UWHealth

CLINICAL SYNOPSIS

Blood Product Transfusion in Neonates: Indications and Key Points

PATIENT POPULATION	Neonatal patients with an indication for blood product transfusion
INTENDED AUDIENCE	Clinicians involved with ordering and administration of blood products in neonates
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ORDERING BLOOD	
If patient needs...	**ACTION**
Routine blood transfusion, non-urgent	Order blood via routine blood products order set
Urgent/emergent/massive blood transfusion	Order via urgent/emergent blood products order panel

KEY REMINDERS

- Transfuse only the MINIMUM number of units necessary.
- Transfusion rates may be altered from the guidance below depending on the hemodynamic stability and disease process; nurses should follow the provider orders.
- Transfusion of any blood product should be completed within 4 hrs.

PRODUCT	SUGGESTED DOSING & VOLUME	SUGGESTED ADMINISTRATION[1,2]	INDICATIONS (listed in HealthLink)
RED BLOOD CELLS[3-9]	Dosing: 10-20 mL/kg Hemoglobin is increased by 2-4 g/dL using the above dosing recommendations	• Infuse over 3 hours via PIV or central line >2.0 Fr diameter • Use blood tubing if administering via bag and use syringe tubing if administering via syringe. Administer on a pump.	Planned procedure/Surgical preparedness Active bleeding Pre-term infants requiring mechanical ventilation, Target Hgb ≥ 11 g/dL Pre-term infants requiring NIV/High CPAP, Target Hgb ≥ 10 g/dL Pre-term infants requiring Low CPAP or HFNC/LFNC, Target Hgb ≥ 9 g/dL Pre-term infants not requiring respiratory support, Target Hgb ≥ 7 g/dL Term infants not requiring significant respiratory support, Target Hgb ≥ 7 g/dL Term infants with severe lung disease requiring assisted ventilation, Target Hgb ≥ 10 g/dL Notes: • For congenital heart disease patients, please refer to Blood Product Transfusion in Pediatrics: Indication and Key Points - Clinical Synopsis • See section below for guidance re. feeding during RBC transfusions in premature infants

PLATELETS[4-6,8-12] **(SINGLE DONOR)**	Dosing: 10-20 mL/kg	• Infuse over 1-2 hours • Use syringe tubing and administer on pump	Planned procedure/Surgical preparedness
			Active bleeding
			Target platelets > 25 K/µL in stable term and pre-term infants without bleeding
			Target platelets > 50 K/µL in infants undergoing non-CNS surgery or invasive procedures (e.g., LP, central line placement), high risk for IVH, or risk/concern for coagulopathy (e.g., sepsis, HIE, known thrombi)
			Target platelets > 100 K/µL in infants undergoing CNS surgery
FRESH FROZEN PLASMA[4-6,9,13]	Dosing: 10-20 mL/kg	• Infuse over 30-60 minutes • Use syringe tubing and administer on pump • Do NOT warm	Planned procedure/Surgery preparedness
			Active bleeding or oozing (including infants undergoing therapeutic hypothermia for HIE irrespective of coagulation measures)
CRYOPRECIPITATE[5,6,9,14-16] *Stored frozen as 5 pooled units	Dosing: 5-10 mL/kg Volume: 5 pooled units is ~ 120mL or as 1 pooled unit is ~ 15mL	• Infuse over 30-60 minutes • Use blood tubing if administering via bag and use syringe tubing if administering via syringe. Administer on a pump.	Planned procedure/Surgical preparedness
			Fibrinogen < 150 mg/dL with active bleeding, liver dysfunction, or DIC
			Fibrinogen deficiency (defined as <100 mg/dL)
			Factor XIII deficiency
			Notes: • Contains fibrinogen, Factor VIII, Factor XIII, and von Willebrand factor (vWF)
GRANULOCYTE TRANSFUSION			
GRANULOCYTES[17,18]	Dosing: 10-20 mL/kg, max 300 mL (discuss with heme)	Infuse over 2-3 hrs	Severe neutropenia (absolute neutrophil count <500/µL) or congenital neutrophil dysfunction with bacterial or fungal infection unresponsive to appropriate antimicrobial therapy* **Granulocyte transfusion can only be ordered upon approval from Transfusion Medicine.*

Notes:

- Patient should have reasonable chance for recovery of marrow function.
- Granulocytes must be RBC crossmatch compatible, Rh compatible in females of childbearing potential and irradiated.
- Granulocytes must be transfused with standard blood administration sets. DO NOT transfuse with leukocyte reduction filters.
- Granulocytes are transfused prior to completion of donor day-of-donation infectious disease testing.

IRRADIATED BLOOD[14,19-22]	
Notes: • Irradiated blood is indicated for use in patients at risk for Graft-Versus-Host-Disease (GVHD) from transfusion, as listed to the right. • Blood components that contain viable lymphocytes may be irradiated to prevent proliferation of T lymphocytes, which is the immediate cause of GVHD. • Irradiated blood is prepared by exposing the component to a source of radiation.	Patients <1 year of age
	Patients with aplastic anemia or unexplained cytopenias
	Patients with lymphopenia (absolute lymphocyte count < 500/mL) and bone marrow suppression
	Peripheral stem cell/bone marrow transplant candidate/recipient
	Hematological malignancies including Hodgkin's disease, lymphoma, leukemia and myelodysplastic syndromes
	Severe immunosuppression- non-hematologic cancer patients treated with multiagent chemotherapy or combined chemo/radiotherapy within the past year
	Immunodeficient patients (e.g., congenital immunodeficiency who exhibit defective cell medicated immunity, DiGeorge syndrome, Wiscott Aldrich syndrome, SCID)
	Intrauterine transfusions
	Patients receiving donor units from blood relatives
	Recipients of HLA matched or crossmatched platelets
	Patients receiving anti-lymphocyte or anti-thymocyte medication (e.g., alemtuzumab, ATG, etc.)
	Patients receiving purine analogues (e.g., azathioprine, fludarabine, cladribine, etc.)

Special Products – Transfusion Medicine Pearls	
Washed RBCs and platelets[23]	• Washing with saline to remove the plasma in the product is time and labor intensive and leads to a high risk of product wastage because the shelf-life is shortened to 4 hrs for platelets and 24 for RBCs from the time washing process is started. • Indications for washed cellular products include a history of an anaphylactic transfusion reaction, recurrent severe allergic transfusion reactions, or the removal of an offending antibody (e.g. washed maternal platelets for a neonate with neonatal alloimmune thrombocytopenia)
HLA-matched platelets[24]	• HLA-matched platelets are indicated when the patient has an immune component to platelet transfusion refractoriness. • If the patient has 2 consecutive poor increments when measured within 60 minutes after transfusion, then the next step is class I HLA antibody testing and a transfusion medicine consult.
Autologous and directed donation[25-27]	• Per WI Laboratory policy, the indication for products from autologous/directed blood donation is a clinically-significant, rare blood phenotype (e.g., a clinically-significant antibody to a very common red blood cell antigen, platelet antigen, or IgA) • Thus, we do not approve requests for products from autologous/directed donation due to patient/family preferences, including preferences regarding COVID-19-vaccinated donors.
CMV transmission mitigation[22,23,28-39]	Leukoreduction • All RBCs and platelets are leukoreduced. • Transfusion of leukoreduced blood products reduces the risk of CMV transmission to levels not significantly different from transfusion of CMV-seronegative blood. There have been no reports of CMV transmission from a unit of leukoreduced blood. Thus, leukoreduced components are considered a suitable alternative to CMV-seronegative transfusion. Nomenclature surrounding CMV status of blood products and use of CMV-seronegative products

	• "CMV-negative" blood is a misnomer, as blood suppliers may test some donors for serology (i.e. antibodies to CMV) but do not test for CMV nucleic acid. • Studies that compared CMV-seronegative donors to those from CMV-seropositive donors and reported a potential difference in risk are complicated by background CMV transmission that is unrelated to transfusion. • CMV-seronegative donors are scarce, and insisting on blood from CMV-seronegative donors may introduce a significant delay (several hours or longer) in obtaining such products with no quantifiable clinical benefit. • If the blood product cannot be leukoreduced (e.g. hematopoietic stem cell product, granulocytes, shortage or failure of leukoreduction filters), then blood from CMV-seronegative donors should be considered for high-risk patients.

Guidance for Enteral Feeding During RBC Transfusion in Premature Infants[40-46]

Background

- There is evidence in premature infants demonstrating *potential* associations between:
  - RBC transfusion and a potential increased risk of necrotizing enterocolitis (NEC)
  - Anemia and a potential increased risk of NEC
- However, there are significant limitations to this evidence that limit the ability to establish any causal relationships and conflicting reports regarding this risk exists
- Given the controversy surrounding this topic and conflicting evidence, UW Health has developed a risk-based approach to feeding with RBC transfusions, outlined here

Low-Risk (All of the below must be true)	High-Risk (If <u>any</u> of the below apply)
• PMA ≥ 30 wks • Clinically stable • No prior NEC/SIP (per physician discretion) • No current vasoactive support • No current metabolic acidosis • Tolerating current feeds	• < 30 wks • Current concern for NEC • On vasoactive agents • Rising lactate/acidosis • Hemodynamically significant PDA (per provider discretion) • Culture positive sepsis (per provider discretion) • Transfusion given for acute decompensation
Feeding plan if low-risk for NEC • Continue current feeds before, during, and after transfusion.	**Feeding plan if high-risk for NEC** • Hold feeds 2 h before, during, and 2 h after transfusion; resume at prior rate if exam stable. • Timing to be ideally coordinated to not miss more than 2 feeds • Consider IV fluids to meet TF goals; monitor glucose • Obtain blood glucose halfway through infusion and two hours post transfusion to assess for reactive hypoglycemia

Monitoring

- Standard cardiorespiratory monitoring; track ABD events.
- If new abdominal signs (distension, blood in stool), rising lactate, or escalating ABDs → NPO and evaluate per NEC pathway.

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