

1 Introduction

This booklet is aimed at providing useful basic information for all blood users about the blood products available from the Blood Transfusion Service.

In addition it includes advice regarding the legal responsibilities of persons administering transfusions, administration techniques, patient identification and monitoring, and recognition and treatment of common transfusion reactions.

2 Risks of blood transfusion

Transfusion of blood or blood products involves the doctor in the evaluation of the risk/benefit ratio to the patient. All blood products carry a risk of adverse effects, ranging from sensitisation to donor cells or proteins, to transmission of disease, including HIV infection. The transfusion service endeavours to minimise major risks in the following manner:

1 HAEMOLYTIC TRANSFUSION REACTIONS

By crossmatch and compatibility testing and strict attention to details of patient name, number, and identification procedures at point of issue. The medical practitioner ordering blood should ensure strict specimen identification of patient name, hospital number, and folder and crossmatch protocol. See section on *“Ordering and Administration of blood”* (Section 5). Patients must be monitored at the start of the transfusion and every 15 minutes thereafter. Transfusions should be stopped immediately should there be any signs of untoward reaction. See *“Transfusion Reactions”* (Section 11).

2 TRANSMISSIBLE DISEASE AND DONOR SELECTION

a) Health screening

All donors are screened by means of a written questionnaire for evidence of any past or present infection that might be transmitted to the patient. This screening includes questions about behavioural patterns that may identify a risk of HIV and other infections. In addition the donor may be further questioned verbally prior to being selected for the donation process.

b) Testing

All donated units are screened for laboratory evidence of Syphilis, Hepatitis B and C, HIV 1 and 2. The tests used are internationally validated and are subject to stringent quality control.

The specific tests are those for Hepatitis B surface antigen, Hepatitis C antibody, HIV 1 and 2 antibodies, HIV p24 antigen, and Syphilis. All reactive units are removed from quarantine and incinerated. Further confirmatory tests are performed to confirm reactivity and the donors are subsequently notified and deferred. The inclusion of the p24 antigen test for HIV infection

potentially reduces the “window period” from 22 days to 14-16 days.

Note that in any particular individual, the immuno-silent “window period” may be considerably longer.

ONLY UNITS THAT ARE NEGATIVE FOR THE ABOVE MARKERS ARE ACCEPTED FOR TRANSFUSION OR FOR FURTHER PROCESSING.

Given the strict adherence to international standards of donor deferral and extremely sensitive test systems the risk of hidden infection is low, but recipients must be informed about the risk.

c) Look back programme

This programme was initiated in 1985 by the Blood Transfusion Services of South Africa to assess the incidence of transfusion-transmitted infection.

This programme traces any patient who received HIV and Hepatitis negative blood from a donor whose subsequent donation is found positive for either infection. Patients are contacted through the hospital or their private physician and are offered counselling and testing. Contacting the recipient is obligatory and may help prevent secondary spread to others through sexual contact. Ultimately the doctor who ordered the blood transfusion is responsible for counselling and testing the recipient and for managing and treating the patient, or for referring the patient to a specialist, where appropriate.

3 ADDITIONAL SAFETY MEASURES

Where the applicable technology exists, the blood product is further treated to inactivate any latent infection.

Currently the following products undergo viral inactivation procedures or include steps as part of the manufacturing process that have been documented in the literature as viral reduction steps: Albumin, Stabilised Serum, Factor VIII and IX concentrate complexes, intravenous immunoglobulins and fresh dried plasma (FDP). While not all intramuscular immunoglobulin preparations undergo specific viral inactivation procedures, the manufacturing process is by cold ethanol fractionation which further reduces the risk of viral transmissions. Plasma products such as cryoprecipitate and fresh frozen plasma (FFP) carry a similar risk to cellular products; however, a virally inactivated lyophilised FDP (Bioplasma FDP) is produced by National Bioproducts Institute (NBI), while other Services are currently introducing a quarantined retested FFP to avoid window period infections.

3 Alternative transfusion options

These procedures require careful planning, and cannot be carried out for emergency operations at short notice. Implementation of the procedure may only be carried out on weekdays.

1 AUTOLOGOUS DONATION

This option is an alternative to allogeneic blood for those patients whose general condition falls within donor guidelines, and whose intraoperative blood requirements can be reasonably accurately assessed.

Suitable candidates must be able to tolerate the rapid withdrawal of 450-500 ml of blood, and the longer-term reduction in haemoglobin levels. They should be over 50 kg in weight, have a haemoglobin level of 11 g/dl (Hct of 0.33) or more, and be between the age of 16 and 70. Older or younger patients may be accepted after consultation with the medical staff of the Service.

Absolute contraindications to admission to this programme include severe heart disease, severe respiratory disease and bacteraemia. Other conditions such as insulin dependent diabetes mellitus and patients on anti-convulsive therapy should be assessed carefully in conjunction with the attending physician.

The patient's doctor should initiate all requests for this procedure and refer the patient to the Regional Blood Transfusion Service. The procedure should be initiated about six weeks prior to the operation depending on the amount of blood needed.

2 DESIGNATED DONATION

Another alternative to allogeneic or autologous transfusion is the donation of the patient's blood requirements by family or friends who have compatible blood groups. However, in terms of voluntary self-deferral safety, this carries a risk of the exertion of undue pressure by the prospective recipient.

It must be reiterated that this is not an option in an emergency situation, as all blood must be fully tested before issue. Blood from relatives carries the risk of "graft versus host" disease and all blood from such donors must be gamma irradiated before transfusion.

ALL SELECTED DONORS MUST CONFORM TO THE ACCEPTED VOLUNTARY DONOR CRITERIA.

NOTE:

Designated donation procedures will only be carried out on weekdays and within office hours.

Because of the stringency of the testing procedures and requirements of irradiation at least 2 working days are required prior to issue.

4 Legal aspects of transfusion

In brief, a practitioner's responsibility concerns patient safety and this encompasses correct identity, blood compatibility, correct handling of the blood prior to and during transfusion, informed consent, reporting of untoward reactions and death, retention of samples and who is permitted to transfuse the patient. Practitioners should be able to justify all requests for blood components.

It is recommended that the practitioner responsible for the transfusion should obtain informed consent for the transfusion from the recipient.

It is the responsibility of the medical practitioner or registered nurse who transfuses a patient with blood components to ensure that a suitable compatibility test has been performed and that the patient has been satisfactorily identified.

- i. The above mentioned persons shall verify that the certificate of compatibility on the container has been completed, and that
- ii. The patient has been satisfactorily identified and is the correct patient for whom the blood in each container to be transfused is intended.

The blood should be kept at 1-6 °C¹ at all times until just before transfusion. An approved warming technique using a device specifically designed for that purpose may be employed immediately prior to transfusion.

The container should remain hermetically sealed until transfusion, and transfusion should be completed within six hours of the unit being opened or entered. No drugs or intravenous fluids may be added to the product, unless required for reconstitution of the product.

Blood or blood products shall not be transfused after the stated expiry date, which is clearly recorded on the label.

At the **commencement and during the transfusion** the patient shall be observed regularly. If the patient shows signs of an untoward reaction to the transfusion the following steps shall be taken:

- i. Stop the transfusion.
- ii. Keep the vein open with normal saline using a new transfusion set.
- iii. Notify the hospital blood bank or Regional Transfusion Service telephonically and complete a written report on the form provided.

¹ Blood must be stored at 1-6 °C and transported at 1-10 °C

- iv. The completed form together with the suspect unit, post transfusion blood samples, and urine sample, shall be forwarded to the transfusion centre or blood bank as soon as possible.
- v. No further transfusion of blood should occur until the reason for the reaction has been determined.

The pre-transfusion specimen, container of blood or blood product, and administration set, should be retained for a minimum of 24 hours and kept at 1-6 °C during this period. For further information regarding the handling of the units and administration set contact your local blood bank immediately after dealing with the patient.

Reactions to blood products may be serological, relating to red cells, leukocytes, protein antigens or bacterial contamination. Additionally the Transfusion Service concerned must be notified of evidence of transfusion-transmitted infections such as hepatitis, malaria or HIV. A description of the signs and symptoms of the most significant reactions and their treatment can be found under the appropriate heading "*Transfusion Reactions*" (see Section 11).

5 Ordering and administration of blood

Procedures for the administration of blood may vary in different hospitals but safety is always the primary concern. As monitoring of the patient during transfusion is usually a nursing responsibility, accurate and thorough guidelines should be available for all nurses.

In order to ensure the safety of transfusion, these guidelines should include:

- i. Correct identification and verification of the patient and the blood unit.
- ii. Correct aseptic technique.
- iii. Careful observation of the patient during transfusion.
- iv. Special precautions.

1 IDENTIFICATION AND VERIFICATION

The safe transfusion of blood products starts with the positive identification of the patient at the time of drawing a blood sample for compatibility testing. Identification is carried out by questioning the conscious patient or suitable responsible person and by matching the name and hospital registration number on the unit with the patient's records and name band. After being filled with blood, the sample should be clearly labelled at the patient's bedside, with full names, date of birth, hospital number, date of sample and ward name or number. In the under age or unconscious patient the medical staff may assume the responsibility for identification.

The clinician should complete a requisition form outlining all the above information plus details of previous medical, obstetric, and transfusion history, the diagnosis, reason for transfusion, number and type of component required, and the date and time when the blood or blood components should be available. This information will assist the blood bank staff in identifying the recipient and in finding the compatible units. The blood bank will return all incomplete or illegible forms, and samples. The reason for this is that the Transfusion Service cannot accept any legal responsibility if they are not supplied with the appropriate information as outlined above. Laboratory tests are carried out on the sample to determine the ABO and Rh status of the patient, to detect blood group antibodies and to test for serological compatibility with the available donor.

a) The Unit

Prior to commencing the transfusion, the blood unit is preferably verified by a medical practitioner and a registered nurse or by two registered nurses. However, staffing and other requirements do not always make this practicable; nevertheless, special care must be exercised in identification procedures. It should always be assumed that one has the wrong patient or the wrong unit, until all identification has been specifically checked. The following guidelines should be adhered to:

- i. All identification is carried out at the patient's side.
- ii. All information is read aloud by both people checking the blood.
- iii. The recipient's name and identification number on the unit must be identical to that on the hospital record (folder).
- iv. The identification number on the unit must correlate with the unit identification number on the requisition form and/or label.
- v. The donor's ABO and Rh groups must be recorded on the blood unit (and the transfusion requisition).
- vi. Verification of compatibility between the donor and the recipient must be made.
- vii. If possible the patient's ABO and Rh groups should be confirmed from previous transfusion information.
- viii. The date and time of expiry of the unit must be checked. On no account must expired blood be transfused.
- ix. The blood component and the container must be visually examined for abnormalities. The hermetic seal of the container must be intact and show no evidence of being pierced after the container was filled.

b) The patient

Asking for his/her full name, birth date and other relevant details identifies the patient. The questions should be phrased so that the patient gives a specific answer and not just "yes" or "no". For example "What are your full names?" and not "Are you Mr J Smith?" The patient information must correlate with that on the blood unit (and requisition form).

Extra care must be taken in identifying the unconscious, anaesthetised or unidentified patient by checking identity bands, written records and requisition forms. ONLY if all identification is in order may the transfusion be initiated.

2 ASEPTIC TECHNIQUE

Blood is usually transfused through a large needle or cannula, the size of which is selected according to the calibre of the patient's veins. Almost any peripheral vein is suitable for transfusion; however, those in the forearm are best, as the patient's movement will not be restricted. Meticulous skin care and aseptic technique cannot be overemphasised in transfusion therapy as blood acts as an ideal culture medium for bacterial growth. The proposed site for venepuncture should be cleaned with the recommended hospital antiseptic working from clean to dirty area. Ideally, gloves and a sterile field should be used to position the cannulae for transfusion, but most especially in the immunocompromised and long-term transfusion patients. The site should never be re-palpated after cleansing.

During transfusion the transfusion site should be visible through a transparent dressing so that any inflammation or infiltration may be seen immediately. The transfusion should be repositioned if inflammation is observed.

3 MONITORING THE PATIENT

One of the major roles of the nurse, in transfusion therapy, is monitoring of the patient. The accurate and quick interpretation of adverse effects could prevent a fatal reaction occurring.

The unit number, date of transfusion, and the starting and finishing time of each unit transfused should be recorded in the patient's folder. Some services require additional signatures on accompanying forms. All this information should be permanently retained in the patient's folder.

Baseline observations of vital signs should be recorded prior to commencing the transfusion. The patient is then observed closely for the first 30 minutes of the transfusion, to observe any untoward reaction, and to ensure that the desired rate of transfusion is maintained. In cases of major blood loss, ideally the CVP, pulse, BP, respiratory rate and urinary output should be monitored every 15 minutes throughout the transfusion. In less acute cases the recipient's vital signs should be checked every half hour after the initial 30-minute observation. Patients at risk for circulatory overload should be observed for 12-24 hours after transfusion.

In the event of any untoward sign or symptom occurring, the transfusion must be stopped immediately, the drip set changed, and the vein kept open with a transfusion of normal saline.

All empty blood units should be returned to blood bank. In any event, they must be retained for 48 hours following transfusion, at a temperature of 1-6 °C.

4 SPECIAL PRECAUTIONS

a) Rate of transfusion

The rate of the transfusion depends on the clinical condition of the patient. A patient in acute shock from massive blood loss will require rapid transfu-

sion whereas a patient with chronic anaemia should not exceed 2 ml per minute. A relatively slow drip of 5 ml per minute is recommended for the first 30 minutes and if there is no sign of untoward reaction the rate can then be increased. Blood transfusions must be completed within 6 hours of entry of the pack. Blood components that are not used immediately should be stored at the temperature specified by the blood bank. Blood components that are no longer required for a specific patient must be returned to the blood bank for correct storage (if still contained in the original packaging and no seals are broken) or disposal.

b) Filters

Red blood cells, whole blood, cryoprecipitate, FFP and WPBTS VIAHF (Factor VIII concentrate) are administered through a standard blood recipient set, or Y-type giving set. These sets have 170 μm mesh filters to prevent the transfusion of clots or coagulation debris.

A platelet giving set should preferably be used with platelets although the standard 170 μm filter administration giving set may also be used in an emergency. The latter results in greater loss of the available platelets due to larger surface area for adhesion.

The filter should be covered with blood to ensure that the full filtering area is used. The use of "microaggregate" filters is optional and is not routinely recommended by the blood transfusion services. Additionally if the blood has been leucodepleted by the transfusion service there is no need to transfuse through a bedside leucodepletion filter. If this is done it will further reduce the red cells received by the patient and may result in the need for further transfusions (thus increasing the risk) to achieve the desired result.

The administration set should be changed:

- i. When there is a transfusion reaction, in order to prevent potentially harmful blood entering the patient's system.
- ii. Between red cells and other blood products, and between red cell transfusions of different ABO groups.
- iii. Before infusing other fluids, e.g. Dextran, Ringers lactate.
- iv. Every 12-24 hours in patients requiring long term transfusion.

c) Temperature of the blood

If cold blood is administered at a slow rate it does not appear to affect the circulatory system. However, in cases where rapid transfusion is necessary, complications such as cardiac arrhythmia can be avoided by warming the blood to not more than 37 °C. Overheating of the blood can cause extensive haemolysis with resultant severe transfusion reaction and possible death. Blood should be warmed with a blood warmer specifically designed for that purpose. This apparatus should be equipped with a visible temperature-monitoring device and should have

an audible alarm. The practice of warming blood in a sink of warm water is ineffectual, as only the outer red cell layers are warmed, and hazardous as the ports may become contaminated. Further, overheating may occur with devastating haemolysis. Under no circumstances should blood be warmed in a microwave oven or similar device. This not only results in haemolysis but also causes conformational and changes or denaturation of proteins in the donor blood. This practice will cause a catastrophic reaction in the patient and will often result in death. Blood warming is not routinely indicated and refrigerated blood may be transfused without harm over several hours.

Indications for warming are:

- i. Massive transfusion of more than 50 ml/kg/h.
- ii. Infants transfused at greater than 15 ml/kg/h.
- iii. Neonates receiving exchange transfusion or large volume transfusion.
- iv. Patients with high titre cold haemagglutinins reactive in vitro at temperatures above 30 °C.

d) Additives

With the exception of sterile normal saline, no medications or other fluid should be added to the blood or blood products before or during a transfusion because:

- i. Bacterial contamination is a real hazard whenever any unit of blood is entered.
- ii. A reaction could occur between the drug and the anticoagulant or nutrient fluid in the blood, e.g. Dextrose solutions might cause lysis or aggregation of the red cells in the transfusion set.
- iii. Because blood may be administered slowly, therapeutic levels of a drug may not be achieved.
- iv. If it is difficult to infuse medication through an alternative access site then a Y piece may be inserted near the junction of the insertion of the IV transfusion cannula.