Northern Devon Healthcare NHS

NHS Trust

TRANSFUSION TRAINING RESOURCE AND ASSESSMENT OF COMPETENCY

Name
Job Title
Clinical Area

Version 1.*2*

Document Class	*Workbook*	*Organisation*	*NDHT*
Audience	*All clinical staff involved in the blood transfusion process*	*Revised by*	*Hospital Transfusion Team*
Title	*Transfusion Training Resource and Assessment of Competency*	*Date revised*	*May 2010*
Author (s)	*K. Wedgeworth & M. Webb*	*Authorship Date*	*February 2008*
Ratified by	*Hospital Transfusion Committee*	*Date to be reviewed*	*May 2013*

CONTENTS

INTRODUCTION

Blood transfusion is an integral part of treatment in most medical and surgical specialties. Blood supplies are well regulated and the safety of transfusions has improved greatly through stringent screening of donors and testing of donated blood. However, blood transfusions are still associated with a range of adverse effects and future developments may discover unknown or previously unsuspected pathogens. The annual Serious Hazards of Transfusion (SHOT) Report continue to highlight that although severe reactions are rare, the transfusion process is not without risk.

Blood transfusion is a multi-step procedure. This workbook is aimed at all staff involved in the transfusion process, from the prescription, phlebotomy, issuing, collection and administration of blood products. Documented evidence of training and completed competency assessment for all staff is required to ensure patients and products are managed in a safe and efficient manner. This is reinforced by the National Patient Safety Agency (NPSA) Safer practice Notice No. 14 Right Patient, Right Blood (2006), the Better Blood Transfusion Directive (DoH 2007) and the Blood Safety & Quality Regulations (2005).

The following table indicates the chapters relevant to each staff group. Individuals are required to complete the questions as evidence of their level of knowledge of their role in the transfusion process.

Chapter	Medical staff	Laboratory staff	Registered nursing/ midwifery/ theatre staff	Unregistered nursing/ Midwifery theatre staff	Phlebotomists	Porters & Theatre Support workers
1	✓	✓	✓	n/a	n/a	n/a
2	✓	✓	✓	✓ (#)	n/a	n/a
3	✓	✓ (#)	✓ (#)	n/a	n/a	n/a
4	✓	n/a	✓	n/a	n/a	n/a
5	✓	✓	✓	✓	✓	n/a
6	n/a	✓	✓	✓	n/a	✓
7	✓	n/a	✓	✓	n/a	n/a
8	✓	n/a	✓ (#)	n/a	n/a	n/a
9	✓	✓	✓	✓	✓	✓

✓ Complete questions at end of each chapter

\# Required to answer select questions only

n/a Not required to answer questions from these chapters

The final sign off sheet (page 31) confirms you have satisfactorily completed the workbook and have been assessed as competent in your role in the transfusion process. Please ensure training records are kept up to date by sending a copy of page 31 to Kathleen Wedgeworth, Clinical Nurse Specialist Office, Level 1, NDDH.

Chapter 1

BLOOD AND BLOOD GROUPS

Blood Donation

Blood donors in the UK must be volunteers between the age of 17 and 65, weigh more than 50Kg and be in good health. Certain medical conditions and lifestyles permanently exclude donors and other exclusions e.g. foreign travel to a malaria area, are for a finite time. All blood donations are tested for ABO and Rh (D) type. Microbiological testing is mandatory for Hepatitis B and C, HIV 1 and 2, HTLV 1 and 2 and Syphilis. At present there is no test available for variant Creutzfeldt - Jakob disease (vCJD), so, as a precaution, all donations are filtered to remove the white blood cells (leucodepleted) which are thought to be the most likely source of infection. In addition, persons who have received a blood transfusion since 1980 are excluded from donating.

The human body can quickly replace lost red cells by a process known as erythropoiesis which occurs in the bone marrow. However to prevent donors becoming anaemic they are restricted to donating a maximum of three times per annum.

Blood is made up of 55% plasma and 45% cellular components. Donated blood is processed by the National Blood Service (NBS) into several therapeutic products. The cellular components include red blood cells, platelets and granulocytes while plasma is issued as Fresh Frozen Plasma (FFP) and Cryoprecipitate. Plasma derivatives such as albumin, coagulation factors and immunoglobulins are produced from non-UK plasma as an added safeguard against the transmission of vCJD.

Blood Groups

The four major blood groups are A, B, AB, and O. These are determined by the presence or absence of two antigens A and B on the red cell surface. In normal adults, the plasma contains the converse antibody to the antigen present as shown below.

Antigen (red cells)	Antibody (plasma)	Blood Group
A	B	A
B	A	B
A and B	none	AB
None	A and B	O

Each of the groups is further divided into Rh Positive and Rh Negative. The Rh type is determined by the presence or absence of the D antigen. Approximately 85% of the UK population are Rh (D) positive and the remaining 15% are Rh (D) negative. The transfusion of Rh (D) positive blood into a Rh (D) negative recipient may result in the development of anti-D antibody. It is particularly important to avoid this in women of childbearing age.

Questions - Chapter 1

1. Where in the body are red cells produced and what is the process known as?

2. Why are persons who have received a blood transfusion banned from donating blood?

3. The transfusion of Rh (D) positive blood could have a detrimental effect for a person of Rh (D) negative blood group
   (tick as appropriate)

   True [ ] or False [ ]

4. Fill in the blank columns in the following table with the best choice blood group.
   Please indicate where no choice is possible.

Recipient group	Donor group 1st choice	Donor group 2nd choice	Donor group 3rd choice
O			
A			
B			
AB			

Chapter 2

BLOOD PRODUCTS

The National Blood Service (NBS), which is part of the NHS Blood and Transplant (NHSBT) organisation, collects all blood in the UK from volunteer donors. The blood we use in North Devon comes from the Plymouth Centre, which is a subsidiary of the main centre at Bristol.

Donor blood is routinely separated by the NHSBT into red cells, platelets and plasma. The red cells are re-suspended in a solution containing Saline, Adenine, Glucose and Mannitol (SAG-M) and this enables the red cells to be stored for 35 days from the date of donation. The platelets from 4 donations are pooled together using sterile techniques to produce 1 Adult Therapeutic Dose (ATD) of platelets. The plasma is frozen to prepare Fresh Frozen Plasma (FFP) or used to prepare Cryoprecipitate (Cryo).

Red cells

Red cells are produced in bone marrow and used to treat anaemia from a variety of causes ranging from acute blood loss to malignancy. They must be stored at $4^{o}C$ +/- $2^{o}C$ in a blood bank refrigerator which complies with British Standard BS 4376 Part 1 (1991). The blood bank refrigerator must be fitted with a temperature recording chart and alarm. Once removed from storage, the blood transfusion must be commenced within 30 minutes and completed within 4 hours.

Platelets

Platelets are cell fragments that are vital to the clotting process. They also are produced in bone marrow. As well as pooled platelets, platelets can be produced by apheresis. Up to 3 ATDs of apheresis platelets are obtained from the blood of one donor using a machine which separates the blood and returns all but the platelets to the donor. Platelets are used to control or prevent bleeding in patients with thrombocytopenia. Platelets require special storage conditions at $22^{o}C$ +/- $2^{o}C$ with continual agitation. Once removed from the agitator they should be administered as quickly as possible and the transfusion should be over no more than 30 minutes.

Human leucocyte antigen (HLA) matched blood products may be required if, for example, normal platelet concentrate donations do not achieve a satisfactory increment in the platelet count due to the presence of anti-platelet antibodies.

Red cells and platelets are sometimes irradiated to prevent patients who are immunocompromised from developing Transfusion Associated Graft versus Host Disease (TAGvHD). A standard dose of irradiation is applied to the product to destroy any viable white cells present.
Patients requiring irradiated products include (although the list is not exhaustive):

- Bone Marrow Recipients
- Patients with Hodgkin’s disease.
- Patients receiving purine analogues eg Fludarabine.
- Patients receiving HLA matched blood and platelets.
- Babies who have had intra-uterine transfusions.

Fresh Frozen Plasma (FFP)

FFP is produced by freezing the plasma from a single unit of blood. FFP contains all clotting factors and its main use is the control of massive bleeding. It may also be appropriate to use for warfarin reversal if a prothrombin complex concentrate eg Octaplex is unavailable or if there are contra-indications for its use.

Methylene blue (MB) virally inactivated FFP is available for neonates and children under 16 years old.

FFP should be prescribed at approximately 15ml/kg weight making the usual dose for adults 4 units. FFP can be stored frozen at -30^{o}C or below for 2 years but should be administered as soon as possible after thawing to gain maximum benefit for the patient. The normal transfusion rate for 1 unit of FFP is 15 to 20 minutes.

Cryoprecipitate (Cryo)

Cryoprecipitate is produced by rapidly freezing plasma in ethanol and dry ice and then slowly thawing it at 4^{o}C. This causes clotting factors to precipitate from the plasma. Cryoprecipitate is rich in fibrinogen, factor VIII, factor XIII and von Willebrand's factor. The precipitates are then re-suspended in a small amount of plasma and refrozen to -30^{o}C. The product is normally supplied as a pool of 5 donations and 1 adult therapeutic dose is 2 pools. One such treatment would typically raise the plasma fibrinogen level by 1g/l.

Cryoprecipitate is rarely used but is very effective in controlling bleeding due to Disseminated Intravascular Coagulopathy (DIC). As with FFP, Cryoprecipitate can be stored for up to 2 years but once thawed the product should be administered as soon as possible to gain maximum benefit for the patient.

Batch Products

Other blood products are batch products made from pooled plasma donations. Since 1999, all batched products licensed for use in this country are made from non-UK plasma. In effect, this means plasma from voluntary donors in the USA.

The batch products in common use are:

- Normal Human Immunoglobulin for the treatment of hypogammaglobulinaemia and certain neurological conditions.
- Human Albumin Solution for protein replacement and the treatment of burn victims.
- Single clotting factor preparations for the treatment of coagulopathy.
- Anti-D Immunoglobulin for the prevention of Rh Haemolytic Disease of the Newborn.
- Anti-Tetanus Immunoglobulin to provide passive immunity to Tetanus.

Other rarer immunoglobulin preparations are also available e.g. Anti-Varicella.

Questions - Chapter 2

1. Why is the ward refrigerator not suitable for storing red cells?

2. What is the correct storage condition for platelets?

3. Why are products sometimes irradiated?
(Unregistered Staff are not required to answer this question)

4. What is the usual dose of FFP for an adult 80kg patient?
(Unregistered Staff are not required to answer this question)

5. What is the main use for Anti-D immunoglobulin?
(Unregistered Staff are not required to answer this question)

Chapter 3

USES AND ALTERNATIVES TO THE USE OF BLOOD PRODUCTS

Always consider whether there is a safer alternative to the use of blood and blood products.
Is it really necessary to transfuse?
What are the alternative options?
Consideration of alternatives is very important in those patients who for religious reasons will not accept blood and blood products.

Red cell transfusions

Red cells may be indicated in the following situations but clinical judgement plays an essential part in the decision:

- Acute blood loss greater than 30% of total volume (more than 1000mls).
- Peri-operatively if haemoglobin (Hb) is less that 7g/dl or if Hb less than 8g/dl in patients with known cardiovascular or respiratory disease or risk factors.
- Post operatively if haemoglobin is less than 7.0g/dl.
- Acute myocardial infarction if haemoglobin less than 10.0g/dl.
- Refractory anaemias (myeloid dysplasias) when symptomatic.

Alternatives:

- If the anaemia is of long-standing the patient may have adjusted to a low haemoglobin level and the decision to transfuse should be based on symptoms rather than a haemoglobin level.
- If the anaemia is due to a simple deficiency then correction of the deficiency with iron, folate or vitamin B12 is preferable. A blood transfusion in someone with pernicious anaemia may precipitate heart failure.
- If the anaemia is due to renal failure the use of erythropoietin (eg darbepoietin weekly sc) can be effective – see NICE Clinical Guideline 39 - Sept 2006 and dosage regime in BNF.
- There is no evidence to support a pre-operative haemoglobin transfusion trigger of 10.0g/dl. A haemoglobin level between 8.0 and 10.0g/dl is a safe pre-operative level even in patients with significant cardio-respiratory disease.
- Patients should not normally be transfused if the haemoglobin is over 10.0g/dl. In the management of critically ill patients in intensive care Hebert et al New Eng Med J (1999) found that the group managed with a conservative transfusion strategy (maintaining Hb 7.0 – 9.0g/dl) did significantly better than a group given a liberal transfusion management (Hb 10 – 12g/dl) in terms of hospital mortality, adverse cardiac events and rate of organ dysfunction.
- If the surgical field is sterile and free of malignant cells intra-operative red cell salvage techniques avoid the use of donor blood transfusion.
- Tranexamic acid and fibrin sealants may be used to reduce blood loss.

Platelet transfusions

Uses:

- Bone marrow failure with a platelet count of 10 $x10^9$/l or less.
- Bone marrow failure with complicating factors such as sepsis or coagulopathy with a platelet count of 20 $x10^9$/l or less.
- Patients needing lumbar puncture, epidural anaesthesia, central line insertion if the platelet count is less than 50 $x10^9$/l.
- Patients needing laparotomy if platelets less than 80 $x10^9$/l.
- Patients needing ophthalmic or brain surgery if platelets less than 100 $x10^9$/l.
- Immune thrombocytopenia only if there is major haemorrhage.

Alternatives:

- A platelet infusion is not usually necessary if the platelet count is over 10 $x10^9$/l and the patient is not bleeding or needing an invasive procedure.
- A platelet infusion is less likely to be effective if the cause of the thrombocytopenia is immunological (eg ITP).
- A platelet infusion may aggravate the situation in disseminated intravascular coagulation (DIC) and thrombotic thrombocytopenic purpura (TTP).
- Platelet infusions are the most likely product to be bacterially contaminated.
- Consider alternatives for the management of mucosal bleeding eg Tranexamic acid.

Fresh frozen plasma (FFP)

Uses:

- FFP should only be used to correct single coagulation factor deficiencies if there is not available a virally inactivated product (eg Factor V deficiency).
- Octaplas is indicated in the treatment of thrombotic thrombocytopenic purpura (TTP).
- Massive blood loss with depletion of coagulation factors.

Alternatives:

- A virally inactivated prothrombin complex concentrate (PCC) eg Octaplex, which contains factors II, VII, IX and X should be used for the emergency correction of over-anticoagulation with warfarin. Vitamin K should be administered in addition and this is the only action that is required if the patient is not bleeding or in a life threatening situation.
- FFP is used when there is a contra-indication to the use of PCC (eg mechanical prosthetic heart valves or severe liver disease).
- Recombinant coagulation factors are available for the treatment of haemophilia A (factor VIII) and haemophilia B (Factor IX)
- Virally inactivated freeze dried material (eg factor 8Y) is available for the treatment of von Willebrand syndrome

Coagulation factors

Uses:

- Plasma derived coagulation factor concentrates are available for the treatment of von Willebrand syndrome (eg factor 8Y). Recombinant factor VIII for haemophilia A and recombinant factor IX for Haemophilia B should be used in preference to plasma derived material in these conditions.
- Virally inactivated prothrombin concentrate (eg Octaplex) containing factors II, VII, IX & X is preferable to FFP for the emergency correction bleeding due to warfarin over-anticoagulation.

Alternatives:

- Tranexamic acid may be used in certain circumstances (eg dental extractions) to reduce the use of coagulation concentrates.
- Desmopressin (DDAVP) can be used in some types of von Willebrand syndrome and in mild haemophilia to produce a temporary rise in the factor VIII level.

Intravenous immunoglobulin

Uses:

- Approved indications for the use of intravenous immunoglobulin (IVIg) include common variable immunodeficiency, idiopathic thrombocytopenia (ITP), Guillain Barre Syndrome, acquired hypogammaglobulinaemia (eg in chronic lymphocytic leukaemia) and following allogeneic bone marrow transplantation.
- Unlicensed indications for which there is scientific evidence include myasthenia gravis, dermatomyositis and Wegener's granulomatosis

Alternatives:

- Consider immunisation with pneumococcal vaccine where appropriate
- Prompt antibiotic treatment of bacterial infection
- Prophylaxis against Pneumocystis in certain immune deficient states and after some cytotoxic agents eg Fludarabine

Questions - Chapter 3

1. In which clinical situations is there a strong indication to consider the transfusion of red cells?
   (tick as appropriate)

a) [ ] Asymptomatic anaemia.
b) [ ] Acute bleeding with estimated loss of less than 500mls.
c) [ ] Acute bleeding with estimated loss greater than 1000mls.
d) [ ] Haemoglobin (Hb) less than 7g/dl.
e) [ ] To restore post-op Hb to pre-op level.

2. In which clinical situations is there a strong indication to consider the transfusion of platelets?
(tick as appropriate)

a) [ ] Bleeding with platelet count less than 50 $x10^9$/l.
b) [ ] Disseminated Intravascular Coagulation (DIC) without bleeding.
c) [ ] Surgical procedures with platelet count less than 50 $x10^9$/l.
d) [ ] Stable Immune Thrombocytopaenic Purpura (ITP).

3. In which clinical situations is there a strong indication to consider the transfusion of Fresh Frozen Plasma (FFP)?
(tick as appropriate)

a) [ ] Reversal of Warfarin therapy if major bleeding.
b) [ ] DIC with major bleeding.
c) [ ] Hypotension.
d) [ ] Reversal of heparin therapy.
e) [ ] Thrombocytopaenia with bleeding

4. **(Question aimed at medical staff only)**
A 60kg lady is septic and has developed DIC with bleeding from her wound sites. Haematology results are as follows:
INR 2.8, APTR 2.4, Fibrinogen 120mg/l, Platelets 34 $x10^9$/l
What blood product support does this patient require?
(tick as appropriate)

(a) [ ] 2 units FFP
(b) [ ] 4 units FFP
(c) [ ] Platelets
(d) [ ] Cryo
(e) [ ] None

5. **(Question aimed at medical staff only)**
A 14 year old boy with severe haemophilia A (factor VIII 1%) has an acute haemarthrosis. What blood product is required?
(tick as appropriate)

(a) [ ] Prothrombin complex concentrate (PCC) (eg Octaplex)
(b) [ ] Fresh frozen Plasma (FFP)
(c) [ ] Recombinant factor VIII concentrate
(d) [ ] Desmopressin
(e) [ ] None

6. **(Question aimed at medical staff only)**
A 75 year old woman weighing 60kg who has been anti-coagulated with warfarin for Atrial Fibrillation has been admitted hypotensive due to heavy acute gastro-intestinal blood loss. Her INR is 10.5.
What action would you take to reverse the over-anticoagulation?
(tick as appropriate)

(a) [ ] Administer vitamin K
(b) [ ] Administer 2 units of FFP
(c) [ ] Administer 4 units of FFP
(d) [ ] Administer PCC (Octaplex) 25units/kg
(e) [ ] Administer PCC (Octaplex) 50units/kg
(f) [ ] Cryoprecipitate

Chapter 4

PRESCRIPTION OF BLOOD AND BLOOD PRODUCTS

Blood and blood products may only be prescribed by a medical officer. Clinical guidelines regarding the transfusion of blood and blood products are available on Tarkanet as is the NDHT Blood Transfusion Policy. All doctors are expected to familiarise themselves with these documents but further advice may be obtained from the transfusion laboratory or the Consultant Haematologists. Where the need for blood is not yet established a Group and Save (G&S) sample may be sent to the laboratory for preliminary testing. Refer to the agreed surgical blood order schedule (ASBOS) for the number of units of red cells routinely crossmatched for surgical procedures.

Patient's consent to a transfusion

For medico-legal requirements, the reason for the transfusion must be clearly indicated in the patient's notes.

Patients are not required to sign a specific consent form relating to the transfusion. However they must be fully informed of the need for the transfusion. This includes the risks involved and any alternatives that may be available. For surgical procedures, the risk of receiving a transfusion must be discussed with the patients and documented on the surgical consent form.

Patient information leaflets, supplied from the National Blood Service, are available within the clinical areas and are a useful starting point for discussion with the patient.

A competent patient may refuse to accept a blood transfusion. For further information and guidance refer to the NDHT policy for 'the management of patients refusing blood products' available on Tarkanet.

The prescription should be written on the intravenous chart and should clearly indicate the product required and the duration of the transfusion.

Routine requests for cross-match must be made on the correct transfusion request form, preferably giving 24 hours notice. While the laboratory staff will endeavour to check the patient's record it is the responsibility of the prescriber to note any special requirements, e.g. Irradiated Products.

Urgent or emergency requests must be telephoned to the Transfusion Laboratory during laboratory hours or bleep "Haematology on-call" out of hours. In an emergency, fully cross-matched blood will normally be available in 40 minutes from the receipt of the sample but it is important to realise that this could take longer if the laboratory staff encounter serological problems.

For certain categories of patient, blood can be available without cross-matching. For these patients, provided a current G&S is held in the laboratory blood will be immediately available. This is of particular advantage for surgical patients as it means there is no need to have blood available on standby.

Questions - Chapter 4

1. Who can prescribe blood?

2. It is essential to document in the patient's case notes the reason for the transfusion
   (tick as appropriate)

   True [ ] or False [ ]

3. Why is a cross-match different from a Group and Save request?

4. How long does it normally take for ***cross-matched*** blood to be made available in an emergency?

5. Does the patient have the right to refuse a potentially life-saving transfusion, in an emergency situation?

6. When should the emergency units O Rh D negative blood be used?
   (tick as appropriate)

(a) [ ] When it was forgotten to order crossmatched blood
(b) [ ] When it is difficult to obtain a blood sample for crossmatching
(c) [ ] When the need for blood is extremely urgent
(d) [ ] When a patient is being transferred to another hospital

7. Maintaining effective communication between clinical and laboratory staff ensures blood products are available in a timely manner.
   (tick as appropriate)

   True [ ] or False [ ]

Chapter 5

BLOOD SAMPLES FOR TRANSFUSION

Stringent checking procedures are essential prior to taking blood samples to ensure correct patient identification and validly of results.

SHOT continues to report that mismatched blood transfusions are the commonest cause of transfusion-related morbidity and mortality. An error can occur at any stage of the transfusion process. However errors at the sampling stage comprise 50% of near miss incidents (SHOT 2007).

The transfusion request form must be accompanied by an EDTA blood sample in a pink capped bottle.

The sample label **MUST** include the patient's:

Surname
Forename
Date of Birth
Hospital ID number

If the hospital number is not available then the patient's NHS number may be used.

All blood samples **MUST** be labelled immediately at the patient's bedside using the identity wristband to confirm identification. Details should also be checked verbally with the patient where feasible.

Signing the sample bottle and request form confirms that the person collecting the blood sample has carried out the correct checking procedures for patient identification.

Addressograph labels are not acceptable on blood samples for transfusion.

The Laboratory enforces a zero tolerance policy and any samples, which do not conform to the correct criteria, **WILL** be discarded and a repeat requested. Inadequately labelled samples contribute to serious errors and delays in providing the blood products required.

Requests to upgrade a group and save (G&S) to a cross-match may be made by telephone but staff are reminded that full patient identification is required.

Questions - Chapter 5

1. What would you do if you were asked to label blood samples taken by your colleague?

2. The Transfusion Lab will not accept mis-labelled samples?
   (tick as appropriate)

   True [ ] or False [ ]

3. Do you perform venepuncture?
   (tick as appropriate)

   Yes [ ] or No [ ]

   If Yes, answer Questions 4 & 5

   If No forward to next chapter

4. What are the minimum labelling requirements for a blood sample for transfusion requests?

5. When should the sample bottle be labelled?
   (tick as appropriate)

(a) [ ] Prior to taking blood samples
(b) [ ] At the patient's bedside
(c) [ ] When the addressograph label is available
(d) [ ] At the nurses station
(e) [ ] In the treatment room

Chapter 6

COLLECTION OF BLOOD PRODUCTS FROM STORAGE

Collecting products from the hospital blood transfusion laboratory.
Collecting products from the blood storage fridge.

Prior to collecting or arranging delivery of the blood product to the clinical area

The indication for the transfusion must be clearly documented in the patient's case notes. This justifies the need for the transfusion, especially if an adverse reaction occurs.

The patient has been informed why the transfusion is necessary. They have received the patient information leaflet and have been given the opportunity to ask questions.

The following checks should be undertaken:

1. **Prescription:**

The prescription clearly indicates:

- patient's identity details as on the identity wristband
- blood product required
- date transfusion required
- dose of blood products
- special requirements eg irradiated products
- duration of the transfusion
- signature of the prescriber

2. **Preparation of the patient:**

- Check that the patient understands the process and is aware to report any signs or symptoms of a transfusion reaction.
- All patients receiving a blood transfusion must have an identity wristband indicating their surname, forename, date of birth and hospital/NHS number. If the identity wristband is removed eg for cannulation purposes, it is the responsibility of the individual who removes it to replace it ensuring that all patient details are correct.
- Check that intravenous (iv) access is patent. The cannula gauge will depend on the size of the patient's vein and the rate of the transfusion.
- Baseline vital signs (temperature, pulse, blood pressure and respiration rate) are recorded not more than 60 minutes before starting each unit. This forms a baseline so a transfusion reaction can be identified and managed.
- Ensure the nurse call system is within easy reach for the patient.

3. Compatibility form:

The compatibility form lists the compatible units available for the patient. It is printed at the same time as the label for the unit of blood and the patient information is taken from the crossmatch sample.

This form is usually sent to the clinical area when the blood products are available.

If the transfusion is urgent, the Transfusion Laboratory staff will inform the ward staff when the units are available.

When platelets, FFP, immunoglobulins and other blood products are issued, the compatibility form is available for collection from the Transfusion Laboratory when the products are collected.

4. Patient identity details:

To ensure that the correct blood is collected for the correct patient it is important to have printed patient's identity details from the clinical area entered on the transfusion record card.

The following patient details are recorded on the transfusion record card and match those on the patient's identity wristband:

- surname
- first name
- date of birth
- hospital/NHS number

5. Equipment available:

Administration sets

- All blood components must be transfused through a blood administration set with an integral 170 - 200micron filter.

- Change the administration set every 2 units, if blood of a different group is given and on completion of the transfusion if further intravenous fluids or platelets/other blood products are required.

- A standard intravenous solution set with a 15micron filter is suitable for the administration of immunoglobulins and albumin solutions.

- The administration set must be compatible with the infusion device used.

- It is not necessary to prime the administration set with 0.9% sodium chloride prior to the transfusion.

Infusion Device

Use of an infusion pump will guarantee an accurate rate of delivery of the blood product.

The Baxter Colleague pump is suitable for administering red cells and plasma derivatives to both adult and paediatric patients.

Staff members must be competent to use the infusion device.

An infusion device is not necessary for the administration of platelets, FFP and cryoprecipitate.

Blood warmers

Blood should only be warmed using a specifically designed commercial device with a visible thermometer and audible warning alarm.

Staff must be competent to use the blood warming device.

Blood warmers must be used and serviced according to the manufacturers' instructions.

Indications for use of a blood warmer:

- rapid transfusion ie infusion rate greater than 50ml/kg/hr for adults or 15ml/kg/hour for children
- exchange transfusion in infants
- transfusing a patient who has clinically significant cold agglutinins

Infusion pumps and blood warmers are available from the Equipment Library, which is accessible out of hours by Bleep 500 and portering staff.

Collecting or arranging delivery of the blood product

Only collect blood products when you are sure there will be no delay in administering them.

Collecting only one unit of red cells at a time reduces the risk of a patient receiving 'wrong blood'.

1. Take the transfusion record card (or other printed patient identity details from the clinical area) and compatibility form to the blood fridge or the laboratory.

2. If collecting from the blood storage fridge at NDDH access is through a series of barcode scans using the Blood Audit & Release System (BARS). This audits the blood fridge activity and records which units have been removed and by whom. Training is available to all staff who requires access to BARS and can be arranged by contacting Extension number 2440 (or 01271 322440).

3. Select the correct blood component and close the door firmly on the fridge.

4. Check the patient details on the unit match those on the transfusion record card or other printed patient identity details from the clinical area.

5. Check the product details on the unit match the compatibility form.

6. Visually inspect the products for leakage, discolouration, clotting or clumping.

7. Check the expiry date. Products must be transfused before midnight of the expiry date.

Contact the Transfusion Lab ext 2327 (or 01271 322327) if there are any discrepancies or you have any concerns about the transfusion.

On return to the clinical area hand the unit of blood to the person who requested it.

Red cells must be connected to the patient within 30 minutes of collecting from storage. It is possible to return the units to the blood fridge and BARS will calculate the time they have been out of controlled storage.

If a red cell component has been out of the temperature control for more than 30 minutes, it cannot be used for transfusion. Inform the Transfusion Laboratory staff.

Blood units must **NEVER** be stored in a ward or domestic fridge.
The blood storage fridges at NDDH are centrally alarmed and the temperature is continuously monitored and recorded. The Transfusion Laboratory and Switchboard are alerted if the temperature deviates from the recommended range.

Blood storage fridges in the community hospitals are fitted with local alarms only but all are situated in areas which are manned at all times.

Questions - Chapter 6

1. Who may collect blood products from storage?

2. What paperwork is required when collecting blood products from storage?

3. If a discrepancy in patient identification is found, who would you contact?

Chapter 7

THE ADMINISTRATION OF BLOOD & BLOOD PRODUCTS

All practitioners should ensure they have the necessary knowledge and skills required when managing a patient receiving a blood transfusion and be assessed as competent in accordance with the relevant regulations, standards and notices (NPSA 2006, BSQR SI 2005 No.50 as amended).

Avoid transfusing overnight if the patient's clinical condition is stable and the transfusion can be delayed until the following morning.

Each blood component must be checked prior to administration, **at the patient's bedside**, by a registered practitioner.

If the checking is interrupted the whole process must be restarted.

Do not add other medications to a blood component or infuse other medications through the same cannula as blood. If an adverse reaction occurs, it may be impossible to determine if it is due to the blood, to the medication that has been added or to an interaction of the two.

Duration of transfusion

It is acceptable to prescribe units of red cells for administration over 2 or 3 hours. Each unit of red cells must be transfused within 4 hours of removal from storage.

Platelets are usually prescribed for administration over 30 minutes. For maximum benefit to the patient they must be transfused as soon as possible after removal from the agitator.

Each unit of FFP and cryoprecipitate is usually prescribed to be administered over 30 minutes. For maximum benefit to the patient these products must be transfused as soon as possible after thawing.

See individual product information for recommended duration of immunoglobulin and albumin infusions.

Essential Patient and Product Checks

Prior to commencing the transfusion

1. Prescription clearly indicates:
   - Patient's full name, date of birth and hospital/NHS number
   - Description of blood product
   - Date of the transfusion
   - Duration of the transfusion
   - Doctor's signature
   - Additional medications eg diuretics
   - Any special requirements eg irradiated products

2. Check that the blood component issued matches the prescription.

3. Visual inspection of the unit for: haemolysis
   leakage
   discolouration
   clumping

4. Patient is prepared for the transfusion (see chapter 6 section 2)

5. The patient's full name, date of birth and hospital/NHS number must correspond on the patient's identity wristband, compatibility form, transfusion record card, prescription and on the unit of blood. These details should be checked verbally with the patient, if possible.

6. Check the unit number on the compatibility form matches the number on the unit of blood.

7. Check ABO and Rh D group on the blood product pack matches the compatibility form. Red cells may be issued that are a different ABO group but are compatible (group O red cells for a patient of group B). The Transfusion Laboratory must acknowledge the difference and state that compatible blood has been issued on the compatibility form.

8. Check expiry date. Products must be transfused before midnight of the expiry date.

Any discrepancy with details should be reported immediately to the NDHT Transfusion Laboratory on 01271 322327 (ext 2327) or bleep out of hours.

After commencing the transfusion

The staff who have checked the patient and product details must sign, date and time the compatibility form and intravenous prescription chart indicating the pre-administration checks have been carried out.

Enter details to an existing fluid balance chart. Commence a fluid balance chart if you are concerned about the patient's urinary output.

During the transfusion

Visual observation is often the best way of assessing a patient during the transfusion, so ensure the patient is in an area where they can be closely observed.

Ensure the rate of infusion is maintained.

Monitoring of all patients is required as an adverse reaction may occur with any blood product.

Record patients vital signs ie temperature, pulse, blood pressure and respiration rate within 15 minutes of starting each unit and at least hourly throughout the transfusion.

Further observations are dependent on the patient's clinical condition and each patient must be assessed accordingly, in particular unconscious or confused patients.

Any change in the patient's condition since the transfusion began is indicative of a reaction and must not be ignored.

Any rise in temperature of 1.5°C above the patient's baseline value during the transfusion is significant. Stop the transfusion and seek urgent medical assistance.

On completion of the transfusion

Record the patient's vital signs. This will be the baseline for the subsequent unit.

Record the completion time on the compatibility form and fluid balance chart, if used.

When the transfusion episode is completed, file one part of the compatibility form in the patient's case notes and return the other part to the Transfusion Laboratory. This provides confirmation that the units of blood were transfused to the correct patient.

Ensure the patient has passed urine, without difficulty.

Note the clinical response to the transfusion.

Note any adverse reactions and report accordingly.

Advise the patient to report any unusual symptoms that may suggest a delayed transfusion reaction, especially if the patient is discharged immediately after the transfusion. Reinforce this with written instructions.

Retain the empty blood bags for 24 hours and then dispose of as clinical waste.

Questions - Chapter 7

1. A blood transfusion should only take place at night when clinically essential
   (tick as appropriate)

   True [ ] or False [ ]

2. What is the maximum duration for transfusing a unit of red cells?

3. Checking the patient's identity wristband immediately before the transfusion is a crucial step to ensure the correct patient receives the correct blood product
   (tick as appropriate)

   True [ ] or False [ ]

3. What are the minimum vital signs that are essential to record for a patient receiving a blood transfusion?

4. The frequency of recording vital signs for patients receiving a transfusion will depend on their clinical condition. However the NDHT Blood Transfusion policy dictates specific times. What are these times?

5. A clear and accurate record of the transfusion enables the blood products and the patient to be traced, if required.
   (tick as appropriate)

   True [ ] or False [ ]

Chapter 8

ADVERSE REACTIONS TO BLOOD PRODUCTS

Acute Reactions

Acute adverse reactions occurring while a transfusion is in progress may be due to:

- Red cell incompatibility (acute haemolytic transfusion reaction)
  An ABO incompatibility causing red cell destruction within the circulation may lead to renal failure and cause disseminated intra-vascular coagulation (DIC).

- Bacterial contamination
  This is more likely to occur with a platelet infusion as platelets are stored at room temperature (22°C) and may lead to rigors and hypotension.

- Severe allergic reaction or anaphylaxis
  This is more likely to occur with blood components containing plasma proteins and may lead to chest pain, bronchospasm, hypotension and cardio-respiratory arrest. Mast cell tryptase levels taken 8 to 12 hours after the event will help to confirm the nature of the reaction in retrospect. Severe anaphylactic reactions can also occur in patients who are IgA deficient and have developed anti-IgA antibodies.

- Transfusion related acute lung injury (TRALI)
  This causes acute breathlessness and findings similar to the adult respiratory distress syndrome (ARDS). The donor is generally a woman who has developed white cell antibodies and the incidence of TRALI is rare since the introduction of male donor FFP but can occur when blood is being transfused rapidly.

- Transfusion Associated Circulatory Overload (TACO)
  Acute left ventricular failure and sudden breathlessness may be precipitated by transfusion in persons who have a chronic anaemia and are normovolaemic.

It is only necessary for a small volume of ABO incompatible or bacterially contaminated blood to be infused to provoke a serious acute reaction so it is essential to observe the patient closely at the start of each unit of blood product.

The following symptoms and signs may indicate an acute transfusion reaction, which requires that the transfusion be stopped immediately:

- Apprehensive feeling, agitation and pain in the chest, flank or abdomen
- Fever of 1.5°C above the baseline
- Hypotension
- Bronchospasm
- Angio-oedema

If any of the above symptoms or signs occurs, the following action should be taken:

1. Stop the transfusion immediately and disconnect the giving set
2. Keep the line patent with 0.9% sodium chloride
3. Seek urgent medical review of the patient
4. Check temperature, BP, pulse, respiratory rate and oxygen saturation
5. Check identity of the patient, blood unit and documentation
6. Notify the transfusion laboratory
7. Send the following blood samples from the opposite arm
   Blood cultures
   6ml EDTA crossmatch sample (pink cap)
   4ml EDTA for FBC (purple cap)
   4ml clotted blood for u&e, bilirubin & plasma haemoglobin (red cap)
   3.5ml citrated blood (blue cap) for coagulation screen
8. Return the remains of the unit of blood to the transfusion laboratory
9. Send the first available urine sample and monitor urine output for at least 24hours

If the only finding is a rise of temperature of less than 1.5°C above the baseline or an urticarial rash the following action should be taken:

1. Stop the transfusion
2. Check identity of the patient, blood unit and documentation
3. Give paracetamol for fever
4. Give antihistamine for urticaria (eg Chlorphenamine 10mg IV)
5. Recommence the transfusion at a slower rate and observe more closely

Longer Term Complications of Blood Products

- Development of antibodies to red cell, white cell or platelet antigens

- Iron overload

- Acquisition of viral or parasitic infection
  HIV
  HTLV I & II
  HBV
  HCV
  CMV
  HPV B19
  Malaria
  Syphilis

- Transfusion associated graft versus host disease (TAGVHD)

Questions - Chapter 8

1. What would you do if you suspected your patient was having an acute transfusion reaction?
   (tick as appropriate)

(a) [ ] Slow the transfusion.
(b) [ ] Stop the transfusion.
(c) [ ] Inform the nurse in charge.
(d) [ ] Inform the consultant in charge.
(e) [ ] Summon a doctor.
(f) [ ] Maintain venous access.

2. Which of the following are symptoms of an Acute Transfusion Reaction (ATR)?
   (tick as appropriate)

(a) [ ] Temperature rise of greater than 1.5^{o}C above the baseline.
(b) [ ] Fall in blood pressure.
(c) [ ] Intense headache.
(d) [ ] Haematuria.
(e) [ ] Pins and needles in extremities.

3. Shortly after starting a red cell transfusion your patient develops severe lower back pain and becomes shocked.
   List your plan of management including appropriate blood tests.

a)

b)

c)

d)

e)

f)

g)

h)

I)

J)

4. **(Question aimed at medical staff only)**
Which of the following are associated with a Delayed Transfusion Reaction (DTR)?
(tick as appropriate)

(a) [ ] Pyrexia.
(b) [ ] Falling Haemoglobin (Hb) level.
(c) [ ] Positive Direct Antiglobulin (Coombs) Test.
(d) [ ] Low platelet count.
(e) [ ] Raised APTTR.

5. **(Question aimed at medical staff only)**
Which of the following statements are true regarding Transfusion Related Acute Lung Injury (TRALI)?
(tick as appropriate)

(a) [ ] TRALI is more common in female patients.
(b) [ ] TRALI is an Acute Respiratory Distress.
(c) [ ] TRALI is caused by the reaction of antibodies to white cell antigens.
(d) [ ] TRALI can be reduced by preparing FFP from male only donors.

6. **(Question aimed at medical staff only)**
Which of the following statements are true regarding Transfusion Associated Graft versus Host Disease (TAGvHD)?
(tick as appropriate)

(a) [ ] TAGvHD is more common in female patients.
(b) [ ] TAGvHD is associated with the transfusion of white blood cells.
(c) [ ] TAGvHD is usually fatal.
(d) [ ] TAGvHD can be reduced by leucodepletion of blood.
(e) [ ] TAGvHD can be eliminated by the irradiation of blood and blood products.

7. **(Question aimed at medical staff only)**
A patient has become pyrexial during a red cell transfusion. The patient is asymptomatic and has the following observations:
Temperature 38.0^{o}C, pulse 84, BP 120/76.
How would you manage the situation?
(tick as appropriate)

(a) [ ] Stop the transfusion.
(b) [ ] Advise administration of paracetamol.
(c) [ ] Advise administration of chlorphenamine.
(d) [ ] Advise administration of hydrocortisone.
(e) [ ] Consider recommencing transfusion at a slower rate following assessment.
(f) [ ] Advise nursing staff to monitor and record additional vital signs.
(g) [ ] Inform the transfusion department.

8. **(Question aimed at medical staff only)**
During a red cell transfusion a patient develops an urticarial rash. His observations are otherwise stable and there is no evidence of bronchospasm.
How would you manage the situation?
(tick as appropriate)

(a) [ ] Stop the transfusion.
(b) [ ] Advise administration of paracetamol.
(c) [ ] Advise administration of chlorphenamine.
(d) [ ] Advise administration of hydrocortisone.
(e) [ ] Consider recommencing transfusion at a slower rate following assessment.
(f) [ ] Advise nursing staff to monitor and record additional vital signs.
(g) [ ] Inform the transfusion department.

Chapter 9:

INCIDENT REPORTING

Blood transfusion is a frequent and well accepted treatment in both surgery and medicine. However it is not without risks and should never be undertaken lightly.

Blood transfusion is carefully monitored by the Medicines and Healthcare Products Regulatory Agency (MHRA) and every laboratory is required to complete a compliance report each year and submit this to the MHRA. The MHRA may then inspect the laboratory to ensure the accuracy of the report. Non-compliance could result in the laboratory being refused permission to operate and in the responsible person (the Chief Executive of the Trust) being prosecuted.

All adverse events or reactions pertaining to the transfusion laboratory must be reported to the Serious Adverse Blood Reactions and Events (SABRE) which is operated by the MHRA and where necessary, corrective action must be shown to have been undertaken.

A further agency monitoring transfusion is called the Serious Hazards of Transfusion (SHOT). Each laboratory is required to report to SHOT any clinical incident in the field of blood transfusion and these incidents are collated in categories.

An annual report is issued by SHOT with recommendations made to improve the safety of blood transfusion. However the most common incidents reported involve the administration to the patient of the wrong blood component.

It is also required to keep a record of “near miss” events for inclusion in the SHOT report. A near miss event is an error, with potential for injury, which might have occurred but didn’t, as it was detected and corrected before the transfusion took place. These near miss events are often noticed because of discrepancies with the historical records and some of the events recorded could have had tragic consequences for the patients but for the vigilance of staff.

To enable accurate reporting to SABRE and SHOT, it is essential that any untoward incidents are reported to the Transfusion Laboratory or member of the Transfusion Team and that the NDHT Clinical Incident Form is completed.

The Hospital Transfusion Team has access to the Clinical Risk Database DATIX and are able to monitor all incidents and respond to serious problems in a timely manner.

Questions - Chapter 9

1. What does the acronym SHOT stand for?

2. The commonest untoward incident reported to SHOT is ‘incorrect blood component transfused’.
   Give two examples of these ‘wrong blood’ incidents.

   (a)

   (b)

3. All staff are responsible for reporting incidents, errors and near miss events relating to blood transfusion practice and complete the Trust’s incident report documentation.
   (tick as appropriate)

   True [ ] or False [ ]

REFERENCES / SUGGESTED READING

The Blood Safety and Quality Regulations 2005 No. 50 London: The Stationery Office

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British Committee for Standards in Haematology (BCSH) (2001) Guidelines for the clinical use of red cell transfusions *British Journal of Haematology;* 113 (1): 24-31

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Hebert PC, Wells G, Blajchman MA et al (1999) A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care *The New England Journal of Medicine* 340 (6): 409-417

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Medicines and Healthcare products Regulatory Agency (MHRA) (2006) Serious Adverse Blood Reactions & Events (SABRE)

National Patient Safety NPSA (2006) Right patient, right blood: advice for safer blood transfusions

National Institute for Health and Clinical Excellence (NICE) (Sept 2006) Anaemia management in chronic kidney disease

NDHT Blood Transfusion Policy (Tarkanet)

NDHT Clinical Guidelines for Blood Transfusion (Tarkanet)

NDHT Protocol for the management of patients refusing blood products (Tarkanet)

Royal College of Nursing (RCN) (2006) *Right blood, right patient, right time:* RCN Guidance for improving transfusion practice

Serious Hazards of Transfusion (SHOT) scheme (1996 - 2008) SHOT *Annual Reports 1996 - 2008*. SHOT office. Manchester.

Northern Devon Healthcare NHS
NHS Trust

CONFIRMATION OF COMPETENCE IN BLOOD TRANSFUSION

Name of Candidate _____

Job Title _____

PIN/REGISTRATION Number_____

Clinical area_____

Workbook Completed	Date	Assessor
……..% achieved		**Signature:** **Print:**

Competency documents completed	Date	Assessor
Obtain venous blood sample		**Signature:** **Print:**
Unregistered staff's role in the administration of blood transfusion		**Signature:** **Print:**
Registered staff's role in the administration of blood transfusion		**Signature:** **Print:**

Once the workbook has been completed and competency has been achieved, please send a copy of this page to Kathleen Wedgeworth, Clinical Nurse Specialist Office, Level 1, NDDH to ensure training records are updated.

NOTES: