Statement of Editorial Purpose

The Hospital Physician Hematology Board Review Manual is a study guide for fellows and practicing physicians preparing for board examinations in hematology. Each manual reviews a topic essential to the current practice of hematology.

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Note from the Publisher:
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Transfusion Therapy is an essential part of hematology practice, allowing for curative therapy of diseases such as leukemia, aplastic anemia, and aggressive lymphomas. Nonetheless, transfusions are associated with significant risks, including transfusion-transmitted infections and transfusion-related reactions, and controversy remains about key issues in transfusion therapy, such as triggers for red cell transfusions. This article reviews the available blood products and indications for transfusion along with the associated risks and also discusses specific clinical situations, such as massive transfusion.

**Blood Products**

**Whole Blood**

Whole blood is the product of 1 unit of donated blood plus anticoagulant/preservative, and by definition contains 1 unit of plasma and red cells. Whole blood can be stored for 5 weeks. Although it was the standard product in the past, currently whole blood is rarely used since 1 unit of donated blood can now be fractionated into 1 unit of red blood cells (RBC), 1 unit of platelets, and 1 unit of fresh frozen plasma (FFP). Thus, the use of whole blood for just a single transfusion represents a waste of resources. The one exception is autologous blood donations, which are whole blood units. A summary of available blood products is shown in Table 1.

**Packed Red Cells**

The remaining red cell mass after most of the plasma is removed is called the “packed” red cell unit (hematocrit = 70%–80%), and so red cells are often called “packed” red cells, or PRBC. To improve the flow of blood and to provide “nutrients” for the red cells, a preservative is added which reduces the hematocrit to about 60%. The volume of a red cell unit is about 340 mL. In the average adult, 1 unit of RBC raises the hematocrit by 3%. The indications for transfusion of red cells are to increase red cell mass, and thus oxygen delivery, in patients who are compromised by their anemia.

Several randomized trials have helped define the indications for red cell transfusions and justify lower hematocrit thresholds for initiating transfusion. The TRICC trial showed that in critical care patients (30-day mortality, 18.7%–23.3%), a conservative transfusion strategy of waiting until the hematocrit was below 21% had the same outcomes as transfusing at a threshold of 24%.1 The TRACS trial showed that a hematocrit target of 24% had the same benefit as a target of 30% in patients after cardiac bypass surgery.2 For patients suffering an acute myocardial infarction, the outcomes were worse with aggressive transfusion at hematocrit of 30% compared to 24%.3 Finally, the FOCUS trial showed that in older patients (average age 80 years) after hip fracture surgery, transfusions based on symptoms and not a fixed trigger of 30% had the same outcomes but considerable savings in blood products.4 Based on these trials, patients should be transfused for symptoms and not “numbers.” Young patients, especially those with reversible anemias, can tolerate low blood counts and should not be transfused based on an arbitrary number.

**Platelets**

Several types of platelet products exist. One unit of platelet concentrate is derived from 1 unit of donor blood. Plateletpheresis from volunteer donors can be used to harvest platelets with the resulting product being called plateletpheresis platelets. One unit of single-donor (pheresis) platelets is equivalent to 6 platelet concentrates. Finally, HLA-matched platelets are single-donor pheresis units that are from an HLA-matched donor. This product should be ordered only if there is evidence of HLA antibodies (see “Platelet Alloimmunization” below).

The dose of platelets for the average patient is 6 units of platelet concentrate or 1 pheresis unit. In theory 1 unit of platelet concentrate can raise the count by 5 to 7 x 10^9/L, but often this response is blunted by concurrent illness or bleeding. In patients who appear to have a poor response, one can check a platelet count 15 minutes after platelet infusion. No rise or a minimal rise (<2 x 10^9/L) in the platelet