Newborn Critical Care Center (NCCC) Clinical Guidelines

Transfusion of Blood Products

GENERAL INFORMATION

The most common cause of early neonatal anemia is blood sampling; make every effort to limit withdrawal of blood for diagnostic purposes. For inborn VLBW infants, the provider should collect a cord blood sample at the time of delivery for any initial laboratory sample needs, e.g. blood culture, CBC, Type and Screen.

Other causes of anemia in the neonate that should be considered include:

- Hemolysis
- Intrapartum hemorrhage
- Neonatal hemorrhage
- Physiologic anemia / anemia of prematurity

At UNC Hospitals, each infant in the neonatal unit is assigned a packed red cell unit upon their first transfusion. Subsequent transfusions are taken from this designated unit, decreasing exposures to blood donors and thereby reducing the risks associated with transfusion. If the volume of transfusions exceeds the volume of the unit or if the unit expires (> 42 days), a new unit will be assigned to the patient. Infant type and screen samples expire after ***4 months*** (**NOT** 120 days) unless discharged first.

For the family of Jehovah's Witness faith - please refer to the accompanying hospital protocol.

GUIDELINES FOR PACKED RED CELL ADMINISTRATION

- The volume of RBC transfusion should equal 15 mL/kg unless the infant is volume sensitive
- There must be a signed consent form on the chart for blood product administration unless there is a life-threatening issue
- Estimated transfusion risk per unit transfused: *(AABB Technical Manual, 19th Edition)*
    1. Hep B 1: 843,000 to 1:2,008,000
    2. Hep C 1:1,149,000
    3. HIV 1:1,467,000
    4. HTLV < 1:1,000,000
    5. Parvo B19 1:20,000- 1:50,000
    6. Bacteria 1:6000

*The following guidelines incorporate information from the American Red Cross recommendations and the PINT and Bell et al RCTs.[1, 2,3] Results of the TOP Trial will likely be available at the time of the next guideline review. (*https://clinicaltrials.gov/ct2/show/NCT01702805)

PRBCs FOR INFANTS </= 4 MONTHS OF AGE	
Hct 20% and reticulocyte count < 5% *or* Hgb </= 7 g/dL	• Healthy premature infants
Hct < 20-30% or Hgb < 7-10 g/dL	• Moderate or severe apneas • Poor weight gain • Sustained tachycardia • Oxygen requirement
Hct < 30-36% or Hgb < 10-12 g/dL	• Moderate cardiopulmonary disease • *(CPAP or high flow nasal cannula)* • Major surgery up to 48 hours post-operative
Hct < 36-40% or Hgb < 12-13.5 g/dL	• Term infant < 24 hours old and history of acute blood loss • Term infant with cardiopulmonary failure
Hct < 40-45% or Hgb < 13.5-15 g/dL	• Severe cardiopulmonary disease *(mechanical ventilation; FiO2 >0.35)* • Acute, symptomatic congenital heart disease

PRBCs FOR INFANTS > 4 MOS OF AGE
• Hct ≤ 20% or Hgb < 7 g/dL
• Postoperative up to 48 hours: Hct < 25% or Hgb ≤ 8 g/dL
• Acute blood loss
• Chronic transfusion regimen for thalassemia or other red-cell dependent disorder

GUIDELINES FOR PLATELET ADMINISTRATION

- The volume of transfusion should equal 10 - 15 mL/kg
- Once delivered to the unit, platelets must be transfused within 4 hours
- It is **not recommended** to use platelets as colloid or volume expansion in the setting of critical illness or hypotension, given emerging evidence that platelet transfusions are independently associated with increased mortality and a variety of adverse events in a dose-dependent manner.

The following guideline is based on American Red Cross recommendations and the Curley, et. al. RCT.

FOR INFANTS </= 4 MONTHS OF AGE	
Platelet count < 100,000	• ECMO • Pre- or post-operatively up to 48 hours • DIC
Platelet count < 50,000	• Active bleeding • Unstable/ill preterm neonate • Infant </= 30 weeks gestational age for the first 72 hours of life (due to risk of IVH in VLBW)
Platelet count < 30,000	• Stable preterm infant • Unstable/ill term infant
Platelet count < 20,000	• Stable term infant

FOR INFANTS > 4 MONTHS OF AGE	
THROMBOCYTOPENIA	
Platelet count < 10,000	• Failure of platelet production
Platelet count < 50,000	**Stable non-neonate with one of the following:** • Active bleeding • Before an invasive procedure with failure of platelet production • Post-operatively up to 48 hours
NO THROMBOCYTOPENIA	
• Active bleeding in association with qualitative platelet defect • Unexplained excessive bleeding in anticoagulated infant	

GUIDELINES FOR FRESH FROZEN PLASMA (FFP) ADMINISTRATION

- The volume of transfusion should equal 10 - 15 mL/kg
- FFP can be used for 6 hours after preparation
- Once delivered to the unit, FFP must be transfused within 4 hours
- All FFP is irradiated for infants less than 4 months or until discharge, whichever occurs later

FOR INFANTS </= 4 MONTHS
Any of the following: • Active bleeding • Refractory hypotension • Sepsis
FOR INFANTS > 4 MONTHS
• PT and/or PTT > 1.5 times the mean normal value in a non-bleeding patient scheduled for surgery or invasive procedure • Diffuse microvascular bleeding in a patient given one or more blood products and PT and/or PTT > 1.5 times the mean normal value or not yet available • Acute blood loss • Other indications may include TTP, ITP, emergency reversal of warfarin and treatment of plasma anticoagulant deficiencies such as protein C, protein S or antithrombin III when specific therapy is not available or advisable

GUIDELINES FOR CRYOPRECIPTATE ADMINISTRATION

- The volume of transfusion should equal 10 - 15 mL/kg
- Enriched with von Willebrand factor, fibrinogen, and factor VIII
- Each unit of cryoprecipitate contains > 150 mg of fibrinogen and > 80 international units of factor VIII

FOR ALL INFANTS
• Hypofibrinogenemia (fibrinogen < 100 mg/dL) or dysfibrogenemia with active bleeding • Hypofibrinogenemia or dysfibrogenemia while undergoing an invasive procedure • Von Willebrand disease with active bleeding but only when both of the following are true: a. Desamino-D-arginine vasopressin (DDAVP) is contraindicated, not available, or does not elicit response *AND* b. Virus-inactivated plasma-derived factor VIII concentrate (which contains von Willebrand factor) is not available

DIRECT DONATION OF BLOOD PRODUCTS

Direct donation is discouraged for the NCCC population given the increased risks of directed donor blood and time constraints. To proceed with direct donation, contact the blood bank for procedure.

GENERAL PRINCIPLES

- Transfusion orders are located in the **"Neonatal Procedure Focused"** order set in Epic. Once opened, select the appropriate blood product.
- The "**Prepare**" order should include the volume to be transfused plus an additional 5 mL to prime the IV tubing. The "**Transfuse**" order should be written only for the desired transfusion volume. Both must be completed prior to submitting order.
- Furosemide (Lasix) should not be routinely ordered with transfusions.
- Blood components are typically given above total fluids, but may be given within total fluids if patient is extremely volume sensitive.

References:

1. American Red Cross. A Compendium of Transfusion Practice Guidelines. A Compilation from Recent Peer-Reviewed Literature. 3rd Edition. 2017.
2. Bell EF, Strauss RG, Widness JA, et al. Randomized Trial of Liberal versus Restrictive Guidelines for Red Blood Cell Transfusion in Preterm Infants. Pediatrics. 2005; 115: 1685 – 1691.
3. Kirpalani H, Whyte RK, Andersen C, et al. The Premature Infants in Need of Transfusion (PINT) Study: A Randomized, Controlled Trial of a Restrictive (Low) versus Liberal (High) Transfusion Threshold for Extremely Low Birth Weight Infants. J Pediatr. 2006; 149: 301 – 307.
4. Carson JL, et al. Red blood cell transfusion: A clinical practice guideline from the AABB. Ann Int Med. 2012;157:49-58.
5. Baer VL, Lambert DK, Henry E, Snow GL, Sola-Visner MC, Christensen RD. Do platelet transfusions in the NICU adversely affect survival? Analysis of 1600 thrombocytopenic neonates in a multihospital healthcare system. J Perinatol. 2007;27:790–796.
6. Curley A, Stanworth SJ, Willoughby K, Fustolo-Gunnink SF, Venkatesh V, Hudson C, Deary A, Hodge R, Hopkins V, Lopez Santamaria B, Mora A, Llewelyn C, D'Amore A, Khan R, Onland W, Lopriore E, Fijnvandraat K, New H, Clarke P, Watts T; PlaNeT2 MATISSE Collaborators. N Engl J Med. 2019 Jan 17;380(3):242-251.

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APPENDIX A

TYPE AND SCREEN/BLOOD TYPE REFERENCE

Two blood samples are required for patients at risk for receiving a blood transfusion during their hospitalization.

IF PATIENT WAS BORN IN LABOR AND DELIVERY:

A sample for blood typing (ABO/Rh) should be sent on ***ALL*** NCCC admissions from L&D. If it is determined by the provider that a patient is at risk for a blood transfusion, a second sample for screening (**TYPE AND SCREEN**) should also be sent.

First Specimen:
OB will provide *1-2 mL of cord blood in a large lavender- or blue-topped tube* and label it with mom's sticker. Bring this tube back to the unit and affix the baby's patient ID label to the specimen as well.

- This can be tested for **BLOOD TYPE** only (check type sample). The order in Epic appears as "cord blood type."

Second Specimen:
A *large lavender-topped tube with 1-2 mL* of blood is required for the **TYPE AND SCREEN**.

- Do not send a bullet tube for this testing.
- Affix the large lab label along with an ID sticker to the specimen.
- The order in Epic appears as "Type and Screen."

If L&D did not provide a cord blood sample:
A *small tube/bullet tube* is acceptable for confirmatory **BLOOD TYPE** (check type sample).

- This sample must be drawn at a ***different*** time and sent in a ***different*** bag from the large lavender tube for Type & Screen.
- The order in Epic appears as "ABO/Rh."

IF PATIENT WAS AN OUTSIDE TRANSPORT:

Two different specimens are required.
Do not send both specimens to the lab in the same bag at the same time.

1. For the initial specimen (**TYPE AND SCREEN**): Collect 1-2 mL of blood and send in a *large lavender-topped tube.*
2. For the confirmatory **BLOOD TYPE** (check type sample): A *small tube/bullet tube* is fine to send for the confirmatory blood type (ABO/Rh) sample only.