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Subject:	TRANSFUSION GUIDELINES				
Approved by: Laboratory Executive Director, Ed Hughes (electronic signature)					
Approved by: Laboratory Medical Director, Mark P. Burton, MD (electronic signature)					

GENERAL GUIDELINES

The minimal effective dose of all blood components should be used.

SINGLE UNIT transfusions of red cells are often effective.

Consent for blood transfusion required unless emergent.

Red Blood Cells – Leukoreduced

Unit of red cells in an adult will increase Hct by approximately 3% and Hgb by 1 g/dL

- Hematocrit \leq 21% or hemoglobin \leq 7g/dL
- Hematocrit \leq 24% or hemoglobin \leq 8g/dL, in a patient with coronary artery disease and unstable angina / myocardial infarction/ cardiogenic shock
- Rapid blood loss with $>$ 30-40% of estimated blood volume ($>$ 1500 – 2000 mL) not responding to appropriate volume resuscitation, or with ongoing blood loss
- The patient has been determined to be normovolemic and there is evidence to support the need for increased oxygen carrying capacity as witnessed by (indicate):
 - Tachycardia, hypotension not corrected by adequate volume replacement alone
 - $PVO_2 < 25$ torr, extraction ratio $>$ 50% $VO_2 < 50\%$ of baseline –
- Autologous predonated red cells: same criteria as above

Platelets, apheresis – leukoreduced

A single dose of platelets (adult: one apheresis; neonatal dose 5 ml/kg) will increase the count by 25,000 to 50,000/cc³ or neonates by 50,000 to 100,000/cc³

- Platelet count \leq 10,000/ cc³ prophylactically in a patient with failure of platelet production
- Platelet count \leq 20,000/ cc³ and signs of hemorrhagic diathesis (petechiae, mucosal bleeding)
- Platelet count \leq 50,000/ cc³ in a patient with (indicate):
 - Active hemorrhage
 - Invasive procedure (recent, in-progress, planned)
- Platelet dysfunction

Fresh Frozen Plasma

- Abnormal coagulation studies and significant hemorrhage
- Prophylactic use for PT/APTT $>$ 1.5 times the mean of the reference range

- Emergent reversal of Coumadin

Cryoprecipitate

- Fibrinogen \leq 100 mg/dL
- Fibrinogen \leq 150 mg/dL, with active hemorrhage

Transfusion Guidelines for Red Blood Cells

ADULT

- I. Acute blood loss
 - a. $>30\text{-}40\%$ of blood volume
 - b. $>20\%$ fall in BP that is NOT corrected by volume replacement OR
 - c. $>25\%$ increase in HR that is NOT corrected by volume replacement
- II. Chronic anemia
 - a. Hgb ≤ 7.0 g/dL AND unresponsive to pharmacologic treatment
- III. Anemia
 - a. Hgb 7 – 10g/dL in selected patient with severe infection, ventilator dependency, angina, congestive heart failure, cerebrovascular insufficiency, renal failure, preoperative status, immediate post-operative patient, intracardiac shunt
 - b. Hgb <10.0 g/dL, unresponsive to pharmacologic treatment AND significant symptoms not corrected by volume replacement OR significant symptomatic cardiovascular, pulmonary or cerebrovascular disease
 - c. Hgb >10 g/dL in setting of shock, massive trauma
 - d. Selected patients with sickle cell or thalassemia syndromes regardless of Hgb
 - e. Anemia due to malignancy or its treatment AND not responsive to pharmacologic treatment
 1. Hgb ≤ 8.0 g/dL
 2. Hgb < 10 g/dL with symptoms OR significant symptomatic cardiovascular, pulmonary or cerebrovascular disease OR anticipating chemo or radiation therapy
- IV. Perioperative anemia
 - a. Postoperative Hgb ≤ 8.0 g/dL
 - b. Pre-, intra- or postoperative Hb <10.0 g/dL AND significant symptoms or signs not corrected by volume replacement OR significant cardiovascular, pulmonary or cerebrovascular disease and risk for ischemia
 - c. Ongoing intraoperative blood loss requiring immediate resuscitation
 - d. Surgical case with critical tissue needs: DOCUMENT
- V. Other
 - a. Documented need for increased O₂ carrying capacity in ICU (Hb <10.0 g/dL AND PvO₂ <25 mm Hg with extraction ratio $>50\%$ OR VO₂ $<50\%$ of baseline)

- b. Acute myocardial infarction in patient ≥ 65 years of age with $Hct \leq 30\%$
- c. **Other indications must be documented**

PEDIATRIC

Neonates <4 months

- a. $Hgb \leq 7g/dL$ AND reticulocyte count $< 4\%$ ($< 100,000$ absolute) OR
- b. $Hgb \leq 8g/dL$ AND at least ONE of the following:
 - 1. Apnea/bradycardia (≥ 10 episodes/24 hours or ≥ 2 episodes requiring bag-mask ventilation)
 - 2. Sustained tachycardia (> 180 beats.min) OR sustained tachypnea (> 80 breaths.min)
 - 3. Inadequate weight gain (≤ 10 g/day despite ≥ 420 kJ/kg/d)
 - 4. Mild RDS with FiO_2 0.25-0.35 OR nasal cannula 1/8 – 1/4 L/min OR IMV or NCPAP with $Paw < 6$ cm H_2O
- c. $Hgb \leq 10$ g/dL with moderate RDS (FiO_2 .035-0.5 OR nasal cannula O_2 IMV with Paw 6-8 cm H_2O)
- d. $Hgb \leq 12$ g/dL AND severe RDS OR cyanotic heart disease (IMV with $FiO_2 > 0.5$ and $Paw > 8$ cm H_2O)
- e. Acute blood loss with shock ($> 15-20\%$ estimated total blood volume)

Children >4 months of age

- a. Acute blood loss
 - 1. $> 30-40\%$ blood volume OR
 - 2. $< 30\%$ blood volume AND significant risk of ischemia OR confounding disease process
 - 3. $Hgb < 6g/dL$
 - 4. $Hgb < 10g/dL$ AND at least one of the following
 - a) Tachycardis OR hypotension unresponsive to volume replacement
 - b) Mixed venous $pO_2 < 25$ mm Hg with extraction ratio $> 50\%$
 - c) $VO_2 < 50\%$ of baseline
- b. Chronic anemia
 - 1. $Hgb \leq 7$ g/dL
 - 2. $Hgb \leq 8$ g/dL AND symptoms/signs unresponsive to volume replacement OR risk factor for ischemia; DOCUMENT
- c. **Other indications must be documented at the time of transfusion**

Transfusion Guidelines for Platelets

- 1. Prophylaxis for stable patient with platelet count of $< 10,000 \mu/L$
- 2. Prophylaxis for patient with platelet count of $< 20,000 \mu/L$ AND one or more of the following conditions:
 - A. Fever $> 38^\circ C$
 - B. Minor bleeding

- C. On heparin
 - D. Concomitant coagulopathy
 - E. Anatomic lesion predisposed to bleeding
3. Platelet count <50,000 μ /L AND one or more of the following conditions:
 - A. Significant bleeding
 - B. Patient needs surgery
 - C. Patient needs invasive procedure
 4. Platelet count <100,000 AND one or more of the following conditions:
 - A. CNS, eye or respiratory tract bleeding
 - B. Requires CNS surgery
 - C. On extracorporeal circulatory support (ECMO, VAD, CPB)
 5. Patient with diagnosed and documented platelet defect AND one or more of the following conditions:
 - A. Significant bleeding
 - B. Patient needs surgery
 - C. Patient needs invasive procedure
 - D. Following clinical parameters reflecting coagulopathy:
Bleeding time >9 minutes, DIC manifested by D-dimer >1, FDP >40, fibrinogen <100, INR >1.4, PTT >50 seconds
 6. Patient on platelet IIb/IIIa receptor inhibitor or ADP receptor inhibitor AND one or more of the following conditions:
 - A. Significant bleeding
 - B. Requires surgery
 7. **Other indications must be documented at the time of transfusion**

Transfusion Guidelines for Fresh Frozen Plasma (FFP)

1. Coagulopathy
 - A. Due to congenital or acquired deficiency of coagulation factors WITH bleeding
OR
 - B. Invasive procedure WITH
 - a) PT / INR >1.5 midpoint normal range
 - b) APTT > 1.5 upper limit normal range
 - c) Factor assay <25%
2. Massive blood transfusion: replacement of >1 blood volume OR >10 units RBCs within 24 hours with evidence of coagulopathy (see 1.) AND bleeding
3. Reversal of warfarin for active bleeding or prior to emergent invasive procedure
4. Documented congenital or acquired coagulation factor deficiency for active bleeding or prior to emergent invasive procedure including:

- A. Deficiency of Factor II, V, VII, IX, X, XI **if** noninfectious or recombinant factor is not available
 - B. von Willebrand's Disease if DDAVP not effective OR noninfectious Factor VIII not available
 - C. Acquired deficiency of multiple factors
 - a) Severe liver disease
 - b) DIC
 - c) Vitamin K depletion
 - d) Following extracorporeal circulation (CPB, ECMO)
5. Deficiency of ATIII, heparin cofactor II, protein C or S **if** noninfectious or recombinant factor is not available
 6. Plasma Exchange for TTP or HUS
 7. C esterase inhibitor deficiency with angioedema
 8. **Other indications must be documented at the time of transfusion**

Transfusion Guidelines for Cryoprecipitate

1. Congenital or acquired hypofibrinogenemia OR measured fibrinogen level <100 mg/dl AND one or more of the following conditions:
 - A. Significant bleeding
 - B. Patient requires surgery
2. von Willebrand's disease when exogenous vWF is needed (consider appropriate Factor VIII concentrate or desmopressin for mild or moderate type I disease)
3. Hemophilia A (when non-infectious Factor VII concentrate NOT available)
4. Fibrin Glue (when non-infectious commercial fibrin sealant is NOT available)
5. Bleeding in uremic patients after or concurrently with DDAVP