

CCHMC Blood Utilization Policy	<i>Policy Number</i>	BB.TRG.901
	<i>Effective Date</i>	08/29/2022
CCHMC Transfusion Guidelines	<i>Page</i>	1

BLOOD PRODUCTS AND INDICATIONS

-For platelet, plasma, and cryoprecipitate orders needed at a future time – must call blood bank (513-636-4508) when you are ready for the blood bank to start preparing units.
-For administration of RBCs, whole blood reconstituted, and granulocytes, the patient must have a valid type and screen, which expires every 3 days. For administration of platelets, plasma, and cryoprecipitate, the patient must have an ABO/Rh type on file in the blood bank.

-Type and screen collection – 6mL whole blood EDTA tube; minimum volume - 3mL whole blood EDTA tube (See policies BB.SPE.801 and BB.SPE.801a)

Exception to the above:

- Inpatient neonates <4 months old without red cell antibodies (including passively acquired non-ABO antibodies)
 - Since neonatal immune system rarely produces antibodies in response to RBC transfusions, upon completion of 1st type and screen, blood bank will call and request 2nd separate ABO/Rh type. Then the neonate type and screen will be valid in blood bank until patient is 4 months old or until discharged, whichever occurs first.

Red Blood Cells – Average unit volume 300mL

If total volume to transfuse is >220mL, then recommend ordering in units. A 10-15mL/kg transfusion should raise Hgb by 2-3 g/dL or Hct by 6%. For patients ≥70kg, 1 unit of RBCs should increase Hgb by 1 g/dL or Hct by 3%. Recommend to transfuse 1 unit and re-check Hgb/Hct before ordering 2nd unit.

Indications:

1. Hgb≤7 (Hct≤21%)
2. Hgb≤8 (Hct≤24%) and active bleeding, risk of end organ ischemia, or receiving radiation therapy with sedation for malignancy
3. Hgb≤15 (Hct ≤45%) and cyanotic congenital heart disease* or symptomatic neonatal anemia†
4. ECMO‡
5. Prime extracorporeal circuits (e.g. Apheresis)
6. Massive Transfusion Protocol or acute blood loss with hypovolemic shock
7. Cardiac Surgery, high & moderate risk and Hgb<10 (Hct<30%)
8. Cardiac Surgery, low risk (simple ASD, VSD, short CPB run) and Hgb<9 (Hct<27%)
9. Hemoglobinopathy—acute complication/prophylaxis or chronic transfusion
10. Neonatal exchange transfusion
11. Red cell exchange by CCHMC Pheresis Service
12. Red cell exchange by Hoxworth Pheresis Service
13. Intrauterine transfusion
14. Pre-op blood set up for surgery
15. Transfusion reason outside above criteria

Platelets – Apheresis platelet (single donor)

average unit volume 230mL.

A 10-15mL/kg transfusion should give an expected platelet count rise of ~50,000. If 10-60 min post-platelet transfusion count does not show appropriate increment, consider platelet refractoriness (immune vs. non-immune factors). Orders ≥2 units at a time will be evaluated by blood bank medical director.

Indications:

1. PLT≤10K and prophylactic transfusion
2. PLT≤30K and post-op NeuroOnc or oncology patient receiving IM injection
3. PLT≤50K and invasive procedure/surgery, active bleeding, high grade gliomas and DIPG, on anticoagulation, stable neonate
4. PLT≤100K and unstable premie, neurosurgery, diagnostic LP for malignancy, or ECMO
5. Continuous platelet infusion
6. Platelet dysfunction/disorder & risk of bleeding
7. Massive Transfusion Protocol
8. Pre-op blood set up for surgery
9. Transfusion reason outside above criteria

Plasma – Average unit volume 240mL.

Takes ~20-30min to thaw FFP.

Contains all the coagulation proteins. A 10-20mL/kg transfusion typically raises procoagulant factors by 20-30%. Plasma is not indicated for volume expansion, enhancement of wound healing, or heparin reversal.

Indications:

1. Documented coagulopathy and risk of bleeding
2. Massive Transfusion Protocol or acute blood loss
3. Support during active bleeding, DIC, or ECMO
4. Protein S, C, AT-III, Factor II, V, X, XI deficiency and no specific factor concentrate available
5. Reverse Warfarin effect
6. Treatment of TTP
7. Plasma exchange by CCHMC Pheresis Service
8. Plasma exchange by Hoxworth Pheresis Service
9. Pre-op blood set up for surgery
10. Transfusion reason outside above criteria

Cryoprecipitate – Average unit volume 15mL. Takes ~15min to thaw Cryo.

1 to 2 units/10kg should raise fibrinogen 60-100 mg/dL. Contains fibrinogen, vWF, Factors VIII and XIII.

Indications:

1. Fibrinogen <200mg/dL on ECMO and bleeding
2. Fibrinogen ≤150mg/dL and coagulopathy with liver disease/transplant, cardiopulmonary bypass, DIC
3. Fibrinogen ≤100 mg/dL and bleeding, invasive procedure, or on ECMO non-bleeding
4. Dysfibrinogenemia & active bleeding
5. Factor XIII deficiency and bleeding or invasive procedure
6. For Plasma exchange by CCHMC Pheresis
7. For Plasma exchange by Hoxworth Pheresis
8. Massive Transfusion Protocol
9. Pre-op blood set up for surgery
10. Transfusion reason outside above criteria

Granulocytes – Average unit volume varies

All granulocyte units need to be irradiated and matched for patient's CMV status. Must be transfused via gravity within 24 hours of collection, preferably as soon as possible since the viability/functionality of the product dramatically decreases over time. Do NOT use infusion pump to administer – this will damage granulocytes.

Indications:

1. Documented bacterial or fungal infection, with ANC<500/uL or granulocyte dysfunction and lack of response to standard therapy
2. Transfusion reason outside above criteria

Whole Blood, Reconstituted – Average unit volume varies

Whole blood reconstituted from leukoreduced RBCs and compatible plasma. The desired hematocrit should be stated in the order comment. This product expires within 5 days.

Indications:

1. Neonatal exchange transfusion
2. Transfusion reason outside above criteria

*Congenital heart disease:

- a) Hct > 30% for 2 ventricles
- b) Hct > 35% for MCS
- c) Hct > 40% for single ventricles
- d) Hct > 45% for symptomatic SV

‡ECMO:

- a) Hgb≤10 or persistent inadequate oxygen delivery
- b) Replacement of ongoing sanguineous losses
- c) Priming circuit

†Neonatal anemia:

- a) Less than 4 months; Hgb<15 (Hct<45%) and congenital cyanotic heart disease or on ECMO
- b) Less than 4 months; Hgb≤12 (Hct≤36%) and needing moderate/significant mechanical ventilation (MAP>8cm and FiO2>40%)
- c) Less than 4 months; Hgb≤10 (Hct≤30%) and needing minimal mechanical ventilation (PPV with settings less than described above or on CPAP ≥5cm H2O and FiO2>40%)
- d) Less than 4 months; Hgb≤8 (Hct≤24%) and on supplemental oxygen or with symptomatic anemia

CCHMC Blood Utilization Policy	<i>Policy Number</i>	BB.TRG.901
	<i>Effective Date</i>	08/29/2022
CCHMC Transfusion Guidelines	<i>Page</i>	2

BLOOD PRODUCT MODIFICATIONS/SPECIAL REQUIREMENTS AND INDICATIONS

-All patients ≤ 4 months old will receive Hgb S negative RBCs, Irradiated RBCs, Reconstituted Whole Blood, and Platelets and if receiving full RBC unit it will be $\leq 5-7$ days old.
-If irradiation is requested/required, all patients < 1 year old will receive a RBC that has been irradiated within 24 hours of issue to help prevent potassium overload.

<u>Irradiated</u> Inactivation of donor lymphocytes by gamma- or X-irradiation can prevent proliferation of transfused lymphocytes and development of transfusion-associated graft-versus-host disease (TA-GVHD). Pathogen reduced platelets are irradiation equivalent. Indications: - Any patient ≤ 4 months of age - Known or suspected cellular immune deficiency (SCIDS, Wiskott-Aldrich syndrome, DiGeorge syndrome, etc) - Immunosuppression due to any malignancy/cancer-related treatments (chemotherapy, radiation, etc) - Stem cell transplant patients (allo and auto) - Solid organ transplant recipient or candidate - Patients receiving or received Thymoglobulin (ATG) or Alemtuzumab (Campath) in past 12 months. - Component from blood relatives or directed donors - HLA-matched or crossmatched platelets - Granulocytes & Liquid Plasma - Intrauterine transfusion	<u>Washed</u> Using an automated device, a cellular product (only RBC or platelet) is repeatedly washed with normal saline. There is a $>95\%$ reduction of plasma and its constituents. This process results in approximate cell loss of 20% for RBC and 30% for platelets. The process requires 2 hours for Burnet and 4 hours for Liberty once requested and is performed at Hoxworth Blood Center. Washed platelets are not available for Liberty due to shortened expiration of product. RBCs must be transfused within 24 hours and platelets within 4 hours from the start of washing procedure. Indications: - Recurrent severe allergic/any anaphylactic reactions that are unresponsive to pre-medication (Single washed) - IgA deficiency and anti-IgA antibodies (Triple washed)	<u>Directed or Autologous Donation</u> - Directed donation = Blood donated by family or friends specifically for an individual - Autologous donation = Blood donated by patient for themselves - Directed and autologous donations are not safer than collected blood from volunteers - All directed donations need to be irradiated. See Directed Blood Donation Information Knowing Note for further explanation http://centerlink.cchmc.org/echirp/patient-and-family-education/knowning-notes/lab
<u>CMV negative</u> 100% of CCHMC RBCs and platelets are leukoreduced and considered "CMV safe". CMV sero-negative blood should only be ordered in the following situation. Indications: Granulocyte transfusions in recipients who are CMV sero-negative.	<u>Volume reduced</u> Removal of plasma from cellular products via centrifugation (specifically platelets). Performed at Hoxworth Blood Center and takes 2 hours for Burnet. Volume reduced platelets are not available for Liberty due to shortened expiration of product. Volume reduced platelets must be transfused within 4 hours from start of reduction process. Indications: - For patients at risk for volume overload - If ABO incompatible platelet needs to be given in small patient (due to inventory supply issues)	<u>Sickle negative</u> RBCs negative for Hemoglobin S. Processing time is 20 min for Burnet and 2 hours for Liberty. Indications: - Patients with sickle cell disease - Intrauterine transfusions
<u>Leukoreduced</u> Removal of leukocytes in blood via filtration or apheresis collection at blood donor center. 100% of RBCs and platelets at CCHMC are leukoreduced. - Reduces rate of febrile non-hemolytic transfusion reactions - Reduces risk of CMV transmission. Blood is considered "CMV safe" - Reduces leukocyte alloimmunization	<u>Minimum donor exposure (MDX)/Split Unit</u> 1 unit of RBCs (~300mL) is used for multiple transfusions to the same small patient. Order volume MUST be <150 mL to get at least 2 doses off an MDX/Split unit. Indications: - Neonates or potential transplant patients in which there is concern about multiple exposures - Patient who cannot tolerate full unit volume over 4hr transfusion limit (add comment how to split unit)	<u>Spun Sed (High HCT)</u> An RBC with a specific hematocrit. Preparation performed by Hoxworth Blood Center and takes ~6 hours. Indications: For neonatal exchange transfusions or intrauterine transfusions needing a specific hematocrit
<u>Specialty Matched Platelets (HLA/XM)</u> Platelets selected to match recipient HLA type or platelets crossmatched with recipient plasma. Consult with blood bank (513-636-4508) Indication: Immune mediated platelet refractoriness with documented HLA Class I antibodies in patient (positive platelet antibody screen)	<u>Octaplas Plasma</u> Solvent-detergent treated plasma. Must be requested from blood bank several days in advance of anticipated use, product has to be ordered. (Average unit volume 200mL) Indication: Patient needing plasma transfusion but has history of recurrent moderate-severe allergic reactions.	<u>Cryo Reduced Plasma</u> Plasma that has the cryoprecipitate removed. Indication: Thrombotic Thrombocytopenic Purpura (TTP) resistant to standard therapy with plasma.

TIME NEEDED FOR BLOOD PRODUCTS TO BE AVAILABLE FOR TRANSFUSION – for additional detail see policy BB.BC.POS.024

Approximate Turnaround Time	How to Obtain	Testing Performed/Products Issued	Risk for Hemolysis
Emergency Release RBC – 5 min	Verbal order – phone call to BB	None, O Neg RBC issued STAT	Low*; life threatening hemolysis rare
Trauma Cooler – 5 min	Trauma cooler sent automatically only for Trauma STATs	None (Send Type and Screen as soon as possible) Trauma Cooler (Burnet) – 2 O Neg RBCs, 2 AB liquid plasma Trauma Cooler (Liberty) – 2-4 O Neg RBCs 1 st MTP pack – varies see policy BB.MBT.211	Low*; life threatening hemolysis rare
Massive Transfusion Protocol (only available at Burnet Campus) - 1 st MTP pack – 20-30 min	Verbal order – phone call to BB		
No current type and screen and no RBC antibodies – 60-90 min Current type and screen and no RBC antibodies – 10-15min	Epic Blood Administration order set	ABO, Rh type Antibody screen negative Electronic crossmatch performed (if eligible)	Negligible
Patients with new or historical RBC antibodies – Time varies from 2 to 24 hours (contact blood bank 513-636-4508)	Epic Blood Administration order set	ABO, Rh type Antibody screen positive Antibody identification performed Manual (serologic) crossmatch performed	Negligible
RBCs for patients with sickle cell disease – at least 2 hours	Epic Blood Administration order set	Testing performed depends on RBC antibody history Best matched based on genotype (with Rh and K preference), sickle cell negative RBCs provided	Negligible

*Red cell antibodies are found in approximately 0.5% of patients and could cause an acute/delayed hemolytic reaction.

CCHMC Blood Utilization Policy	<i>Policy Number</i>	BB.TRG.901
CCHMC Transfusion Guidelines	<i>Effective Date</i>	08/29/2022
	<i>Page</i>	3