



Policy /Procedure Document	
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Policy Owner:	Chief Medical Officer
Required Approvals:	Transfusion Committee Hospital Leadership

TITLE:	Blood and Blood Components Utilization Guidelines
SCOPE:	Memorial Hospital of South Bend Physicians and Nursing Associates
PURPOSE:	These guidelines are intended to be helpful in common clinical scenarios where blood transfusion is being considered. However, they do not replace clinical judgment. In cases where these guidelines do not apply, careful documentation of the clinical circumstances and rationale for transfusion therapy in the medical record is highly recommended.
POLICY/PROCEDURE:	

I. Adults

A. Packed Red Blood Cells (PRBCs, includes autologous and directed donor units).

1. **Description of Product:** Red blood cells obtained from 450-500 ml whole blood or collected by apheresis, anticoagulated, and leukocyte reduced to less than 5.0×10^6 leukocytes per unit, estimated volume 250ml. In general, 1 transfused unit PRBCs increases adult patient hemoglobin about 1 g/dL and Hematocrit about 3%.
Whole blood is not available.
2. **PRBC Product Augmentation Orders:**
 - a. **Leukocyte Reduction:** See Description of Product, above. All cellular blood products (PRBC and Platelets) produced by The Medical Foundation are leukoreduced by filtration prior to storage. Leukoreduced products convey reduced risk for transmission of CMV and for primary HLA alloimmunization.
 - b. **Washed PRBCs:** Product washing removes plasma proteins. Indications include history of repeat, severe allergic reactions to plasma containing components, and the presence of antibodies to IgA when specific IgA deficient components are not available. Not Available as a Stat Order. Washing adds at least an hour to product preparation and is not performed onsite. Washing also reduces RBC yield of a unit up to 20% and shortens product expiration to 24 hours.
 - c. **Irradiation:** Used for prevention of transfusion-associated graft- vs-host disease (TA-GVHD), which is caused by proliferation of viable donor T-lymphocytes in a susceptible recipient. Susceptible recipients include: profoundly immunocompromised patients, recipients of intrauterine transfusion, patients undergoing marrow or peripheral blood stem cell transplantation, among others. To be effective, an irradiation order should be continued for all cellular blood components (PRBCs and Platelets) for the duration of a patient's susceptible period.
 - d. **Extended Phenotype Matching:** Used in patients where multiple PRBC transfusions are anticipated over a prolonged period (e.g., patients with sickle cell anemia, myelodysplasia, etc), extended antigen matching of units prior to

transfusion will reduce risk for alloimmunization to RBC antigens. Please consult Pathologist for additional information.

3. Indications:

- a. **General Information:** Red blood cell transfusion is rarely indicated when hemoglobin is above 10 g/dL and is almost always indicated when hemoglobin is below 6 g/dL.
 - i. Transfuse one PRBC unit at a time in hemodynamically stable, nonbleeding patients, with assessment of symptoms and post-transfusion Hgb level prior to giving the next unit. Laboratory assessment of Hgb may be performed as early as 15 minutes following blood transfusion.
 - ii. Signs/symptoms of anemia and/or tissue hypoxia include tachycardia, hypotension, new EKG changes, mixed venous oxygen saturation less than 55%, or clinical evidence of myocardial ischemia unresponsive to optimization of hemodynamics and oxygenation.
 - iii. Signs/symptoms of myocardial ischemia are recurrent chest pain, new EKG changes, evidence of active heart failure
- b. **Actively Bleeding Adults:**
 - i. Ongoing blood loss >25% of circulating blood volume (estimated 70mL/kg) with no response to fluid bolus.
 - ii. Ongoing acute blood loss, Hgb <8 g/dL and AND ischemic heart disease
 - iii. Ongoing acute blood loss, Hgb <8 AND evidence of tissue hypoxia or myocardial ischemia
 - iv. Ongoing acute blood loss, Hgb <8 AND hemodynamic instability
 - v. Ongoing Gastrointestinal hemorrhage and Hgb < 7 g/dL.
 - vi. For patients requiring massive transfusion due to traumatic injury or other cause, transfusion often cannot be managed effectively using only a Hgb threshold. See also Massive Transfusion Policy
- c. **Nonbleeding Adults:**
 - i. Surgical Indications: PreOp Hgb < 7 g/dL with inadequate response to medical treatment for anemia. PostOp: Hgb < 7 g/dL and evidence of tissue hypoxia.
 - ii. Cardiac Indications: Hgb <7 g/dL with stable ischemic heart disease; Hgb <8 g/dL with evidence of cardiac ischemia, and may be appropriate when Hgb is between 8 and 10 g/dL, depending on symptoms.
 - iii. Hematology/Oncology Indications: Hgb <7 g/dL in setting of chemotherapy or radiation treatment; Hgb < 8 when transfusion dependent
 - iv. Neurologic Indications: Hgb < 8 for traumatic brain injury or intracranial hypertension
- d. **Other Indications:**
 - i. Hgb < 7 and evidence of tissue hypoxia; Adjunct to hemodialysis.

B. Platelets

1. **Description of Product:** Single donor platelet unit collected by apheresis contains >3 x 10¹¹ platelets per dose and is leukocyte reduced (see PRBCs, above). Estimated volume 250-300 ml per product. One apheresis platelet product is a standard adult dose of platelets that will generally increase the patient platelet count by 30-60 K.
2. **Platelet Augmentation Orders:**
 - a. **Leukocyte Reduction:** See I.A. 2. a, above.
3. **Indications:**

- a. Platelet count equal to or less than 20,000 for most non-surgery patients and equal to or less than 50,000 for patients being prepared for surgery.
 - i. Procedures with insignificant expected blood loss or vaginal deliveries can be performed at counts <50,000 without prophylactic transfusion.
 - ii. In the absence of other coagulopathy, major invasive procedures require platelet count of 40-50,000 (CVP placement, paracentesis/thoracentesis, respiratory tract/GI biopsies, closed liver biopsy, lumbar puncture, sinus aspiration, dental extraction, etc.).
- b. Bleeding or increased risk of bleeding in patients with documented platelet function defect, either inherited or acquired (including medication-induced), regardless of platelet count.
 - i. For reversal of more potent anti-platelet drugs such as Prasugrel, Clopidogrel and Ticagrelor prior to surgery, one unit apheresis platelets is typically sufficient.
 - ii. For less potent anti-platelet drugs such as aspirin or dipyridamole, usually no platelet transfusion is necessary.
- c. During massive transfusion. See Massive Transfusion Protocol.
- d. During any surgical procedure regardless of platelet count when known or suspected platelet dysfunction results in major microvascular bleeding in the surgical field, as opposed to bleeding from large open vessels.
- e. Neurologic or ophthalmologic procedures typically require a platelet count near 100,000 to limit closed space bleeding.
- f. In cardiovascular surgery when coagulation parameters are not significantly abnormal but unexpected major microvascular bleeding occurs, platelet transfusion at platelet count <100,000 may be appropriate
- g. Platelet count >10,000 in patients with therapy-induced hypoproliferative thrombocytopenia at risk for spontaneous bleeding. Up to one unit apheresis platelets is appropriate in this circumstance. Greater doses are not more effective, and lower doses equal to one half of a standard apheresis unit are equally effective.
- h. Platelet transfusion not generally indicated in autoimmune thrombocytopenia and contraindicated in thrombotic thrombocytopenic purpura (TTP) and heparin induced thrombocytopenia (HIT) except for life threatening hemorrhage.

C. Frozen Plasma (FP)

1. **Description of Product:** Anticoagulated plasma removed from 450-500 ml of whole blood or collected by apheresis, frozen at -18°C within 24 hours of collection, typical volume 200-250 ml (Frozen Plasma 24, or FP24).. Fresh Frozen Plasma (FFP) is frozen within 8 hours of collection at similar temperature. FP24 will have slightly reduced levels of Factors V and VIII but both remain at hemostatic levels and the two products are used interchangeably. FFP is often not available. In general, 10-20 ml plasma transfusion per kg body weight (3 to 6 units in an adult) will raise coagulation factors about 20%.
2. **Indications:**
 - a. Multiple coagulation factors decreased to less than or equal to 25% of normal activity, or single coagulation factor deficiency for which no concentrate is available, with ongoing bleeding or increased risk of bleeding. Document with appropriate laboratory studies.
 - b. PT >1.5X the upper limit of normal range (usually >18 seconds), with increased risk of bleeding. NOTE: INR value is dependent on specific assay variables such as equipment and reagents, and thus can be site-dependent. Currently at EGH, INR 1.8-1.9 when PT is 18 seconds.

- c. PIT > 1.5X the upper limit of normal range (usually > 55-60 seconds), with increased risk of bleeding
- d. Thrombotic Thrombocytopenic Purpura (ITP)/hemolytic uremic syndrome (HUS), often as plasma exchange.*
- e. IV or PO vitamin K is the standard approach for warfarin reversal in most circumstances. However, plasma may be administered with IV or PO Vitamin K when more rapid reversal of warfarin effect is desirable. For urgent warfarin reversal in a bleeding patient, see also Pharmacy recommendations for use of Vitamin K and Kcentra (a 'four factor' Prothrombin complex concentrate).
- f. Rare plasma protein deficiencies, such as CI-inhibitor
- g. During massive transfusion (see above).

D. Cryoprecipitate

1. **Description of product:** Prepared from one unit of FFP which is thawed, and the cold-precipitated proteins are collected in 10-20 ml plasma in a bag (single unit). 5 unit pools of cryoprecipitate are available. Cryoprecipitate is a rich source of Fibrinogen, Factor VIII:C (procoagulant), Factor VIII:vWF (von Willebrand factor), fibronectin, and factor XIII. Each unit must contain 80IU Factor VIII:C and 150 mg fibrinogen. Typically, one unit given per each 10kg body weight will raise patient fibrinogen level by about 50 mg/dL.
2. **Indications:**
 - a. Bleeding due to Hypofibrinogenemia or Factor XIII deficiency.
 - b. Procedures that require fibrin glue
 - c. SECOND LINE therapy for hemophilia A or von Willebrand' s disease as specific factor concentrates (virally inactivated or recombinant) are available.

II. Pediatrics

A. PRBCs.

1. **Description of Product:** See IAI, above. Group O negative, CMV seronegative products are preferentially reserved for neonates and infants. However, all PRBC products are leukocyte reduced, a process which also reduces CMV transmission risk and is an alternative to CMV seronegative products.
2. **Product Augmentation Orders:** See I.A.2. above.
3. **Indications for Neonates and Infants:**
 - a. Most PRBC transfusions are infused slowly over 2-4 hours at a dose of about 15 mL/kg body weigh
 - b. Acute blood loss with hypotension
 - c. <40% hematocrit with severe respiratory distress
 - d. <30% with mild-moderate respiratory distress
 - e. <40% with severe cardiac disease
 - f. <30% in perioperative arena or critical care
4. **Indications for Children and Adolescents:**
 - a. A PRBC transfusion of 5-10 mL/kg body weight will increase the patient hemoglobin level 2-4 g/dL
 - b. Acute blood loss any source greater than or equal to 25% of circulating blood volume
 - c. <24% hematocrit in perioperative arena or critical care
 - d. <30-% hematocrit in acute or chronic anemia and severe cardiorespiratory disease
 - e. <24% hematocrit with symptomatic chronic anemia
 - f. <24% hematocrit with bone marrow failure

B. Platelets.

1. **Description of Product:** See 1BI, above. CMV seronegative products are preferentially reserved for neonates and infants. Leukocyte reduction also reduces CMV transmission risk and is an alternative to CMV seronegative products. A typical dose is 10mL platelet product/kg body weight.
2. **Indications for Neonates and Infants:**
 - a. In surgery and most other settings a standard dosage of 10 to 15 mL platelet product/kg body weight is given.
 - b. Platelet count <50,000 with bleeding
 - c. Additional consensus data not available. In general many agree that neonates of any gestational age should be transfused at higher platelet counts than children or adults due to developmental issues in platelet function. Also, that very ill premature neonates should be transfused at higher platelet counts (50 to 100,000) than stable or term neonates.
3. **Indications for Children:**
 - a. Platelet count <50,000 in patients with therapy-induced hypoproliferative thrombocytopenia at risk for spontaneous bleeding.
 - b. Platelet count <50,000 with active bleeding or planned procedure
 - c. Platelet count <100,000 with bleeding, disseminated intravascular coagulation or other coagulation problem
 - d. Bleeding or increased risk of bleeding in patients with documented platelet function defect, either inherited or acquired (including medication-induced), regardless of platelet count
 - e. Cardiovascular bypass surgery with excessive microvascular bleeding at any platelet count
 - f. Platelet transfusion not generally indicated in autoimmune thrombocytopenia and contraindicated in thrombotic thrombocytopenic purpura (TTP), hemolytic uremic syndrome and heparin induced thrombocytopenia (HIT) except for life threatening hemorrhage.

C. Frozen Plasma

1. **Description of Product:** See ICI, above.
2. **Indications for FP transfusion in Neonates and Older Children:**
 - a. IV or PO vitamin K is the standard approach for warfarin reversal in most circumstances. However, plasma may be administered with IV or PO Vitamin K when more rapid reversal of warfarin effect is desirable. For urgent warfarin reversal in a bleeding patient, see also Pharmacy recommendations for use of Vitamin K and Kcentra (a 'four factor' Prothrombin complex concentrate).
 - b. Multiple coagulation factors decreased to less than or equal to 25% of normal activity, or single coagulation factor deficiency for which no concentrate is available, with risk of bleeding. Document with appropriate laboratory studies.
 - c. During massive transfusion.
 - d. Thrombotic Thrombocytopenic Purpura (TTP)/hemolytic uremic syndrome (HUS), often as plasma exchange.*
 - e. Rare plasma protein deficiencies, such as C1-inhibitor

D. Cryoprecipitate

1. **Description of Product:** See ID1, above.
2. **Indications for cryoprecipitate transfusion in Neonates and Older Children:**
 - a. Hypofibrinogenemia or dysfibrinogenemia with bleeding or prior to an invasive procedure
 - b. Factor XIII deficiency with bleeding or prior to an invasive procedure

- c. Procedures that require fibrin sealant
- d. SECOND LINE therapy for hemophilia A or von Willebrand's disease as specific factor concentrates (virally inactivated or recombinant) are available

*Cryopoor FFP or solvent-detergent treated FFP may have some benefit for TTP patients who require massive doses of plasma in multiple exchange procedures. However, these products are not available in inventory and must be ordered. Consultation with the transfusion service is highly recommended.

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SIGNATURES OF APPROVAL:

Date Signed	Signature	Name	Title
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