Indiana University Health

Transfusion Guidelines

Updated February, 2005

I. Whole Blood

The use of whole blood is not recommended and is not available from the Blood Center. Blood components should be selected according to the patient's needs.

II. Red Blood Cells (RBCs)

Transfusion must be completed within 4 hours of issue from the Blood Bank. If transfusion is not begun immediately the RBCs must be stored at 1-6° C or returned to the Blood Bank. (Storage is only allowed in preapproved areas, such as the operating room and several of the critical care areas).

The effectiveness of each transfusion should be documented in the medical record. Single unit transfusions of RBCs are often effective. In adult patients, one unit of RBCs will increase the hemoglobin level by approximately 1 g/dl (hematocrit by 3%).

A. Acceptable Usage

1. Acute Blood loss exceeding 30-40% of blood volume (pediatric patients - 10-15 ml/Kg) and/or
   not responding to appropriate volume resuscitation, and/or with ongoing blood loss.
2. Patient is normovolemic and there is evidence to support a need for increased oxygen carrying capacity by the following :
   a. Hypotension not corrected by adequate volume replacement alone.
   b. PVO2<25 torr, when SaO2 completely saturated; extraction ratio>50%, VO2<50% of baseline.
   c. Neonates and young infants less than 56 weeks postmenstrual age with hematocrit < 0.30 and frequent and/or severe apnea/bradycardia, poor weight gain, sustained tachycardia and/or tachypnea or mild respiratory distress.
   d. Neonates and young infants less than 56 weeks postmenstrual age with hematocrit < 0.35 and moderate respiratory distress or with hematocrit < 0.40 and severe respiratory distress, cyanotic congenital heart disease or receiving extracorporeal membrane oxygenation.
3. Hemoglobin of ≤ 7 gm/dl (hematocrit ≤ 21%), if not due to a treatable cause. Treatment of underlying cause is preferable if patient is not symptomatic.
4. Preoperatively for patients with a hemoglobin ≤ 8 gm/dl (hematocrit ≤ 24%) with the potential for significant blood loss.
5. Hemoglobin ≤ 9 gm/dl (hematocrit ≤ 27%) in a patient with coronary artery disease (unstable angina/ myocardial infarction), cardiogenic shock or congestive heart failure.

B. Not recommended

1. For volume replacement alone.
2. In place of a hematinic.
3. For enhancement of wound healing.
4. To improve general "well-being".

III. Washed RBCs:

A. Acceptable Usage

1. History of anaphylactic reaction to blood components.
2. History of prior severe allergic transfusion reactions not prevented by pretransfusion administration of antihistamines.
3. IgA deficiency with documented IgA antibodies.
4. Febrile reactions associated with red cell administration not prevented by leukocyte reduction.
5. Extracorporeal membrane oxygenation, exchange transfusion or large volume transfusion (> 20 mL/kg) in pediatric or neonatal patients.

B. Not recommended for leukocyte reduction to prevent febrile reactions.

IV. Leukoreduced RBCs

A. Acceptable Usage

1. Prevention of HLA/WBC alloimmunization.
2. Prevention of nonhemolytic febrile reactions.
3. Prevention of CMV transmission in immunosuppressed patients.
4. Neonates and young infants less than or equal to 56 weeks postmenstrual age.
5. Intrauterine transfusion.

B. Possible Benefits of Leukoreduction

1. Reduced post-operative infections.
2. Reduced cardiac surgery mortality.
3. Reduced transfusion-induced immunomodulation.
4. Prevent post cardiopulmonary bypass lung injury.

C. Physicians may request leukocyte-reduced RBCs for a patient or patient group not listed above.

V. Platelets (plateletpheresis or platelet concentrates):

Transfusion should begin immediately upon receiving platelets. Once initiated, transfusion must be completed within 4 hours. A single adult dose of platelets (one apheresis or 5 concentrates) should increase the platelet count by 25-35,000/µl. A second dose may be indicated if there was an inadequate post-transfusion increment (CCI) and/or continued microvascular bleeding. Each dose of platelets contains the equivalent of one unit of plasma (plasma in platelet concentrates has decreased levels of factors V and VIII).

A. Acceptable Usage

1. Prophylactically in a nonbleeding patient with failure of platelet production and platelet count ≤ 10,000/µl (< 30,000/µl in term neonates and < 50,000/µl in preterm neonates).

Platelets, Acceptable Usage, con't.

2. Patient with platelet count ≤ 20,000/µl (≤ 50,000/µl in neonates) and signs of hemorrhagic diathesis, as manifested by petechiae and/or mucosal bleeding.
3. Normothermic patients with signs of diffuse microvascular bleeding .
4. Patient to undergo surgery or invasive procedure where clinically significant bleeding is anticipated and platelet count ≤ 50,000/µl (See Notes below).
5. Diffuse microvascular bleeding following cardiopulmonary bypass or with intra-aortic balloon pump and platelet count not yet available or < 100,000/µl.
6. Bleeding in a normothermic patient with documented qualitative platelet defect, regardless of platelet count.
7. Massive transfusion (> 1 blood volume) with diffuse microvascular bleeding and inadequate time to obtain platelet count. Correct hypothermia. (See Notes below).
8. Extracorporeal membrane oxygenation with platelet count < 100,000/µl.

B. Notes

1. Massive transfusion - Platelet transfusions are not required unless there is evidence of diffuse microvascular bleeding and /or platelet count ≤ 50,000/µl. Prophylactic platelet transfusions are not necessary. Correct the hypothermia.
2. Idiopathic immune thrombocytopenic purpura - Platelet transfusions are not indicated unless there is life-threatening bleeding. (During splenectomy, platelet transfusions may be used if necessary after clamping the splenic vascular pedicle.)
3. Thrombotic Thrombocytopenic Purpura/Hemolytic-Uremic Syndrome - Platelet transfusions are a relative contraindication and may worsen the patient's condition.
4. Systemic hypothermia (< 35° C) - The associated thrombocytopathy is best treated by warming the patient.
5. The majority of platelet products supplied by the Blood Center are plateletpheresis products that are leukoreduced.

VI. HLA-Matched or Crossmatched Platelets

A. Acceptable Usage

1. Patients who are immunologically refractory to platelets, i.e. no clinical cause(s) for their refractory state.

VII. Fresh Frozen Plasma (FFP):

For an adult patient, a maximum of 4 units of FFP will be thawed at one time. Transfusion of FFP must be completed within 4 hours of issue from Blood Bank.

A. Acceptable Usage

1. Treatment of a clinical coagulopathy due to deficiency of procoagulants other than Factor VIII, IX, or fibrinogen as indicated by the following:
   a. Actively bleeding patient or patient scheduled for surgery or invasive procedure with PT and/or PTT > 1.5 times the mean of the reference range (10-15 ml/kg will usually suffice).
   b. Prophylactically in critically ill patients with a clinical coagulopathy at risk for

further bleeding.

FFP, Acceptable Usage, con't.

2. Coumadin effect/overdose with major injury/bleeding or impending surgery if vitamin K cannot be used; vitamin K reversal usually occurs within 12-24 hours. Trauma patients on Coumadin need immediate reversal using both FFP and vitamin K.

3. Treatment of documented or presumptive Antithrombin III deficiency and concentrate is not available.

4. Treatment of thrombotic thrombocytopenia purpura or hemolyticuremic syndrome.

B. Not recommended:

1. For volume expansion.

2. For treatment of nutritional deficiencies.

3. Prophylactically with massive transfusion - FFP should be used only if there is documented laboratory or clinical evidence of diffuse microvascular bleeding. Most microvascular bleeding associated with massive transfusion is due to thrombocytopenia and is best treated with platelet transfusions which also contain large amounts of plasma (250 ml/5 units of platelet concentrate; 250-300ml/ plateletpheresis).

VIII. Cryoprecipitate

One unit of cryoprecipitate per 10 kilograms body weight should be adequate to achieve hemostasis. An average adult dose should therefore be 6-8 units, with 10 units as a maximum single dose (unless the patient is receiving fibrinolytics and/or fibrinogen < 50 mg/dl, in which case 20 or more units may be necessary).

A. Acceptable Usage

1. Documented hypofibrinogenemia.

   a. Actively bleeding patient with fibrinogen ≤ 100 mg/dl.

   b. Prophylactically in patients in whom a bleed may cause serious clinical sequelae and fibrinogen ≤ 100 mg/dl.

   c. Fibrinogen ≤ 125 mg/dl associated with diffuse microvascular bleeding.

2. Dysfibrinogenemia.

3. Von Willebrand's disease not treatable with DDAVP and von Willebrand concentrate (intermediate purity factor VIII concentrates such as Humate P or Alphanate) unavailable.

4. Select cases of hemophilia A unresponsive to DDAVP when factor VIII concentrates are unavailable.

5. Factor XIII deficiency.

6. Fibrin glue.

7. Uremic bleeding unresponsive to DDAVP.

IX. **Factor VIIa concentrate (NovoSeven)**

A. Acceptable Usage

1. Factor VIII and IX deficiency with inhibitor levels greater than 5 Bethesda units.

B. Off-Label Use

1. Off- label uses include enhancement of primary and secondary hemostasis (other than factor VIII and IX inhibitors). Factor VIIa is the treatment of choice for patients with factor VII deficiency and significant hemorrhage.

2. Off- label use should be approved (see Clarian guidelines).

X. **Factor VIII concentrate**

A. Acceptable Usage

1. Hemophilia A (Factor VIII deficiency).

2. Factor VIII inhibitor levels less than 5 Bethesda Units.

XI. **Factor IX concentrate:**

A. Acceptable Usage

1. Hemophilia B (Factor IX deficiency).

2. Factor IX inhibitor levels less than 5 Bethesda Units.

XII. **Activated Factor IX Complex Concentrate**

Due to the significant risk of thrombosis, this product should be used only after consultation with a hematologist. These concentrates include partially activated products (Proplex T, Konyne 80 and Profilnine) as well as fully activated concentrates (FEIBA and Autoplex).

A. Acceptable Usage

1. Factor VIII and IX deficiency with inhibitor levels greater than or equal to 5 Bethesda Units.

XIII. **Autologous transfusion:**

Autologous blood should only be collected prior to elective procedures for which there is a greater than 10% chance of requiring red cell transfusion. It is recommended that the Standard Surgical Blood Order Schedule be used as a guide to the number of units that should be predeposited. Those procedures listed as 0 or T&S should not require the deposition of autologous blood. Appropriate indications and schedules of collection can be discussed with the Blood Bank or Blood Center physicians.

A. Acceptable Usage

1. The same as for allogeneic blood.

2. If required by written protocol.

B. Note: Transfusion decisions may be divided simplistically into three situations:

1. Patient definitely needs transfusion.

2. Patient definitely does not need transfusion.

3. Patient probably/possibly may benefit from transfusion.
In the latter situation, the decision to transfuse autologous blood is appropriate.

C. Risk associated with autologous transfusion

1. Misidentification of unit with potential resultant hemolytic reaction or disease transmission.
2. Accidental use of allogeneic blood rather than autologous unit - possibility of transfusion reaction or disease transmission.
3. Bacterial contamination of unit with subsequent sepsis.
4. Volume overload.
5. Allergic reaction due to processing or storage techniques, e.g., plasticizers used in production of bags and tubing, anticoagulants, and sterilization compounds, such as ethylene oxide gas.

XIV. **Intraoperative blood salvage**

A. Acceptable Usage

1. Expectation of salvage of a clinically significant volume of RBCs.

B. Not Recommended

1. Possible intestinal contamination.
2. Possible infectious lesion.
3. Possible contamination of salvaged blood by tumor cells (e.g. carcinomatosis of abdominal cavity, incision of tumor)

XV. **Irradiated blood products**

Viable lymphocytes in the transfused cellular blood products may cause transfusion induced graft-versus-host disease, a usually fatal complication. Irradiation of cellular blood products with 2500 cGy inactivates lymphocytes. Red cells, platelets, and granulocyte transfusions should always be irradiated to prevent this complication. Fresh-frozen plasma, cryoprecipitate and clotting-factor concentrates do not contain viable lymphocytes, and therefore do not require irradiation.

A. **Acceptable Usage**

1. Neonates and young infants < 56 weeks postmenstrual age.
2. Fetuses receiving intrauterine transfusions.
3. Neonatal exchange transfusion recipients.
4. Directed donations from blood relatives.
5. HLA compatible plateletpheresis products by typing or crossmatching.
6. Granulocyte transfusions.
7. Stem-cell transplant recipients.
8. Immuno-suppressed, or suspicion for immunosuppression until diagnosis is established (e.g. DiGeorge syndrome), patients, congenital (e.g., SCID or Wiskott-Aldrich syndrome), or acquired due to disease (e.g., CLL or Hodgkin's disease) or therapy (e.g., fludarabine).
9. Extracorporeal membrane oxygenation recipients.

XVI. Resuscitation Notes*

Hypothermia, acidemia, and low flow states associated with acute hemorrhage impact the normal hemostatic mechanisms in several ways, e.g., microthrombosis (DIC), impaired platelet function (hypothermia), slowed protein kinetics (hypothermia, acidemia), impairing fibrin formation. Several studies performed in actively bleeding patients have strongly suggested that efforts directed at reversing the coagulopathy with component transfusion in the face of hypothermia (T<35°C) and low flow states are ineffective without first achieving better resuscitation. The Trauma Committee strongly recommends that all effort be expended on achieving optimal resuscitation end points before consideration of treating the coagulopathy with component therapy.

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