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GLOBAL BLOOD SAFETY INITIATIVE

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GUIDELINES FOR THE APPROPRIATE USE OF BLOOD

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WORLD HEALTH ORGANIZATION

GLOBAL PROGRAMME ON AIDS

Health Laboratory Technology Unit

League of Red Cross and Red Crescent Societies

Guidelines for the appropriate use of blood

The Global Blood Safety Initiative (GBSI) is a cooperative endeavour to support the development of safe and effective blood transfusion services in all countries. Core participants are the World Health Organization's Global Programme on AIDS (GPA) and unit of Health Laboratory Technology (LAB), the League of Red Cross and Red Crescent Societies (LRCS), the United Nations Development Programme (UNDP) and the International Society of Blood Transfusion (ISBT). The Initiative is also supported by The World Federation of Hemophilia and other bilateral and multilateral development agencies and nongovernmental organizations.

This document was reviewed and endorsed by the GBSI Consultation on Developing and Strengthening Blood Transfusion Services, held in Geneva from 2 to 5 May 1989. A total of 17 specialists in blood transfusion medicine and haematology from 15 countries participated in the consultation. The participants are listed on the last page.

1. Introduction

1.1 Blood transfusion has undoubted benefits, but it also carries serious risks including the possibility of transmission of infectious agents (e.g., human immunodeficiency virus (HIV) and hepatitis viruses); immune related problems (e.g., intravascular hemolysis); and circulatory overload. Moreover, it is expensive and uses a scarce human resource.

1.2 The AIDS (acquired immunodeficiency syndrome) pandemic, and the transmission of HIV by blood and blood products, have focussed attention on the risks of blood transfusion. This has lead to a critical appraisal of blood transfusion practice and to the recognition that the appropriate use of blood and blood products is an important strategy for reducing these risks.

1.3 These guidelines are intended primarily for national authorities to assist in the development of national guidelines which take local circumstances into account. They will also be useful to individuals or to groups of individuals (e.g., hospital transfusion committees) for guidance in the management of patients, particularly when national guidelines have not been formulated.

1.4 They are based on the following principles:

1.4.1 recognition of the need to reduce the prevalence of disorders which require haemotherapy by:

- improving public health and other measures (e.g., water supply, waste disposal);
- strengthening primary health care programmes (e.g., antenatal care);

1.4.2 promotion of the use of alternative therapeutic modalities (e.g., haematinics);

1.4.3 application of strict indications for use of blood and blood components;

1.4.4 encouragement of close monitoring and critical review of blood transfusion practice.

1.5 The decision to transfuse blood or blood products must be based on a careful assessment which indicates that they are necessary for saving life or for preventing major morbidity. Responsibility for the decision to transfuse must rest ultimately with the attending physician, although this will often be made in consultation when specialist transfusion advice is available.

1.6 Blood which has not been obtained from appropriately selected donors and/or which has not been appropriately screened for infectious agents should not be transfused, other than in the most exceptional life-threatening situations.

1.7 A decision about the desirability of preparing components should take into account the risk of transmission of infection from one donation to several recipients, and blood from the safest donors should be used. This is particularly important in areas of high HIV prevalence, in which the possibility of false negative tests is increased.

1.8 Compatibility testing must be carried out on all whole blood and red cells transfused even if, in life-threatening emergencies, this is done after they have been issued.

2. Haemorrhage

2.1 Blood transfusion should not be the first consideration during the management of patients with acute haemorrhage, because blood volume replacement is initially more urgent than red cell replacement. Accurate diagnosis, adequate oxygenation and volume replacement with plasma substitutes (crystalloids and colloids), and prompt and meticulous surgical

care, may obviate the need for blood transfusion.

2.2 The amount of blood lost and the patient's clinical condition, assessed by measuring the blood pressure, pulse rate, central venous pressure and urine flow, will determine the need for and urgency of blood volume replacement. Generally, a previously healthy adult can tolerate a loss of up to 20% of the circulating blood volume without transfusion. Volume replacement with plasma substitutes will be necessary for a loss of between 20% and 30%. Blood transfusion will be required, in addition, when the loss exceeds 30%, particularly in patients with massive haemorrhage (more than 50% of blood lost in less than three hours).

2.3 Initial volume replacement (50 ml/kg or three times the estimated blood loss) should be with isotonic crystalloid solutions such as physiological saline (0.156 mol/L or 9 g/L). Dextrose solutions are not recommended.

2.4 Synthetic colloids may be necessary for the management of continuing haemorrhage, particularly if there are signs of hypotensive shock. Gelatins may be used in doses up to 50 ml/kg, or hydroxyethyl starch or dextran 70 in doses up to 20 ml/kg, during the first 24 hours. Albumin or plasma protein fraction may also be used, but are more expensive.

2.5 Plasma is not the first choice for volume replacement because of the risk of transmitting infection. Red cells are not indicated for volume replacement, but (as red cell concentrate or in whole blood) solely for improving oxygen delivery capacity.

2.6 Blood components may be required for restoration of haemostasis in patients who have massive haemorrhage.

2.7 Blood transfusion should be stopped when haemodynamic stability has been attained, even if anaemia has not been corrected. Haematinics may be required for this purpose subsequently.

3. Burns

3.1 Volume replacement is usually necessary only when the burn exceeds 20% of the body surface area. Crystalloids and colloids may suffice during the first 24 hours.

3.2 Albumin or plasma protein fraction are the preparations of choice for correcting acute protein depletion in patients with burns, but they are expensive. When they are not available cryosupernate or fresh frozen plasma (FFP) may be used.

4. Surgery

4.1 Anaemic patients

Decisions on the need to transfuse anaemic patients who are about to undergo general anaesthesia or surgical procedures should be based on the rate of the development of the anaemia and on assessment of its effect on the prognosis, and not solely on an arbitrarily defined haemoglobin concentration (Hb) or packed cell volume (PCV).

4.2 Amount of blood reserved

The amount of blood reserved for patients undergoing surgical operations varies with the type and complexity of the procedure. It should be determined by a careful audit of local surgical practice.

4.3 Preoperative blood collection for autologous transfusion

4.3.1 This requires careful patient selection, meticulous record keeping and labelling, and adequate facilities for the collection and storage of blood. Collection and storage are the joint responsibility of the patient's clinician and the blood bank physician, and there must be good communication between them. Well-organized blood transfusion services are therefore essential.

4.3.2 Patients whose Hbs are lower than those required of other blood donors may be accepted if the Hb is more than 100 g/L or the PCV is more than 0.30.

4.3.3 The requirements for testing and screening of preoperative autologous donations should comply with the national blood policy. If blood collected for autologous transfusion is used instead for homologous transfusion, the selection of the donor and the processing of the donation (including screening for infectious agents) must satisfy the standards for homologous donations.

4.3.4 Up to five units of blood may be collected from a patient for autologous transfusion. Collections should be at least seven days apart, and the last donation should be at least four days before surgery. There is no indication for a single-unit autologous transfusion to an adult.

4.3.5 Contraindications for this procedure are: active bacterial infection, heart disease, cerebrovascular disease, obstructive respiratory disease, complications of pregnancy, such as pre-eclampsia, and sickle cell disease.

4.3.6 Oral iron supplementation is indicated. Other haematinics may also be required in some geographical areas.

4.3.7 Indications for the clinical use of autologous blood units are identical with those for the use of homologous blood.

4.4 Preoperative isovolaemic haemodilution

4.4.1 This is accomplished by removing two or more units of blood, which is replaced by an equal volume of crystalloids or colloids so that there is no change in the circulating blood volume. Thus, although the main objective is to improve tissue perfusion, autologous blood is available for post-operative transfusion.

4.4.2 The preoperative Hb and PCV may fall to 100 g/L or 0.30, respectively, without adverse effects, provided that the circulating volume is maintained at all times. Patients with cardiac disease must be carefully evaluated before their Hb or PCV is reduced to these levels.

4.5 Intraoperative blood salvage

4.5.1 Intraoperative blood salvage should be practised only in operating theatres with adequate facilities, appropriately trained staff and adequate quality assurance. The latter includes careful monitoring, and provision of and adherence to written standard procedures.

4.5.2 The indications for transfusion using salvaged blood are identical with those for transfusion of homologous blood.

4.5.3 This procedure may be considered when blood is present in the abdominal or thoracic cavity. In exceptional circumstances blood may also be salvaged during orthopaedic operations at one location, during major vascular surgery, or from gun-shot or stab wounds.

4.5.4 Blood must not be used if the estimated period of bleeding at the site is six hours or more. Other contraindications include: contamination of the blood by bowel contents or by pancreatic juice, or the presence of sepsis or malignancy.

4.5.5 In emergencies blood may be infused after sterile straining through gauze and mixing with an anticoagulant such as citrate or heparin, provided that this is done carefully by trained staff. The use of simple and cost-effective devices, in which sterile blood is collected by low pressure vacuum or gravity, is preferable. Mechanical cell savers are also available, but are expensive.

4.5.6 Systemic antibiotic therapy may be necessary.

5. Anaemia

5.1 Nutritional anaemias

5.1.1 Properly organized public health measures are very effective in reducing the incidence of nutritional anaemias. These include: education about nutrition, food preparation and breast-feeding; provision of adequate maternal and child health care; family planning; provision of clean water; and adequate facilities for disposal of human waste.

5.1.2 Prophylactic administration of haematinics is indicated in some groups of individuals. Examples are: the administration of iron (and folic acid also in some geographical areas) during pregnancy and to premature infants; and the administration of folic acid to patients with chronic haemolytic disease.

5.1.3 Nutritional anaemias respond readily to appropriate haematinics. It is always important, in addition, to treat or correct the underlying cause of the anaemia.

5.1.4 Red cell transfusion is necessary only if the anaemia is associated with incipient or established cardiac failure. In such cases the risk of circulatory overload is reduced by slow transfusion of concentrated red cells (not more than 1 ml/kg/hr) and concomitant diuretic therapy.

5.2 Malaria

5.2.1 Public health measures should be pursued vigorously to reduce the risk of transmission of malaria.

5.2.2 Antimalarial prophylaxis is recommended for selected groups, such as pregnant women and patients with sickle cell disease, in areas where malaria is endemic.

5.2.3 Prompt treatment of clinical malaria is necessary to prevent anaemia.

5.2.4 Anaemia due to malaria responds to treatment with anti-malarials and appropriate haematinics. Red cell transfusion is required only when the anaemia is associated with incipient or established cardiac failure.

5.3 Anaemia due to other infections (e.g., hookworm, schistosomiasis, tuberculosis) usually responds to treatment of the underlying infection and of complicating haematinic deficiencies, where appropriate. Red cell transfusion is not usually required.

6. Hereditary haemolytic anaemia

6.1 Clinics should be established to provide specialized care for patients with the hereditary haemolytic anaemias of major public health importance: sickle cell disease, some of the thalassaemic syndromes and some patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency. This is necessary in order to maintain health and reduce the need for blood transfusion. Emphasis is on: early diagnosis; education; genetic counselling; family planning; antenatal care; folic acid supplementation; prophylaxis against malaria and pneumococcal infections; and prompt treatment of crises.

6.2 Sickle cell disease

6.2.1 Blood transfusion is not required for the management of patients with sickle cell disease in the steady state.

6.2.2 Red cell transfusion is indicated in patients:

- with severe anaemia, and incipient or established cardiac failure;
- in sequestration crisis, with rapidly falling Hb;
- for whom delivery is imminent, and whose Hb is less than 80 g/L;
- who have acute haemorrhage, but whose blood pressure and oxygenation are not maintained by plasma substitutes.

6.3 Thalassaemic syndromes

6.3.1 Patients with ß -thalassaemia major are transfusion dependent. The type of red cell preparation, the frequency of transfusion and the method used to prevent iron overload should be decided nationally, taking into account the available resources.

6.3.2 Splenic artery embolization or splenectomy may be necessary for patients with hypersplenism.

6.3.3 Patients with other thalassaemic syndromes (e.g. ß -thalassaemia intermedia, Hb H disease) do not need transfusion therapy to sustain life. The indications for transfusion are those outlined for sickle cell disease (see Section 6.2.2).

6.4 G6PD deficiency

6.4.1 The risk of acute intravascular haemolysis and, therefore, the need for red cell transfusions for G6PD deficient individuals is reduced by educating them, their families and health care personnel about precipitating factors or agents such as oxidative drugs and chemicals, herbal medicines, fava beans, infections and metabolic derangements.

6.4.2 Indications for transfusion are: severe neonatal jaundice; acute intravascular haemolysis with rapidly falling Hb; and severe anaemia with incipient or established cardiac failure.

7. Neonatal period

7.1 Blood transfusion requirements for neonates can be reduced by:

7.1.1 providing adequate antenatal care (see Section 8.1.2);

7.1.2 training health care personnel in the techniques of safe delivery;

7.1.3 encouraging breast-feeding;

7.1.4 providing vitamin K prophylaxis for all newborns;

7.1.5 providing phototherapy facilities at maternity units for the treatment of neonatal hyperbilirubinaemia;

7.1.6 introducing laboratory microtechniques to reduce the amount of blood lost through frequent sampling.

7.2 The main indications for red cell transfusion are severe neonatal anaemia and/or jaundice due to:

- severe acute haemorrhage;
- alloimmunisation (e.g., ABO or Rh(D) haemolytic disease of the newborn);
- septicaemia;
- prematurity;
- G6PD deficiency.

7.3 Preparation of several paediatric packs from single blood units should be encouraged. Their use for repeated transfusions to the same patient increases safety by reducing the exposure to several donors, and also improves the efficient use of blood donations.

8. Pregnancy

8.1 The prevalence of anaemia and the need for transfusions during pregnancy can be reduced by:

8.1.1 the prevention and management of nutritional anaemia (Section 5.1);

8.1.2 providing adequate antenatal care, with particular attention to:

- improving nutritional status, including iron supplementation (and folic acid also in some geographical areas);
- measures to reduce the risk of premature delivery;
- providing effective anti-malarial prophylaxis in endemic areas, and treating malaria promptly;
- identifying and monitoring high risk pregnancies (e.g., those in patients with haemoglobinopathies and bad obstetric histories).

8.2 Red cell transfusion is indicated for the management of severe anaemia associated with incipient or established cardiac failure. It may be necessary during the management of obstetric haemorrhage (see Section 2); or for a patient approaching delivery with a Hb less than 70 g/L.

9. Disorders of haemostasis

9.1 Coagulation disorders

9.1.1 Coagulation factor concentrates are available for the management of bleeding episodes and surgical procedures in patients with haemophilia A (Factor VIII concentrate) and haemophilia B (Factor IX concentrate). They can be viral-inactivated, have long shelf-life and are prepared in specific dosages, but are expensive.

9.1.2 Cryoprecipitate is effective for the management of patients with haemophilia A and von Willebrand's disease. However, desmopressin is preferred for treatment of bleeding episodes in patients with von Willebrand's disease. Cryoprecipitate is less expensive than factor VIII concentrate. Efforts must be made for technology transfer to produce lyophilized preparations which are stored and transported more easily and have a longer shelf-life, and which can be treated to inactivate viruses.

9.1.3 Cryosupernate or plasma may be used for controlling bleeding episodes in haemophilia B patients if factor IX concentrate is unavailable.

9.1.4 Parenteral vitamin K administration is the treatment of first choice for bleeding episodes due to coagulation abnormalities complicating obstructive jaundice or liver disease. If this is not effective, replacement therapy with cryosupernate or plasma or factor concentrate may be necessary.

9.1.5 Cessation of medication or reduction of dosage may stop abnormal bleeding in patients on anticoagulant therapy. Anticoagulation due to these drugs may also be reversed by appropriate antagonists (e.g., vitamin K, protamine). Cryosupernate or plasma may be required to stop bleeding if these measures are ineffective.

9.1.6 Vitamin K is the treatment of choice for haemorrhagic disease of the newborn and transfusion of blood or blood components is rarely necessary.

9.1.7 Identification and correction of the underlying cause is fundamentally important in the management of patients with disseminated intravascular coagulation. Cryoprecipitate, FFP or platelets may be required, and red cells may also have to be given if severe symptomatic anaemia develops.

9.2 Platelet disorders

9.2.1 Platelet transfusions are indicated for the management of patients with thrombocytopaenia or with abnormal platelet function in whom life-threatening haemorrhage is likely or is occurring, but should be avoided in patients with immune thrombocytopaenia (e.g. idiopathic thrombocytopaenic purpura).

9.2.2 Repeated platelet transfusions often result in alloimmunisation and refractoriness to subsequent platelet infusions.

10. Quality assurance

10.1 Quality assurance in the blood transfusion services is a comprehensive activity implementing the principles of good manufacturing and laboratory practice, and ensuring quality standards for all of the phases from donor selection to transfusion. It includes preparation of and adherence to standard operating procedures; appropriately trained staff; monitoring the quality of materials, reagents, equipment, procedures and products (quality control); and participating in external quality assessment (proficiency testing) schemes.

10.2 Quality of blood transfusion practice

Quality assurance of hospital blood transfusion services deals with the preparation, distribution and transfusion of blood and blood products. The quality of transfusion practice can be improved by observing the following recommendations:

10.2.1 A suitably qualified person should be responsible for the operation of the hospital transfusion service.

10.2.2 Responsibilities of the blood transfusion laboratory include:

- evaluating the appropriateness of transfusion requests;
- performing the investigations necessary for ensuring the safety of the products released for transfusion;
- monitoring records of these investigations and of units collected, received, and despatched;
- collecting data on the pattern of usage of blood products;
- investigating adverse effects of blood and blood products.

10.2.3 Each hospital should have a hospital transfusion committee, the membership of which should comprise senior representatives of the major clinical disciplines, nursing services, the hospital administration and the person directing the hospital transfusion service.

10.2.4 The functions of the hospital transfusion committee are to:

- monitor the source of the supply of blood and blood products, and their safety;
- monitor adverse effects of blood transfusion;
- establish the blood ordering schedules;
- monitor the appropriateness of the use of blood and blood products;
- facilitate appropriate continuing education for the medical and nursing staff.

11. Strategies for implementation

11.1 An effectively functioning national blood transfusion advisory committee (NBTAC) will facilitate the drawing up and successful implementation of national guidelines for appropriate use of blood and blood products. Establishment of a NBTAC is therefore a priority for countries in which this or a similar body does not exist. It should include a senior professional officer of the country's health ministry, representatives of blood suppliers and blood users, and the director of transfusion services.

11.2 The NBTAC will promote the appropriate use of blood and blood products through the following activities:

11.2.1 formulating a national blood policy, with appropriate supportive regulations, and national guidelines for the use of blood and blood products;

11.2.2 facilitating the successful implementation of the guidelines by helping to establish appropriate educational policies for medical students, clinicians, blood bank staff and other health care workers involved in the clinical practice of blood transfusion;

11.2.3 devising mechanisms, including promoting the establishment of hospital transfusion committees, to monitor the pattern of usage of blood and blood products, the implementation of the guidelines and the efficacy of educational policies;

11.2.4 ensuring interaction and collaboration between blood suppliers and users to improve the quality of transfusion practice;

11.2.5 ensuring that adequate supplies of crystalloids and colloids are available;

11.2.6 promoting local preparation and use of essential blood components – that is, red cells, plasma, cryoprecipitate and platelets – to ensure the optimal use of each donation (but see also Section 1.7);

11.2.7 encouraging the strengthening of primary health care programmes and other measures which can reduce the need for blood transfusion.

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