

CHEO BLOOD PRODUCT TRANSFUSION GUIDELINES

RISKS OF TRANSFUSION FOR INFORMED CONSENT

1 in 20	Febrile Non Hemolytic reaction to platelets (per PLT pool)
1 in 100	Minor allergic reaction
1 in 300	Febrile non-haemolytic reaction to red cells
1 in 700	Transfusion-related acute circulatory overload (TACO)*
1 in 7000	Delayed haemolytic reaction
1 in 10000	Transfusion-related acute lung injury (TRALI)*
1 in 10,000	Symptomatic bacterial sepsis from platelets (per PLT pool)
1 in 40,000	Acute haemolytic transfusion reaction (HTR) due to ABO-incompatibility error*
1 in 40,000	Severe allergic reaction
1 in 60,000	Death from bacterial sepsis (per PLT transfusion)*
1 in 153,000	Hepatitis B virus (HBV) transmission
1 in 250,000	Symptomatic bacterial sepsis from red cells
1 in 500,000	Death from bacterial sepsis (per red cell unit)*
1 in 2,300,000	Hepatitis C virus (HCV) transmission
1 in 7,800,000	HIV transmission

*Main causes of mortality (non-infectious risks account for 87-100% of fatal complications)

IMPORTANT TO REMEMBER

1. These guidelines will assist you to determine the appropriate blood product(s) and dose for your pediatric patient.
2. Informed consent must be obtained by most responsible physician or delegate prior to transfusion
3. Ensure blood component patient identification (ID) matches recipient's ID bracelet prior to transfusion
4. Report all suspected transfusion reactions to the transfusion medicine lab (ext 2424 & form # 2242)

PRBCs BLEEDING OR HEMOLYSIS: YOUNG INFANT TO ADOLESCENT

CLINICAL SETTING	RECOMMENDATION Hgb g/L (Hct)	*TYPICAL DOSE mL/kg
LOW RISK PATIENT	Maintain Hgb 60 - 90 (0.20 - 0.30)	10-15
<ul style="list-style-type: none"> • IMPAIRED CARDIOPULMONARY FUNCTION • INCREASED O₂ CONSUMPTION • #CYANOTIC HEART DISEASE • BRAIN INSULT 	Maintain Hgb 70 - 100 (0.23 - 0.33)	10-15

*Infusion time: 30 minutes–4 hours max (transfuse 1 mL/kg/hr 1st 15 minutes if possible), more rapid in unstable patients

#At this time the evidence is unclear regarding the level of Hgb considered adequate for oxygenation after cardiac surgery

PRBCs BLEEDING OR HEMOLYSIS: PREMATURE NEONATE - 44 WEEKS PMA

CLINICAL SETTING	RECOMMENDATION Hgb g/L (Hct)	**TYPICAL DOSE mL/kg
LOW RISK PATIENT	Maintain Hgb 70 - 120 (0.23 - 0.40)	10-15
<ul style="list-style-type: none"> • IMPAIRED CARDIOPULMONARY FUNCTION • INCREASED O₂ CONSUMPTION • #CYANOTIC HEART DISEASE • BRAIN INSULT • NECROTIZING ENTEROCOLITIS 	Maintain Hgb 90 - 120 (0.27- 0.40)	10-15

**Infusion time: 30 minutes–4 hours max (transfuse 1 mL/kg/hr 1st 15 minutes if possible), more rapid in unstable patients

#At this time the evidence is unclear regarding the level of Hgb considered adequate for oxygenation after cardiac surgery

PRBCs NO EVIDENCE OF BLEEDING OR HEMOLYSIS: YOUNG INFANT TO ADOLESCENT

HEMOGLOBIN g/L (Hct)	RECOMMENDATION	*TYPICAL DOSE 👍 mL/kg
< 50 (0.17)	Transfusion recommended	10
50 – 60 (0.17-0.20)	**Likely appropriate	5-10
60 – 100 (0.20-0.33)	**Likely appropriate if signs/symptoms of impaired tissue oxygen delivery	5-10
> 100 (0.33)	Likely inappropriate. Document indication in patient's chart	None

* Infusion time: 30 minutes – 4 hrs max (transfuse slowly 1 mL/kg/hr for 1st 15 minutes)

👍 (Rule of thumb) Expected increase in hemoglobin (Hct) level is 10 g / L (0.03) per 5 ml/kg PRBC;

Asymptomatic healthy children with iron deficiency anemia **should not be transfused

PRBCs NO EVIDENCE OF BLEEDING OR HEMOLYSIS: PREMATURE NEONATE - 44 WEEKS PMA

HEMOGLOBIN g/L (Hct)	RECOMMENDATION	*TYPICAL DOSE 👍 mL/kg
<60 (0.20)	Transfusion recommended	15
60 - 75 (0.20- 0.25)	Transfusion likely appropriate especially if no weight gain, tachycardia >180 bpm, tachypnea or need for supplemental O ₂	10-15
75– 120 (0.25 - 40)	Transfusion may be appropriate if there are signs/symptoms of impaired tissue oxygen delivery and/or requiring mechanical ventilation	10-15
>120 (0.40)	Transfusion likely inappropriate. Document indication in patient's chart.	N/A

Infusion time: 30 minutes – 4 hrs max (transfuse slowly 1 mL/kg/hr for 1st 15 minutes)

👍 (Rule of Thumb) Expected increase in hemoglobin (Hct) level is 10 g / L (0.03) per 5 mL/kg PRBC

PRBCs SICKLE CELL DISEASE (SCD) includes HbSS & Sβ⁰-thal

CLINICAL SETTING	RECOMMENDATION Hgb g/L (Hct) (Avoid over transfusion > 110 g/L)	TYPICAL DOSE mL/kg
<ul style="list-style-type: none"> Hb SS or Hb Sβ⁰-thal SCHEDULED TO UNDERGO ANY SURGERY <p>Note: Hb SC, Sβ⁺-thal - transfusion is to be decided on a case by case basis.</p>	Transfuse to Hgb 90 - 110 (0.30 - 0.35) and/or ↓ HgbS < 30-60%	10 Consider partial exchange transfusion to avoid TACO
<ul style="list-style-type: none"> SYMPTOMATIC ANEMIA CRISES (aplastic¹, sequestration² or ↑ hemolysis) 	Maintain Hgb 50-110 (0.18-0.35)	3-10
<ul style="list-style-type: none"> ACUTE CHEST SYNDROME OR STROKE MULTIORGAN DYSFUNCTION SYNDROME 	Transfuse to Hgb 90 - 110 (0.30 - 0.35) and/or ↓ HgbS < 30-50%	10 Consider exchange transfusion if severe disease

¹Aplastic crises- transfuse slowly to avoid TACO;

²Sequestration crises- transfuse 3-5 ml/kg to avoid over transfusion

IMPORTANT TO REMEMBER

- For chronic anemia, transfuse **maximum 1 unit** & then re-assess patient and Hgb level.
- A PRBC unit may have multiple aliquots withdrawn on an as needed basis to minimize donor exposure.
- Avoid rapid transfusion via central venous line** (esp. irradiated blood); may cause hyperkalemic cardiac arrest.
- Transfusion is **not recommended** for uncomplicated acute pain.

PLATELETS

CLINICAL SETTING	PLT COUNT	#RECOMMENDATION
IMMUNE THROMBOCYTOPENIA (ITP) <ul style="list-style-type: none"> Infant-adolescent Neonatal alloimmune Neonatal autoimmune 	< 10 < 30 < 30	10 mL/kg ONLY with serious bleeding (e.g. ICH) 15-20 mL/kg maternal or PLA1* negative PLTs 15-20 mL/kg ONLY with serious bleeding (e.g. ICH)
NON-IMMUNE THROMBOCYTOPENIA <ul style="list-style-type: none"> Infant-adolescent If fever >38.5°C Well neonate PCA > 33 weeks Unwell term neonate or PCA ≤ 33 weeks 	< 10 < 20 < 30 < 50	5-10 mL/kg to max 300 ml PLTs 5-10 mL/kg to max 300 mL PLTs 10-15 mL/kg PLTs 10-15 mL/kg PLTs
INVASIVE DIAGNOSTIC/THERAPEUTIC PROCEDURE including CVL placement, liver & renal biopsy, thoraco/paracentesis, endos/bronchoscopy & biopsy, dental restorations & extractions and lumbar puncture <ul style="list-style-type: none"> Infant-adolescent Well neonate Unwell term neonate or PCA ≤ 33 weeks 	< 25 < 50 < 100	10 mL/kg to max 300 mL PLTs (prior to procedure) 10-15 mL/kg PLTs (prior to procedure) 10-15 mL/kg PLTs (prior to procedure)
BLEEDING <ul style="list-style-type: none"> During major surgery or massive bleeding Post-op CV surgery 	<50 <100	10 mL/kg to max 300 mL PLTs
HEAD TRAUMA	<100	10 mL/kg to max 300 mL PLTs
REGIONAL ANESTHESIA INCLUDING EPIDURAL	< 50	10 mL/kg to max 300 mL PLTs
PATIENT WITH CNS TUMOUR & <ol style="list-style-type: none"> Receiving Chemo and/or radiation plus VP shunt or gross total resection or residual tumour. Receiving antiangiogenesis agent or past history of intracranial bleed To undergo neurosurgical procedure 	< 30 <50 <100	10 mL/kg to max 300 mL PLTs
PLATELET DYSFUNCTION & MARKED BLEEDING (e.g. ASA, post cardiopulmonary bypass-CPB, anti-PLT agents and renal failure)	Any	10 mL/kg to max 300 mL PLTs (Consider desmopressin 0.3 mcg/kg IV over 15 minutes to max 20 mcg for patients with renal failure or post CPB)

#Infusion time: 15 – 30 mins (max 4 hrs); * PLA1= platelet antibody 1

IMPORTANT TO REMEMBER

- ABO and Rh type specific PLTs are preferred especially in patients who require long term PLT support.
- ABO plasma compatible PLTs are a reasonable substitute when ABO type specific PLTs are unavailable.
- ABO plasma incompatible PLTs can be volume reduced but this process destroys 20-30% of viable PLTs
- Administer WinRho (Rh Immune Globulin) 120 mcg vial to Rh Neg patient receiving Rh Pos PLTs.

CRYOPRECIPITATE

CLINICAL SETTING	LAB VALUE	#RECOMMENDATION
BLEEDING due to DIC	Fibrinogen <1.5 g/L	Cryoprecipitate 2mL/kg (1 unit/10 kg)
MASSIVE BLEEDING	Fibrinogen <1.75 g/L	Cryoprecipitate 2mL/kg (1 unit/10 kg)

#Infusion time: < 30 mins (max 4 hours)

IMPORTANT TO REMEMBER

- ABO compatibility is the reverse of PRBCs and is not necessary in older children and adolescents.

FROZEN PLASMA (FP)
(WITH FEW EXCEPTIONS, DO NOT TRANSFUSE BASED ONLY ON LAB VALUES)

CLINICAL SETTING	[#] REASON TO TRANSFUSE FROZEN PLASMA (FP) 15 ml/kg
BLEEDING	MASSIVE BLEEDING (MB) (i.e. > 20 mL/Kg/h OR > 50 mL/Kg over 1st 6 h) and INR > 2 (or rapidity of bleeding and evidence of clinical coagulopathy does not allow MD to wait for results). Administer 1:1 (FP:PRBC) replacement until INR ≤ 1.8 as per management of MB guidelines .
	TRAUMA on arrival to ER without any prior volume resuscitation & INR > 1.8. If within 3 hours of trauma occurrence consider IV tranexamic acid 15 mg/kg load followed by 1.5 mg/kg/hr X 7 hours ± prothrombin complex concentrate (PCC e.g. Octaplex® 30 IU/kg IV)
	CONGENITAL THROMBOTIC THROMBOCYTOPENIA PURPURA (TTP)
	LIVER DISEASE or DIC with INR > 1.5
	REVERSAL OF WARFARIN or VITAMIN K DEFICIENCY only when intravenous vitamin K would not suffice and PCC is unavailable (see management below ¹).
INHERITED OR ACQUIRED SINGLE FACTOR DEFICIENCIES where specific factor concentrate is unavailable	
EMERGENCY WITHIN 6 HOURS: 1. SURGERY & INR > 1.5 2. MAJOR/MINOR PROCEDURE² & INR ≥ 2	REVERSAL OF WARFARIN or VITAMIN K DEFICIENCY only when intravenous vitamin K would not suffice and PCC is unavailable (see management below ¹).
ELECTIVE/URGENT/EMERGENCY 1. SURGERY & INR > 1.5 2. MAJOR/MINOR PROCEDURE² & INR ≥ 2	LIVER DISEASE or DIC INHERITED OR ACQUIRED SINGLE FACTOR DEFICIENCIES where specific factor concentrate is unavailable
REGIONAL ANESTHESIA: 1. NEUROAXIAL & INR > 1.5 2. PERIPHERAL N. BLOCK & INR ≥ 2	REVERSAL OF WARFARIN or VITAMIN K DEFICIENCY only when intravenous vitamin K would not suffice and PCC is unavailable (see management below ¹).
	LIVER DISEASE or DIC INHERITED OR ACQUIRED SINGLE FACTOR DEFICIENCIES where specific factor concentrate is unavailable
HEPARIN RESISTANCE DUE TO ↓ ANTI-THROMBIN	Only when specific anti-thrombin concentrate is not available
PLASMA EXCHANGE	ACQUIRED THROMBOTIC THROMBOCYTOPENIA PURPURA

[#] Infusion time: 30-2 hrs (max 4 hrs)

IMPORTANT TO REMEMBER

- Management for warfarin reversal or vitamin K deficiency in the event of bleeding/emergent surgery**
1st Line: Vitamin K 1-10 mg (neonate-adolescent) IV over 10-20 minutes (needs 6-8hrs to work. May repeat q12h prn)
2nd Line: PCC (e.g. Octaplex®) 15 IU/kg IV for INR ≤ 3 and 30 IU/kg if INR > 3 (acts immediately; lasts 6 hrs. Contraindicated in DIC and anti-thrombin deficiency)
3rd Line: Frozen Plasma (FP) 15 mL/kg
- Major Procedure-** Diagnostic/interventional in non-compressible sites including trachea, esophagus and colon, organ biopsies or sites where bleeding can be catastrophic eg diagnostic LP, **Minor Procedure-** CVL placement, thoraco/abdominocentesis or dental extractions
- FP DOES NOT reverse heparin or low molecular weight heparin.**
- Reference values for coagulation tests achieve adult ranges by six months of age.**