Packed Red Blood Cell (pRBC)

A. Indications:
   o To increase oxygen carrying capacity in the following settings:
     ◆ Treatment of chronic, symptomatic anemia in patients unresponsive to conservative therapy or when medical necessity does not allow time for conservative therapy (hemolysis, marrow failure)
     ◆ Treatment of an actively bleeding patient (i.e. from trauma, surgery, spontaneous hemorrhage)
   o In most patients, a hemoglobin level of 7-8 g/dL is sufficient to maintain an adequate oxygen carrying capacity.
   o Rarely need to transfuse patient with Hgb>10g/dL
   o If Hgb is between 7 and 10g/dL: need to assess patient. Transfusion threshold should be patient-specific.
   o Factors such as age, degree of anemia, intravascular volume, and underlying cardiac, pulmonary, or vascular disease should be used to assess the need for transfusion.

B. Dose response:
   o In an average adult (70kg): one pRBC unit increases Hgb by 1 g/dL (Hct by 2 – 3%)
   o Infant: 10-15ml/kg to achieve the same response

C. Contraindications:
   o Transfusion of RBCs is not indicated when restoration of blood volume and symptomatic relief can be accomplished using crystalloids or colloids alone (generally when blood loss is less than 20% of blood volume).

D. Compatible fluids: ONLY the following can be infused in the same line as RBCs
   o Normal Saline (0.9%)
   o ABO compatible plasma
   o 5% Albumin
   o Plasmalyte

E. Incompatible fluid: Everything else! Blood should not contact Lactated Ringer’s solution, 0.45% NS, antibiotics/other drugs, or TPN

F. Frozen Red RBCs
   • Preparation: freeze with 40% glycerol, store at -65C for 10 years (or at -120C if 20% glycerol used)
   • Thaw at 37C for 30min, then deglycerolization (essentially the same of washing) performed to remove glycerol prior to transfusion. Must use within 24 hrs of deglycerolization.
   • Deglycerolize: wash with solution of decreasing osmolarity (NaCl solutions, 12%, 1.6%, 0.9% with 0.2% dextrose). Deglycerolization removes glycerol, WBC fragments, and...
plasma. Should recover >80% of RBC in original unit after deglycerolization. Final hematocrit should be <80%

- Indications for preparing frozen cells:
  - Phenotyped units
  - Rare units
  - Autologous units if compatible allogeneic units are difficult to find

**Whole Blood**

A. A unit of WB (whole blood) has ~500mL of blood, 70 ml of anticoagulant-preservation
B. Hematocrit is usually 36-44%
C. One unit of WB should increase the hgb by 1g/dL and hct by 3% in an adult. In an infant, the same response can be achieved at a dose of ~15ml/kg.
D. Store at 1-6°C. Shelf life depends on the preservative used.
E. WB stored longer than 24 hours has few viable platelets, or granulocytes. Levels of Factor V and VIII also decrease with storage. Other clotting factor levels are well maintained.
F. Indications: because WB provides both RBC and plasma, WB is primarily indicated for patients with large blood loss and need both RBC and clotting factor/volume replacement. The use of WB limits donor exposure.
G. However, if volume replacement is not needed, use of WB increases the risk of volume overload
H. Fresh whole blood (WB collectd within the last 48-72 hours) are rarely needed. Some evidence that use of fresh WB may improve the outcomes of infants undergoing complex cardiac surgeries, and in trauma patients.
I. Because of the limited indications for WB, this product is unavailable at most places.