



Clinical Guidelines for the use of **Blood products** in South Africa

3rd Edition

Edited by the Medical Directors of the
South African National Blood Service

2003

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DISCLAIMER

The editors of this publication have made every effort to ensure that the information given in this publication is accurate. However it is good medical practice and strongly recommended that the dosages and indications for the scheduled products mentioned in this booklet be confirmed as it may differ from the MCC approved package inserts. This can be done with reference to the printed package insert, which have been approved by the Medicines Control Council and included in each pack. Alternatively, for NBI products specifically this can be done by contacting the NBI information centre on (031) 719 6789 or 082 870 3705 or 082 895 0056

The South African National Blood Service or the Western Province Blood Transfusion Service or the National Bioproducts Institute cannot be held responsible for any errors or omissions contained within this publication.

FOREWORD

Blood transfusion is the cornerstone of therapy for many serious and common diseases. Indeed, without blood products it would be impossible to implement many of the modern regimens used for the treatment of malignant diseases and perform the complex surgery now regarded as routine.

South Africa is in the fortunate position to be self-sufficient for blood products. Voluntary non-remunerated donors donate our blood and this ensures that the safety of our blood compares favourably with that of the rest of the developed world. This is remarkable considering that we procure our blood in a country regarded as one most severely affected by the HIV/AIDS pandemic.

The ready availability of low-risk blood is a blessing, but also an insidious trap. We tend to prescribe blood too readily and often do not consider alternative options. There are compelling reasons to use blood products appropriately and only if there is no alternative.

First, blood is a scarce national resource. There is a chronic shortage of blood and it is becoming increasingly difficult and expensive to procure sufficient blood from low-risk donor populations.

Second, blood transfusion is not without risk. We tend to think that this risk is only the transmission of transfusion-transmissible agents, particularly HIV. There are however other serious hazards of transfusion, such as haemolytic transfusion reactions, most which are caused by administrative errors in the blood bank or the hospitals.

We therefore owe it to our patients to use blood appropriately and to manage actively the risk inherent in a transfusion. This is simply good clinical practice! We must also remember that blood is only available because of the unselfishness and social responsibility of the blood donors. The donors expect us to use their blood appropriately.

Clinical Guidelines for the use of Blood Products is the outcome of the combined efforts of the medical directors of all the blood transfusion services of South Africa. They must be congratulated on their efforts. The publication and distribution of the Guidelines would also have been impossible without the sponsorship of Adcock Ingram Critical Care.

The end result is a quality manual that does the blood services proud. No doubt, all health care workers and students will regularly use this practical manual. Ultimately the patients will reap the benefit.

Prof A duP Heyns
Chief Executive Officer
South African National Blood Service
January 2001

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.

6 Red cell products

1 WHOLE BLOOD

Whole blood is considered to be a complex tissue from which the numerous and clinically appropriate components are processed. In most transfusion services whole blood is scarce, and is reserved for those few clinical situations where it can be best utilised.

Many of the components, particularly clotting factors and platelets, deteriorate within hours of donation. It is necessary to separate, process and store these within 6-12 hours of donation in order to ensure adequate supply of these products for use in the appropriate clinical situation.

a) Indications

- i. Massive haemorrhage with possibility of recurrence or continuation.
- ii. Exchange transfusion in neonates.

NOTE:

In the absence of available whole blood one should not delay transfusion but maintain adequate blood volume and oxygen carrying capacity with packed red cells, crystalloid or colloid solutions.

In massive haemorrhage after one blood volume exchange with banked blood it may be necessary to supplement with fresh frozen plasma and platelet concentrates. Whenever possible the haemostatic profile of the patient should be monitored and the above components transfused only if there is a specific haemostatic defect.

No drugs or solutions other than normal saline should be added to the blood units.

Calcium containing fluids must not be used in the same line as citrated whole blood or plasma.

Infusion with high molecular weight dextran or hydroxyethyl starch may cause problems with the crossmatch. Blood bank should be informed if these solutions have been infused so that appropriate measures can be taken.

2 RED CELL CONCENTRATES (RCC)

This product is prepared from a unit of whole blood from which the plasma has been removed by centrifugation in a closed sterile system. Approximately 110 ml of a licensed nutrient solution is then added to the residual red cells. These nutrient solutions contain glucose, mannitol, and adenine in various concentrations, suspended in sterile saline. This results in maximal plasma removal, a haematocrit of approximately 0.6 (Hb of about 20 g/dl) as well as long-term storage of the red cells for up to 42 days. Most centres also remove the buffy coat which gives a leucocyte poor product

a) Indications:

Red Cell Concentrates (RCC) are used to improve tissue oxygenation where this is impaired by either anaemia or haemorrhage.

Specific indications include:

- i. Normovolaemic anaemia when haematinic therapy is not appropriate - e.g.
 - Defective bone marrow production e.g. myelodysplasias, thalassaemia.
 - Increased red cell destruction e.g. acute and chronic haemolysis.
- ii. Ongoing haemorrhage, where initial volume resuscitation has been carried out with crystalloid solutions.
- iii. For elective surgical operations to replace whole blood loss, using crystalloid as the initial volume replacement fluid.

NOTE:

A dose of 4 ml/kg (approximately 1 unit of RCC) will raise the venous Hb by 1 g/dl. The patient should however be monitored clinically to ensure that the predicted haemoglobin increment has been achieved.

Red cell concentrates are currently suspended in nutrient fluids that contain no citrate. Therefore it is not necessary to give calcium supplements to patients even in massive transfusion situations. It is also unlikely that the minute amount of residual plasma will cause significant allergic reactions.

Do not add any fluid or drugs to the unit.

There is no absolute RCC transfusion “trigger” but the following guidelines are offered:

- i. A minimum Hb of 10 g/dl (Hct 0.3) is required for:
 - Patients unlikely to increase cardiac output or regional blood flow sufficient to compensate for decreased O₂ carrying capacity.
 - Post-operative patients with complications that substantially increase O₂ demand.
 - Patients > 65 years.
- ii. A minimum Hb of 8 g/dl (Hct 0.25) is required:
 - As minimum pre-operative level for surgery in which more than 500 ml loss is expected.
 - As intra-operative and post-operative level for many patients with mild to moderate systemic disease and after cardiac surgery.
- iii. A minimum of 6 g/dl (Hct 0.18) is acceptable for:
 - Well compensated chronically anaemic patients.
 - Healthy patients during intra-operative haemodilution or hypothermic cardiopulmonary by-pass.

3 OTHER RED CELL PRODUCTS

Leucocyte depleted (filtered), washed (plasma free), and irradiated products are appropriate transfusion options in a number of clinical conditions. These may be transfused from the onset of therapy, or alternatively if the patient exhibits reactions to leucocyte or protein antigens as described in *“Transfusion Reactions” (Section 11)*. The various alternative red cell products are listed in Table 1 and the indications for use in Table 2.

Table 1: Red cell products

LEUCOCYTE	WASHED RED CELLS	FROZEN STORED RED CELLS
Prepared by filtration of red cell concentrate	Prepared by washing red cell concentrate	Prepared by freezing red cells in a glycerol medium
99.9% leucocyte removal	80% leucocyte removal	98% leucocyte/platelet removal
90% red cell recovery	Absolute plasma removal	Absolute plasma removal

Table 2: Clinical indications for other red cell products

LEUCOCYTE DEPLETED RED BLOOD CELLS	WASHED RED CELLS	FROZEN STORED RED CELLS
<ul style="list-style-type: none">• If recurrent Febrile non-haemolytic transfusion reactions (FNHTR) occur after red cell transfusion, despite the use of buffy coat poor red cell concentrates or bedside filtered concentrates, leucocyte depleted red cell concentrates prepared in the blood bank should be used. In general, it is preferable to use leucocyte depleted red cells prepared in the blood bank since this ensures a more consistent quality product.• Patients with severe aplastic anaemia who are potential stem cell transplant recipients should receive leucocyte-depleted components from the beginning of their transfusion support.• Leucocyte depletion is an effective alternative to the use of CMV seronegative blood components for the prevention of transfusion transmitted CMV infection to at risk patients.• For foetal/neonatal transfusions. These components should be used for intrauterine transfusions and are preferred for infants less than 1 year of age but definitely recommended for infants 4	<p>months and younger.</p> <ul style="list-style-type: none">• History of severe allergic reaction to whole blood, packed cells or plasma products.• Patients with known class or subclass specific anti-IgA antibodies.• Transfusion of neonates with T-cell activation due to necrotising enterocolitis.	<ul style="list-style-type: none">• Long term storage of blood units with rare blood groups.

IMPORTANT NOTE:

Preparation of some of these products takes time (eg; washing and thawing of frozen red cells) and clinicians must expect to wait between 1-4 hours depending on the product, and even longer if the product must be transported any significant distance.

The expiry time of some of these products is 24 hours since the process of production involves opening the original red cell unit. Although this is done under aseptic conditions and under laminar flow, one cannot totally exclude the possibility of bacterial contamination. Hence the product should be used as soon as possible to minimise the risk of bacterial growth. However, leucocyte depleted red cells will be prepared pre-storage, using a sterile docking device and be stored for 42 days. Leucocyte depleted red cells must be prepared within 48 hours from collection for greatest efficacy.

4 IRRADIATED BLOOD PRODUCTS

For prevention of Graft-v-Host disease in:

- i. Immune suppressed patients.
- ii. Pre- and post bone marrow transplant patients.
- iii. Patients receiving blood from blood relatives.
- iv. Intrauterine transfusions.
- v. Neonates; exchange transfusions only.

NOTE:

It is not necessary to irradiate fresh frozen plasma, cryoprecipitate or fractionated plasma products if transfused to the above patients.

7 Paediatric transfusion products

The clinical indications for transfusion in neonates and infants may differ from those for adults, as infants are more susceptible to some of the harmful effects of transfusion. For the purpose of these guidelines, neonates are considered to be babies within 4 weeks of their normal gestational age. Infants are babies within the first year of life.

Most neonatal paediatric transfusions are small volume, given to replace the blood losses of investigative sampling or to alleviate the anaemia of prematurity.

Larger transfusions are needed for replacement during surgery or pathological blood loss. Replacement in excess of blood volume may occur during cardiac bypass surgery or total blood volume exchange.

Only blood that has been donated by voluntary donors and subjected to stringent testing may be transfused. The practice of the “walk-in donor” and collection of small amounts of blood from selected special panels of donors is no longer condoned. Donations by relatives have not been shown to be microbiologically safer than that from the general donor population and are not encouraged. Under certain circumstances, blood from the mother may be used.

All blood donated from relatives must be irradiated prior to transfusion to prevent “graft versus host” disease.

1 TESTING

- i. During the first 4 months of life the pretransfusion testing differs from adults in that, provided there are no atypical antibodies in the maternal or infant’s serum, and the direct antiglobulin test is negative, the traditional crossmatch is not necessary. However, the ABO and Rh group should be reconfirmed prior to all transfusions.
- ii. For infants older than 4 months the compatibility testing procedures should be the same as for adults.

2 PRETRANSFUSION TESTING FOR NEONATES

- i. ABO and Rh group.

- ii. Preferably samples from the mother and neonate.
- iii. Screen for the presence of atypical antibodies.
- iv. Conventional crossmatch not necessary if no antibodies present.
- v. Several small volume transfusions (“top ups”) from the same donor can be given to neonates in the first 4 months of life. There is no need for further crossmatching but each small volume transfusion must be taken from new unopened red cell daughter pack. (See “Limited Donor Exposure Programme” at the end of this chapter).

v. Severe
match
this ch

3 OTHER CONSIDERATIONS

- i. The age of the unit does not matter for small volumes such as top-up transfusions. For larger volume transfusions such as exchange transfusions or resuscitation of an actively bleeding infant, blood up to 5 days old may be given without causing any metabolic complication due to potassium or reduced 2,3 DPG.
- ii. Potential hazards include hypocalcaemia (citrate toxicity), particularly when whole blood is transfused, hyperkalaemia, rebound hypoglycaemia, CMV infection, GvHD, transfusion overload and haemolytic transfusion reactions in infants with necrotising enterocolitis.

4 INDICATIONS FOR RED CELL TRANSFUSION

a) Top-up transfusion

- i. Consider for any symptomatic neonate whose haemoglobin is <10 g/dl.
- ii. Neonates requiring supplemental oxygen should be maintained at a higher haemoglobin concentration.
- iii. The rate of transfusion should not exceed 5 ml/kg/h and for no longer than 5 hours. This is to minimise the risk of bacterial proliferation which may occur as a result of the blood warming to room temperature.

b) Exchange transfusion

- i. Exchange transfusions are mainly indicated in the treatment of alloimmune haemolytic disease of the new born. The object of the transfusion in this instance is to remove Rhesus (D) red cells and reduce bilirubin levels and maternally derived antibody. The bilirubin level at which an exchange transfusion is indicated varies according to the weight of the baby although under no circumstances should the bilirubin concentration exceed a concentration of 340 $\mu\text{g/l}$. Note that in pre-term babies the threshold is considerably lower and specialist paediatric advice should be taken.
- ii. Blood for exchange transfusion may be plasma reduced to haematocrit between 0.5 and 0.6.
- iii. The age of blood for exchange transfusion should be within 120 hours (5 days) from collection.
- iv. Blood should be warmed only during rapid transfusion and during exchange transfusion. Only approved and properly maintained blood warming equipment should be used.

5 TREATMENT OF HYPOVOLAEMIC SHOCK.

- i. Initial treatment in adults is usually carried out with crystalloid solution. However, in paediatric patients, the initial replacement fluid recommended is 4-5% albumin solution. FFP should not be used unless there are co-existing coagulation abnormalities.
- ii. Indications for Platelets and Fresh Frozen Plasma.
 - The usual adult guidelines pertain to paediatric patients for both products. However, thrombocytopenia is potentially more hazardous in the neonate and a threshold of $30\text{-}50 \times 10^9/\text{l}$ may justify transfusion. In general, one random donor concentrate will constitute a single dose in an infant, but in neonates, the volume may need to be reduced.
- iii. In cases of neonatal alloimmune thrombocytopenia, specialist advice should be sought. Emergency treatment of unexpected and symptomatic cases can usually be provided by transfusion of a unit of washed maternal platelets.

6 SPECIFIC PAEDIATRIC PRODUCTS

The use of an adult unit of red cell concentrate or FFP results in significant wastage since the volumes required in paediatric patients are generally small. Many blood banks have specific small volume red cell concentrate and FFP units available on request.

a) Red cell concentrate

- Infant: 120 to 140 ml volume.
- Neonate: 80 ml volume.

b) FFP

- Infant: 130 ml volume

The volume of blood component must be specifically measured when transfusing neonates and small infants, and not estimated.

7 LIMITED DONOR EXPOSURE PROGRAMME

Certain centres with busy paediatric units have arrangements with the blood bank to ensure that any paediatric patient with extended transfusion needs is included in their "limited donor exposure" programme.

This programme ensures that the transfusion requirements of one child are catered for by reserving units bled from one donor for a specific infant. This ensures that the child is exposed to only one or two sets of donor risk factors and antigens during its treatment period.

Contact your Transfusion Service to find out what products they have available.

8

Leucocyte depleted blood components

In recent years there has been increasing usage of leucocyte depleted cellular blood components. Some countries in the developed world (e.g. United Kingdom, France, Sweden, Canada) have recommended universal prestorage leucocyte depletion of cellular concentrates. Also, the Blood Products Advisory Committee of the FDA in the USA has resolved that the cost benefit ratio associated with leucocyte depletion is sufficiently great to justify universal leucocyte depletion of all cellular components. These policy decisions have been taken despite the fact that not all controlled randomised trials have conclusively demonstrated clinical benefits. Leucocyte depletion is also very costly; in South Africa universal leucocyte depletion of red cell concentrates would cost more than 100 million Rand based on 2001 filter costs.

In South Africa the following guidelines are thus recommended.

1 DEFINITION

- i. Leucocyte depleted components designated as such must contain fewer than 5×10^6 leucocytes per red cell unit or adult therapeutic dose of platelets. Fewer than 5×10^8 leucocytes per red cell unit is considered adequate to prevent febrile non haemolytic transfusion reactions (FNHTR).
- ii. To achieve leucocyte counts less than 5×10^6 leucocyte depletion should be carried out under controlled conditions, preferably within 48 hours after the collection of the donated unit. This prevents the accumulation of cytokines and leucocyte fragments, which occurs with storage. Ideally this involves blood bank or blood transfusion centre preparation of the component.
- iii. Removing the buffy coat from the red cell concentrates and utilising these to prepare random donor platelets results in a red cell concentrate and a platelet unit that are relatively leucocyte depleted but not to the extent that is required for most indications for leucocyte depletion.

2 INDICATIONS FOR LEUCOCYTE DEPLETED COMPONENTS

- i. If recurrent FNHTR's occur after red cell transfusion despite the use of buffy coat depleted red cell concentrates or bedside filtered concentrates, leucocyte depleted red cell concentrates processed at the transfusion service should be used.
- ii. The prevention of FNHTR's associated with platelet transfusions can largely be brought about by the use of buffy coat platelet preparations. If reactions occur despite their use, leucocyte depleted concentrates are recommended. Bedside filtration is not recommended for FNHTR's associated with platelet transfusions.
- iii. Platelets prepared from single donors using most current apheresis machines are leucocyte depleted as part of the process. In general any patient requiring prolonged platelet support should probably receive single donor platelets.
- iv. Patients with severe aplastic anaemia who are potential stem cell transplant recipients should receive leucocyte depleted components from the beginning of the transfusion support.
- v. Leucocyte depletion of blood components is an effective alternative to the use of CMV seronegative blood components for the prevention of transfusion transmitted CMV infection to at risk patients.
- vi. Foetal/neonatal transfusions: Leucocyte depleted blood components should be used for intra-uterine transfusions and are recommended for all infants under 1 year of age.

9 Platelets

Platelet transfusions are required in a number of conditions to control bleeding episodes. The decision to transfuse should be based on a combination of clinical and laboratory findings rather than on empirical platelet levels. Response to platelet transfusions should be judged on clinical improvement, normalisation of bleeding time, and relative increase in circulating platelet count. Significant increases may not occur in the actively bleeding patient due to rapid utilisation.

1 INDICATIONS FOR PLATELET TRANSFUSIONS

- i. Bleeding due to thrombocytopenia, which is the result of defective platelet production (aplastic anaemia or leukaemia).
- ii. Defective function (congenital platelet disorders).
- iii. Increased consumption (disseminated intravascular coagulation).
- iv. Dilutional effect as in massive transfusion.

GENERAL NOTES:

Blood loss in excess of 5 ml/kg/h is unlikely to be due entirely to thrombocytopenia.

It is not appropriate to administer platelets to patients with Immune Thrombocytopenia unless there is life-threatening haemorrhage. This is because platelet survival is reduced to a few hours due to the platelet antibodies in the patient's circulation (see Table 4).

Prevention of febrile non-haemolytic transfusion reactions (FNHTR) associated with platelet transfusions can largely be brought about by the use of buffy coat preparations. If reactions occur, leucocyte depleted concentrates are recommended. These should be prepared in the blood bank. Platelets prepared from single donors using apheresis machines are leukodepleted as part of the process. Clinicians must consult with their local centres concerning the availability.

Table 3: Thrombocytopenia and bleeding

PLATELET COUNT	RISK OF BLEEDING
< 5 x 10 ⁹ /l	Life threatening bleeding is a strong possibility
5-20 x 10 ⁹ /l	Increased likelihood of spontaneous bleeding, particularly intracranial haemorrhage
20-50 x 10 ⁹ /l	Increased likelihood of bleeding with trauma, surgical procedures and specific lesions such as gastric ulcers
> 50 x 10 ⁹ /l	Bleeding rarely occurs, even in major surgery. For surgery to the eye or brain a platelet level of 100 x 10 ⁹ /l is recommended

Clinical evidence of Thrombocytopenia or thrombopathy include:

- i. Diffuse oozing from surgical incision.
- ii. Oozing from venepuncture sites.
- iii. Scattered petechiae.
- iv. Ecchymoses in areas not associated with trauma or incisions.
- v. Mucocutaneous bleeding.
- vi. Retinal bleeding.

2 PLATELET PRODUCTS

a) *Random donor platelets*

- i. These platelet concentrates are prepared from whole blood within 8 hours of collection. The concentrates may be stored for 5 days in special satellite bags that allow for gaseous exchange at 22 °C with continuous agitation. Each single donor unit contains approximately 60–80 x 10⁹ platelets in 50 ml of citrated plasma.
- ii. To transfuse sufficient platelets for a therapeutic dose several of the individual units are pooled (see Table 4). In general, random donor platelets are recommended for acute disorders such as acute disseminated intravascular coagulation.

NOTE:

Although multiple units of random platelets may be required over a short period there is little danger of alloimmunisation as in continuous long-term therapy. In the latter situation (apheresis) single donor platelet concentrates are recommended.

b) Apheresis single donor platelet concentrate

- i. This is a unit of platelets from a single donor, prepared by using standardised protocols on a blood cell separator. Each unit contains at least 300×10^9 platelets in 300 ml of citrated plasma. Depending on the system used the product has a shelf life of 24 hours (open system) to 5 days (closed system). The product has fewer than 5×10^6 leucocytes in total, and is considered leucocyte depleted.
- ii. Apheresis products are particularly recommended in patients on long term platelet support (e.g. bone marrow transplant) to minimise exposure to alloantigens. The risk of exposure to latent donor infections is also reduced, and is therefore probably preferable to random donor platelets. However, they are more costly and time consuming to produce.

3 GENERAL RULES REGARDING PLATELET TRANSFUSION

- i. Platelets should be transfused through a platelet giving set and over 15-30 minutes. Longer transfusion times may negate the effect particularly in the actively bleeding patient. Transfusion through a standard 170 micron filter will reduce the amount of platelets received by the patient.
- ii. Apheresis units are usually obtained from a donor with the same ABO and Rh group as the patient and are red cell free. Random donor units are usually prepared from group A and group O Rh-positive and Rh-negative units. Use of Rh-positive units in Rh-negative patients is permitted provided the clinician agrees. Because the random units contain very small amounts of red cells Rh immunisation is unlikely to occur. However in premenopausal women of child bearing age the use of Anti-D immunoglobulin prophylaxis is recommended. The same dosage as for prevention of Haemolytic disease of the newborn is suggested. *Dosage suggested is 500 iu of anti-D immunoglobulin per 6-8 pooled random platelets.*

NOTE:

Anti-D immunoglobulin is an intramuscular preparation and should only be given once the bleeding parameters have returned to suitable levels.

Table 4: Platelet information and dosage guidelines

PLATELET PRODUCT	VOLUME	NUMBER OF PLATELETS IN PRODUCT	DOSAGE		EXPECTED INCREMENT
			Adults	Paediatric	
Random platelet *	50 ml	60 - 80 x 10 ⁹	1 unit per 10 kg	1 unit per 10 kg For infants under 10 kg 5 ml/kg	30 - 50 x 10 ⁹ /l
Apheresis platelet unit	200 - 300 ml	>300 x 10 ⁹	1 unit per average adult	34 ml of an Apheresis unit per kg	50 - 60 x 10 ⁹

* Some services pool random platelets and these pools are equivalent to apheresis platelets for dosage purposes

4 MONITORING PATIENT

The response to platelet transfusion may be assessed either by an improvement in the clinical situation in the actively bleeding patient, or may be calculated in the stable patient receiving prophylactic transfusion. Various formulae are available:

- i. **Platelet recovery (R)** is calculated from platelet increment (PI) x 10⁹/l, the blood volume (BV) in litres, and the platelet dose (PD) transfused (x 10⁹).

$$R(\%) = \frac{PI \times BV}{PD}$$

Although a successful transfusion may produce a platelet recovery of 67% in a stable patient, the minimum standard for a successful transfusion may be considered as a platelet recovery of greater than 30% at 1-hour post transfusion and greater than 20% after 20 hours.

- ii. **Corrected platelet increment.** The corrected increment (CI) x 10⁹/l is calculated from the platelet increment (PI), the body surface area in square metres (BSA) and the number of platelet concentrates (n) transfused:

$$CI(x10^9/l) = \frac{PI \times BSA}{n}$$

- A CI of less than $7,5 \times 10^9/l$ indicates an unsuccessful platelet transfusion. In practice, an increase in the patient's platelet count of less than $20 \times 10^9/l$ at 20-24 hours after transfusion is considered a poor response.
- A poor response may be due to alloimmunisation, infection, DIC, splenomegaly, and treatment with antibiotics and amphotericin. In such cases higher dosage regimes, of 1-2 apheresis units per average adult, or 2 units of random platelets per 10 kg are recommended. If a good clinical response is obtained, despite a poor increment, further or increased dosages of platelets may not be required.

10 Plasma derived products

There are wide ranges of plasma products available with specific indications for their use. All plasma products utilise liquid or frozen plasma as their starting material. This may then be subjected to simple physical or more complex chemico-physical processing to produce specific products; the latter are termed plasma derivatives.

The various products, usage guidelines, and recommended dosage schedules are outlined below. Clinicians should be aware that all these products are antigenic and are potentially capable of causing allergic or anaphylactic reactions. The patient should be observed as for cellular products during the initial 15 minutes of any transfusion.

1 FRESH FROZEN PLASMA

Fresh frozen plasma is separated from anticoagulated whole blood within 18 hours of donation. This is done by separating the plasma in a closed sterile system and freezing it to below -18°C . It contains all the clotting factors in normal physiological levels. Fresh frozen single donor plasma carries the same risk of latent viral infection as a unit of red cell concentrate. However, a lyophilised fresh plasma product (Bioplasma FDP), aliquoted from large pools of plasma and treated with a solvent-detergent preparation to inactivate undetected lipoprotein coated viruses is available from National Bioproducts Institute in 50 ml and 200 ml volumes when reconstituted. Other areas, at the time of writing, are introducing retested quarantined FFP as an alternative method of avoiding window period infections. Indications and dosages for both products are similar.

FFP must be thawed before use according to the instructions detailed on the package, or by the hospital blood bank before issue. In the case of FDP reconstitute according to the guidelines provided by the manufacturer.

Table 5: Fresh frozen plasma

PRODUCT	VOLUME	CONTENT	DOSAGE
Fresh frozen plasma	± 280 ml	Physiological levels of all coagulation factors	15 - 20 ml/kg as an initial dose. Further therapy is dependant on response and laboratory monitoring

Table 6: Average levels of coagulation factor in a unit of FFP

FACTOR	AVERAGE LEVELS PER UNIT OF FFP
Fibrinogen	200 mg
Factor II	1,03 u/ml
Factor V	0,64 u/ml
Factor VII	1,21 u/ml
Factor VIII	0,85 u/ml
Factor IX	0,91 u/ml
Factor X	1,25 u/ml
Factor XI	0,79 u/ml
Antithrombin III	104%
Plasma pseudo-Cholinesterase	3000-10 000 iu/l

An average unit of FFP will also contain solutes from the anticoagulant from the original unit of whole blood.

Table 7: Solutes in FFP

SOLUTE	AVERAGE LEVELS PER UNIT OF FFP
Glucose	24,8 mmol/l
Potassium	3,0 mmol/l
Sodium	165 mmol/l
Chloride	79 mmol/l
Osmolarity	322 mmol/l
pH	7,9

CAUTION: FFP is hyperosmolar due to the additives listed. In elderly and very young patients, care should be taken not to precipitate pulmonary oedema if cardio-pulmonary function is compromised and tissue oedema is present. Hypernatraemia and hypokalaemia may occur if large volumes are transfused.

Table 8: Clinical indications for FFP

DEFINITE INDICATIONS	CONDITIONAL USES (if active bleeding and evidence of disturbed coagulation)	NO JUSTIFICATION FOR USE OF FFP
<ul style="list-style-type: none">• Replacement of single factor deficiencies (If single factor concentrates not available).• Immediate reversal of Warfarin effect.• Vitamin K deficiency associated with active bleeding.• Acute DIC.• Thrombotic thrombocytopenic purpura (TTP) (Preferably cryo poor plasma)• Inherited deficiencies of coagulation.• Scoline apnoea	<ul style="list-style-type: none">• Massive transfusions.• Liver disease.• Cardiopulmonary by-pass surgery.	<ul style="list-style-type: none">• Hypovolaemia.• Plasma exchange procedure (except TTP).• Nutritional support and protein losing states.

NOTES:

Units of FFP must be administered through a blood giving set after thawing at 30-37 °C. Compatibility testing is not required but units should be ABO compatible with the patient's red cells, especially if large volumes are to be transfused. If the ABO group of the patient is not available then group AB fresh frozen plasma should be used as it contains no A or B isoagglutinins.

Transfuse as rapidly as possible, at 15-20 minutes per unit in the average adult in order to obtain a good clinical effect. The labile coagulation factors deteriorate within a few hours of thawing or reconstitution.

2 SPECIFIC COAGULATION FACTOR PRODUCTS

All these products are produced from fresh frozen plasma and are used in a variety of bleeding disorders when one or other of the coagulation factors is deficient.

Table 9: Coagulation concentrates

PRODUCT	CONTENT	UNITS	VOLUME
Cryoprecipitate (cold soluble fraction of FFP)	Factor VIII/vWF	±100 iu	6-8 ml
	Fibrinogen	150-250 mg	
	Fibronectin	150-250 mg	
	FXIII		
VIRALLY INACTIVATED CONCENTRATES			
VIAHF 250(WPBTS) (Paediatric)	Factor VIII/vWF	250 iu	50 ml after reconstitution with sterile water
VIAHF 500 (Adult)(WPBTS)	Factor VIII/vWF	400-600 iu	As above
Haemosolvate Factor VIII (NBI)	Factor VIII/vWF	300 iu	10 ml after reconstitution with sterile water for injection
		500 iu	
		1000 iu	
Haemosolvex Factor IX (NBI)	Factor IX (also contains II, VII and X)	500 iu	10 ml after reconstitution with sterile water for injection

Table 10: Clinical indications for coagulation concentrates

PRODUCT	CONDITION
Cryoprecipitate	Hypofibrinogenaemia - Acquired and congenital. Factor XIII deficiency
VIAHF / Haemosolvate, Factor VIII	Haemophilia A von Willebrands Disease
Haemosolvex	Haemophilia B (Christmas Disease)
Factor IX	Congenital/Acquired deficiency of II, VII, X, IX

NOTE:

Check package insert for reconstitution procedures and storage.
Infuse through a blood filter if using WPBTS VIAHF. The filter can be flushed after transfusion with sterile saline to ensure the entire product reaches the patient.

a) Dosage Schedule

The levels of Factor VIII or other relevant factor should be monitored throughout therapy. This facility may not be available in areas away from major treatment centres and dosage schedules may have to be empirically applied therefore as suggested below. *However, elective major surgery in haemophiliacs and treatment of major haemorrhage should be undertaken only at centres where access to proper monitoring is available. Contact your local haematologist or haemophilia treatment centre for help.*

Factor VIII has a half-life of 8-12 hours so treatment should be given every 8-12 hours for at least the first 24 hours and then every 12 hours. After major surgery the transfusions may be required on a scheduled basis for at least 10 days. Following transfusion of Factor VIII there is a more prolonged rise in Factor VIII in patients with vWD; therefore transfusions of concentrate for vWD are usually required only every 24 hours.

3 HAEMOPHILIA A

When haematological monitoring is available the number of Factor VIII units required may be calculated from the following formula:

$$\text{Factor VIII dose} = \frac{\text{Patient's mass (kg)} \times \text{Desired increase in Factor VIII}}{2}$$

Table 11: Haemophilia A Target factor levels

DEGREE OF BLEEDING	DESIRED FACTOR LEVEL
Minor bleeding (ecchymoses, cuts)	Levels should be raised initially to 50% and maintained at 25% for 24 hours
Moderate bleeding, e.g. joint and dental surgery ceases	Raise levels to 50% and maintain at 30-60% for 3-5 days after bleeding ceases
Major bleeding, surgical procedures/head injury	Raise levels to 100% and maintain at minimum levels of 50-60% for 10 days

Table 12: Empirical dosage regimen if monitoring is not available

TYPE OF BLEED	UNITS REQUIRED	FREQUENCY
Minor bleed (epistaxis, ecchymoses, cuts)	10 iu/kg	Single dose usually suffices
Moderate bleeds (small joints, dental surgery)	10-20 iu/kg	Single dose; repeat 8-12 hourly if adequate clinical effect is not maintained
Severe bleeds (retroperitoneal haemorrhage, joint bleeding, possible intracranial bleed)	20 iu/kg	Initial single dose repeat 8-12 hourly, depending on perceived or monitored major clinical effect
Pre and post operative schedules for major surgery or trauma	30-60 iu/kg pulse dose immediately prior to surgery, thereafter maintain plasma levels by transfusion of 10 iu/kg every 12 hours for 3-5 days, follow with 20 iu/kg single dose transfusion for 5-7 days	

NOTE:

All elective surgery should be undertaken in a specialist centre.

Transfusion of factor should be rapid. Patients should be observed carefully for any untoward reaction to the product, particularly those of allergic nature. **See Reactions "Allergic/Anaphylactic" (Section 11).**

When monitoring is available (recommended for all major operations) more exact regimens can be followed. Continuous transfusion regimens are also efficacious and may well provide more consistent haemostatis levels. These regimens should, however, be under specialist supervision.

It should be borne in mind that about 10% of Haemophilia A patients have antibodies (inhibitors) to Factor VIII and these patients may not respond to the therapy described above. These patients must be referred to a specialist haemophilia treatment centre as an emergency.

4 VON WILLEBRAND DISEASE (VWD)

Intermediate purity Factor VIII concentrates are the treatment of choice where DDAVP (vasopressin analogue) is not effective. The local products contain adequate amounts of high molecular weight multimers.

a) Dosage

- i. Use Factor VIII units as a measurable entity.
- ii. Using 30 iu units of Factor VIII per kg.
- iii. Monitor every 24 hours.
- iv. If bleeding persists despite adequate levels of Factor VIII, then transfuse Cryoprecipitate (10-20 iu units FVIII per kg) or Random platelet concentrate (1 concentrate per 10 kg).

5 HAEMOPHILIA B

The clinical picture of Haemophilia B is identical to that of Haemophilia A, and the levels required are similar to those of Haemophilia A, although slightly lower levels of Factor IX are usually adequate for normal haemostasis. Factor IX has a longer half-life than Factor VIII (up to 24 hours) and therefore only daily doses may be required. For prolonged therapy (> 5 days) a pure Factor IX concentrate is preferable since prolonged Factor IX complex transfusion has been reported to lead to thrombosis. The reports however only refer to concentrates manufactured outside South Africa. There have been no reports of thrombosis with the local product. When haematological monitoring is available the number of Factor IX units required may be calculated from the following formula:

$$\text{Factor IX dose} = \text{Patient's Mass (kg)} \times \text{Desired increase in Factor IX} \times 1.2$$

Table 13: Haemophilia B target factor levels

PRODUCT	VOLUME	FREQUENCY
Haemosolvex Factor IX	10 ml after reconstitution with sterile water for injection	Factor IX has a half life of 24 hours so daily doses may be required

If monitoring is not available, give 10-20 iu/kg as a daily or twice daily dose regime. Do not give in conjunction with Cyclokapron® or Amicar®.

6 HYPOFIBRINOGENAEMIA

Table 14: Hypofibrinogenemia treatment guidelines

PRODUCT	TYPE OF DEFICIENCY	
Cryoprecipitate: Each unit has 150-200 mg fibrinogen 10 units = 1,5-2,0 g	Acquired	
	As in cases of abruptio placenta, and massive transfusion syndrome	2-6 g per average adult
	Congenital.	4-8 Cryoprecipitate
		units will raise the fibrinogen level to homeostatic levels effective for

7 OTHER PLASMA PRODUCTS

a) *Albumin 20% Solution*

Prepared by fractionation of a large pool of plasma. The process involves steps like pasteurisation and cold ethanol fractionation, which inactivates viruses such as HIV and hepatitis virus.

Table 15: Indications for albumin

APPROPRIATE	OCCASIONAL	UNJUSTIFIED.
<ul style="list-style-type: none"> • Burns • Replacement fluid following paracentesis and therapeutic plasmapheresis • Shock 	<ul style="list-style-type: none"> • Acute liver failure • Acute renal failure • Ascites • Hypoproteinaemia after surgery • Renal dialysis 	<ul style="list-style-type: none"> • Under nutrition • Cirrhosis • Chronic renal failure

PRACTICAL NOTE:

Volume expansion in acute hypovolaemia is more appropriately obtained using crystalloid or synthetic colloid solutions.

In a dehydrated patient it is inappropriate to use 20% Albumin solution as a volume expander. If a physiological albumin solution is required then add 100 ml 20% albumin to 400 ml saline or Ringers lactate. There is a 4% product available from NBI.

In thermal burns the early restoration of fluid volume is best achieved with crystalloids. Albumin may be given 8-12 hours after the onset of the burn

Dosage:

- i. Calculate the patient's plasma volume from the following formula

$$PV = \text{body weight (kg)} \times 0,04$$

- ii. Calculate the number of grams of albumin required for a particular patient as follows:

$$\text{Dose} = \text{Desired Albumin level (g/dl)} - \text{Actual Albumin level (g/dl)} \times \text{plasma volume (l)} \times 2^*$$

*Since half the albumin transfused will diffuse into the extravascular compartment it is necessary to use this multiplication factor to achieve the desired intravascular levels.

Products available.

- i. 4% Albumin in 8 g/200 ml and 16 g/400 ml bottles (NBI).
- ii. 20% albumin in 20 g/100 ml, 10 g/50 ml bottles (WPBTS, NBI).

NOTE:

Assess carefully before administering to any patient with known hypersensitivity to human proteins.

b) Stabilised Human Serum

Stabilised Human Serum is prepared from large pools of donor plasma that is subjected to:

- i. Selective absorption of lipoprotein, coagulation factors, and complement components.
- ii. Reduction of viral content by the above processes and by ultra violet irradiation.
- iii. A heat treatment step that is licensed as a validated viral inactivation procedure for HIV.
- iv. The resultant stable protein solution contains a wide and constant spectrum of antibodies in the IgA, IgM and IgG classes, many of the transport proteins, and albumin. It provides an ideal physiological volume

Table 16: Composition of stabilised human serum

COMPOSITION	PER LITRE	PER 250 ML
Total protein	50 g	12,5 g
Albumin	30 g	7,5 g
Na ⁺	120 mmol	30 mmol
K ⁺	3 mmol	0,75 mmol
Ca ²⁺	2 mmol	0,5 mmol
Cl ⁻	100 mmol	25 mmol

expander in volumes equivalent to that lost.

Usage

- i. Burns.
- ii. Hypovolaemia.

Administration

- i. Adults: Intravenous transfusion to a dosage of up to 8 units of 250 ml per 24 hours.
- ii. Children: 3-6 ml per kg per 24 hours.

Side effects

- i. Transient urticarial reactions.
- ii. Pyrexia.
- iii. Rigors.
- iv. Hypotension.

Treatment of side effects

Stop transfusion, and administer antihistamines, prednisone, or hydrocortisone either intramuscularly, or intravenously, depending on the severity of the symptoms.

IMPORTANT:

Do not give to any patient with a known sensitivity or allergy to human protein solutions.

8 IMMUNOGLOBULIN THERAPY

Immunoglobulin is the antibody-containing fraction of human plasma that is obtained by the fractionation of pooled plasma units, all of which have been tested and found non-reactive for HBsAg, anti-HCV, anti-HIV and p24 HIV antigen. Specific hyperimmune immunoglobulin preparations are prepared from plasma from donors with high titres of specific antibodies. The manufacturing process per se for immunoglobulins has virucidal effects and preparations used and manufactured in South Africa have never been reported to transmit hepatitis or HIV. More

Table 17: Indications for intravenous immunoglobins

INDICATION
Agammaglobulinaemia
Immunosuppressed patients
Kawasaki disease
Idiopathic thrombocytopenic purpura

recently introduced intravenous products contain specific viral inactivation steps for lipid enveloped viruses.

PRACTICAL NOTE:

Anaphylactic reactions may occur if an intramuscular product is used intravenously.

Anaphylactic or severe allergic reactions may occur if the patient suffers from IgA deficiency, or has experienced a previous severe reaction to human protein product.

Table 18: Intramuscular immunoglobulin preparations

PRODUCT	COMPOSITION	INDICATION	DOSE
Hebagam IM (Human hepatitis B immunoglobulin)	100 iu/ml	Post exposure prophylaxis	
	2 ml ampoule	Needle-stick injury Mucosal exposure Sexual exposure	>10 years 500 iu 5-9 years 300 iu <5 years 200 iu Treat preferably within 48 hours, and not more than 7 days after exposure. Repeat after 28 days unless recipient has been shown to be immune or has received hepatitis B vaccine
		Newborn babies born to HBsAg positive mothers (especially those who are HBeAg positive)	Treat preferably at birth, and definitely within 48 hours after birth Dose 200 iu

Table 18 continued: Intramuscular immunoglobulin preparations

PRODUCT	COMPOSITION	INDICATION	DOSE
Intragam (Human normal immunoglobulin IM)	2 ml and 5 ml ampoules	Hepatitis A prophylaxis	
		1. Post-exposure prophylaxis:	
		Within one week of household contact	0,02-0,04 ml/kg
		2. Travellers to endemic areas:	
		visit <3 months	0,02 ml/kg
		Visit >3 months continued exposure	0,06 ml/kg every 4-6 months
		Measles prophylaxis	
		Within one week of contact	0,2-0,25 ml/kg (max. 15 ml)
		Susceptible immunocompromised children	0,5 ml/kg (max. 15 ml)
		Replacement therapy	
		Congenital immunoglobulin 4-8 weeks	0,2-0,5 ml/kg repeat every
		Transient hypogammaglobulinaemia	0,2-0,5 ml/kg repeat when necessary
Rabigam IM (Human rabies immunoglobulin)	150 iu/ml 2 ml ampoule	Post-exposure prophylaxis Known or suspected exposure to the rabies virus in conjunction with the rabies vaccine	20 iu/kg Infiltrate half the dose into the wound where anatomically feasible and the remainder as a deep IM injection
Rhesugam IM (Human anti-D(Rh ₀) immunoglobulin)	500 iu (100 µg) per 2 ml ampoule	Prevention of Rh disease	500 iu
Tetagam IM (Human tetanus immunoglobulin)	125 iu/ml 2 ml ampoule 500 iu/ml 1 ml ampoule	Post-exposure prophylaxis patients >10years	250 iu. If more than 24 hours since injury use 500 iu
		Treatment of clinical tetanus	3000-6000 iu as a single dose
Vazigam IM (Human varicella zoster immunoglobulin)	100 iu/ml 2 ml ampoule	Post-exposure prophylaxis in high risk patient Administer within 96 hours of the exposure	< 5 years: 2 ml 6-10 years: 4 ml 11-14 years: 5 ml >15 years: 6 ml

Table 19: Intravenous immunoglobulin

PRODUCT	COMPOSITION	INDICATION	DOSE
Polygam	1 g/50 ml (2% solution)	Replacement therapy	100-400 mg/kg
(Lyophilised	3 g/100 ml (3% solution)	for primary antibody	at monthly intervals
human normal	6 g/200 ml (3% solution)	deficiency syndromes	
immuno- globulin IV)	12 g/400 ml (3% solution)	Adjunctive therapy in the prevention of infections in secondary antibody deficiency For immunomodulation in ITP and Kawasaki disease	400 mg/kg/day for 5 days or 1-2 g/kg as a single dose

11

Transfusion reactions

TYPE – DIAGNOSIS – ACTION – TREATMENT

A transfusion reaction may be defined as “any potentially adverse sign or symptom which occurs after the start of any transfusion of blood or blood products”. It stands to reason therefore that in order to notice any adverse effect, the patient’s condition prior to, during and after the transfusion must be monitored.

Bearing in mind that “caution saves lives”, it is good medical practice to be suspicious and to take action fast. The steps to be taken if there is any sign that a reaction may be occurring are simple and apply in all instances.

- Stop the transfusion immediately.
- Keep the vein open with normal saline in a new drip set.
- Contact the transfusion service for advice.

Whilst the investigation of the transfusion reaction proceeds, the vein should be kept open with crystalloid solution which allows venous access for:

- i. Further transfusion therapy if required.
- ii. Suitable therapy to combat the effects of the reaction.

1 MONITORING

The basic monitoring of the patient prior to the initial transfusion and during subsequent transfusion should cover:

- i. Pulse.
- ii. Blood pressure.
- iii. Temperature

- iv. Respiration rate.
- v. General visual observation.
- vi. Verbal enquiry as to the patient’s well being.

Any abnormal symptoms existing at the start of transfusion should be noted e.g. dyspnoea, chills, oliguria, etc. Changes in intensity of these symptoms may also indicate the potential for a transfusion reaction and should be assessed clinically. In cases of severe haemorrhage the rate of transfusion precludes monitoring individual

units at specific intervals, and the effect of one unit may only be seen at the time of the transfusion of the second or third unit. These patients are however usually closely monitored for changes in their primary condition and transfusion reactions are readily detected. Extra care must be taken in the unconscious patient to monitor and react to changes in vital signs. Excessive oozing from the operative site or venous access points and unexplained hypotension may indicate that a haemolytic transfusion reaction is occurring.

Table 20: Signs and symptoms that are highly suggestive of a serious transfusion reaction

Chills/rigors	Fever/sweating
Tachycardia/Bradycardia	Dyspnoea
Hypertension	Hypotension
Urticaria	Chest or flank pain
Nausea/vomiting	Haemoglobinuria
Oliguria/Anuria	Agitation

2 INVESTIGATION

The investigation of a reaction is primarily to exclude severe or life threatening situations. The transfusion service has a specific set of instructions for investigating reactions and it is the legal responsibility of the clinician to assist in this undertaking:

- i. Send appropriate samples, clearly labelled – a minimum requirement will include:
 - Clotted blood sample.
 - EDTA tube.
 - Post transfusion urine sample – depending on the nature of the reaction.
- ii. Return the suspect unit/s and drip set to the nearest blood bank. If it is suspected that the reaction is due to bacterial contamination ensure that blood bank is informed so that cultures and gram stains are performed. Obtain blood for blood culture from the patient.
- iii. Complete the reaction report form specifying patient details, reason for transfusion, pre- and post transfusion signs and symptoms.

3 TYPES OF REACTIONS

The list of potential reactions is lengthy, and there are many different ways of classification. Reactions include those due to incompatibility, transmissible disease, bacterial contamination and storage lesions due to the age of the transfused blood products. However, for most practical purposes, the following are the most serious or the most frequently observed and are described fully.

Table 21: Potentially life threatening reactions

ACUTE HAEMOLYTIC REACTIONS	SIGNS / SYMPTOMS	MANAGEMENT
<p>Caused by exposure of patient to incompatible donor red cells (usually mismatched ABO blood)</p> <hr/> <p>NOTE: In the case of an acute haemolytic reaction, the Transfusion Service's medical officer on call will be informed and will immediately communicate with the patient's physician.</p>	<p>Usually abrupt in onset and within 15-20 minutes after initiation of any red cell containing blood product</p> <p>Tachycardia, fever, flushing, restlessness, chills, low back pain, dyspnoea, chest pain, followed by hypotension, oliguria, shock and DIC</p> <p>Abnormal bleeding and hypotension may be the only signs in the unconscious patient</p> <p>Further signs: Haemoglobinuria/anaemia</p>	<ol style="list-style-type: none">1. Stop the transfusion, change the transfusion set and filter. Keep the vein open with normal saline2. Notify the blood bank for (a) clerical check i.e. patient/donor ID numbers (b) send unit/tubing to laboratory with the urine specimen, blood samples and reaction report3. Monitor vital signs, including in some instances the pulmonary artery pressure or CVP. Measure urinary output; observe for abnormal bleeding, especially if the patient is in post operative stage4. Maintain intravascular volume and urinary output with crystalloid/colloid solutions. Prevent/treat renal failure with furosemide i.vi 120 mg (and mannitol 1 gram). Monitor patient closely5. Consult Renal physician with a view to starting haemodialysis to reduce plasma haemoglobin and prevent acute renal failure6. Consult Haematological/Renal Dept. for further assessment of coagulation profile and renal functions
BACTERIAL CONTAMINATION	SIGNS/SYMPTOMS:	MANAGEMENT
<p>Caused by any contaminated blood product</p>	<p>Usually rapid onset, about one hour post transfusion. Chills, fever, abdominal cramps, vomiting or diarrhoea. Renal failure, flushed dry skin, hypotension and shock</p>	<ol style="list-style-type: none">1. Stop the transfusion. Change filter and tubing. Keep vein open with crystalloid or colloid solution2. Notify blood bank, send blood samples, unit and tubing/filter to the blood bank for gram stain and culture3. Monitor vital signs and administer broad spectrum antibiotics, vasopressors, steroids, fluids and electrolytes

Table 21 continued: Potentially life threatening reactions

ANAPHYLACTIC REACTIONS

Severe, usually due to antibodies to IgA immunoglobulin or severe reactions to other plasma proteins

SIGNS/SYMPTOMS:

Sudden onset, symptoms include dyspnoea, hypotension/shock, facial and/or glottal oedema plus explosive GI symptoms. May lead to cardiac arrest/death

MANAGEMENT

1. Stop the transfusion. Keep vein open; maintain IV volume and BP with crystalloid or colloid solutions
2. Give adrenaline, dopamine, steroids and oxygen
3. Monitor vital signs

Prevention:

Patients may be IgA deficient and require assessment of immunoglobulin profile. Further therapy must be with washed red cells that are plasma free

TRANSFUSION RELATED ACUTE LUNG INJURY

Severe, usually caused by Leucoagglutinins in the plasma of the donor.

SIGNS/SYMPTOMS:

Dyspnoea, hypotension, Fever Bilateral pulmonary oedema usually occurring within 4 hours of a transfusion.

MANAGEMENT

Should be initiated as soon as possible and consists of fluid support to maintain blood pressure and cardiac output. Ventilation support. Diuretics should not be used as they may have a deleterious effect.

DELAYED TRANSFUSION REACTION Extravascular Haemolytic Reaction

Caused by exposure to incompatible red cells in the presence of an atypical IgG antibody such as anti Kell, anti Duffy etc. Severity variable from ranging from mild to severe

SIGNS/SYMPTOMS:

Signs and symptoms may appear within hours in a severe reaction (often anti Kell) and is characterised by a drop in haemoglobin and Jaundice. In some cases there may be additional complications such as renal failure and DIC. However most cases are mild and are only noticed some 2 to 10 days after the transfusion with mild jaundice and anaemia. Often the "reaction" goes unnoticed.

MANAGEMENT

The severe reactions should be managed with supportive measures appropriate to the patients condition. In cases with renal failure measures such as haemodialysis should be implemented and most cases resolve completely. If there is a bleeding diathesis then appropriate transfusion therapy should be given. In most cases the reaction is mild and no particular interventions are required.

TRANSFUSION ASSOCIATED GRAFT VS HOST DISEASE (TA GVHD)

This extremely rare condition results from the Transfusion of lymphocytes that share an HLA haplotype with the recipient. Characteristically the donor lymphocytes are homozygous for a particular HLA haplotype whereas the recipient is a heterozygote. The condition is more likely to occur in situations where blood relatives of the patient are the donors and can be prevented by irradiation of the blood at 25-30 Gy. Leucodepletion is not considered to be adequate to prevent TAGVHD

SIGNS/SYMPTOMS:

The reaction is often florid and occurs 10 to 14 days after the transfusion. The patient presents with severe Jaundice, a maculo papular rash, pancytopenia and diarrhoea

MANAGEMENT

This condition carries an extremely high mortality rate. Therapy is directed at eliminating the clone of engrafted lymphocytes by chemotherapy. This should be done by a specialist oncology unit if possible.

POST TRANSFUSION PURPURA

This rare condition results from recipient alloantibodies directed against donor platelet antigens. The antibodies are usually directed against HPA1a or HPA 5a and since most individuals have these antigens antibodies are rare. In most cases the recipient is female.

SIGNS/SYMPTOMS:

This condition is characterised by a florid pancytopenia occurring some 9-10 days after transfusion. The recipients own platelets appear also to be destroyed in this reaction by unknown mechanisms

MANAGEMENT

This potentially lethal reaction is treated ideally with Intravenous Gammaglobulin(2g/Kg over 2 to 5 days) Platelet support (if possible HPA compatible) may be necessary but this often requires high doses in the presence of appropriate immunosuppressive therapy (e.g. Steroids) In some cases plasma exchange may be successful

Table 22: Less serious reactions

FEBRILE	SIGNS/SYMPTOMS:	MANAGEMENT
<p><i>Cause:</i> Usually recipient leucocyte or platelet antibodies to transfused donor cells</p>	<p>Onset usually with 1-2 hours after start of transfusion. Headache, myalgia, malaise, fever, chills, tachycardia and hypertension. Commonly found in multiparous or multi-transfused patients</p>	<ol style="list-style-type: none">1. Stop the transfusion. Keep vein open with crystalloid/colloid solution. Notify blood bank and send urine, post transfusion samples and pack to blood bank. Must be differentiated from early acute haemolytic transfusion reaction2. Administer antipyretics3. Further management. If repeated on further transfusion then transfuse with leucocyte depleted blood. If latter not available, then given antipyretics and filter red cell products through a 20-40 micron filter
ALLERGIC	SIGNS/SYMPTOMS:	MANAGEMENT
<p><i>Cause:</i> Allergens to plasma proteins</p>	<p>Usually mild. NO FEVER. Itching, hives, urticaria, erythema. Limited to skin only</p>	<ol style="list-style-type: none">1 Stop the transfusion. Keep IV open. Notify blood bank and send post transfusion samples, urine and packs2. Administer antihistamines. Commence transfusion with a new unit once blood bank has ascertained that this is not a haemolytic transfusion reaction

12 Transfusion reaction reports

The transfusion service should complete and send out a preliminary report of the reaction as soon as possible after receiving the specimens. A full report will be dispatched after completion of serological and/or bacteriological investigation, and will include advice for further transfusion therapy. The report must be inserted into the patient's file.

13 Maximum surgical blood ordering schedule (MSBOS)

In order to eliminate unnecessary use of a scarce resource, and to minimise costs to the hospital or patient, the Blood Users Committees of the hospitals should rationalise the ordering of blood into operative categories.

Blood should only be ordered if there is a significant likelihood of it being required and only the recommended number of units should be ordered for the specific type of elective surgery. Exceptions may occur, depending on the clinical status of the patient.

If blood is required in less than 30% of cases of a particular operation, then the option of Group and Screen is recommended. In the event that blood is needed, it can be rapidly selected and released.

In either of the above instances, the practice of over ordering is to be discouraged. In the event of a more than anticipated blood loss, extra units can be issued within a few minutes. Please remember that for every unit of blood that is ordered and not used, a crossmatch fee is levied.

The following MSBOS schedule is intended merely as a guideline; individual hospitals need to formulate their own schedules according to local practice.

Table 23: Blood ordering schedule as devised by Groote Schuur Hospital

SURGICAL PROCEDURE	BLOOD ORDER
ENT	
Post tonsillectomy haemorrhage	Group and Screen
Major head and neck surgery with skin flaps	Group and Screen
Epistaxis (uncontrolled by packing)	Group and Screen
Juvenile angiofibroma	2 units red cell concentrate
CARDIOTHORACIC	
Broncho pulmonary resection	2 units red cell concentrate
Pleurectomy and decortication	2 units red cell concentrate
Cardiopulmonary bypass	4 units red cell concentrate
Pericardiectomy	2 units red cell concentrate
Oesophagectomy	2 units red cell concentrate

HEPATO-BILIARY AND UPPER GIT SURGERY

Bile Duct Repair	Group and Screen
Liver resection (Porto Caval Shunts)	4 units red cell concentrate
Whipples operation-pancreatico duodenectomy	2 units red cell concentrate
Total gastrectomy / Pancreatic resection	2 units red cell concentrate

VASCULAR SURGERY

Aortic aneurysm	2 units red cell concentrate
Thoraco-abdominal aneurysm	2 units red cell concentrate

TRANSPLANT UNIT

Renal Transplant	Group and Screen
Graft Nephrectomy	Group and Screen
Living related donor nephrectomy	Group and Screen
Liver transplant (straight forward)	5 units red cell concentrate
Liver transplant (complicated)	Consult surgeon

NEUROSURGERY

Burrhole drainage of chronic subdural	No blood is required
Burrhole drainage of brain abscess	No blood is required
Burrhole for tumour biopsy	No blood is required
Laminectomy for disc removal	No blood is required
Decompressive laminectomy for spinal stenosis	No blood is required
Exterior cervical discectomy and fusion	No blood is required
Laminectomy for tumour removal	No blood is required
Ventriculo-peritoneal shunts	No blood is required
Drainage of acute subdural haematoma	Group and Screen
Drainage of acute extradural haematoma	Group and Screen
Craniotomy for depressed skull fractures	Group and Screen
Craniotomy for intracranial tumours	Group and Screen
Trans-sphenoidal removal of pituitary tumours	Group and Screen
Craniotomy for antero fossa repair	Group and Screen
Craniotomy for aneurysm	2 units red cell concentrate
Craniotomy for arteriovenous malformations	2 units red cell concentrate
Craniotomy for drainage of an intracerebral haematoma	2 units red cell concentrate
Craniotomy for meningioma removal	2 units red cell concentrate

OBSTETRICS

Placenta Praevia	Group and Screen
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ORTHOPAEDICS

BKA	Group and Screen
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AKA	Group and Screen
Bone grafting major (Iliac crest)	Group and Screen
Closed prograde intramedullary fixation of fractures	Group and Screen
Moore's hemiarthroplasty	Group and Screen
Cervical fusion (anterior)	Group and Screen
Fracture neck of femur (internal fixation)	Group and Screen
Lumbar spinal fusion	Group and Screen
Forequarter amputation	2 units red cell concentrate
En bloc excision tumour (consult surgeon)	2 units red cell concentrate
Arthrodesis of hips	2 units red cell concentrate
Hip disarticulation	2 units red cell concentrate
Hind quarter amputation	3 units red cell concentrate
Open reduction fractured pelvis	Consult surgeon
Dislocation of hip, central dislocation, open reduction	3 units red cell concentrate
TKR	2 units red cell concentrate
THR	2 units red cell concentrate
PLASTIC SURGERY	
Major de-sloughing procedures	Group and Screen
Breast reconstruction	Group and Screen
Free flap	2 units whole blood
UROLOGY	
Prostatectomy (TUR or open)	Group and Screen
Urinary Diversion	Group and Screen
Augmentation cystoplasty	Group and Screen
Major TUR bladder tumour	Group and Screen
Bladder diverticulectomy	Group and Screen
Transabdominal vesico-vaginal fistula repair	Group and Screen
Total penectomy	Group and Screen
Standard urethroplasty	Group and Screen
Inguinal node dissection	Group and Screen
Open nephrolithotomy for staghorn calculus	Group and Screen
Partial nephrectomy	Group and Screen
Simple nephrectomy	Group and Screen
Radical nephrectomy	2 units red cell concentrate
Nephro-ureterectomy	2 units red cell concentrate
Urinary undiversion	2 units red cell concentrate
Bladder replacement	2 units red cell concentrate

Continent diversion	2 units red cell concentrate
Radical prostatectomy	4 units red cell concentrate
Cystectomy	2 units red cell concentrate
Kidney exploration (post trauma)	2 units red cell concentrate

Table 24: Definitions of blood products, blood components and plasma derivatives

Blood Product: Any product manufactured from human blood. This includes blood components and plasma derivatives.

Blood Component: This term refers to a product separated from a single unit of whole blood e.g.

- Red cell concentrate.
- Platelet concentrate.
- Fresh frozen plasma.
- Cryoprecipitate.

Plasma Derivative: This term refers to a plasma product separated from a large volume of pooled plasma by a process called fractionation. These derivatives are manufactured from human plasma under pharmaceutical manufacturing conditions e.g.

- Coagulation factors such as Factor VIII and Factor IX.
- Albumin.
- Immunoglobulins.

Whole blood: All blood cellular and plasma components together as collected from the donor.

Plasma: This is the non-cellular component of anti-coagulated blood.

Serum: This is the non-cellular component of coagulated blood without the clotting factors.

Table 25: Terms associated with ordering blood

NOTE: CONTACT YOUR LOCAL BLOOD BANK TO ENQUIRE, WHICH OF THESE SERVICES ARE AVAILABLE TO YOU AND VERIFY THE TIME PERIODS INVOLVED.

Emergency blood without specimen:	Blood (usually Group O Rh-negative blood) that is kept in the emergency fridge in Casualty, theatre or the blood bank. This blood is not for a specific patient and is used without any crossmatching. <i>This blood should only be used in extreme emergencies. This blood is used on the prescriber's own responsibility.</i>
Emergency blood with specimen: (Inland region "Red Label")	Blood of the patient's ABO and Rh type is issued but no crossmatch is performed. It takes 10-20 minutes for this blood to be issued.
Group and screen:	When this is requested a specimen from the patient will be grouped and tested to ensure that it does not contain antibodies, which could delay finding compatible blood components. The purpose of this is to identify a rare donation requirement and take timely action. In normal circumstances should blood be requested it will undergo a standard crossmatch.
Blood on standby:	Blood ordered on standby is grouped and tested for antibodies and the initial crossmatching is done. It is kept for 72 hours. When the blood is needed please note that it will still take about 20-40 minutes before it will be issued. The reason for this is that the crossmatching must be completed. It does however save money for the patient in that if the blood is not used the patient only pays for the crossmatching and not the units of blood components ordered.
Routine blood order: (Standard or full crossmatch)	Blood ordered routinely is fully crossmatched before issue. Once issued it is not returnable (unless packed in a special returnable hamper* within a specified time span) and the patient or hospital pays whether the units were used or not. It takes 1-2 hours for blood to be issued on a standard crossmatch.

** The East Coast and South Western Regions may provide hampers for blood products. Blood dispatched in these sealed hampers may be returned to stock provided they have not been opened and the time period specified on the label has not been exceeded.*

Table 26: List of products for which National Bioproducts Institute is the applicant

PRODUCT NAME	REG. NUMBER	DOSAGE FORM	ACTIVE INGREDIENT
Albusol 20%	T/30.3/739	Solution for IV Infusion	Human Plasma Albumin
Albusol 4%	T/30.3.738	Solution for IV Infusion	Human Plasma Albumin
Bioplasma FDP (50 ml and 200 ml)	28/30.3/405	Lyophilised powder for IV Infusion	Fresh Human Plasma
Haemosolvate Factor VIII 300 IU	31/30.3/392	Powder for Injection	Human Factor VIII concentrate
Haemosolvate Factor VIII 500 IU (1000 IU – 2 x 500 IU)	Y/30.3/292	Powder for Injection	Human Factor VIII concentrate
Haemosolvex Factor IX	W/30.3/191	Powder for Injection	Human Factor IX complex
Hebagam IM	T/30.2/0746	Solution for IM Injection	Human Hepatitis B Immunoglobulin
Intragam 2 ml	T/30.2/740	Solution for IM Injection	Human Normal Immunoglobulin for Intramuscular Injection
Intragam 5 ml	T/30.2/741	Solution for IM Injection	Human Normal Immunoglobulin for Intramuscular Injection
Polygam 1 g	Z/30.2/367	Lyophilised powder for Infusion	Human Normal Immunoglobulin for Intravenous Infusion
Polygam 3 g	Z30.2/368	Lyophilised powder for Infusion	Human Normal Immunoglobulin for Intravenous Infusion
Polygam 6 g	Z30.2/369	Lyophilised powder for Infusion	Human Normal Immunoglobulin for Intravenous Infusion
Polygam 12 g	29/30.2511	Lyophilised powder for Infusion	Human Normal Immunoglobulin for Intravenous Infusion
Rabigam IM	T/30.2/748	Solution for IM Injection	Human Rabies Immunoglobulin
Rhesugam IM	T30.2/750	Solution for IM Injection	Human Anti-D (Rho) Immunoglobulin
Tetagam IM 250 IU	T/30.2/743	Solution for IM Injection	Human Tetanus Immunoglobulin
Tetagam IM 500 IU	T/30.2/744	Solution for IM Injection	Human Tetanus Immunoglobulin
Vazigam IM	T/30.2/749	Solution for IM Injection	Human Varicella zoster Immunoglobulin

14 Contact telephone numbers

Blood Products referred to in this booklet are available at the blood banks outlined below. Please note that some of the fractionated manufactured products are schedule 4 medicines and should be obtained on prescription from a pharmacist. However advice on the use of these products may be obtained at the numbers below or at the National Bioproducts Institute as listed below.

SANBS National Directorate

Prof Anthon Heyns <i>Chief Executive Officer</i>	Home: 011 673 9512
	Office: 011 761 9111
	Cell: 082 4504 799
Dr Teresa Nel <i>National Medical Director</i>	Cell: 082 781 5259i

East Coast Region (Border)

Blood banks at the following hospitals:

Aliwal North Hospital	051 6332765
All Saints Hospital	047 5481082
Butterworth Hospital	0474 4914579
Cecilia Makiwane Hospital	043 7082221
Frere Hospital	043 704 8234/ 043 704 8235
Frontier Hospital	045 8393903
Grey Hospital	043 6421448
St Elizabeth's Hospital	039 2531011
Umtata Hospital	047 5325601/ 047 5323730

For advice regarding Transfusion medicine, contact

Dr. Paddy Knox	043 7048219/ 082 8073362
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East Coast Region (Eastern Province)

Blood banks at the following hospitals:

Headquarters (24 Hours)	041 391 8215/6
Livingstone Hospital (24 Hours)	041 405 2136
Dora Nginza Hospital	041 464 7542 / 041 405 2136
Uitenhage	041 966 1440 / 083 310 0714
Adelaide	046 684 0348 / 083 259 4355
Cradock	048 881 3808 / 083 285 4356

De Aar	053 631 4361 / 083 285 9357
Graaf-Reinet	049 892 2603 / 083 285 9358
Grahamstown	046 622 7847 / 083 285 9359
Humansdorp	042 295 3259 / 083 285 9360
Middelburg	049 842 1950 / 083 310 0722
Somerset East	042 243 2001 / 083 459 3783

For advice regarding Transfusion medicine, contact

Dr Arnaldo Santos	41 391 8226 / 083 285 9353
Other Matters	041 373 1201 / 391 8200

East Coast Region (Kwa-Zulu Natal)

Blood banks at the following hospitals

Addington	031 337 3771
Benedictine	0358 310 272
Dundee	034 212 2257
Edendale	033 395 4055
Empangeni	035 772 3871
Eshowe	0354 741 768
Estcourt	0363 524 341/522 100
Greys	033 897 3216
King Edward	031 205 6111
Ladysmith	036 637 4932
Madadeni	034 374 9265
Newcastle	034 315 4448
Ngwelezane	035 794 2792
Northdale	033 387 1800/387 9026
Port Shepstone	039 682 0794
Prince Mshyeni	031 906 4704
RK Khan	031 403 2004
Scottburgh	039 976 0151/976 1300
Stanger	032 551 1684
Vryheid	0381 981 3641
Wentworth	031 468 1384

For advice regarding Transfusion medicine, contact

Dr Vis Poovalingam (Medical Director)	Work	031 719 6630
	Home	081 2627238/9
	Cell	083 6568731
Dr Rita Govender	Work	031 7196839
	Home	031 4644791
	Cell	083 2693214

Inland Region (All provinces)*For advice regarding Transfusion medicine, contact*

Dr R.L. Crookes	Home	011 675 1478
	Office Hours	011 761 9222
	Cell	082 450 4800

For advice regarding Autologous Trans fusions, contact

Autologous unit		482 4672/4
	Cell	082 467 0592
Dr Melodie Hougaard	Cell	082 454 5804

Inland Region (Free State)

Blood banks at the following hospitals:

Bethlehem Provincial Hospital		058 303 5560
Ernest Oppenheimer Hospital	Welkom	057 900 4516
Kroonstad Hospital		056 212 2862
Manapo Hospital		058 7133000
Pelenomi Hospital Bloemfontein		051 432 4542
Universitas Hospital Bloemfontein		051 444 3468
Welkom		057 352 2707

Inland Region (Gauteng)

Arrwyp Hospital	Kempton Park	011 970 4194
Baragwanath Hospital		011 933 8336
Far East Rand Hospital	Springs	011 817 1426
Ga-Rankuwa Hospital		012 560 0159
Helen Joseph	Johannesburg	011 489 0774
Johannesburg General Hospital		011 488 3268
Kalafong Hospital		012 373 8896
Meulmed Hospital Pretoria		012 341 3937
Milpark	Johannesburg	011 482 1911
Natalspruit Hospital	Alberton	011 389 0626
Pretoria Academic Hospital		012 329 1284
Sebokeng		016 88 1426
Sunninghill Hospital Midrand		011 807 8023
Tambo Memorial Hospital Boksburg		011 917 3333
Tembisa Hospital		011 926 2865
Union Hospital	Alberton	011 907 0074
Unitas Hospital Pretoria		012 664 4843
Vereenging		016 421 4181
West Rand-Krugersdorp		011 955 6604

Inland Region (Mpumalanga)

Ermelo	017 811 2631
Middelburg Hospital	013 282 4811
Nelspruit	013 744 7940
Trichardt /Secunda	0176 38 0464
Witbank Hospital	013 656 3143

Inland Region (Northern Cape)

Kimberley	053 833 1651
Upington	054 331 1247

Inland Region (Limpopo Province)

For advice regarding Transfusion medicine, contact

Dr Andre Fouche	Polekwane	Office 015 291 2597
		After hours 082 556 5546
Ellisras		014 7634542
Mankweng		015 2671563
Phalaborwa		015 7810130
Pietersburg Provincial Hospital		015 297 3636
Tzaneen		

Inland Region (North West Province)

Klerksdorp	018 462 5351
Potchefstroom	01482 97 1781
Rustenburg	014 592 0305

Western Province Blood Transfusion Service

Blood banks at the following hospitals

Groote Schuur Hospital:		021 4044091/2
Tygerberg Hospital:		021 9384901
Red Cross War Memorial Children's Hospital:		021 6891118
George		044 8742074
Paarl		021 8711030
Worcester		023 3422450
MCV Hospital (Somerset West)		021 8511400
For advice regarding Transfusion medicine, contact		
Dr Arthur Bird	Home	021 7155079
	Office Hours	021 5076318
	Cell	083 3091580
Dr Greg Bellairs	Office Hours:	021 507 6317
	Cell:	082 259 2119

The National Bioproducts Institute (NBI)

NBI manufactures or supplies biological products from plasma of human origin. For information related to the products and the clinical settings within which they are used, please contact the Information Centre on the following numbers:

All hours	
Tel:	031 719 6704
Fax:	031 708 5614
E-mail	natalnbi@nbi_kzn.org.za
After hours	
Carolyn Rochat	082 895 0056
Anita Lalloo	082 870 3705

Treatment of Haemophilia

For questions related to the treatment of haemophilia and von Willebrand Disease it is recommended that the Treatment Guidelines for Haemophilia in South Africa be consulted. Alternatively consult:

Sr Anne Gilham (Haemophilia nurse co-ordinator)		011 787 6710
		083 225 9850
Sr Miriam Mokwena (Haemophilia nurse)		011 787 6710
		082 896 3833
Sr Anne Cruikshank (Cape Town)	Work	021 404 3084
	Cell	082 788 1038
Sr Dolly Nkosi (Durban)	Work	031 360 3680
	Cell	083 265 5248

