

RED BLOOD CELL TRANSFUSION:

Acute blood loss with:

- Blood loss > 2000 ml or >40% blood volume
- Blood loss > 1500 ml or >30% blood volume AND inadequate response to crystalloid solution, experiencing at least one of the following:
 - Systolic BP < 90
 - Tachycardia > 120 bpm
 - Delayed capillary refill, cold and pale skin
 - Acutely decreased systolic or diastolic blood pressure >30 mmHg
 - Acute mental status changes: anxiety, confusion, lethargy
 - Oliguria or anuria
 - Tachypnea > 30-40 bpm
 - Diaphoresis
- Pre-transfusion Hgb < 8.0 g/dl or Hct <24%
- Trauma patient with Hgb <10g/dl or Hct <30% during acute resuscitation phase
- Traumatic Brain Injury patient with Hgb < 10 g.dL or Hct < 30%

Chronic Anemia with:

- Hgb <7 g/dl or Hct < 21%
- Hgb <8 g/dl or Hct <24% AND coronary artery, pulmonary, peripheral vascular or cerebrovascular disease
- Hgb <10 g/dl or Hct <30% and
 - Symptomatic chronic anemia AND active bleeding or bleeding tendency
 - Symptomatic chronic anemia AND coronary artery, pulmonary, peripheral vascular or cerebrovascular disease
- Acute myocardial infarction/cardiac ischemia with Hgb <10 g/dl or Hct <30% during acute resuscitation phase
- Manual or apheresis red blood cell exchange transfusion

Contraindications and Precautions for Red Blood Cell Administration:

Red blood cell transfusion is NOT indicated for:

- Increasing colloid osmotic pressure
- Volume expansion
- Iron or B12 supplementation
- Improved wound healing
- Improvement of subjective well-being

Red blood cell transfusion may be contraindicated for:

- Patients with a history of hyperhemolysis after transfusion

PLATELET TRANSFUSION:

- Pre-transfusion platelet count < 100,000 / μ L in a patient with:
 - Acute central nervous system bleeding
 - Pulmonary hemorrhage
 - Planned ophthalmic or neurosurgical procedures
 - Hemorrhage into the eye
- Pre-transfusion platelet count < 75,000/ μ L with:
 - Prolonged cardiopulmonary bypass times
 - Reoperation of cardiopulmonary patients
 - Continued post-cardiovascular surgery bleeding in patients recently treated with a platelet inhibitor such as clopidogrel.
- Pre-transfusion platelet count < 50,000/ μ L with:
 - Diffuse bleeding
 - Planned invasive procedure
- Prophylactic dosing for:
 - Stable patients with a pretransfusion platelet count <10,000/ μ L
 - Patients with platelet count <20,000/ μ L and fever, sepsis, hypersplenism, coincident coagulopathy, or anatomic lesion predisposing them to bleeding.
- Massive transfusion (>10 RBC's)
- Massive hemorrhage and/or extensive vascular injury.
- Bleeding in patients with congenital or acquired platelet dysfunction.

Contraindications and Precautions for Platelet Transfusion:

Except in life-threatening emergencies, platelet transfusion is **contraindicated** for:

- Thrombotic thrombocytopenic purpura (TTP)
- Heparin-induced thrombocytopenia (HIT)

Platelet transfusion is **not indicated** for:

- Uremic platelet dysfunction. Transfused platelets immediately become "uremic platelets."
- Prophylactic transfusion prior to cardiopulmonary bypass surgery

Platelet transfusion **may not benefit patients with:**

- Idiopathic immune thrombocytopenic purpura (ITP)
- Untreated disseminated intravascular coagulation (DIC) without active bleeding
- Septicemia
- Hypersplenism

PLASMA TRANSFUSION:

Acute bleeding (including intracranial or intraocular hemorrhage) AND **multiple coagulation deficiencies.**

- Massive transfusion (≥ 10 RBC units)
- Prophylactic (pre-procedural) administration, *given such that transfusion is completed within 1 hour of the procedure*, when pre-transfusion PT >16 , PTT >60 , INR ≥ 2.0 .
- Emergency warfarin reversal in a bleeding patient or patient requiring urgent procedure/surgery.
- Rare indications, when clinically indicated:
 - Isolated elevated PTT due to isolated Factor XI deficiency.
 - Factor assay demonstrating factor deficiency: (Factors II, V, X, XI).
 - Plasmapheresis / Treatment of thrombotic thrombocytopenic purpura (TTP) or hemolytic uremic syndrome (HUS).
 - Replacement of other coagulation regulatory proteins.

Contraindications and Precautions for Plasma Administration:

Due to the risks of transfusion transmitted diseases and transfusion reactions, plasma should never be transfused for:

Volume expansion

Specific factor replacement when factor concentrate is available
Protein replacement for nutritionally deficient patients.

FFP/plasma is **not indicated for reversal of minimally elevated PT, PTT, or INR** in stable, nonbleeding patients. Minor coagulation deficiencies as shown by minimally elevated PT, INR and PTT have not been shown to correlate with adverse bleeding risk or surgical bleeding, and cannot be corrected by transfusion in 99% of cases.

FFP/plasma is **not indicated for non-emergent warfarin (or vitamin K deficiency) reversal.** Vitamin K deficiency (and warfarin therapy) leads to the deficiency of Factors II, VII, IX, X, and proteins C and S. Non-urgent reversal of warfarin should be treated with 1 to 4 mg of oral Vitamin K (510 mg if the INR > 9). In case reversal is needed for bleeding or an urgent procedure, Vitamin K should be administered in addition to plasma.

Isolated elevated PTT is usually due to heparin administration or lipid anticoagulant, in which case FFP/plasma administration will not correct the PTT (and may cause exacerbation of bleeding in cases of heparin dosing). Contact factor deficiencies are not associated with bleeding and do not require replacement. Isolated Factor XI deficiency may require plasma replacement. (Holland and Serode; *Current Opin Hem* 2006)

Due to the short in vitro half-life of Factor VII (2-6 hours), dosing of plasma prior to procedure should be timed to complete transfusion within 1 hour of initiating the procedure, with the option of

continued transfusion during the procedure. Plasma administered several hours or the day prior to procedure will have no effect, and constitutes an unnecessary transfusion.

CRYO TRANSFUSION:

- Fibrinogen deficiency:
 - Pre-transfusion fibrinogen level <120 mg/dL
 - Pre-transfusion fibrinogen level <150 mg/dL with continued massive bleeding, or DIC
- Documented Factor XIII deficiency
- To augment platelet function in bleeding uremic patients *who are non-responsive to pharmacotherapy (desmopressin) and Dialysis*

Contraindications and Precautions for Cryoprecipitate Administration:

Cryoprecipitate **should NOT be used for:**

- Patients with factor deficiencies other than fibrinogen or rarely, Factor XIII.
- Hemophilia A or von Willebrand disease when factor concentrate is available.

ABO-compatible cryoprecipitate is not needed, except for small infants, due to the minute plasma volume transfused. Large volumes of ABO – incompatible transfusion may cause a positive DAT, or rarely, hemolysis.