HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Laboratory and Blood Bank		
Document:	Multidisciplinary Policy and Procedure		
Title:	Transfusion in Infants Less Than 4 Months of Age and Neonates		
Applies To:	Blood Bank Staff, Treating Physicians and Staff Nurses		
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1. PURPOSE:

1.1 To ensure that blood & blood components are ordered for clinically appropriate conditions with a goal to optimize patient outcomes and ensure blood & blood components are used appropriately according to established standards taking into consideration the special transfusion practice in neonatal and pediatric patients.

2. DEFINITIONS:

2.1 Neonate age start from zero day to 28 days .
2.2 Infant age start from one month up to 1 year .

3. POLICY:

3.1 Blood bank technicians/ specialists must be aware that patients less than 4 months of age have small blood volumes and immature organ function, which necessitate special approaches to component therapy.
3.2 Blood banks is capable of providing smaller, appropriately sized blood components to meet their needs.
3.3 When administered slowly, small-volume transfusions typically do not require a blood warmer. However, inline blood warmers are required for all RBC exchange transfusions.
3.4 The recommended therapy for New-borns is an exchange transfusion with the freshest blood conveniently available (less than 5 to 7 days old up to 14 days).
3.5 The medical need for fresh RBC units for small-volume transfusions has been suggested as unnecessary.
3.6 Initial patient testing must include ABO and D typing of their red cells and a screen for unexpected red cell antibodies.
3.7 Antibody screen for unexpected red cell antibodies is performed using either plasma or serum from the infant or mother.
3.8 During any one hospitalization, crossmatch compatibility testing and repeat ABO and D typing may be omitted as long as all of the following criteria are met:;
  3.8.1 The antibody screen is negative.
  3.8.2 Transfused red cells are group O.
  3.8.3 Transfused cells are either D negative or the same D type as the patient.
3.9 If the antibody is present, ABO-compatible RBCs must be used until the acquired antibody is no longer detected.
3.10 Direct Antiglobulin Test (DAT) will be performed on cord blood venous blood or capillary blood samples from newborn before any blood transfusion, all Transfusion reaction investigation, blood samples which show positive auto control, and upon request of treating physician.
3.11 A recipient can receive multiple small-volume transfusions from a single unit until it reaches its expiration date.
3.12 Small-volume transfusions (5 to 15 ml/kg) containing additive solution (AS) are safe for this patient population.
3.13 For infants with renal or hepatic insufficiency, the treating doctor has to order removing of the AS from the unit before transfusions.
3.14 When using AS-RBC units in exchange transfusion, blood bank removes the additive-containing plasma in order to reduce the volume transfused.

3.15 If it becomes necessary to administer ABO- incompatible platelets to an infant, plasma may be removed either by volume reduction or washing.

3.16 General policies for blood components transfusion are to be considered.

4. PROCEDURE:

4.1 Introduction:

4.1.1 Transfusion practice in neonatal and pediatric patients differs from the practice in adults.

4.1.2 Blood volume, hematologic values, immune system maturity, and physiologic responses to hypovolemia and hypoxia are widely variable in this heterogeneous population contributing to the complexity of pediatric transfusion practice.

4.2 Considerations in component preparation and therapy:

4.2.1 Blood banks staff must be aware that patients less than 4 months of age have small blood volumes and immature organ function (e.g. the immune system), which necessitate special approaches to component therapy. This is especially important for very low birth weight (VLBW) infants (<1500 grams) and extremely low birth weight (ELBW) infants (<1000 grams).

4.2.2 Fetal and Neonatal Physiology Affecting Transfusion Practice:

4.2.2.1 Healthy term neonates have mean cord blood hemoglobin of 16.9 ± 1.6 g/dL, while that of preterm neonates is 15.9 ± 2.4 g/dL.

4.2.2.2 The hemoglobin concentrations normally decline during the first few weeks of life. As a result, "physiologic anemia of infancy" occurs in newborns and "physiologic anemia of prematurity" occurs in preterm infants.

4.2.2.3 Both anemias are considered self-limited and are usually tolerated without any harmful effects.

4.2.3 Infant Size and Blood Volume:

4.2.3.1 Blood volumes of pediatric patients vary with body weight.

4.2.3.2 Blood bank is capable of providing smaller, appropriately sized blood components to meet their needs.

4.2.3.3 Once sick preterm and term neonates receive multiple transfusions they will have proportionately lower levels of circulating fetal hemoglobin and an increase in adult hemoglobin.

4.2.4 Erythropoietic Response:

4.2.4.1 The erythropoietin "EPO" response in newborns differs from that in adults and older children. In the fetus, there is reduced EPO production in the face of hypoxia (hyporesponsiveness).

4.2.4.2 The use of recombinant human erythropoietin (rHuEPO) has been shown to reduce donor exposures in premature infants and minimize the severity of their anemia.

4.2.5 Cold Stress:

4.2.5.1 Because blood at room temperature can decrease an infant's core temperature by 0.7 to 2.5 °C, inline blood warmers are required for all RBC exchange transfusions.

4.2.5.2 A radiant heater should never be used to warm the blood because of the risk of hemolysis.

4.2.5.3 Furthermore, to prevent hemolysis in neonates undergoing phototherapy, the blood administration tubing should be positioned to minimize exposure to phototherapy light.

4.2.6 Immunologic Status:

4.2.6.1 The infant has immature immune system. Most of their humoral immunity (antibody protection) is provided by the mother starting early in pregnancy (approximately 12 weeks) through placental transfer of immunoglobulins. IgG1 is the predominant maternal subclass crossing the placenta.

4.2.6.2 The lack of red cell alloantibody production during this period is not well understood but has been postulated to be attributed to deficient T- helper function, enhanced T-suppressor activity, and poor antigen-presenting cell function.

4.2.6.3 Transfusion-associated graft-vs-host disease (TA- GVHD) has been reported most frequently in the newborn with confirmed or suspected congenital immunodeficiency.

4.2.6.4 Neonates with TA-GVHD clinically present following a prolonged latent period, with fever first occurring at an average of 28 days after exposure as compared to 10 days for affected adults. Once TA-GVHD has occurred, there is a more than 90% chance of associated mortality.

4.2.6.5 Fortunately, TA-GVHD can be completely prevented by pre-transfusion irradiation of blood components for individuals with suspected and/or documented T-cell immunodeficiency as well as for all patients receiving directed-donor units from biologic relatives.

4.2.7 Metabolic Problems:

4.2.7.1 In the infant less than 4 months of age, large-volume transfusions of whole blood or plasma may result in acidosis or hypocalcemia because of the inability of the infant's immature liver to effectively metabolize citrate. The immature kidneys also contribute to these complications.

4.2.8 Potassium:

4.2.8.1 Small-volume, simple transfusions administered slowly have been shown to have little effect on serum potassium concentrations in infants less than 4 months of age.

4.2.8.2 The type of anticoagulant-preservative solution used to store RBCs at collection will determine the amount of potassium leak. For instance, a unit of RBCs preserved in additive solutions such as AS-1, AS-3, or AS-5, will deliver less extracellular potassium than RBCs stored in CPDA-1.

4.2.8.3 Washing may be required to remove the excess potassium before transfusion.

4.2.9 2 , 3 – diphosphoglycerate:

4.2.9.1 If a large proportion of the neonate's blood volume is composed of transfused 2,3-DPG depleted blood, the resulting shift in the hemoglobin oxygen dissociation curve will further increase oxygen affinity for hemoglobin and reduce oxygen availability to the tissues.

4.2.9.2 The recommended therapy for newborns is an exchange transfusion with the freshest blood conveniently available (up to 14 days).

4.2.9.3 However, the medical need for fresh RBC units for small-volume transfusions has not been established and has even been suggested as unnecessary.

4.3 **RBC transfusion support:**

4.3.1 Ill neonates are more likely to receive RBC transfusions than any other patient age group, and RBCs are the component most often transfused during the neonatal period. RBC replacement is considered for sick neonates when approximately 10% of the patient's blood volume has been lost.

4.3.2 Indications: Most of the recommendations are based on the experience acquired in clinical practice rather than on evidence-based medicine.

4.3.2.1 Hematocrit <20% with low reticulocyte count and symptomatic anemia (tachycardia, tachypnea, poor feeding).

4.3.2.2 Hematocrit <30% and any of the following:

4.3.2.2.1 On <35% oxygen hood.

4.3.2.2.2 On oxygen by nasal cannula.

4.3.2.2.3 On continuous positive airway pressure (CPAP) and/or intermittent mandatory ventilation on mechanical ventilation with mean airway pressure <6 cm of water.

4.3.2.2.4 With significant tachycardia or tachypnea (heart rate >180 beats/minute for 24 hours, respiratory rate >80 beats/minute for 24 hours).

4.3.2.2.5 With significant apnea or bradycardia (>6 episodes in 12 hours or 2 episodes in 24 hours requiring bag and mask ventilation while receiving therapeutic doses of methylxanthines).

4.3.2.2.6 With low weight gain (<10 g/day observed over 4 days while receiving ≥100 kcal/kg/day).

4.3.2.3 Hematocrit <35% and either of the following:

4.3.2.3.1 On >35% oxygen hood.

4.3.2.3.2 On continuous positive airway pressure/intermittent mandatory ventilation with mean airway pressure ≥6-8 cm of water.

4.3.2.4 Hematocrit <45% and either of the following:

4.3.2.4.1 On extracorporeal membrane oxygenation (ECMO).

4.3.2.4.2 With congenital cyanotic heart disease.

4.3.3 Compatibility Testing:

4.3.3.1 Initial patient testing must include ABO and D typing of their red cells and a screen for unexpected red cell antibodies, using either plasma or serum from the infant or mother.

4.3.3.2 During any one hospitalization, crossmatch compatibility testing and repeat ABO and D typing may be omitted as long as all of the following criteria are met:

4.3.3.2.1 The antibody screen is negative,

4.3.3.2.2 Transfused red cells are group O, and

4.3.3.2.3 Transfused cells are either D negative or the same D type as the patient.

4.3.3.3 Testing the infant's reverse type for anti-A and/or anti-B is not necessary.
However, before non-group-O RBCs can be issued, testing of the infant's plasma or serum may be required to detect passively acquired maternal anti-A or anti-B and should include the antiglobulin phase.
If the antibody is present, ABO-compatible RBCs must be used until the acquired antibody is no longer detected.

4.3.3.4 Once a negative antibody screen is obtained, crossmatches and use of antigen negative blood are no longer required up to 4 months of age because of the immature immunologic status of these infants.

4.3.3.5 Thus, repeated type and screen testing, as required for adults and children older than 4 months, is unnecessary in this population and merely contributes to iatrogenic and significant blood loss.

4.3.3.6 Of importance, the blood bank needs to avoid the transfusion of any components that may passively transfer unexpected alloantibodies or ABO-incompatible antibodies to the recipient.

4.3.4 Direct Anti-globulin Test (DAT):

4.3.4.1 DAT will be performed on cord blood samples or venous blood or capillary blood samples from newborn before any blood transfusion , all Transfusion reaction investigation, blood samples which show positive auto control, and upon request of treating physician. Refer to "direct antiglobulin test (DAT)" chapter (LB-IPP-230).

4.3.5 Clinically significant antibodies of maternal origin:

4.3.5.1 Group 1: Anti - D, - c, - E, - e, - C, - K, - k, - Fy^a
These antibodies are commonly associated with clinical HDN. Those most often associated with moderate to severe HDN are anti-D, anti-c and anti-K.

4.3.5.2 Group 2: Anti, - C^w, - Fy^b, - Jk^a, - Jk^b, - S, - s, -M.
These antibodies may cause a positive DAT but therapy, if necessary, is likely to be limited to phototherapy.

4.3.5.3 Group 3: Anti-P1, - N, - H, - Le^a, - Le^b, -Lu^a, - Lu^b.
These antibodies are not documented to cause clinical HDN.

4.3.6 Aliquoting for Small-Volume Transfusion:

4.3.6.1 The purpose of creating small-volume aliquots is to limit donor exposures and decrease donor-related risks.

4.3.6.2 Once an aliquot is produced, it requires labelling with the expiration date and recording the origin and disposition of each smaller unit.

4.3.6.3 Reducing donor exposures is more readily accomplished by this technique, whereby a recipient can receive multiple small-volume transfusions from a single unit until it reaches its expiration date.

4.3.7 RBC Additive Solution (AS):

4.3.7.1 Historically, transfused RBCs for pediatric patients contained CPDA-1 anticoagulant-preservative solution. However, as additive solutions have evolved to extend the shelf life of RBCs, many began to question their safety in neonates.

4.3.7.2 One concern is the large amount of adenine and mannitol in AS and its relation to renal toxicity. Moreover, mannitol is a potent diuretic with effects on fluid dynamics that can result in fluctuations in the cerebral blood flow of pre-term infants.

4.3.7.3 Most evidences suggest that small-volume transfusions (5 to 15 mL/kg) containing AS are safe for this patient population. Specifically, when AS-1 and AS-3 were compared, no harmful effects were observed in neonates receiving small-volume, simple transfusions. These transfusions were shown to be as effective as CPDA-1 RBCs in increasing hemoglobin levels in recipients.

4.3.7.4 However, for infants with renal or hepatic insufficiency, it would be prudent practice to remove the AS from the plasma, particularly if multiple transfusions from the same unit are expected.

4.3.8 Specific Indications for RBCs:

4.3.8.1 In neonates, symptomatic anemia is the major indication for simple transfusion.

4.3.8.2 Specifically, a venous hemoglobin of <13 g/dL in the first 24 hours of life necessitates clinical consideration of a red cell transfusion.

4.3.8.3 When approximately 10% of a sick neonate's blood volume has been removed or lost.

4.3.9 Exchange Transfusion for Hyperbilirubinemia:

4.3.9.1 Exchange transfusion in neonates involves replacement of one to two whole blood volumes.

4.3.9.2 The primary use of this therapy is to treat excessively high levels of unconjugated bilirubin, or hyperbilirubinemia.

4.3.9.3 In high concentrations, bilirubin may cross the blood brain barrier, concentrate in the basal ganglia and cerebellum of preterm and term infants, and cause irreversible damage to the central nervous system known as kernicterus.

4.3.9.4 Pre-term and term infants are susceptible to this complication because of their immature livers, which poorly conjugate bilirubin, as well as their incompletely developed blood brain barriers that allow bilirubin transit.

4.3.9.5 Phototherapy, which is the use of fluorescent ultraviolet lights, is the current treatment of choice, and exchange transfusion is reserved for patients who fail phototherapy.

4.3.9.6 Exchange transfusion needs to be performed before the development of kernicterus.

4.3.9.7 In term infants, kernicterus rarely develops at bilirubin levels less than 25 mg/dL. However, in sick VLBW infants, kernicterus has occurred at bilirubin levels as low as 8 to 12 mg/dL.

4.3.9.8 Rather than using a single bilirubin level as a decision point, most practitioners base their decisions to perform exchange transfusion on the rate at which the bilirubin is increasing.

4.3.9.9 A double-volume exchange transfusion (two 85 mL/kg transfusions for term infants and two 100 mL/kg transfusions for VLBW infants) removes approximately 70% to 90% of the circulating red cells and approximately 50% of the total bilirubin.

4.3.9.10 After the first exchange transfusion, bilirubin levels may rise again because of a re-equilibration of the extravascular tissue and plasma bilirubin, and may necessitate another exchange transfusion.

4.3.9.11 Exchange Transfusion for Other Causes:

4.3.9.11.1 Occasionally exchange transfusion is used to eliminate toxins, drugs, or chemicals administered to the mother near the time of delivery, when toxic doses have been administered to the infant, or if they accumulate at high levels in the infant as a result of prematurity and/or an inborn error of metabolism.

4.3.9.12 Technique of Exchange Transfusion:

4.3.9.12.1 Typically, red cells are resuspended in ABO-compatible thawed Fresh Frozen Plasma (FFP) for an exchange transfusion.

4.3.9.12.2 Often, red cells less than 5 to 7 days old (up to 14 days) and stored in CPDA-1 are used to avoid high levels of potassium and to maximize red cell survival.

4.3.9.12.3 When using AS-RBC units, blood bank removes the additive-containing plasma in order to reduce the volume transfused.

4.3.9.12.4 The glucose load administered during exchange transfusion has been noted to be extremely high in some cases. This stimulates the infant's pancreas to release insulin, which may result in rebound hypoglycemia. Thus, plasma glucose levels should be monitored during the first few hours following exchange transfusion.

4.3.9.13 Volume And Hematocrit Considerations:

4.3.9.13.1 Clinicians should aim for a final hematocrit of approximately 45% to 60%.

4.3.9.13.2 The reconstituted blood should be well mixed in order to sustain the intended hematocrit throughout the exchange.

4.3.9.13.3 A standard filter and inline blood warmer are recommended.

4.3.9.13.4 The absolute maximum volume of each withdrawal and infusion is dependent on the infant's body weight and hemodynamic status.

4.3.10 Acceptable blood group for Red cells transfusion is as follows:

Patient blood group	First choice	Acceptable alternative	Acceptable in extreme emergency with approval of treating Doctor
O+ve	O+ve	O-ve	------
O-ve	O-ve	--------	O+ve
A+ve	A+ve	A-ve, O+ve, O-ve	------
A-ve	A-ve	O-ve	A +ve, O+ve
B+ve	B+ve	B-ve, O+ve, O- ve	-------
B-ve	B-ve	O-ve	B+ve, O+ve
AB+ve	AB+ve	AB-ve, A+ve, A-ve, B+ve, B-ve, O+ve, O-ve.	--------
AB-ve	AB-ve	A-ve, B-ve, O-ve	AB+ve, A+ve, B+ve, O+ve

4.3.10.1 Release Rh-D positive red blood cells components to Rh-D negative patients is accepted in extreme emergency with unavailability of D negative RBC with approval of the treating doctor.

4.3.11 Indications of fresh blood (RBCs) transfusion: (Commonly 5- 7 days; may extend to 14 days after donation)

4.3.11.1 Fetuses with intrauterine transfusion (Not applicable in MCH).

4.3.11.2 Premature infants.

4.3.11.3 Exchange transfusion.

4.3.11.4 Complicated patients with sickle cell disease.

4.3.11.5 Cardiac patients.

4.3.11.6 Any patient with chronic transfusion needs e.g. B thalassemia.

4.3.11.7 N.B. The medical need for fresh RBC units for small-volume transfusions to newborn has not been established and has even been suggested as unnecessary.

4.3.12 Transfusion Administration:

4.3.12.1 Vascular Access:

4.3.12.1.1 The umbilical vein is most frequently cannulated after birth to administer fluids, transfusions, and monitor central venous pressure.

4.3.12.1.2 Vascular catheters (24- gauge) and small needles (25-gauge) have been safely used for RBC transfusion, without causing hemolysis.

4.3.12.2 Pumps and Warming:

4.3.12.2.1 When administered slowly, small-volume transfusions typically do not require a blood warmer; however, control of the rate and volume transfused is important.

4.3.12.3 Transfusion Sets and Filters:

4.3.12.3.1 All blood component transfusions must go through a standard filter between 170 and 260 microns.

4.3.12.3.2 Microaggregate filters (20 to 40 microns) are sometimes used for simple transfusion because of their small priming volume. However, providers should be aware that hemolysis may occur when stored blood is administered through these filters using negative pressure filtration.

4.4 **Platelet transfusion support:**

4.4.1 Mild to moderate thrombocytopenia (platelet count <150,000/µL) is the most common hemostatic abnormality in sick preterm and full-term infants, and it affects approximately 20% of the infants in the neonatal intensive care unit.

4.4.2 Unlike adult patients who rarely have severe bleeding complications until platelet counts decline to less than 10,000/µL, preterm infants with other complicating illnesses may bleed at higher platelet counts. This increased risk may be attributable to:

4.4.2.1 Lower concentrations of plasma coagulation factors.

4.4.2.2 Circulation of an anticoagulant that potentiates thrombin inhibition.

4.4.2.3 Intrinsic or extrinsic platelet dysfunction.

4.4.2.4 Increased vascular fragility.

4.4.3 Platelet transfusion guidelines in neonates and older children:

4.4.3.1 With Thrombocytopenia:

4.4.3.1.1 Platelet count 5,000 to 10,000/µL with failure of platelet production.

4.4.3.1.2 Platelet count <30,000/µL in neonate with failure of platelet production.

4.4.3.1.3 Platelet count <50,000/µL in stable premature infant with:

4.4.3.1.3.1 Active bleeding, or

4.4.3.1.3.2 Before an invasive procedure with failure of platelet production.

4.4.3.1.4 Platelet count <100,000/µL in sick premature infant with:

4.4.3.1.4.1 Active bleeding, or;

4.4.3.1.4.2 Before an invasive procedure in patient with DIC.

4.4.3.2 Without Thrombocytopenia:

4.4.3.2.1 Active bleeding in association with qualitative platelet defect.

4.4.3.2.2 Patient undergoing ECMO with:

4.4.3.2.2.1 A platelet count of <100,000/ µL or

4.4.3.2.2.2 Higher platelet counts and bleeding.

4.4.4 Components and Dose:

4.4.4.1 The use of whole-blood-derived platelets, specifically platelet doses of 5 to 10 mL/kg body weight, have been demonstrated to raise the platelet count of an average full-term newborn by 50,000 to 100,000/µL, depending on the concentration of the platelet component used.

4.4.4.2 When possible, the platelet component should be ABO group-specific and should not contain clinically significant unexpected red cell antibodies. Transfusion of ABO-incompatible plasma should be avoided in pediatric patients and especially in infants because of their small blood and plasma volumes.

4.4.4.3 Different choices of platelet component's blood group:

Patient's BLOOD GROUP	FIRST CHOICE	ALTERNATIVE (if RBC's are visually unapparent)	In emergency (with unavailability of ABO matched platelets)
O	O	A, B, AB	----------
A	A	AB	B, O
B	B	AB	A, O
AB	AB	----------	A, B, O

4.4.4.4 If it becomes necessary to administer ABO- incompatible platelets to an infant, plasma may be removed either by volume reduction or washing. The platelets may then be resuspended in saline or compatible plasma.

4.4.4.5 However, routine centrifugation to remove plasma from platelets should be avoided because it is unnecessary and harmful to the platelets.

4.4.5 Administration:

4.4.5.1 Via 150-280 filter administration set.

4.4.5.2 Transfused within 4 hours.

4.4.5.3 ABO-matched platelets (as before).

4.4.5.4 For Rh (D) type:

Patient's Rh type	Can receive
D negative	D negative
D positive	D negative or positive

4.4.5.5 If Rh +ve platelets are transfused to Rh negative patient (with unavailability of D negative platelets), they should be given anti D immunoglobulin.

4.4.5.6 Given the 3- week half-life of IgG and the minimal red cell content of most platelet units, a single dose of RhIG would be expected to provide prophylaxis for multiple transfusions over a 2- to 4- week period (certainly for the period during which anti-D was detectable serologically).

4.4.6 Determination of platelet response: refer to "Blood/blood components transfusion" chapter (LB-MPP-239).

4.4.6.1 Responses to platelet transfusion are most often quantitated using the Corrected count increment (CCI) at 1 hour after transfusion.

4.4.6.2 A sample 10 minutes after transfusion yields similar information and may be easier to obtain routinely.

4.4.6.3 The calculation is based on the count increment (CI = post-transfusion count – pre-transfusion count), the platelet content of the unit (expressed × 10^{11}), and the size of the patient (expressed as body surface area, or BSA, in m2).

4.4.6.4 A CCI above 7500 is considered evidence of a successful transfusion; two transfusions with CCIs below 5000 are regarded as evidence of refractoriness.

4.5 **Plasma transfusion support to enhance hemostasis**:

4.5.1 Introduction:

4.5.1.1 Infants are typically unable to produce the required amounts of coagulation proteins in the early postnatal period.

4.5.1.2 Despite these issues, the pro-coagulant and anticoagulant systems are usually in a fine balance in healthy newborns, which is why spontaneous bleeding and thrombosis are rarely observed..

4.5.1.3 Thus, serious bleeding may occur in sick premature infants during the first week of life.

4.5.2 Transfusion guidelines for fresh frozen plasma (ffp) in neonates and older children:

4.5.2.1 FFP is frequently used to replace coagulation factors in preterm and term infants:

4.5.2.1.1 When specific factor concentrates are not available, including but not limited to, anti-thrombin, protein C or S deficiency, and Factor II, Factor V, Factor X, and Factor XI deficiencies.

4.5.2.1.2 During therapeutic plasma exchange when FFP is indicated.

4.5.2.1.3 Support during treatment of DIC.

4.5.2.1.4 Reversal of warfarin in an emergency situation, such as before an invasive procedure with active bleeding.

4.5.2.1.5 Note: FFP is not indicated for volume expansion or enhancement of wound healing.

4.5.2.2 Administration:

4.5.2.2.1 Allow at least 30 min. for thawing, which is done at 37°C with continuous agitation and once thawed FFP must be used as soon as possible (30 min).

4.5.2.2.2 Must be transfused via administration set with filter as RBCs.

4.5.2.2.3 Infusion rate is 1-2 ml/min.

4.5.2.2.4 Check PT and PTT Post Transfusion.

4.5.2.2.5 The common dose for FFP is 10 to 15 mL/ kg, which is expected to increase all factor activity levels by 15% to 20%, unless there is a marked consumptive coagulopathy

4.5.2.2.6 FFP for infants must be ABO compatible, unlike in adults, and free of clinically significant unexpected antibodies because transfused antibodies can reach high concentrations in infants and children with very small plasma volumes.

Patient's BLOOD GROUP	CAN RECEIVE
O	O,A,B or AB
A	A or AB
B	B or AB
AB	AB

4.5.2.2.7 They can be given regardless of Rh D group.

4.5.2.2.8 A common practice at some institutions is to use group AB FFP because a single unit can provide multiple small-volume doses for several neonates.

4.5.3 Thawing of FFP:

4.5.3.1 Principle:

4.5.3.1.1 Thawed Plasma is prepared from Fresh Frozen Plasma. FFP should be rapidly thawed at 30 to 37 °C but should not remain at this temperature once thawing is complete.

4.5.3.2 Guidelines:

4.5.3.2.1 Thawed FFP units are prepared by thawing the FFP between 30 and 37°C without direct contact with the water.

4.5.3.2.2 Thawed FFP units are stored in blood bank refrigerator between 1 and 6°C.

4.5.3.2.3 Thawed FFP units are transported in properly insulated container between 1 and 10°C.

4.5.3.2.4 Thawed FFP units are assigned an expiration time of twenty four hours from the thawing time.

4.5.3.3 Notes:

4.5.3.3.1 Once thawed, FFP must be used as soon as possible (30 min). It must be transfused within 24 hours of thawing to preserve acceptable amounts of factor VIII.

5. MATERIALS AND EQUIPMENT:

5.1 Water bath for FFP thawing

5.2 Hematos system of blood bank

6. RESPONSIBILITIES:

6.1 Blood bank staff has to follow the policy and procedures.

6.2 The treating physician should be guided by ordering guidelines, indications and contraindications of different blood products. He/she is solely responsible for deciding the need and prescribing blood component.

6.3 Staff Nurses

7. APPENDICES:

7.1 N/A

8. REFERENCES:

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8.10 Australian & New Zealand Society of Blood Transfusion / The Royal Australian and New Zealand College of Obstetricians and Gynaecologists- 3rd Edition, March 2007.
8.9 Good Manufacturing Practice for Blood Establishments, Version 2.0, May 2019, Saudi FDA

9. APPROVALS:

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Reviewed by:	Mr. Subah Turayhib Alharbi	Nursing Director		July 15, 2025
Reviewed by:	Dr. Fahad Obaid Al Shammari	Head of Pediatric Department		July 15, 2025
Reviewed by:	Dr. Serhan Hamdan Al Shammari	Head of Neonatal Intensive Care Unit		July 16, 2025
Reviewed by:	Dr. Abdelghani Ibrahim	Head of Operating Room		July 16, 2025
Reviewed by:	Dr. Afif Essie	Head of Pediatric Surgery		July 17, 2025
Reviewed by:	Mr. Abdulelah Ayed Al Mutairi	QM&PS Director		July 17, 2025
Reviewed by:	Dr. Tamer Mohamed Naguib	Medical Director		July 20, 2025
Approved by:	Mr. Khalid Matar Al Anizi	Hospital Director		July 27, 2025