8.0 APPROPRIATE USE OF BLOOD COMPONENTS IN NEONATES AND PEDIATRIC PATIENTS

Policy	The Transfusion Medicine Service follows established guidelines for the appropriate use and administration of blood products in neonates and pediatric patients.
Reason	Aid in the efficacious use of blood components and products. Improve patient safety through judicious use of blood components and products.
Responsibilities of the Medical Director, Transfusion Medicine	• Be familiar with the use of and indications for the use of blood components and products in neonates and pediatric patients • Be available to consult with treating physicians and other staff on the appropriate use and administration of blood products for neonates and pediatric patients • Promote education of treating physicians and other staff in the appropriate use of blood components and products in neonates and pediatric patients including appropriate dosing/monitoring for effectiveness and reporting of transfusion reactions • Initiate discussions with clinical staff when laboratory results and/or clinical setting suggest blood component or product use may, or may not, be indicated • If applicable to hospital population, ensure guidelines for neonates and children are available
Responsibilities of Transfusion Medicine Service staff	• Perform all steps of applicable Transfusion Medicine Service procedures as written • Consult with the Medical Director, Transfusion Medicine (or delegate) as indicated in technical procedures, or as necessary based on technologist's skills and experience, or additional clinical or laboratory information

REFERENCES

21. "Transfusion Guidelines for Neonates and Older Children." 2004.
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27. "Clinical Guide to Transfusion. 2011.
113. Rosef, S.D. 2002.

8.1 NEONATAL RED BLOOD CELL AND PLATELET TRANSFUSION

Policy	The Transfusion Medicine Service follows established policies, processes and procedures for transfusion of blood components and products to neonatal patients.
Reason	Indications for transfusion and specific requirements for neonates are different from transfusion requirements for those over 4 months of age.
Responsibilities of the Medical Director, Transfusion Medicine	• Be familiar with indications for neonatal transfusion and be available for consultation with treating physicians • Ensure guidelines are readily available in institutions with neonates
Responsibilities of Transfusion Medicine Service staff	• Follow associated technical procedures as written • Consult with the Medical Director, Transfusion medicine (or delegate) as indicated by procedures or circumstances • Ensure requests for blood products meet hospital guidelines for indications and dosage

8.2 NEONATAL PATIENT MANAGEMENT

General considerations	• A neonate is considered to be an infant up to 4 months of age • There is conflicting evidence for restrictive transfusion practices and for an effect on the long-term neurodevelopmental outcome in preterm infants exposed to severe anemia • Desirable hemoglobin levels vary with clinical circumstances (see table 8.1) • Transfusion solely to replace blood removed for laboratory tests is not recommended • All neonates should receive CMV-safe components (leuco-reduced or CMV seronegative)
Red Blood Cell Dosage and Type	10-15mL/kg body weight packed red blood cells that are: • Compatible with mother and neonate » ABO group specific where possible » Irradiated if for exchange or massive transfusion (not necessary for low volume transfusions unless previous recipient of intrauterine transfusion)
Massive Transfusion in a neonate (including exchange transfusion)	In addition to meeting the criteria in section above, units should be negative for hemoglobin S.
Compatibility testing – initial pre-transfusion examination	• Cord blood should not be used for pre-transfusion examinations • Required examinations include determination of ABO/RhD and • Antibody screen on a sample from the neonate or mother » If clinically significant antibody(ies) are identified, the neonate must receive antigen negative units, compatible by antiglobulin crossmatch, until the antibody is no longer detectable in the infant's serum/plasma
Compatibility testing – subsequent pre-transfusion examinations	• If the initial antibody screen is negative, repeat examination for unexpected antibodies may be omitted during the current hospital admission, up to 4 months of age. (Alloimmunization in a neonate is unlikely) • If a non-group O neonate needs to receive non-group O red blood cells that are incompatible with the maternal ABO group, the neonate's serum/plasma should be examined for anti-A or anti-B by antiglobulin testing, and compatible blood should be used

Table 8.1: Threshold and Target Hemoglobin Levels for Neonatal Red Blood Cell Transfusion

Transfuse neonate	If the hemoglobin result is	And the neonate is
With acute blood loss	Any hemoglobin level	Hypotensive and ill.
Weaned off mechanical ventilation	<100g/L	Requiring supplemental oxygen
With anemia	<100g/L	Showing signs of anemia with: • Significant unexplained apnea • Persistent unexplained heart rate >165-180 bpm or respiratory rate > 80 per minute lasting >24 hours • Unexplained poor weight gain, 10g/day over 4-7 days despite adequate caloric intake (100-120 kcal/kg/day) • Unexplained lethargy
On ECMO or cyanotic heart disease	130g/L	
With low reticulocyte count and symptoms of anemia (tachycardia, tachypnea, poor feeding)	<70g/L	

Table 8.2: Indications for Neonatal Platelet Transfusion

Transfuse if Neonate is	And the platelet count is	And clinical condition is
Any age up to 4 months	$<20x10^9/L$ ——————————— $<50x10^9/L$ ——————————— $<100x10^9/L$	**any** ——————————— bleeding ——————————— invasive procedure
Premature	$<30x10^9/L$ ——————————— $<100x10^9/L$	stable ——————————— distressed

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21. "Transfusion Guidelines for Neonates and Older Children. 2004.
66. *Handbook of Pediatric Transfusion Medicine.* 2004.
92. *Pediatric Transfusion Therapy.* 2003.
93. *Pediatric Transfusion: A Physician's Handbook.* 2009.
113. Rosef, S.D. 2002.
115. Sacher, R.A. 1989.
137. Webert, K. 2011.

8.3 PEDIATRIC BLOOD COMPONENT TRANSFUSION

Policy	The Transfusion Medicine Service follows established guidelines for the appropriate use and administration of blood components and products to pediatric patients.
Reason	• Indications for transfusion and specific blood component and product requirements differ between children and adults • Aid in the efficacious use of blood components and products • Improve patient safety through the judicious use of blood components and products
Applies to	Patients greater than 4 months of age up to patients of adult size or weight (e.g. >50kg)
Responsibilities of the Medical Director Transfusion Medicine	• Be familiar with the use of and indications for the use of blood components and products in the pediatric population • Where appropriate, ensure guidelines are in place for pediatric patients • Be available to consult with treating physicians and other staff in the appropriate use and administration of blood components and products for pediatric patients • Promote education of clinical and other staff in the appropriate use of blood components and products in pediatric patient including appropriate dosing/ monitoring for effectiveness and reporting of transfusion reactions • Initiate discussion with clinical staff when laboratory results and/or clinical setting suggest blood component or product use may, or may not, be indicated for a pediatric patient
Responsibilities of Transfusion Medicine Service staff	• Follow appropriate technical procedures as written • Consult with the Medical Director, Transfusion Medicine (or delegate) as indicated in technical procedures, or as necessary based on the technologist's skills and experience, additional laboratory examination results or the clinical situation • Consult Medical Director, Transfusion Medicine (or delegate) for requests not meeting hospital guidelines for indication and dosage

REFERENCES

26. Callum, J.L. 2011.
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113. Roseff, S.D. 2002.
137. Webert, K. 2011.

Table 8.3: Pediatric Red Blood Cell Transfusion Guidelines

Transfuse pediatric	Hemoglobin	And the child is or has
Surgical patient	<60-70g/L _____ <80g/L	Pre-operative and alternate therapy is not available _____ Post-operative and showing symptoms or signs of anemia
Severe cardiopulmonary disease	120g/L	Ongoing transfusion requirements
Chemotherapy or irradiation	<70g/L	Ongoing transfusion requirements
Chronic anemia	<70g/L	Symptomatic anemia unresponsive to medical therapy and not bleeding
Complications of sickle cell disease	Target 100 – 110g/L	Treatment or presentation of cerebro-vascular accident, acute chest syndrome, aplastic crisis, splenic sequestration, or pre-operative preparation. Refer to section 9.5
Thalassemia syndrome	Maintain at 90 – 100g/L	Chronic transfusion regimen
Hemorrhage	Maintain >70g/L	Suspected acute blood loss of 15% or more of blood volume

8.4 TRANSFUSION OF FROZEN PLASMA TO PEDIATRIC PATIENTS

Appropriate uses include:

- In conjunction with vitamin K for emergency reversal of warfarin effect in a patient requiring an urgent operative procedure or with life-threatening bleeding
- Active bleeding or major surgery with PT/aPTT results >1.5x the upper limit of normal range
  - » In the absence of heparin, LMWH, lepirudin, hirudin, or other FXa inhibitor, or lupus inhibitor
- Massive transfusion and clinical status precludes waiting for PT/aPTT results
- Acute DIC with bleeding
- Cardiopulmonary bypass procedures with hemorrhage and PT/PTT > 1.5 X the upper limit of normal range
- Preparation of reconstituted whole blood for exchange transfusion in neonates
- Hepatic failure with INR >1.5 and major bleeding or invasive procedure (other than para or thoracocentesis)
- Single coagulation factor deficiencies when alternative specific factor concentrates are not available (e.g. factor V, patient at remote location)
  - » Specific factor concentrates should be made available as soon as possible, if necessary by transferring the patient to a centre where appropriate concentrates are available
- Rare plasma protein deficiencies for which alternative therapy is not immediately available (e.g. C1 esterase deficiency)
- Thrombotic thrombocytopenic purpura
  - » Slow continuous transfusion while awaiting access to exchange transfusion

Inappropriate uses include:

- Hypovolemia
- Therapeutic plasma exchange
- Treatment of immunodeficiency states

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21. "Transfusion Guidelines for Neonates and Older Children." 2004.
26. Callum, J.L. 2011.
113. Roseff, S.D. 2002.
137. Webert, K. 2011.

8.5 TRANSFUSION OF PLATELETS TO PEDIATRIC PATIENTS MORE THAN 4 MONTHS OF AGE

Dose:

- Body weight <10kg: 5-10ml/kg apheresis or buffy coat platelets should increase platelet count 50 – 100 X 10^9/L
- Body weight ≥10kg: 1 unit/10kg of apheresis or buffy coat platelets should increase platelet count 50 – 100 X 10^9/L

Table 8.4 Indications

Transfuse when platelet count is	And the child has
<10 X 10^9/L	Failure of platelet production with: • active bleeding • invasive procedure
< 20 X 10^9/L	Failure of platelet production with: • fever • coagulopathy
<50 X 10^9/L	• serious bleeding • major surgery • invasive procedure with risk of major bleeding
<100 X 10^9/L	• Peri-neurosurgery • Head injury • Post operative cardiac surgery with significant bleeding
Any count	Platelet dysfunction with major bleeding

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21. "Transfusion Guidelines for Neonates and Older Children." 2004.
26. Callum, J.L. 2011.
27. "Clinical Guide to Transfusion." 2011.
113. Roseff, S.D. 2002.

8.6 MANAGEMENT OF CONGENITAL ANEMIAS (see also section 9, Special Transfusion Situations)

Policy	The Transfusion medicine Service has established policies, processes and procedures to assist in the management of patients with congenital anemias that include the provision of phenotypically matched units when appropriate
Reason	Transfusion thresholds and indications for transfusion in patients with sickle cell syndromes, congenital hemolytic anemias or thalassemia syndromes may be different from those with other causes of anemia.
Responsibilities of the Medical Director, Transfusion Medicine	• Be familiar with the management of transfusion in patients with congenital anemias • Work in consultation with clinical staff in individual cases • Work in consultation with clinical staff to determine patient blood group phenotypes and decide on the optimal phenotype of units chosen for ongoing transfusion support • Establish policies and procedures for the provision of special products including: irradiated components, CMV seronegatve components, Hg S negative red blood cells and phenotypically matched red blood cells
Responsibilities of Transfusion Medicine Service staff	• Where possible, ensure full red blood cell phenotype is performed prior to the first transfusion in a patient who will require ongoing transfusion support (refer to section 9.8 for list of antigens) • If the Transfusion Medicine Service does not have the capacity to perform these investigations, send samples to a regional reference laboratory or CBS requesting a full phenotype determination • Record results of phenotype determinations in the patient record • Provide phenotype compatible blood as determined by the Medical Director, Transfusion Medicine and appropriate clinical staff for subsequent transfusions • Check with CBS for availability of phenotype information
Patient Management	• Patients with inherited red blood cell membrane disorders should be transfused for the symptomatic relief of anemia • Non-alloimmunized patients with sickle cell syndromes should receive blood that is of the same Rh (D, C, c, e) and Kell phenotype • Sickle cell syndrome patients with detectable alloantibody should receive antigen negative blood and extended phenotype matched units when possible • Red blood cell units for children with sickle cell syndromes should be negative for HbS if possible

8.7 MANAGEMENT OF TRANSFUSION IN PEDIATRIC PATIENTS WITH AUTOIMMUNE HEMOLYTIC ANEMIA

Refer to section 9.6

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26. Callum, J.L. 2011.
27. “Clinical Guide to Transfusion.” 2011.
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68. Hume, H. 1997.
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