **Suitable environment**
- **Effective teamworking**
- **Communication**
- **Haemovigilance and tracebility**

Remember that in the UK, blood donation is entirely voluntary. Blood is a precious resource which should not be wasted. **Wasted products cannot save lives**.

PATIENT INFORMATION AND CONSENT

Informed and valid consent is required for all patients who will likely (e.g. during or after surgery), or definitely receive, a transfusion. This does not have to be formal written consent but the shared decision-making discussions (including the reason for transfusion, potential risks, etc.) should be documented in the patient's clinical records. If a transfusion is given in an emergency, the patient must be informed after the event and given the relevant information.

Patient information leaflets from NHSBT used at Imperial are available for all blood components. Click on the image to view the patient information leaflet 'Receiving a Blood Transfusion'.

Patients should be aware of the risks, benefits and any possible alternatives to transfusion.

SHOT

SHOT **Consenting patients prior to transfusions (based on SaBTO and NICE guidance)**

Key aspects to be covered when consenting patients for transfusion:

1	Patients and/or family/carer have been provided with relevant information about blood transfusions that would help in their decision-making process.
2	The reason for the transfusion has been discussed.
3	The benefits of the transfusion have been explained.
4	Transfusion risks, both short and long-term risks have been discussed with the patient and/or family/carer (including any additional risks pertinent to long-term multi-transfused patients).
5	The risks, benefits and consequences of **not** accepting the blood transfusion have been elaborated.
6	Transfusion issues specific to the patient have been highlighted.
7	Relevant alternative options have been discussed including how they might reduce the need for a transfusion.
8	The transfusion process has been explained.
9	The need for any specific requirements for blood components and the rationale, including the need for anti-D Ig post transfusion as appropriate has been elaborated and the relevant patient information leaflet has been provided.
10	Patients and/or family/carer has also been informed that once transfused, they are no longer eligible to donate blood.
11	Patients and carers/family have been given the opportunity and been encouraged to ask questions.
12	Patient and/or family/carer is aware that if they change their mind at any point before the transfusion, they are entitled to withdraw their consent and this should be documented and managed appropriately.
13	A synopsis of the discussions and decisions taken documented on the patient's clinical notes.

We will cover the management of patients who refuse transfusion later in the topic.

You can visit the NHS Blood and Transplant website.

Section 3: Requesting transfusion and samples required pre-transfusion

Requesting blood

- Order is placed on Cerner.
- Call the blood transfusion laboratory directly for urgent requests.
- Place orders for blood components in advance, where possible, as not all components are routinely available.

Request the test on Cerner stipulating if it is a:

- Group and Screen.
- Crossmatch (how many units).

The request **must** include:

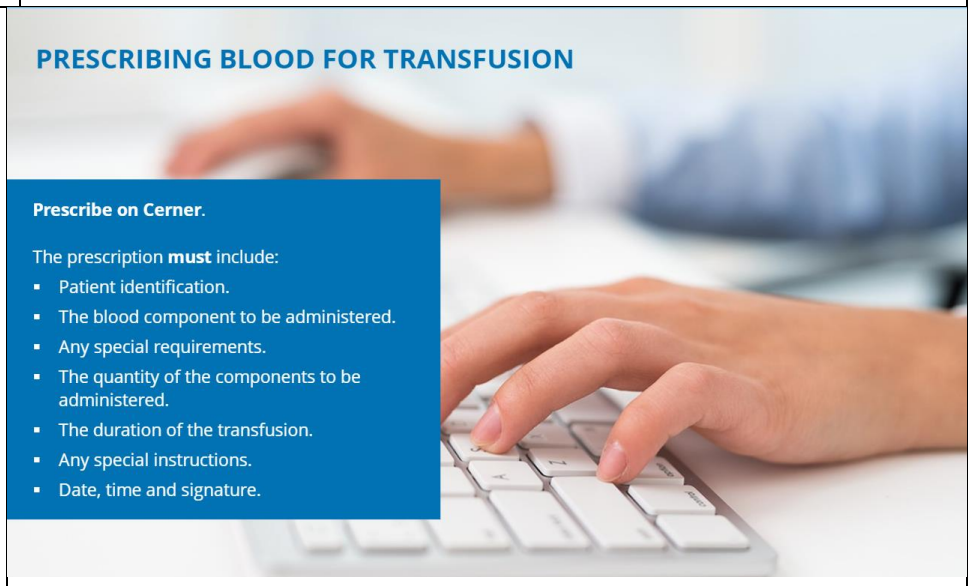
- The reason for the transfusion.
- The blood component required and the number of units/volume in ml.
- The date and time of the transfusion (or planned procedure).
- The patient's location (where required).
- Specific blood requirements.
- The requesting doctor's name and contact details.
- Any special requirements.

Missing information may result in delays or inappropriate components may be given.

Print the form prior to sampling.

Prescribing blood for transfusion

- Record the indication and reason for the transfusion, as well as the clinical objectives to be achieved.



Obtaining a sample for pre-transfusion Compatibility testing

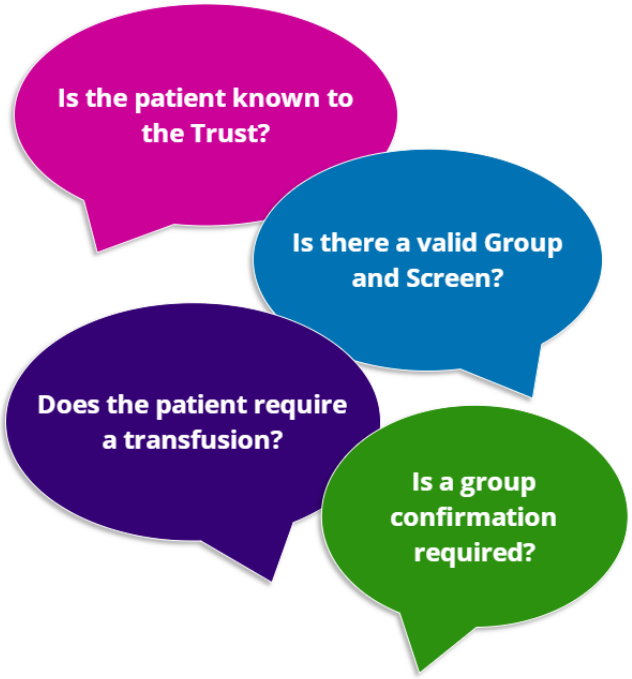
See details on the next pages

SAMPLING PRE-TRANSFUSION DECISION TO BLEED A PATIENT

A sample known as a **Group and Screen** is required prior to a transfusion to determine the ABO and D group of the patient and to screen the patients for atypical red cell antibodies which can potentially cause reactions.

Additional testing for red cell antibody identification is performed when atypical antibodies are detected.

For red cell transfusion, a **crossmatch**, is also required prior to the issue of units.



SAMPLING PRE-TRANSFUSION
Ordering a Group and Screen (G&S)

Group confirmation	Unknown patient	Known patient
The transfusion laboratory must ensure that there are two separate samples from a patient that have generated the same blood group from both samples. These should be provided in pink top tubes, with a handwritten label and a signed and dated form.	▪ There must be two requests made on Cerner so that two request forms can be printed. ▪ The two samples must be taken at different times (a minimum of 5-10 minutes apart). ▪ Samples can be taken by two different people or the same person. ▪ It is **not** acceptable to take two samples at one venepuncture event. Label them with different times and send them to the blood transfusion laboratory.	If the patient is known at Imperial and has a historic blood group on file, only one Group and Screen sample is required. If you are unsure, contact the blood transfusion laboratory for advice.

SAMPLING PRE-TRANSFUSION
Pre-print the Cerner request form

The Cerner order must be pre-printed and taken to the patient's bedside.

The form must include the patient's:

1. Full name.
2. Date of birth.
3. Hospital number.
4. Clinical details.
5. Contact details.

Check if the patient has had treatment from, or been referred from, another Trust.

In the event of the Cerner system being unavailable, complete a paper form.

Crossmatch samples are only valid for 72 hours.

You can view the CERNER forms:

- Requisition form
- Downtime form

SAMPLING PRE-TRANSFUSION
Collection of other equipment

Prepare a decontaminated tray with the correct equipment. This should include:

- Tourniquet.
- Alcohol swab.
- Vacutainer system with safety needle or winged infusion device.
- Blood bottles (check expiry).
- Gauze swab and hypoallergenic tape or plaster.
- PPE according to policy.
- Cerner request form.
- Sharps bin at the point of care.

Paediatrics require 3ml EDTA
Neonates require 1ml EDTA

Adults require 6ml EDTA

SAMPLING PRE-TRANSFUSION
Positive Patient Identification (PPID) and consent

Conscious inpatient	▪ The patient must be asked to state their full name and date of birth. ▪ Check the patient's wristband for the Hospital Number. ▪ Check that all the details provided exactly match the details printed on the identification wristband and the request form. ▪ Explain the procedure to the patient and obtain consent.
Unconscious inpatient	▪ If the patient is unconscious or is unable to give a reliable response, identify them using the information printed on their identification wristband: Name, DOB, Hospital Number.
Outpatients	▪ In outpatients, where there is no identification wristband, the patient must be asked to state their full name, date of birth and address. The staff member must check that these details match the information on the Cerner request form. ▪ Explain the procedure to the patient and obtain consent.

SAMPLING PRE-TRANSFUSION
Obtaining a sample for blood transfusion

- Decontaminate hands.
- Prepare all the equipment using an Aseptic Non-Touch Technique.
- Decontaminate hands.
- Support the chosen limb on a pillow.
- Apply the tourniquet.
- Assess and select the vein.
- Decontaminate the intended venepuncture site and let it dry for 30 seconds.
- Remove the needle guard and inspect the device.
- Insert the needle into the vein.
- Apply the blood collection bottles using the vacutainer system.
- Apply gauze and hypoallergenic tape or plaster.

SAMPLING PRE-TRANSFUSION
Labelling the sample and Cerner request form

The process then varies, depending on whether the patient is an inpatient or an outpatient.

Outpatients

Label the sample immediately, at the patient's bedside, taking the four core patient identifier details from the **Cerner request form**.

- Forename.
- Surname.
- Hospital Number.
- Date of birth (DOB).

Additional mandatory criteria includes:

- The date and time of collection.
- The signature of the person who bled the patient.

Inpatients

Label the sample immediately, at the patient's bedside, taking the four core patient identifier details from the **patient's wristband**:

- Forename.
- Surname.
- Hospital Number.
- Date of birth (DOB).

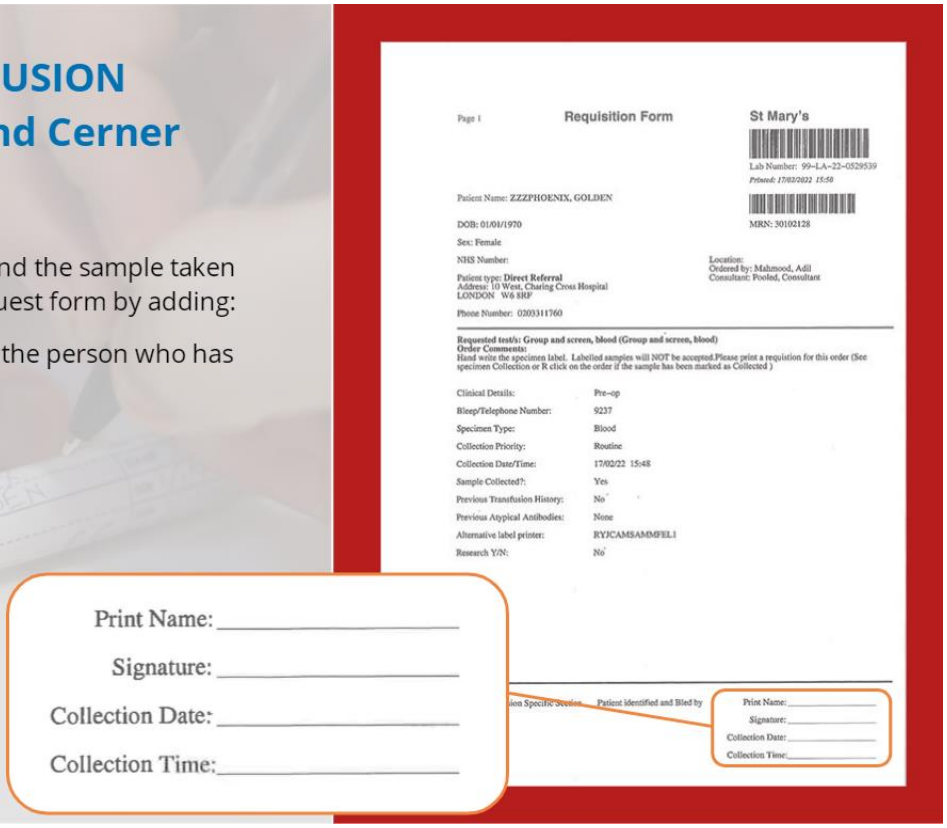
Additional mandatory criteria includes:

- The date and time of collection.
- The signature of the person who bled the patient.

SAMPLING PRE-TRANSFUSION
Labelling the sample and Cerner request form

Once the patient has been identified and the sample taken and labelled, complete the Cerner request form by adding:

- The printed name and signature of the person who has taken the sample.
- The date and time of collection.



SAMPLING PRE-TRANSFUSION
Send the sample to the transfusion laboratory

- Early communication is vital to ensure that there is no delay in the provision of compatible components for a patient in an urgent and/or emergency situation.
- Contact the transfusion laboratory if the sample and blood component request is urgent, otherwise, send it via the normal route.

CANCELLATION OF GROUP AND SCREEN SAMPLES

- If there are any discrepancies or evidence of pre-labelling, the sample will be rejected.
- Haemolysed and underfilled samples will also be cancelled as the sample quality will be compromised.

It is important to have the correct contact details on the form as the laboratory team have a duty to notify the clinical team if they have to reject a sample.

Each of our laboratories has a **zero-tolerance policy** for incorrectly labelled samples.

Section 4: Blood components and products available - Indications and prescription

We will now look at the different blood components and products available and the indications for their use.

Blood components:

- Red Blood Cells (RBCs)
- Platelets
- Fresh Frozen Plasma (FFP)
- Cryoprecipitate
- Granulocytes

Blood products:

- Octaplas
- Anti-D Immunoglobulin
- Clotting Factors

The information in the subsequent slides is relevant for **adults** only. For further information regarding paediatric transfusions, please see the Trust's **Blood Transfusion Policy and Procedures Document for Children and Neonates** which can be found on the intranet.

RED BLOOD CELLS (RBCS)

Red cell transfusion is indicated for the treatment of anaemia.

Red cell transfusions increase haemoglobin and therefore the oxygen carrying capacity of the blood thus reducing tissue hypoxia.

Prescribing

- 4ml/kg will usually raise Hb by 10g/L.
- Usually transfuse each unit over 2-4 hours.
- If there is a previous history of allergic or febrile reactions to red cell transfusion, consider pre-medication with paracetamol, hydrocortisone, chlorphenamine.
- If a patient is at risk of fluid overload, use the TACO pre-transfusion checklist and consider furosemide pre or post transfusion.

The TACO pre-transfusion checklist is on the next page.

Selection of RBCs

- ABO matched.
- RhD matched*.
- Antigen negative for any known clinically significant alloantibodies.
- Crossmatch compatible.
- Fulfilling any special requirements needed.

Certain patient groups have additional requirements (e.g. patients with sickle cell disease), so it is important that this information is on the request form to help the transfusion laboratory select the appropriate units.

*RhD negative patients **must** receive RhD negative cellular components **only** (red cells, platelets, granulocytes), unless in extreme circumstances, e.g. major haemorrhage, no RhD negative cellular components are available. Any deviation outside this will require approval from the transfusion registrar or consultant and Concessionary Release Procedure followed.

Triggers

- There is no clear benefit of liberal over restrictive transfusion policy.
- Usually transfuse if Hb <70g/L to a target of 70-90g/L.
- Consider transfusing at higher Hb (e.g. Hb <80 -90g/L) if a patient has other comorbidities, for example:
  - Cardiac disease (IHD, CCF).
  - Sepsis with tissue hypoxia (high lactate).
  - Neurological injury (stroke, SAH, brain injury).
- Maintain baseline Hb or Hb at which a patient is asymptomatic if known to have chronic anaemia, e.g. sickle cell disease, myelodysplastic syndrome.

Figure 18b.1: TACO pre-transfusion checklist

TACO Checklist	Patient Risk Assessment	YES	NO
	Does the patient have any of the following: diagnosis of 'heart failure', congestive cardiac failure (CCF), severe aortic stenosis, or moderate to severe left ventricular dysfunction?		
	Is the patient on a regular diuretic?		
	Does the patient have severe anaemia?		
	Is the patient known to have pulmonary oedema?		
	Does the patient have respiratory symptoms of undiagnosed cause?		
	Is the fluid balance clinically significantly positive?		
	Is the patient receiving intravenous fluids (or received them in the previous 24 hours)?		
	Is there any peripheral oedema?		
	Does the patient have hypoalbuminaemia?		
	Does the patient have significant renal impairment?		

If Risks Identified	YES	NO
Review the need for transfusion (do the benefits outweigh the risks)?		
Can the transfusion be safely deferred until the issue is investigated, treated or resolved?		

If Proceeding with Transfusion: Assign Actions	TICK
Body weight dosing for red cells	
Transfuse a single unit (red cells) and review symptoms	
Measure fluid balance	
Prophylactic diuretic prescribed	
Monitor vital signs closely, including oxygen saturation	

Name (PRINT):	
Role:	
Date:	**Time (24hr):**
Signature:	

Due to the differences in adult and neonatal physiology, babies may have a different risk for TACO. Calculate the dose by weight and observe the notes above.

TACO=transfusion-associated circulatory overload

EMERGENCY/URGENT RBC TRANSFUSION FOR PATIENTS WITH ANTIBODIES

Patients with atypical red cell antibodies or suspected antibodies (e.g. inconclusive antibody investigation) may require further testing conducted both locally and/or at NHSBT.

This may result in delays in providing fully compatible crossmatched blood to the patient.

If the transfusion is urgently required (i.e. cannot wait for further testing to be completed) the patient should be discussed immediately with the transfusion laboratory and transfusion SpR or consultant who will advise on the options for transfusion and rapid release of blood including concessionary release of suitable or least incompatible blood.

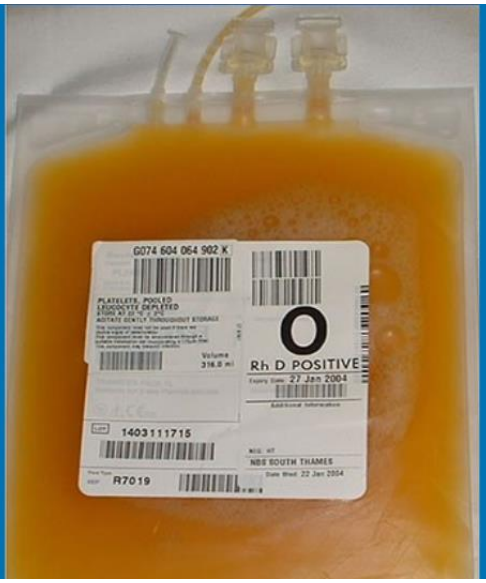
If incompatible blood is to be transfused, steroids +/-intravenous immunoglobulin can be given to reduce the risks of haemolytic transfusion reactions.

The transfusion laboratory will make the clinical team aware of any potential delays to the provision of blood for a patient.

In an emergency (i.e. unexpected life-threatening bleeding), patients should be transfused as per the Major Haemorrhage Protocols.

PLATELETS

Platelet transfusion is indicated for treatment of bleeding or to reduce the risk of bleeding in patients with thrombocytopenia or platelet dysfunction.



Prescribing	Selection of platelets	Triggers
▪ 1 unit will raise the platelet count by 20-40 x10^9/L. ▪ Transfuse each unit over 30 minutes. ▪ If there is a previous history of allergic or febrile reactions, consider pre-medication with paracetamol, hydrocortisone, chlorphenamine.	▪ ABO matched, where possible. ▪ If this is not possible, it is acceptable to give non-ABO matched platelets as long they are high titre anti-A/B negative. ▪ RhD matched*. ▪ Fulfilling any special requirements needed. *RhD negative patients **must** receive RhD negative cellular components **only** (red cells, platelets, granulocytes), unless in extreme circumstances, e.g. major haemorrhage, no RhD negative cellular components are available. Any deviation outside this will require approval from the transfusion registrar or consultant and Concessionary Release Procedure followed.	Differs depending on if a platelet transfusion is prophylactic or therapeutic.

INDICATIONS FOR PLATELETS

Prophylactic platelet transfusion thresholds

The aim is to **prevent** bleeding:

- For reversible bone marrow failure where recovery is anticipated or critical care patient:
  - Usually transfuse if platelets <10 x10^9/L.
  - If there are other risk factors for bleeding, transfuse if platelets <20 x10^9/L.
- For irreversible bone marrow failure with WHO grade 2 or higher bleeding:
  - Variable transfusion threshold depending on the patient.
  - Keep platelets at a level to prevent bleeding symptoms.
- Prior to invasive procedures – transfusion threshold dependent on the specific procedure:
  - CVC insertion – transfuse if platelets <20 x10^9/L.
  - LP – transfuse if platelets <40 x10^9/L.
  - Epidural anaesthesia – transfuse if platelets <80 x10^9/L.
  - Liver biopsy – transfuse if platelets <50 x10^9/L.
  - Major surgery – transfuse if platelets <50 x10^9/L.
  - Neuro/eye surgery – transfuse if platelets <100 x10^9/L.
- Prior to an invasive procedure and the patient is on antiplatelets (e.g. aspirin, clopidogrel, ticagrelor, prasugrel):
  - Stop 5-7 days prior to the procedure, if possible.
  - If it is not possible to stop, discuss with Haematology.

Therapeutic platelet transfusion thresholds

The **treatment** of bleeding:

- Non-major bleeding – transfuse if platelets <30 x10^9/L.
- Major haemorrhage – transfuse if platelets <75 x10^9/L.
- Multiple trauma/intracranial haemorrhage/eye bleed – transfuse if platelets <100 x10^9/L.
- Bleeding in a patient on antiplatelets – if there is significant bleeding in a patient on antiplatelets, the benefit of platelet transfusion will depend on when the last dose on antiplatelet drug was given. Discuss with Haematology.

FRESH FROZEN PLASMA (FFP)

FFP contains all the clotting factors. It is indicated for the treatment of bleeding or to reduce the risk of bleeding due to:

- Acquired coagulopathy, e.g. DIC.
- Inherited coagulopathy (specific factor(s) deficiency) where a factor concentrate is not available, e.g. FV deficiency.

Plasma is frozen to maintain the activity of the clotting factors and must be thawed prior to use. Thaw time is 30 minutes.

Select the image for more information.

Prescribing	Selection of FFP	Triggers
▪ Standard dose is 10-15mls/kg which usually equates to 2-4 units of FFP. ▪ Transfuse each unit over 30 minutes. ▪ If previous allergic reaction consider pre-medication with hydrocortisone and chlorphenamine. ▪ If a patient is at risk of fluid overload, use the TACO pre-transfusion checklist and consider furosemide pre or post transfusion.	▪ ABO matched, where possible. ▪ If this is not possible, it is acceptable to give non-ABO matched FFP as long it is high titre anti-A/B negative. ▪ Group O should only be given to group O patients. ▪ Any D type (pos/neg) can be given.	Differs depending on if a FFP transfusion is prophylactic or therapeutic.

INDICATIONS FOR FFP

Prophylactic FFP transfusion thresholds

The aim is to **prevent** bleeding:

- There is no strong evidence to support prophylactic FFP in non-bleeding patients with abnormal coagulation tests prior to invasive procedures.
- Prior to invasive procedures, FFP can be **considered** for patients with abnormal clotting tests **and** other risk factors indicating significant bleeding risk, for example:
  - Personal or family bleeding history.
  - Drugs.
  - High bleeding risk procedure.
  - Thrombocytopenia.

Therapeutic FFP transfusion thresholds

The **treatment** of bleeding:

- Major haemorrhage:
  - Correct PT + APTT to normal range.
  - Transfuse in at least 1:1 ratio of RBC + FFP.

CRYOPRECIPITATE

Cryoprecipitate contains fibrinogen, factor VIII, factor XIII and Von Willebrand factor. It is indicated for the treatment of bleeding or to reduce the risk of bleeding due to:

- Low fibrinogen, e.g. DIC, liver disease, drugs.
- Fibrinogen dysfunction, e.g. inherited coagulopathy, drugs.

Cryoprecipitate is frozen to maintain the activity of the clotting factors and must be thawed prior to use. Thaw time is 30 minutes.

Select the image for more information.

Prescribing	Selection of cryoprecipitate	Triggers
▪ Standard dose = 2 x units/pools of cryoprecipitate. ▪ Transfuse each unit/pool over 30 minutes. ▪ If previous allergic reaction consider pre-medication with hydrocortisone and chlorphenamine. ▪ If a patient is at risk of fluid overload, use the TACO pre-transfusion checklist and consider furosemide pre or post transfusion.	▪ ABO matched, where possible. ▪ If this is not possible, it is acceptable to give non-ABO matched cryoprecipitate as long it is high titre anti-A/B negative. ▪ Group O should only be given to group O patients. ▪ Any D type (pos/neg) can be given.	Differs depending on if a cryoprecipitate transfusion is prophylactic or therapeutic.

INDICATIONS FOR CRYOPRECIPITATE

Prophylactic cryoprecipitate transfusion thresholds

The aim is to **prevent** bleeding:

- Prior to invasive procedures, cryoprecipitate can be **considered** for patients with low fibrinogen <1g/L or dysfibrinogenaemia **and** other risk factors indicating significant bleeding risk, for example:
  - Personal or family bleeding history.
  - Drugs.
  - High bleeding risk procedure.
  - Thrombocytopenia.

Therapeutic cryoprecipitate transfusion thresholds

The **treatment** of bleeding:

- Major haemorrhage:
  - Keep fibrinogen >1.5g/L.
- Major obstetric haemorrhage:
  - Aim to keep fibrinogen >2g/L.

GRANULOCYTES

Transfusion of granulocytes (neutrophils) may be indicated in patients with life-threatening soft tissue or organ infection with bacteria or fungi and low neutrophil counts, usually in the setting of severe, prolonged neutropenia after cytotoxic chemotherapy.

Granulocytes are only available through special order from NHSBT on a named patient basis, i.e. not routinely available from the hospital blood bank and are specially made by NHSBT.

Discuss any requests with the transfusion SpR or consultant.

Select the image for more information.

Granulocytes are used for:

- The treatment of severe neutropenia (<0.5) due to congenital or acquired bone marrow failure syndrome where neutrophil recovery is expected and the patient is receiving active treatment to achieve disease remission **and** the patient has a proven or highly probable fungal or bacterial infection **not** responding to antimicrobial treatment.
- The treatment of a congenital disorder of neutrophil function regardless of the neutrophil count **and** the patient has a proven or highly probable fungal or bacterial infection **not** responding to antimicrobial treatment.

SPECIAL REQUIREMENTS

- To meet **special requirements** – components have undergone additional testing or manufacturing processes.
- These components may not be available routinely from the hospital transfusion laboratory and may need to be specially ordered from NHSBT.
- A **Blood Transfusion Special Requirement form**, also known as the yellow form, must be completed for:
  - Any patient with special requirements.
  - All haematology patients (even if there are no special requirements).
- Yellow forms must be completed by a SpR.
- A copy must be uploaded to the patient's Cerner notes and the transfusion laboratory.

A list of indications for special requirements can be found on page 3 of the yellow form. This can be downloaded from the Blood transfusion page on the Trust intranet.

You can find the form on the next 3 pages.

Page 1

London Regional Transfusion Committee NHS — Imperial College Healthcare NHS Trust

Blood Transfusion Clinical Special Requirement Request

PATIENT INFORMATION	
Hospital Number:	NHS Number:
First name:	Surname:
Date of Birth: ____/____/____	Ward:
Diagnosis (**Mandatory**):	
Special Requirements Indication Code(s) PLEASE REVIEW NOTES PAGE 3 if in doubt contact bleep 9070	
If Special Requirements no longer required, fill in Notification of Removal of Special Requirements on page 2.	

Patient treated at other hospital(s) **Y / N** Referring Hospital(s):

SPECIAL REQUIREMENTS (CIRCLE OPTIONS BELOW)			REVIEW DATES MUST BE STATED OTHERWISE FORM WILL BE RETURNED
Irradiated Components	Yes / No	**If Yes, Lifelong?** Yes / No	**If not lifelong, Review date:** ____/____/____
CMV Negative Components	Yes / No	**EDD:** ____/____/____	**Review date:** ____/____/____
HLA/HPA Matched Platelets	Yes / No	(delete as appropriate)	**Review date:** ____/____/____
Washed cells	Yes / No		**Review date:** ____/____/____
Haemoglobinopathy	Yes / No	Details:	
If HSCT: State date of HSCT	____/____/____	And tick appropriate box below:	
☐ Pre HSCT (within 3 months; or at diagnosis of AL or AA)		☐ Post HSCT (6 months post or still immunosuppressed)	

COMPLETED BY:	Name:	Signature:
Date:	Job Title:	Contact Number:

- *The patient's clinical team must ensure this form is emailed to the site specific BT Lab: imperial.hh.btlab@nhs.net or imperial.cxh.btlab@nhs.net or imperial.smh.btlab@nhs.net*
- *The laboratory will enter the details into the laboratory IT system and complete the section below.*
- *A pdf copy will be emailed back to clinical team for loading onto patient's Cerner records (Multimedia).*

PLEASE NOTE: If the laboratory section below is not completed, the information on special requirements may not be on the laboratory system and may result in the patient receiving incorrect blood or blood component

ADULT BMT ONLY (COMPLETION BY BT LAB MANAGER / SENIOR BMS ONLY)

Is this patient receiving an ABO Mismatched HSC Transplant? Yes / No *If yes laboratory to complete information below*

Donor and Recipient ABO/RhD Groups:

Recipient ABO/RhD Group: _____

Donor ABO/RhD Group: _____

Recipient Requires Components of the following ABO/RhD Groups:

Component	1st Choice	2nd Choice
Red Cells		
Platelets		
FFP / Cryo		

FOR LABORATORY USE ONLY:	Date	Time	Name
Received in Laboratory			
Patient notes updated on LIMS			
Patient UABD file updated on LIMS			
Confirmation by			
Information required by / from another hospital? Name and contact details of treatment hospital:			
Sent to referring hospital?			
Other relevant information (e.g. antibodies; red cell phenotype/genotype)			

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Page 2

London Regional Transfusion Committee NHS Imperial College Healthcare NHS Trust

Notification of Removal of Special Requirements for Blood Transfusion
This form must only be filled in by Haematology Consultant / StR.

PATIENT INFORMATION	
Hospital Number:	NHS Number:
First name:	Surname:
Date of Birth: ____/____/____	Ward:
Diagnosis (**Mandatory**):	

Please tick to indicate the special blood component which is no longer required:

☐ **IRRADIATED COMPONENTS AFTER HAEMOPOIETIC STEM CELL TRANSPLANT**
PLEASE REVIEW NOTES PAGE 3
Date of stem cell infusion: _____
Date for removal of requirement for irradiated components: _____

☐ I confirm this patient has no additional indications for irradiated products (e.g. Hodgkin lymphoma, treatment with fludarabine, bendamustine, etc) (please tick)

☐ **CMV NEGATIVE RED CELLS / PLATELETS**
Reason for removal of requirement for CMV negative components:

_____

Date for removal of requirement: _____

☐ **HLA MATCHED PRODUCTS**
Reason for removal of requirement for HLA matched components:

_____

Date for removal of requirement: _____

☐ **Other (e.g. Washed RBC's, Platelets etc.) – please state:** _____
Reason for removal of requirement:

_____

Date for removal of requirement: _____

Name of Haematology Registrar/ Consultant (print and sign)	**Contact Details**	**Date**
Please sign and email completed form to either: *imperial.hh.btlab@nhs.net* or *imperial.cxh.btlab@nhs.net* or *imperial.smh.btlab@nhs.net*		

FOR LABORATORY USE ONLY:	Date	Time	Name
Received in Laboratory			
Patient notes updated on LIMS			
Patient UABD file updated on LIMS			
Confirmation by			
Other relevant information (e.g. antibodies; red cell phenotype/genotype):			

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Page 3

London Regional Transfusion Committee NHS Imperial College Healthcare NHS Trust

Indication Codes for Clinical Special Requirements

Irradiated Cellular Blood Components

IB1 Transfusion from first- or second-degree relatives

IB2 Patients receiving CAMPATH (only haematology patients) or Purine analogues (Purine analogues Fludarabine, Cladribine, Pentostatin, Clofarabine), other T cell depleting therapy, Bendamustine, Brentuximab – *lifelong requirement*

IB3 Aplastic anaemia: patients on Anti-thymocyte globulin (ATG) – *review at 12 months, current recommendation on duration is unclear*

IB4 Red cell or platelet transfusion in neonates if there has been a previous IUT- *to continue up to the age of 6 months from the due date*

IB5 All recipients of allogeneic haemopoietic stem cell (HSC) grafts - *from the time of initiation of conditioning chemoradiotherapy –unless have an indication for life long (i.e. Purine analogue / Hodgkin's lymphoma) - continue until >6/12 and*

- *lymphocyte count >1.0 x10^9/L*
- *free of chronic GVHD*
- *off all immunosuppressive drugs*

IB6 Blood transfused to allogeneic HSCT donors within 7 days prior to and during the harvest of their HSC

IB7 Patients who will have autologous HSCT:

- *Any transfusion within 7 days of the collection of their HSCT*
- *Any transfusion from the start of conditioning therapy (unless have an indication for life long (i.e. Purine analogue / Hodgkin's lymphoma) until*
  - *3 months post-transplant*
  - *6 months post-transplant if conditioning TBI has been given*

IB8 Hodgkin's disease, at all stages of the disease – *lifelong requirement*

IB9 Congenital immunodeficiency with defective cell-mediated immunity (e.g. SCID, Di George syndrome, Wiskott Aldrich syndrome, Purine nucleoside deficiency, reticular dysgenesis, ADA, Ataxia telangiectasia, chronic mucosal candidiasis, MHC class 1 or 2 deficiency) - *lifelong requirement*

IB10 CAR_T infusion - 7 days prior to and during the harvest of CAR-T cells, until 3 months following CAR-T cell infusion unless conditioning, disease or previous treatment determine indefinite duration, e.g. previous diagnosis of Hodgkin's Lymphoma or previous purine analogue treatment

CMV- Antibody-Negative Components (red cells, platelets or granulocytes*)

CMV1 Pregnant women who require repeat elective transfusions during course of pregnancy (not transfusions required during labour and post-delivery)

CMV2 Shared care as dictated by treating hospital e.g. Great Ormond St (GOSH) for CMV-negative children undergoing stem cell transplant or with significant T cell immunodeficiency such as SCID, Wiskott Aldrich, X-linked hyper IgM syndrome.

CMV3 *Granulocyte transfusion – if the patient is CMV negative and immunosuppressed (*not for indication on this form, but must indicated on separate Granulocyte Request Form when ordering granulocytes*)

HLA/HPA Matched Platelets

HLA1 Immune Platelet Refractoriness

HLA2 Positive screen for HLA class 1 or HPA antibodies or both

HLA3 Refractoriness to an ABO compatible platelet concentrates on two occasions

Washed Red Cells and Platelets

W1 Recurrent severe allergic reactions to blood components (give details of known reactions)

W2 Documented IgA deficiency with anti-IgA antibodies and previous allergic reaction (NB consider components containing IgA deficient plasma as an alternative)

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OCTAPLAS

Octaplas is a form of **pathogen inactivated FFP** (i.e. FFP which as undergone additional measures to reduce the risk of transfusion transmitted infections).

Octaplas is pooled human plasma which has undergone solvent or detergent treatment.

It is mainly used for therapeutic plasma exchange in patients with thrombotic thrombocytopenic purpura (TTP).

Octaplas is frozen and must be thawed prior to use. Thaw time is 30 minutes.

ANTI-D IMMUNOGLOBULIN

Anti-D immunoglobulin is given to D negative women carrying a D positive/D unknown fetus:

- Routinely at between 28-30 weeks of pregnancy (**RAADP** – routine antenatal anti-D prophylaxis) and after delivery.
- Following potentially sensitising events.

Anti-D immunoglobulin is given to prevent sensitisation and formation of anti-D antibodies which can cause haemolytic disease of the fetus or newborn (HDFN) in subsequent pregnancies.

Anti-D immunoglobulin is usually given as an IM injection but can also be given IV if larger doses are required.

Prior to the administration of anti-D immunoglobulin, a Group and Screen sample should be taken.

CLOTTING FACTORS

Clotting factors are an essential component of haemostasis.

Inherited and acquired deficiencies or dysfuntion of a clotting factor or multiple clotting factors can impair normal haemostatic response and increase bleeding risk.

Inherited clotting factor deficiencies or dysfunction include haemophilia A or B and Von Willebrand disease.

Causes of acquired clotting factor deficiency or dysfunction include DIC, anticoagulant treatment and liver disease.

For emergency reversal of anticoagulation (e.g. in major haemorrhage), use of PCC does not require prior authorisation by the haematology team. Please see the Major haemorrhage protocols, and the Trust guidelines on Warfarin reversal and DOAC (apixaban, rivaroxaban) reversal for more information.

Select the image for more information.

There are different clotting factors available across the Trust, including:

- Prothrombin complex concentrate (e.g. Octaplex) – used for the treatment of bleeding or to reduce the risk of bleeding (e.g. pre-op) in patients with deficiency of factors II, VII, IX, X:
  - Inherited deficiency where a specific coagulation factor concentrate is not available.
  - Acquired deficiency, e.g. a patient on warfarin, apixaban, rivaroxaban.
- Fibrinogen concentrate – used for the treatment of bleeding or to reduce the risk of bleeding (e.g. pre-op) in patients with a deficiency or dysfunction of fibrinogen:
  - Inherited fibrinogen deficiency or dysfrinogenaemia.
  - Acquired deficiency, e.g. a major haemorrhage after 10 or more units of red cells have been transfused.

Specific factor concentrates for inherited coaguloapathies should be discussed with the coagulation Spr or consultant.

Section 5: Alternatives to transfusion

Blood and blood components are a limited resource and careful consideration of their use is vital.

Consider the use of alternative therapies or conservative management before transfusing.

Oral and IV iron

Oral iron is commonly used for the treatment of iron deficiency anaemia and to optimise haemoglobin, e.g. pre-op or during pregnancy.

It is easy to take in the form of tablets but can be associated with unpleasant gastrointestinal side effects which means compliance may be poor. It takes 6-8 weeks to get the full benefit of oral iron supplements.

IV iron is faster acting, so it can be used closer to the surgery or treatment date with fewer side effects. This may not be appropriate for all patients.

Correction of vitamin deficiencies

Vitamin B12 deficiency can be caused by pernicious anaemia, lack of B12 in the diet, malabsorption due to conditions affecting the gut and certain drugs (e.g. proton pump inhibitors). Vitamin B12 deficiency can be treated with B12 injections.

Folate deficiency can be caused by a lack of folate in the diet, malabsorption due to conditions affecting the gut, certain drugs (e.g. anticonvulsants) and pregnancy (increased requirements). Folate deficiency can be treated with folate supplements.

Unless there is haemodynamic compromise, do not transfuse blood in vitamin B12 or folate deficient patients as this can cause cardiac compromise.

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Intraoperative cell salvage

Intraoperative blood cell salvage involves the collection of the solid components of blood lost during an operation which is then transfused back to the same patient.

Blood that is lost during an operation is collected, filtered, washed and re-suspended in saline. It can then be transfused back to the patient either during or immediately after the operation.

Intraoperative cell salvage is commonly used in cardiac and orthopaedic surgery. (NICE 2008)

This procedure is not available at all hospitals, so please check your specific site.

Erthyropoietin

Erythropoietin is not routinely used but may form part of a patient's treatment when the patient declines blood due to their personal beliefs or as part of conservative treatment. (NICE 2016)

For some patients, erythropoietin forms part of their treatment for ongoing diseases or conditions.

Tranexamic acid

Tranexamic acid (TXA) helps blood to clot which can reduce the amount of blood lost during surgery or episodes of large blood loss – this may include a major hemorrhage.

TXA can be administered for anyone expected to lose >500mls (i.e moderate blood loss). For surgical patients, TXA needs to be given at the induction of anaesthesia.

Section 6: Major haemorrhage

A major haemorrhage is defined as blood loss of >30% circulating blood volume (approximately 1500ml in an average adult) within 3 hours or 150ml/min.

There are 3 major haemorrhage protocols: adult, paediatric, and obstetric. Links to these are below. Please refer to the blood transfusion policy for further

Haemorrhage protocols:

- Adult
- Paediatric
- Obstetric

1	Activate the Major Haemorrhage Protocol by calling 2222.
2	Nominate a transfusion co-ordinator.
3	Communicate – call the site-specific transfusion laboratory to provide the patient's details (if known) and other relevant information. Also inform the transfusion labatory when they can **stand down**.

The Major Haemorrhage Protocol should be activated where **unexpected life-threatening bleeding** occurs so that the transfusion laboratory can issue blood components according to pre-agreed protocol and without the need for blood test results or authorisation from a haematologist. **Additional information and guidance is available on the intranet.**

Group O red cells

When the transfusion laboratory is notified of a major haemorrhage, the laboratory will issue group O red cells (blood group O is the universal donor).

Group O red cells may be either D negative or D positive.

Group O D negative

There is limited availability as the donor population is only 8% and the demand is high. The use of O D negative red cells should be limited to:

- Females of <50 years old (i.e. of childbearing age).
- Paediatric patients (male or female) <18 years old.

Section 7: Transfusion reactions

If the observations or the patient's symptoms suggest a transfusion reaction, the nurse should stop the transfusion, assess the patient and call a doctor.

The doctor should assess the patient. Any immediate symptoms should be treated.

All transfusion reactions (even those deemed mild) should be reported.

Please inform one or all of the following:

- The transfusion laboratory.
- The haematology SpR.
- The transfusion practitioner.

The decision to investigate further will be made by the transfusion team based upon the clinical information given.

They will also guide you on initial and subsequent management.

Further information on the management of transfusion reactions can be found in the Trust Transfusion Policy.

IMMEDIATE MANAGEMENT

FOR ANY SUSPECTED TRANSFUSION REACTION:

STOP THE TRANSFUSION

- Undertake rapid clinical assessment (ABCDE approach).
- Check patient ID and blood compatibility.
- Visually inspect the unit.

Is this a severe or life-threatening reaction?

ASK YOURSELF:

- Is there airway and/or breathing and/or circulatory compromise?
- Has the wrong blood been given?
- Is there evidence of a contaminated unit?

IF YES TO ANY OF THESE QUESTIONS:

Severe/life-threatening ATR

Call for immediate help (2222 if arrest/peri-arrest) and discuss urgently with the haematology SpR for advice on further management.

IF NO TO ALL OF THESE QUESTIONS:

Mild or moderate ATR

Contact the transfusion team (lab/transfusion practitioner/transfusion SpR) for advice on further management (in some cases transfusion may be restarted).

Section 8: Patients who refuse transfusion

PATIENTS WHO REFUSE BLOOD

The majority of patients who refuse blood do so on religious grounds, e.g. Jehovah's Witness beliefs. However, patients may have other grounds for refusal.

The Trust will ensure that all patients' beliefs are acknowledged and respected.

Adults can refuse any form of treatment if they have capacity. They can also make **Advanced Decisions** to refuse a potential future treatment. Some patients may also have a medical power of attorney which empowers another adult to consent to or refuse treatment on their behalf.

For any patient who is refusing blood transfusion – check:

- What is the reason(s) that the patient is refusing blood?
- Does this patient have capacity?
- Does this patient have a valid advanced decision or appointed medical power of attorney?

JEHOVAH'S WITNESSES

- Refuse the transfusion of blood or specific components of blood based on interpretation of biblical texts.
- Individuals vary in what they will accept or refuse – you must establish the preferences of each individual.
- Prior to any treatment or procedure where blood transfusion is normally required, the patient must understand:
  - The risks of not having the transfusion.
  - That they are entitled to change their mind at any point and accept the transfusion (oral or written revoke).
- Decision to refuse transfusion must be clearly documented.
- Consult the Hospital Liaison Committee for Jehovah's Witnesses for further advice.

See the Trust Transfusion Protocol for more information.