
*Guidelines for the
Administration
of Blood and
Blood Components*

Issued by the National Blood Users Group

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ABBREVIATIONS

AIDS	Acquired immune deficiency syndrome
BP	Blood pressure
CJD	Creutzfeldt Jakob disease
CMV	Cytomegalovirus
CVP	Central venous pressure
CXR	Chest x-ray
DCT	Direct Coomb's test
DIC	Disseminated intravascular coagulation
FBC	Full blood count
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
HPA	Human platelet antigen
HTLV	Human T-cell lymphotropic virus
IBTS	Irish Blood Transfusion Service
ID Band	Identity band
IgA	Immunoglobulin A
IgG	Immunoglobulin G
IV	Intravenous
IM	Intramuscular
JVP	Jugular venous pressure
LFT	Liver function test
LVF	Left ventricular failure
NBUG	National Blood Users Group
NCHCD	National Centre for Hereditary Coagulation Disorders
NHO	National Haemovigilance Office
RBCs	Red blood cells
PTP	Post transfusion purpura
Rh D	Rhesus D
SD plasma	Solvent detergent plasma
SOPs	Standard Operating Procedures
TACO	Transfusion associated circulatory overload
TA-GVHD	Transfusion associated graft-versus-host disease
TRALI	Transfusion related acute lung injury
TSO	Transfusion surveillance officer
vCJD	variant Creutzfeldt Jakob disease

POSITION STATEMENT

Important steps in the administration of blood components start with the correct identification of the patient and crossmatch sample and end with the collection and infusion of the right blood to the right patient at the right time. Each step is important and must be subject to written procedures and quality management. Processes must be in place to ensure that all steps are adhered to and any divergence from standard procedure is corrected. All staff must be trained and be familiar with procedures which should be regularly updated. Any breakdown in procedures should be investigated and corrected even if the recipient of the transfusion is unharmed.¹

- **Blood Transfusion can be fatal if incorrectly administered**
 - **Errors occur most frequently in:**
 - Patient identification.
 - Sampling/labelling of the pre-transfusion specimen.
 - Removal of blood from the blood fridge before transfusion.
 - Checking the identification of both the patient and the blood component at the bedside.
- **Written policies/protocols must exist**
- **Staff training to implement these policies is critical**
- **Each institution should have or participate in a local transfusion committee**

**National Blood Users Group
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INTRODUCTION

The administration of blood and blood components involves more than 70 steps and each of these may be subject to error.² Standard protocols for the administration of blood are essential to minimise the potential for error. These protocols should be in place in each institution and should conform to standard practice as outlined in these guidelines. A quality management system should exist in each institution.³ This should include an active transfusion committee, a process to correct protocols and practice when deficiencies are identified, participation in local and regional audit and in the national haemovigilance programme.

The recommendations that follow deal with specific areas and should be adapted to the local institution. Guidelines cannot cover every situation, however they may reduce the wide variation in transfusion practice.³ Specific advice can be obtained from consultant haematologists, transfusion surveillance officers (TSO), transfusion scientists, the National Haemovigilance Office (NHO) or from the Irish Blood Transfusion Service (IBTS).

1 PATIENT INFORMATION

Except in emergencies, the risks, benefits and alternatives to blood transfusion should be discussed with the patient and documented in their medical records. The provision of a blood transfusion information leaflet for patients is recommended⁴ and an example of one such leaflet currently in use in Ireland is provided in Appendix 1.

2. PRESCRIPTION

The patient's hospital medical records should contain the indication for the blood transfusion and the number of units required.⁵ All blood and blood components for transfusion should be prescribed by a medical practitioner, preferably on a unit by unit basis.⁶ Specialist advice may be needed on the need for cytomegalovirus (CMV) seronegative or gamma irradiated components. Individuals responsible for the prescription and request of blood components must be familiar with the special needs of their patients. These special requirements should form part of the prescription and should be flagged on the clinical and laboratory records.⁷⁻¹⁴ Any medication to be given in conjunction with the transfusion must be prescribed on the drug chart. No other infusions, solutions or drugs should be added to any blood component as they may result in haemolysis or clotting.¹⁵

3. POSITIVE PATIENT IDENTIFICATION

Hospital policy should address the training of staff in the identification of the patient. This procedure should include asking the patient to state his/her full name and date of birth e.g. patient should be asked "what is your name" not "are you Mr/Mrs Murphy?" The information given by the patient must be identical to that on the patient's identity band (ID band).¹⁶ ID bands should preferably be printed: hand-written bands can be difficult to read, contain varying information and may be subject to overwriting. In the event of removal of ID bands e.g. to access the radial artery, it is the responsibility of the person who removes the ID band to ensure it is reapplied.⁴ A standard procedure should exist for positively identifying the patient and any blood or blood components being transfused during transfer between clinical areas.

3.1 In-patients

A secure patient identification procedure should be in place in all hospitals and the ID band should be worn at all times. All patients should be allocated a unique identification number on admission to hospital, which should remain unchanged for the duration of hospitalisation and should be used in subsequent hospital admissions.¹⁵ This ID band should record the patient's full name, date of birth and a unique identification number.

3.2 Day patients/Out patients

Patient ID bands should be positioned before the pre-transfusion sampling procedure and worn until the transfusion is completed. Where the pre-transfusion sample is taken and the patient is readmitted at a later date for transfusion, policies should be in place for reapplying the original, or a new ID band, before the transfusion is commenced.

3.3 Patients unable to identify themselves

This includes patients who are undergoing general anaesthesia, unconscious or confused patients, young children or patients whose first language is not English. To ensure continuing accurate positive identification, we recommend that these patients should have two ID bands applied e.g. wrist and ankle bands.

4. PRE-TRANSFUSION SAMPLING

Hospital policy should address the training needs of staff who undertake pre-transfusion sampling and provide detailed instructions on venepuncture and on the identification of *patient* and *sample*.⁵ Correct blood sampling techniques are

vital to avoid haemodiluted samples being processed which may lead to incorrect clinical management/inappropriate transfusion.¹²⁻¹⁴ The pre-transfusion blood sample must be taken by trained individuals e.g. phlebotomists, nurses or doctors. Instruction on pre-transfusion sampling should form part of induction programmes. A record of this instruction should be maintained. Personnel responsible for taking samples for blood grouping and cross-matching must strictly follow hospital procedures at all times to avoid errors in patient sampling and patient identification. The person taking the sample must sign the sample tube confirming the patient's identity.¹⁷

5. THE REQUEST FOR BLOOD

Each request for blood must be documented on a laboratory request form and submitted to the laboratory with the blood sample for compatibility testing. The hospital transfusion laboratory should have a policy for documenting telephone requests. The identity of the person making the request and the person receiving it should both be recorded. The following information should be provided: patient's surname, first name, unique identification number, date of birth, location, the number and type of blood components required (including any special requirements), the reason for the request and the time and date the blood components are required.⁴

5.1 The request form

The request form must contain the following minimum information:¹⁵

- Surname and first name.
- Unique identification number.
- Date of birth.
- Gender.

The request form should also contain:

- Blood component required.
- Number of units required.
- Date, time and the location where required.
- Indications for request.
- Patient diagnosis.
- Any special requirements e.g. CMV seronegative, gamma irradiated.
- Previous transfusions, obstetric history, red cell antibodies or any adverse reactions.
- Name and signature of requesting person.

For the unconscious / unidentified patient, the minimum information necessary on the request form is a unique identification number and gender of the patient.

5.2 The sample tube

The sample tube must contain the following minimum information:

- Surname and first name.
- Unique identification number.
- Date of birth.
- Signature of person drawing the sample (the signature is required to confirm that they have verified the patient's identity).
- Date and time sample was drawn.

Sample tubes should be hand-written and labelled immediately after sampling at the patient's side. Electronically generated bar-coded labels are being developed and are under evaluation. For the present, until the automated systems are available, identification procedures must be strictly adhered to at the bedside to reduce sample errors. **The use of**

addressograph labels or the pre-labelling of blood sample tubes is specifically prohibited.⁵

5.3 Inadequately/incorrectly labelled samples

Hospital policy addressing inadequately/incorrectly labelled samples, should be agreed by both the Hospital Transfusion Committee and the Risk Management Department. **Hospital transfusion laboratory staff are acting correctly in refusing to accept a request for compatibility testing when either the request form or the sample is inadequately labelled.**¹⁵

5.4 Emergency requests

Each institution must have a fast tracking procedure for dealing with emergency requests. This should be in keeping with protocols for dealing with massive haemorrhage and with the hospital's major emergency plan:- See "A Guideline for the Use of Blood and Blood Components in the Management of Massive Haemorrhage".¹⁸ Wherever possible the senior doctor managing the clinical situation should state the degree of urgency of the transfusion requirement so that the laboratory can decide what blood should be selected. When several patients require transfusion, one person on the Accident and Emergency team should be delegated to communicate with the hospital transfusion laboratory. This avoids confusion with duplicate orders and incorrect information.

5.5 Major emergency plan

Hospitals should have a major emergency plan in place to cover major accidents/incidents, which should include transfusion provision.

5.6 Telephone requests

Telephone requests should be documented by the laboratory and in the patient's medical records by the requesting doctor.¹⁶ The following minimum information must be given and confirmed:

- (i) Surname.
- (ii) First name.
- (iii) Hospital/accident and emergency number/trauma number.
- (iv) Location.
- (v) Number/volume and type of component.
- (vi) Reason for request.
- (vii) Date and time required.¹³

6. PRE-TRANSFUSION TESTING

Each hospital transfusion laboratory should follow standard operating procedures (SOPs). All laboratories crossmatching blood should participate in external quality control. The hospital transfusion laboratory should verify the patient's ABO and Rhesus D (Rh D) group against previous records for the patient; any discrepancies should be resolved before blood components are issued.⁴ Where there is an urgent requirement for transfusion, group O Rh D negative blood should be issued until the discrepancy is resolved. Hospital transfusion laboratory practices should comply with the guidelines for blood bank computing.¹⁹

6.1 Patients with special requirements

The transfusion laboratory should have a record of patients' special requirements eg CMV seronegative or gamma irradiation, and these components should be selected. Patients with significant red cell antibodies should be issued with antigen negative blood. Consideration should be given to issuing antibody cards to all patients with clinically significant red cell antibodies.¹⁰ When the care of patients with haematological or other disorders requiring transfusion support is shared, there is a risk that not all pertinent transfusion history will be available to both sites. In the absence of networked

pathology information systems, it is essential that local procedures are devised for adequate communication between laboratories as well as clinical teams.¹⁰

7. ISSUING OF BLOOD

Computer generated self-adhesive compatibility labels are recommended. Efforts to standardise these labels nationally should continue for consistency between hospitals and to minimise checking errors. The hospital transfusion laboratory should also provide a blood compatibility report form with the blood component issued.

The compatibility label on each unit should show:¹⁵

- Surname and first name of patient.
- Date of birth.
- Unique identification number.
- Gender.
- ABO group and Rh D group of the patient.
- ABO group and Rh D group of the unit.
- Donation number.
- Expiry date of unit.
- Time when blood is required.
- Location of patient.

The compatibility report form should contain the following information:

- Surname and first name of the patient.
- Date of birth.
- Unique identification number.
- Gender.
- ABO group and Rh D group of the patient.
- ABO group and Rh D group of the unit.
- Donation number.
- Expiry date of unit.
- If not recorded elsewhere, eg prescription sheet, space for signature of persons checking and administering the unit.
- Time when blood is required.
- Location of patient.

The ABO group, Rh D group and unit number must be identical on the *Irish Blood Transfusion Service Label*, *Hospital Compatibility Report Form* and the *Compatibility Label* on the blood pack. Occasionally the ABO group and Rh D group issued for a patient may be of a different group¹⁵, usually due to a shortage of a particular group. In these circumstances, the hospital transfusion laboratory should inform the patient's doctor and include the information on the compatibility report form.

8. STORAGE OF BLOOD COMPONENTS

- Red blood cells and whole blood should **only** be stored in a designated controlled blood refrigerator.¹⁵
- Plasma is stored frozen and thawed in the laboratory immediately before use.
- Platelets are stored at room temperature on a controlled agitator to avoid clumping, and should **never** be stored in a refrigerator.
- The time of removal of all components from the controlled storage should be logged – ideally electronically, or failing that, manually.

- Once a unit of blood has been removed from controlled storage the transfusion should be commenced immediately on delivery to the clinical area. If the transfusion cannot be initiated promptly, the blood should be returned to the hospital transfusion laboratory for storage, unless the transfusion to the intended recipient can be completed within 4 hours. Blood should be returned to the hospital transfusion laboratory for documented disposal if out of controlled storage for more than 30 minutes.¹⁶
- The transfusion of plasma and platelets should be commenced as soon as possible following issue from the laboratory and must not be stored outside the laboratory.
- The use of validated blood transport containers is recommended.

9. COLLECTION OF BLOOD OR COMPONENTS FROM THE HOSPITAL TRANSFUSION LABORATORY

Written requests for the release and collection of blood components are recommended and should contain the patient's full name, date of birth, unique identification number and location of patient. If a telephone request is given to a porter or other member of staff to collect blood, the person must be given the above patient identification details so that he/she can write them down and bring them to the storage area when removing the blood component.⁴ The removal of a blood component from storage must be recorded manually or electronically. *This area is identified as a critical area for human error.*⁷⁻¹¹ Hospital policy should dictate who is trained and certified to collect the blood component.⁴ The person requesting the collection of the blood component must ensure the patient has a patent intravenous cannula before the blood component is removed from storage.

10. PRE-TRANSFUSION IDENTIFICATION

Hospital blood administration policy should include detailed instruction on the procedure for pre-transfusion identification of both the intended recipient and the blood component to be transfused. This procedure must be performed by two persons and both must sign the prescription sheet or the compatibility report form.⁴ Persons authorised to perform pre-transfusion identification include: a registered nurse, doctor or perfusionist. Before starting the transfusion, the following checks are essential **at the patient's bedside** or wherever the patient is to be transfused (See Table 1). **The checks should never be performed remote from the patient or at the nurse's station or in a side room.**

Table 1.

Bedside Checklist ^{4,15}

- **Are the patient identification details identical on:**
 - the patient's identity band?
 - the compatibility label on the blood component pack?
 - the compatibility report form sent with the blood component from the hospital transfusion laboratory?
 - the patient's medical record?
 - the prescription chart?
- **Do these details match who the patient says he/she is?**
 - Patients who can communicate must be asked to state their surname, first name and date of birth.
- **Are the ABO and Rh D group and donation number all identical on:**
 - the IBTS label on the blood component pack?
 - the compatibility label on the blood component pack?
 - the compatibility report form sent with the blood component from the hospital transfusion laboratory?
- **Do the details of the pack, compatibility form and prescription form, match any special requirements** for special types of blood components e.g. CMV seronegative, gamma-irradiated etc?

If there are any discrepancies, the unit must not be transfused. The hospital transfusion laboratory should be informed immediately. Generally it will be necessary to return the unit and compatibility form to the laboratory.

10.1 Inspection of unit prior to administration

- Check that the pack is in date and shows no sign of leakage, unusual colour or haemolysis.
- Check that the platelet packs do not show clumping or appear unusually cloudy, as this may be a sign of bacterial contamination.
- If a defect is suspected, contact the hospital transfusion laboratory for advice.
- If in doubt, do not transfuse.¹⁵

11. ADMINISTRATION OF BLOOD COMPONENTS

11.1 Optimal timing of transfusion

- Elective transfusions and transfusion for transfusion-dependent anaemia should normally be carried out during the day.

11.2 Infusion rates

- In the non-haemorrhaging patient, rates depend on the clinical context, age and cardiac status. Except in the massive transfusion setting, transfusion rates for blood should not exceed 2-4 mls/kg/hr.²⁰
- From starting the infusion (puncturing the blood pack with the infusion set) to completion, infusion of the pack should take a maximum of 4 hours.
- Each unit of solvent detergent (SD) plasma should be transfused to the uncompromised adult over 30-60 minutes. Patients should be examined clinically for evidence of volume overload.¹²⁻¹³
- A single adult dose of apheresis platelets contains an average of 230-300mls and pooled platelets contain an average of 320-340mls. Each dose of platelets should be transfused over a period of 30-60 minutes.

12. BLOOD ADMINISTRATION SETS/EQUIPMENT

12.1 Administration sets

- Cannula size depends on vein size and rate of infusion required.¹⁶
- For whole blood, red cells, platelets, plasma and cryoprecipitate, an infusion set containing an integral filter (170-200 microns)¹⁷ must be used. This is a standard clot screen filter. Bedside white cell filters are no longer required as all blood components are now leucodepleted pre-storage by the IBTS.
- Blood administration sets should normally be changed after a maximum of 6 hours.¹⁷ In the massive transfusion setting the blood administration set may be changed at the discretion of the nurse or doctor administering the blood i.e. if they become blocked or have been used to transfuse multiple units.
- For efficient use, blood administration sets should be primed with the blood component, fully wetting the filter.¹⁶ Multiple blood components administered sequentially through the same set should be ABO compatible. After a red cell component or plasma transfusion, a new blood administration set should be used to transfuse platelets. Blood component administration sets should not be used for subsequent infusions post transfusion as the intravenous fluid may be incompatible with blood in the line.²¹
- Transfusion can take place through one lumen of a multi-lumen central catheter while the other lumen or lumina are in use.²² No other infusion solutions or drugs should be added to any blood component as they may result in haemolysis or clotting.¹⁵

12.2 Blood warmers

Routine warming of blood is not indicated. Patients who will benefit from warmed blood include adults and children receiving massive transfusion,¹⁸ infants requiring exchange transfusion and patients with clinically significant high-titre cold agglutinins active in vitro at 37°C.¹⁵ Blood warmers must be subject to regular servicing and used in accordance with the manufacturer's instructions.

Red blood cells and plasma exposed to temperatures over 40°C may cause severe transfusion reactions. Blood components must NOT be warmed by improvisations such as putting the pack into hot water, in a microwave, or on a radiator, as uncontrolled heating can damage the contents of the pack.¹⁵

12.3 Handling and disposal of blood packs

Hospital policy should cover the use of gloves, trays, bags, accidental spills/damage and disposal. Unless the patient has an acute transfusion reaction, used blood packs should be disposed of after the transfusion in an appropriate designated container i.e. a rigid spill proof bin with yellow lid. If more than 100mls remains in the pack, disposal should be in a spill proof container in accordance with local hospital policy.

13. MONITORING

13.1 In-patients

Severe reactions are most likely to occur within the first 15 minutes/50mls of each unit and patients should be closely observed during this period.^{16,21,23} Temperature, pulse, respirations and blood pressure should be measured and recorded before the transfusion commences and when the transfusion of each unit is completed. Temperature and pulse should be measured 15 minutes after the start of each individual unit.²¹ Additional observations are discretionary and the patient should be monitored as his/her condition warrants, or if there are signs of a transfusion reaction. The patient who is elderly, or who has compromised cardio-respiratory function requires additional monitoring. Patients with chronic anaemia are usually normovolaemic or hypervolaemic and may have signs of cardiac failure before any fluid is infused. If such a patient must be transfused, each unit should be given slowly with a diuretic (e.g. frusemide 20mg) and the patient closely observed. Restricting transfusion to one unit of red blood cells in each 12 hour period should reduce the risk of left ventricular failure (LVF).¹⁵

13.2 Unconscious patients

These patients require continuous observation and monitoring. A transfusion reaction should be considered in the event of any deterioration in the patient's condition during or immediately following a transfusion.¹⁵

13.3 Day patients

Day patients discharged from hospital following a blood transfusion should be issued with an information card indicating the symptoms and signs of transfusion reactions and given advice on when to contact the hospital (See Appendix 2).

14. Adverse events

Patients should be observed closely during the initial 15 mins/50mls of a transfusion.^{16,21,23} Any symptoms, which may indicate a transfusion reaction including distress, pain at or near the transfusion site, loin pain, backache, fever, or dyspnoea, must be investigated as they could indicate a serious reaction. The transfusion must be stopped and the cause of the symptoms investigated immediately. Serious or life-threatening acute reactions are very rare. However, new

symptoms or signs that arise during a transfusion must be taken seriously, as they may be the first warning of a serious reaction.¹⁵ **It is important to realise that signs and symptoms are not necessarily specific to a given type of reaction (See Appendix 3).** The commonest problem associated with transfusion is a rise in temperature. This can be a result of the transfusion itself or the underlying illness and can occur at any time during the transfusion. Each patient should be assessed individually, but in general a temperature rise of 1.5°C above normal should result in the cessation of the transfusion and investigation of a possible transfusion reaction. In the case of simple, urticarial-type reactions with no other symptoms or signs, the patient can be given antihistamines and the transfusion may be continued at a slower rate. (See Appendix 3).

14.1 Acute transfusion reactions

Acute transfusion reactions can be associated with significant morbidity and rarely with mortality (See Appendix 4). Prompt recognition and management is essential. All suspected transfusion reactions should be reported immediately to the hospital transfusion laboratory. Immediate reporting is particularly important if an incorrect unit of blood has been transfused in case blood packs have been transposed and another patient is put at risk.¹⁵

Protocols should be in place to detect, investigate, and where possible prevent adverse reactions.¹⁶ Adverse reactions should be reported to the hospital transfusion laboratory and TSO.

14.2 Management and reporting of adverse events/errors

Failure to adhere to policies and procedures should be dealt with by the local TSO in association with the local Hospital Transfusion Committee. Serious adverse events/errors should be reported to the NHO. Article 15 of the Directive 2002/98/EC of the European Parliament and of the Council of 27 January 2003, which will come into effect in 2005, requires mandatory reporting of 'serious adverse events (accidents and errors) relating to the collection, testing, processing, storage and distribution of blood and blood components which may have an influence on their quality and safety, as well as any serious adverse reactions observed during or after transfusion which may be attributed to the quality and the safety of blood and blood components'.²⁴

14.3 Near miss incidents

Near miss incidents are defined as *"Any error, which if undetected, could result in the determination of a wrong blood group, or issue, collection, or administration of an incorrect, inappropriate or unsuitable component but which was recognised before the transfusion took place."*¹¹ Near miss incidents should be reported to the local TSO. Hospitals should have a system of recording, evaluating and learning from near miss events as these are more frequent than real errors, but often have the same root causes.⁷⁻¹¹ Local audit and education should be used to close the loop on near miss incidents to prevent recurrence.

15. DOCUMENTATION AND TRACEABILITY

15.1 General points

A medical practitioner must record the prescription of blood and blood components. Each hospital must have a system in place to ensure full traceability through maintaining patient and laboratory transfusion records. These records must be stored safely and be available for future look-back and audit exercises. Procedures and policies for each part of the record keeping system must be established and documented. Records may be held in a manual, computerised, or microfilm format or a combination thereof. Records must be protected from inadvertent or unauthorised destruction or modification. Procedures for tracing of blood components in any future look-back should be included in hospital transfusion laboratory SOPs.¹⁶

15.2 Traceability of blood components

The Council of Europe defines traceability as “the ability to identify the actual recipients, of every component released and, conversely, the ability to identify all blood donors involved in the transfusion of a given patient. Retrospective analysis has shown that traceability is not achieved by the simple knowledge of the patient to whom the blood component was initially distributed. Active return of information from the clinical area to the blood transfusion service after the transfusion act is necessary to provide complete and reliable information about the fate of a given blood component. Traceability documents may include information on the existence of immediate adverse reaction”.¹⁷ Article 14 of the EC Blood Directive 2002/98/EC mandates full traceability of all blood components.²⁴ Data needed for full traceability in accordance with this article must be retained for at least 30 years.²⁴

Donation numbers for blood and blood components (whole blood, red cells, platelets, cryoprecipitate and cryo-poor plasma) and batch numbers for pooled blood products (Octaplas and Uniplas, clotting factor concentrates, albumin, anti-D, intravenous immunoglobulin), must be specifically recorded on the transfusion record sheet and filed in the patients medical record and in the hospital transfusion laboratory or pharmacy. Recording practices such as the use of peelable labels containing batch numbers are encouraged to reduce the possibility of transcription error. Standardisation of documentation throughout the country is recommended, as is the maximum use of computerised and electronic data.

16. DEVELOPMENTS IN INFORMATION TECHNOLOGY

Computer systems should be used in the transfusion process as they reduce the risk of transfusion error and facilitate full traceability and audit. These systems are used in hospital transfusion laboratories, but as sampling and administration have been identified as problem areas in the transfusion chain, extension of the use of such systems to the clinical area to ensure correct patient identification at sampling and administration is recommended.⁷⁻¹¹ Use of computerised request forms should be adopted. There is evidence that stimulating awareness of, and compliance with, best practice by computer generated reminders at the point of care is effective.²⁵ Computerised request programmes with pre-established algorithms can guide the clinician to comply with accepted guidelines and ask for additional clinical reasons when overriding the guidelines. They also provide an effective means of online documentation.³

Computerisation is known to reduce human error in the many steps involved in the administration of blood. We recommend that hospital authorities should evaluate the use of computerised systems for the whole transfusion process from pre-transfusion patient sampling through to the administration of the transfusion of blood to the recipient. This will be essential for full traceability.

17. THE TRANSFUSION COMMITTEE

The hospital executive or health board has the responsibility to establish the hospital transfusion committee. The committee should be supported and resourced by hospital management which should also be represented.³ The membership of a hospital transfusion committee should be multidisciplinary representing the main users of blood and should include a consultant haematologist, transfusion scientist and TSO in a hospital or region. The committee should meet regularly and adopt a preventative/corrective approach to transfusion problems. Adverse events and near misses should be examined. The committee should review and audit the use of blood and blood components and make recommendations on appropriate use. The committee's recommendations should be conveyed to the hospital executive in regular reports.

18. EDUCATION AND TRAINING PROGRAMME

The TSO, or another identifiable member of staff, should be responsible for ensuring that all staff involved in the transfusion process receive adequate education and training relevant to their role within that process. This programme should be documented and subject to regular review.

19. HOSPITAL-BASED HAEMOVIGILANCE

Haemovigilance should be under the direction of the consultant haematologist and is the responsibility of all persons involved in the transfusion process.

Haemovigilance should include:

- Promoting the appropriate use of blood and blood components/products.
- Provision and organisation of education and training relevant to staff involved in the transfusion process.
- Co-ordination, collection and reporting to the NHO of serious adverse reactions/events relating to blood transfusion.
- The tracing and recall of blood and blood components as requested by the IBTS.
- Participation in an active hospital transfusion committee.
- Review and audit of all aspects of the transfusion process.

20. THE NATIONAL HAEMOVIGILANCE OFFICE

The NHO receives and follows-up confidential reports from hospitals and medical practitioners of serious adverse events/reactions to blood components following transfusion. Feedback is provided as appropriate. The reports are analysed, the findings are then disseminated and published in the form of an Annual Report, which makes recommendations for future practice.

The NHO recognises the progress that has already been made in the area of administration of blood and blood components. This programme has been co-ordinated through the efforts of local TSO and their teams.

The National Haemovigilance Office can be contacted at:

Irish Blood Transfusion Service,

National Blood Centre,

James Street,

Dublin 8.

Tel: 01 432 2894/2854

Fax: 01 432 2999

Website: www.ibts.ie (Haemovigilance pages)

APPENDIX 1 BLOOD TRANSFUSION INFORMATION FOR PATIENTS (PAGE 1)

What is a blood transfusion?

Giving a patient red blood cells, platelets or plasma is a blood transfusion. Blood is stored in a plastic bag and given through a tube, which is connected to a needle usually inserted in the arm. The transfusion should not be painful but having a needle in your arm may be slightly uncomfortable. Each unit of blood is generally transfused over two to four hours.

Why do patients need blood transfusions?

Blood components¹ are used to correct abnormalities in the blood, which cannot be corrected by any other means. Common reasons for blood transfusions are,

- Blood lost because of an accident or surgery,
- Anaemia²
- Bleeding or clotting disorders.

If you lose a significant amount of blood during an operation or an accident your doctor will want to replace the blood loss with a blood transfusion immediately so that you do not suffer the serious effects of your blood loss.

If you have anaemia, your body does not have enough red cells to carry the oxygen you need and you may feel tired or breathless. Many cases of anaemia may be treated with medication, however not all cases respond and blood transfusion may be required. Your medical team will best explain details about why you may need blood.

Steps taken to ensure that the blood is safe?

The Irish Blood Transfusion Service have many safeguards on our national blood supply. All the donors are voluntary and unpaid as such donors are the safest source of blood. Before giving blood, donors must answer detailed questions about their health and risk factors for diseases to ensure that they are in good health. Every unit is tested for infections which can be transmitted through blood, i.e. Hepatitis B and Hepatitis C, HIV I and 2 (the cause of AIDS), Syphilis and HTLV I and II.

Are there risks involved when having a blood transfusion?

The serious risks of having a blood transfusion are rare and must be balanced against the risk to your health of not having a transfusion. Many hundreds of lives are saved each year by blood transfusions. Investigations and operations can be performed because blood is available. When a blood transfusion is needed the risk of not receiving blood far outweighs the risks of a transfusion. The serious risks are reactions to the blood or the transmission of infections. These risks are minimised by the careful selection of donors, testing and handling of the blood.

Infections and Viruses

A great deal of publicity has been given to the potential risk of getting AIDS or Hepatitis from blood transfusions. All blood transfused in Ireland is tested for these viruses. When you consider the risks of transfusion, it is important to realise that the risk of infection from a blood transfusion is very low. Daily activities such as road travel are associated with much greater risks than the risks of a blood transfusion when you need it. The estimated risks in Ireland for known viruses are:

HIV	1 possibility in 4 million units of blood transfused
Hepatitis C	1 possibility in 4 million units of blood transfused
Hepatitis B	1 possibility in 200,000 units of blood transfused

The careful collection and storage of the blood reduces the risk of bacterial infection, which is rare but can be fatal.

Variant Creutzfeldt Jacob Disease (vCJD), a degenerative neurological disease, was first recognised in 1996 and is caused by eating BSE contaminated meat. Over 150 cases have occurred to date, the vast majority in UK patients or in patients who have lived in the UK for extended periods of time. vCJD is a new disease and the risks of transmission through blood transfusion have been of concern to blood services since its discovery. One case where vCJD has probably been transmitted by transfusion has been identified in the UK. The donor was well at the time of donation but later developed vCJD. The recipient developed vCJD 6 years after the transfusion and it is thought that this was much more likely to have been caused by the transfusion than by eating beef. The predicted incidence of vCJD due to eating infected beef in Ireland is calculated to be very small due to the much lower amount of BSE infected meat consumed in Ireland. To reduce the risks of possible transmission of vCJD through transfusion from a donor who might have become infected with vCJD, the IBTS has introduced a number of precautionary measures since 1999. These include the removal of white cells (believed to contain much of the infectious agent, the prion), the deferral of donors who have lived for a number of years in the UK or who have a history of transfusion outside Ireland and the importation of virally safe plasma from outside of Europe. It is important to realise that the risks of not having a necessary blood transfusion exceeds the extremely low risk of vCJD transmission by transfusion.

APPENDIX 1 BLOOD TRANSFUSION INFORMATION FOR PATIENTS (PAGE 2)

Matching Blood

A harmful reaction to the blood transfusion can be caused by the transfusion of blood, which is not matched to the patient's blood. This is prevented by matching the donated blood with a carefully identified sample from the patient. At the bedside, before the transfusion is started both you and the unit of blood will be carefully identified. This is the reason why the nurse, doctor or phlebotomist asks you to state your name when taking a blood sample and prior to transfusion.

Reactions

Your nurse will observe you carefully during transfusion particularly at the beginning. Tell your nurse immediately if you feel unwell or experience fever or chills during or after the transfusion. Even if you have a reaction to blood it does not mean that there is cause for concern. As a precaution your nurse will stop the transfusion and call a doctor, your symptoms will be treated and the reason for the reaction investigated. All significant reactions are reported to the National Haemovigilance Office at the Irish Blood Transfusion Service.

Transfusions after a reaction

If a patient develops a reaction to the blood transfusion, medication given prior to the next transfusion or giving a different blood product may prevent a further reaction.

The most important blood groups, the ABO and Rh D groups, are matched prior to transfusion. However a match of the patient's blood against the donors can never be perfect. Rarely some months after a transfusion, patients may develop antibodies to the transfused red cells. These antibodies will not usually make the person ill, but will be important for future transfusions or in pregnancy. They will be discovered when the blood is tested and this test will also help decide what blood should be given next time around.

Are there alternatives to having a blood transfusion?

Some blood loss can be replaced by other fluids and your body will then make new red cells over the next few weeks. The following is a brief outline of the alternatives, which can be offered to some patients. The availability of these alternatives generally depends on your underlying illness and your general health. If you would like more information ask your doctor for advice.

Fit persons undergoing a planned surgery may be able to donate their own blood a number of weeks before their surgery. This is called autologous donation. In other circumstances, blood lost during or immediately after an operation can be collected and transfused back to the patient. Medication can, in some instances, be administered to reduce or prevent bleeding.

Using your own blood will prevent the rare transmission of viral infections but will not avoid the rare risks of bacterial infection or the transfusion of an incorrect unit of blood.

Some illnesses or dietary deficiencies, which cause anaemia, may be treated with medications including iron or vitamins.

Can my relatives or friends donate blood for me?

When relatives or friends donate blood it is called directed donation. Research has shown that such transfusions are not any safer than carefully selected voluntary donations. Directed donations are not available in Ireland, the UK or in most European countries.

Further information

You can discuss any worries you have about the blood transfusion with your doctor. If you would like any additional information contact the Department of Transfusion Medicine here in the hospital.

Glossary

1. Blood components

Unit of blood: A unit of donated blood can be separated into a number of individual components principally a red cell preparation, platelets and plasma.

Platelets: Platelets are small blood cells. They are essential to enable blood to clot properly.

Plasma: Plasma is used to correct deficiencies in patients' blood clotting.

2. Anaemia: Anaemia refers to a lower than normal red blood count.

January 2004

APPENDIX 2 POST TRANSFUSION INFORMATION LEAFLET FOR DAY PATIENTS

- You have been transfused with a blood transfusion as prescribed by your doctor here today.
- Occasionally during or after a blood transfusion you may feel unwell; this is referred to as a reaction. Indeed reactions can occur up to several weeks after a transfusion. The symptoms of a transfusion reaction may include:

Apprehension/Faintness/Weakness.

Nausea/Vomiting.

Breathlessness/Chest pain/Back pain.

Hives/Rash/Itch/Flushing.

Fever/Rigors/Chills.

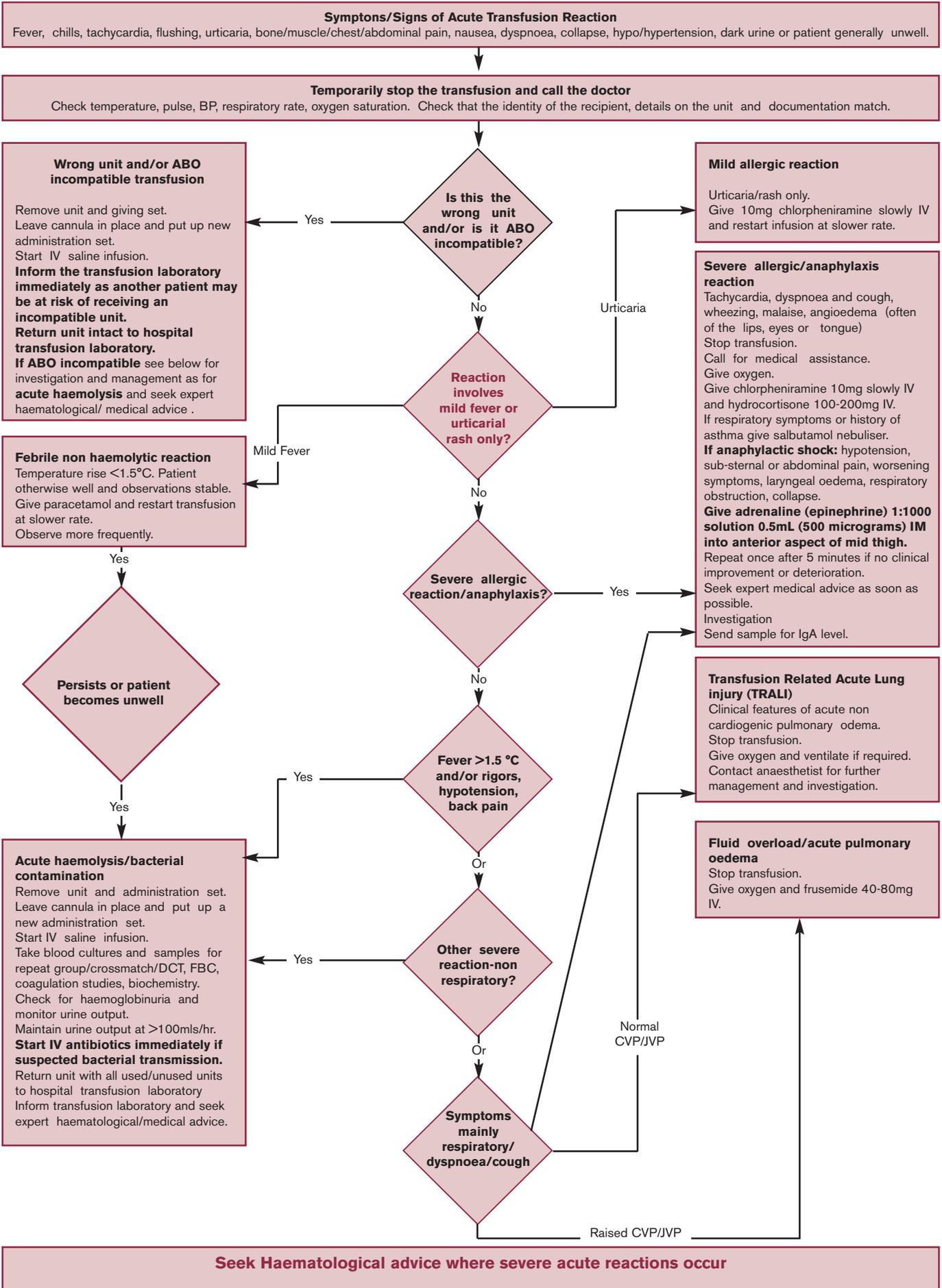
Jaundice/ Dark or Red Urine.

- A reaction may not always be a cause for concern but it is important to inform your nurse or doctor immediately if you experience any unexplained worsening of your symptoms.
- Rarely you may develop a reaction after the transfusion therefore if you experience any worsening of your symptoms it is important to contact a member of your Medical Team.

Contact _____ during clinic hours or _____ out of hours and during the weekend.

Adapted from leaflet issued by Blood Bank and Nursing Staff, University of Michigan Hospitals and Health Centres, Patient Post Transfusion Discharge Instructions, February 2000

APPENDIX 3. MANAGEMENT OF AN ACUTE TRANSFUSION REACTION



APPENDIX 4. COMPLICATIONS OF TRANSFUSION*

Problem	Symptoms and signs	Cause	Onset of symptoms and frequency of occurrence	Management and outcome
Acute Complications				
Acute intravascular haemolysis of transfused red cells	Symptoms of apprehension, agitation, flushing, nausea, pain at venepuncture site, pain in abdomen, flank or chest. Fever, chills, tachycardia, collapse, hypotension, generalised oozing from wounds or puncture sites, dark urine or patient generally unwell.	ABO-incompatible transfusion, e.g. Group A blood to Group O recipient. Usually occurs due to simple clerical error e.g. taking pre-transfusion sample from the wrong patient or failure of the checking procedure, resulting in transfusing blood to the wrong patient.	Often during first few mls of transfusion. ABO incompatible transfusion occur in about 1:50,000-80,000 units transfused ^{7,14} Death 1:2.6 million ^{7,11} Mortality due to DIC and acute renal failure. ²⁶	Discontinue transfusion and change administration set but leave cannula in place. Commence IV saline infusion. Monitor urine output/catheterise. Take blood samples for repeat group and crossmatch, DCT, FBC, coagulation studies and biochemistry to include bilirubin. Urinalysis for haemoglobinuria and urobilinogen. In the event of fever take culture from both patient and pack to exclude other sources of infection. Do not transfuse any further units from this crossmatch. Inform hospital transfusion laboratory immediately. Return unit and administration set intact to hospital transfusion laboratory. Maintain blood pressure and renal perfusion. Maintain urine output at >100mls/hr. Give frusemide if output falls. Treat any DIC with appropriate blood components. Transfuse compatible red cells. Seek expert haematological/medical advice Prevention: Use safe documentation and checking systems to ensure correct sample and patient identification.
Febrile non-haemolytic transfusion reaction	An isolated fever of 1.5°C above normal. Most commonly occurs with platelets.	HLA antibodies See also under severe allergic reaction.	Towards the end of the transfusion or within hours of completing the transfusion. Frequency: as low as 0.05% of transfusions since the introduction of universal leucodepletion in 1999. ²⁷	If temperature rise is less than 1.5°C, the observations are stable and the patient is otherwise well give paracetamol. Restart the transfusion at slower rate and observe more frequently.

Problem	Symptoms and signs	Cause	Onset of symptoms and frequency of occurrence	Management and outcome
Urticaria	Pruritis and rash	More likely to occur with transfusions of platelets or plasma than with red cells.	<p><i>Frequency:</i> 1-3% of transfusions.²⁰ The less severe urticarial reactions can sometimes be delayed for up to 2-3 hours after the start of the transfusion.</p>	<p>Give chlorpheniramine 10mg slowly IV/IM. Restart the transfusion at a slower rate and observe more frequently.</p> <p>Prevention: Premedicate with chlorpheniramine 10-20mg before transfusion in patients having recurrent episodes.</p>
Severe allergic reaction	Pruritis, rash, tachycardia, dyspnoea and cough, wheezing, malaise and angioedema (often of the lips, eyes or tongue).	The cause of these allergic reactions is not fully elucidated. Reactions to plasma proteins have been implicated in some cases. Increasingly the importance of inflammatory cytokines released from platelets during storage, and to a lesser extent since the advent of leucodepletion, from white cells, are being recognised as a cause of allergic transfusion reactions. ²⁸	In general the shorter the interval between the initiation of the transfusion and the onset of symptoms the more severe the reaction is likely to be. ²⁰	<p>Stop the transfusion. Call for medical assistance. Commence oxygen. Give chlorpheniramine 10 mg slowly IV and hydrocortisone 100-200mg IV. If respiratory symptoms or history of asthma, give salbutamol nebuliser.</p>
Anaphylaxis	Worsening symptoms as above, laryngeal oedema, inspiratory stridor, wheeze, cyanosis, substernal or abdominal pain, pronounced tachycardia, hypotension, shock and loss of consciousness.	<p>Often the cause is unknown. As above</p> <p>Occasionally patients will have severe IgA deficiency (<0.05mg/dl)²⁰ with anti-IgA antibodies.</p>	<p>Anaphylaxis is very rare. 1:47,000</p>	<p>Life-threatening. Consider diagnosis of anaphylaxis if severe allergic-type reaction with stridor, wheeze, respiratory distress and/or clinical signs of shock.²⁹</p> <p>Give adrenaline (epinephrine) 1:1000 solution 0.5 ml (500 micrograms) IM into the anterior aspect of the mid-thigh. Repeat once after about 5 minutes in the absence of clinical improvement or if deterioration occurs after the initial treatment especially if consciousness remains impaired as a result of hypotension.²⁹</p> <p>Give antihistamine (chlorpheniramine) 10mg slow IV and hydrocortisone 100-200mgs IV. Give salbutamol nebuliser.</p> <p>Send sample for IgA level.</p> <p>Prevention: Seek specialist haematology advice for future transfusion management.</p>

Problem	Symptoms and signs	Cause	Onset of symptoms and frequency of occurrence	Management and outcome
Bacterial contamination of component.	Rigors, fever, tachycardia, and circulatory collapse	Bacterial contamination of blood components most commonly occurs with platelets as they are stored at room temperature: Staphylococci, Serratia and Bacillus cereus are the most common offending organisms. RBCs are much less commonly contaminated with psychrophilic organisms e.g. Yersinia, Pseudomonas.	Usually during transfusion of first 100ml of the contaminated pack. Platelets Transfusion-transmitted bacterial infection: 1 in 80,000-100,000 platelet therapeutic doses ^{7,11,30} Death: 1 in 270,000-300,000 doses ^{7,11,30} RBCs Rare: 1 in 3-5 million red cell units. ^{7,11,30} Death 1 in 8 –13 million units	High mortality If suspected start IV broad spectrum antibiotics immediately, commence fluid and oxygen support. Discontinue transfusion and return unit and set intact to hospital transfusion laboratory with all used/unused units. Take blood cultures from patient and pack, repeat blood group and crossmatch, DCT, FBC, coagulation screen and biochemistry. Monitor urine output. Seek haematological advice. If confirmed, inform IBTS. Prevention Correct storage and handling of blood components. Visual inspection of units immediately prior to transfusion.
Transfusion associated circulatory overload (TACO)	Acute left ventricular failure (LVF) may occur with dyspnoea, orthopnoea, cyanosis, tachycardia, hypertension, raised jugular venous pressure (JVP) and pulmonary oedema.	When too much fluid is transfused or the transfusion is too rapid, symptoms of circulatory overload may develop. The risk of TACO is increased in infants, adults over 60, and in patients with diminished cardiac reserve or with chronic anaemia.	During or within several hours following the transfusion. Incidence from 1:3,000 ³¹ -14,000 ¹⁴ units transfused, but probably under diagnosed. In some reported series up to 1% of transfusions in elderly patients. ³¹	Discontinue the transfusion. Give oxygen and IV furosemide 40-80mgs. Place the patient in a sitting position. Monitor fluid balance closely. Perform CXR. Prevention: If 'at risk' patients must be transfused, each unit should be given slowly with a prophylactic diuretic and the patient observed closely with particular attention to fluid balance. Restricting transfusion to one unit of RBCs per 12 hour period and transfusing during normal working hours with optimum medical/nursing cover should reduce the risk of TACO. ¹⁵
Transfusion-related acute lung injury (TRALI) Noncardiogenic pulmonary oedema	Symptoms of acute respiratory distress, hypoxia, fever, chills and hypotension with associated bilateral pulmonary oedema. Transient hypertension may occur.	White cell antibodies in donor plasma (usually from multiparous women) interacting with recipients leucocytes, leading to complement activation and white cell sequestration in the lungs. Typically seen as bilateral pulmonary infiltrates on CXR not associated with cardiac failure.	Symptoms typically begin within 1-2 hours of transfusion and are usually present by 4-6 hours. Onset of symptoms after 12 hours is most unlikely to represent TRALI. The incidence is about 1:5,000 units transfused but it is probably under diagnosed. ³²	May be life-threatening. Maintain airway, discontinue transfusion, and commence oxygen. Perform CXR. Manage as for acute respiratory distress syndrome. May require ventilation. Investigations: If suspected clinical diagnosis, take sample for HLA typing and inform IBTS for donor investigations.

Problem	Symptoms and signs	Cause	Onset of symptoms and frequency of occurrence	Management and outcome
Delayed haemolysis of transfused red cells	Unexplained fall in haemoglobin, rising LFTs, jaundice and dark urine.	Patient has IgG antibodies to red cell antigens such as Rh, Kidd, Kell or Duffy because of previous pregnancies or transfusions. The antibodies are undetectable in the crossmatch but further transfusion causes a secondary immune response resulting in delayed haemolysis.	Usually 5-10 days or longer after transfusion. Approximately 1 in 500 red cell transfusions.	<p>Persisting anemia may require transfusion of suitable antigen negative blood. The risk of renal decompensation should be reduced by adequate hydration. Where renal decompensation has occurred this should be appropriately managed.</p> <p>The hospital transfusion laboratory patient records should be amended to include the presence of red cell antibodies. In the future, irrespective of whether the antibody is subsequently detected on antibody screen, antigen negative red cells should only be issued for that patient.</p>
Transfusion-associated graft-versus-host disease (TA-GvHD)	Progression of fever, rash, raised LFTs, diarrhoea and pancytopenia.	Transfused donor T cells can engraft and initiate GvHD in the recipient who is often immunodeficient e.g bone marrow allograft recipient, Hodgkin's disease, fetus receiving intrauterine transfusion. Because of haplotype sharing, blood from relatives can induce GvHD in immunocompetent recipients. Confirmed by skin/bone marrow biopsy appearances and/or the presence of circulating donor lymphocytes.	Rare. 1-6 weeks post transfusion. ⁷⁻¹¹	<p>Usually fatal.</p> <p>Seek specialist medical advice.</p> <p>Prevention: Gamma-irradiation of cellular blood components for susceptible recipients.³³</p>
Post-transfusion purpura (PTP)	Thrombocytopenia often associated with bleeding and poor response to platelet transfusion.	Immune-mediated thrombocytopenia, usually occurring in parous women. Antibodies against human platelet antigens (HPAs) are detectable in the patient's serum, usually anti-HPA-1a.	Rare. 5-12 days after transfusion.	<p>Thrombocytopenia is usually associated with bleeding.</p> <p>Seek expert haematological advice. The treatment of choice is high-dose intravenous immunoglobulin (IVIg). Total dose of IVIG 2g/kg given over 2 or 5 days.¹⁵</p> <p>Platelet transfusions may be required in bleeding patients.</p> <p>Prevention: Despite the low incidence of recurrence patients with a documented history of PTP should receive, if possible, HPA-1a-negative red cell and platelet concentrates for subsequent transfusions.³⁴</p>

Problem	Symptoms and signs	Cause	Onset of symptoms and frequency of occurrence	Management and outcome
<p>Delayed Complications</p> <p>Post-transfusion viral infection</p>	<p>Symptoms depend on virus.</p> <p>Often silent.</p>	<p>Viral infection in donor not detected by donor screening and testing.</p>	<p>Depends on virus: weeks or months or years post-transfusion.</p> <p>Residual risk of viral transmission with tested blood is very low and has been estimated to be: HIV – 1:4 million per units transfused HCV – 1:4 million per units transfused. HBV – 1:200,000 per units transfused</p>	<p>Seek specialist medical advice.</p> <p>All cases of suspected transfusion-transmitted infection should be reported to the IBTS for investigation. If donated blood is excluded, other sources of acquisition, including nosocomial infection, should be considered.</p>
<p>Iron overload</p>	<p>Chronically transfused patients, especially those with haemoglobinopathies have progressive and continuous accumulation of iron, which may lead to cardiac and liver damage.</p>	<p>One unit of red cells contains 250mg of iron.</p> <p>Patients receiving multiple transfusions are at risk.</p>	<p>After several years of frequent transfusions.</p>	<p>Seek specialist medical advice for prevention and treatment in multi transfused patients.</p> <p>Prevention: Use desferrioxamine to increase iron excretion in patients likely to receive long-term transfusions.</p> <p>Causes liver, endocrine and cardiac damage.</p>

* Adapted from the Handbook of Transfusion Medicine, 3rd Edition¹⁵ and The BCSH Guideline on the administration of blood and blood components and the management of transfused patients.⁴

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