HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Laboratory and Blood Bank		
Document:	Multidisciplinary Policy and Procedure		
Title:	Blood/Blood Components Transfusion		
Applies To:	All Blood Bank Staff and Treating Physicians		
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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.

1.2 To support clinical decisions about the use of blood & blood components.

2. DEFINITIONS:

2.1 **PT:** Prothrombin Time

2.2 **APTT:** Activated Partial Thromboplastin Time

2.3 **TTP:** Thrombotic Thrombocytopenia

2.4 **ITP:** Immune Thrombocytopenia

3. POLICY:

3.1 Only physicians order blood and in accordance with a policy clarifying when blood and blood products may be ordered.

3.2 Blood & blood components shall be transfused after written informed consent of the patient or his/her legal guardian.

3.3 The consent shall be taken after discussing the benefits & risks of the transfusion with the patient or his/her guardian.

3.4 Proper selection of blood/blood components for transfusion should be maintained.

3.5 Thawed Fresh Frozen Plasma units are handled in an appropriate manner:

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

3.5.2 Thawed FFP units are stored under properly controlled conditions between 1 and 6°C.

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

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

3.5.5 Requirements for FFP preparation, storage, transport and expiration apply.

4. PROCEDURE:

4.1 **Guidelines of Red Blood Cells Transfusion:**

4.1.1 General guidelines for transfusion:

4.1.1.1 The following criteria represent institution consensus indications for the transfusion of blood and blood components. Such guidelines:

4.1.1.1.1 Prior to the administration of blood or blood components, the indications, risk, and benefits of a blood transfusion and possible alternatives must be discussed with the patient and documented in the medical record.

4.1.1.1.2 It is recommended that transfusions should be documented in the patient's chart as to indications and outcome.

4.1.1.1 Cannot substitute for clinical judgment and the need for flexibility in practice.
4.1.1.2 Should not be considered a mandate to transfuse or not to transfuse.
4.1.1.3 Will serve as the basis for the focused review of transfusion practices.

4.2 **Whole Blood Transfusion:**

4.2.1 Whole blood (WB) is unavailable since oxygen carrying capacity plus volume repletion can be obtained from red cells plus colloid or crystalloid replacement.

4.2.2 Storage of whole blood precludes the production of components, and thus, the most effective use of donated blood.

4.2.3 Blood components therapy has become the standard practice in transfusion medicine. Transfuse only the missing components.

4.2.4 Whole blood transfusion is old practice and wasteful procedure.

4.2.5 Whole blood less than 24 hour is rarely available because of the time required to perform post donation testing.

4.2.6 Whole blood stored over 24 hours;
4.2.6.1 Contains non- functioning platelets and granulocytes.
4.2.6.2 Clotting factors are deficient particularly factor V and VIII.
4.2.6.3 Maintain Factors I, II, IX.

4.2.7 WB may be reconstituted by combining RBCs with FFP to achieve a desired hematocrit level for neonatal exchange transfusions. The reconstituted WB can be stored at 1 to 6 °C for 24 hours with the expiration time that corresponds to the earlier expiration time of the two components.

4.2.8 Components therapy has the following advantages:
4.2.8.1 It guarantees efficacy when transfusing the missing or reduced blood components in small volume and concentrated form.
4.2.8.2 Reduced risk of circulatory overload.
4.2.8.3 Reduced risk of transmitting blood borne disease when one component is transfused rather than whole blood.
4.2.8.4 Reduced incidence of transfusion reactions to plasma components when transfusing concentrated cellular components.
4.2.8.5 Reduced quantity of anticoagulants and electrolyte administration.

4.3 **Red Blood Cells Transfusion:**

4.3.1 Description:
4.3.1.1 One unit contains about 280 ± 60 ml red cells from which most of the plasma has been removed.
4.3.1.2 Stored at 1-6 °C.

4.3.2 Types:
4.3.2.1 RBC stored in additive solution (ADSOL/ SAGM - 100 ml) with shelf life of 42 days and Hematocrit about 52-60%.
4.3.2.2 RBC stored in CPD-A only with shelf life of 35 days and Hematocrit of 60-80%.

4.3.3 Indications:
4.3.3.1 Symptomatic anemia regardless of hemoglobin level.
4.3.3.1.1 Symptomatic anemia resulting in; Tachycardia (> 100 beats/minute), Mental status changes, Electrocardiographic signs of cardiac ischemia, Angina, Shortness of breath, light headedness or dizziness with mild exertion.
4.3.3.2 Acute blood loss > 15% of blood volume with evidence of inadequate oxygen delivery.
4.3.3.2.1 Acute blood loss resulting in diastolic blood pressure < 60 mm Hg, systolic blood pressure decrease > 30 mm Hg, and/or oliguria/anuria.
4.3.3.3 Preoperative Hemoglobin (MCH policy): The requirements of achieving specific hemoglobin level before general anaesthesia in OBS/ Gyne cases (in the absence of symptomatic anemia) are as follows:
4.3.3.3.1 In minor cases, hemoglobin must be ≥ 7 g/dl.
4.3.3.3.2 In C/S and major cases, hemoglobin must be ≥ 8 g/dl.

4.3.3.4 Post-operative and adult cases (MCH policy):
4.3.3.4.1 If the Hemoglobin concentration < 7 gm / dl (in an asymptomatic patient).
4.3.3.4.2 If Hb < 8 gm / dl in elderly with cardiovascular or respiratory disease.
4.3.3.5 Patients on chronic transfusion regimen.
4.3.3.6 Notes:
4.3.3.6.1 When possible, the patient's hemoglobin should be determined prior to transfusion and within 24 to 36 hours after transfusion if the patient remains hospitalized
4.3.3.6.2 Refer to "ordering of blood/blood products and tests" chapter (LB-MPP-236) for "The maximum surgical blood order schedule (MSBOS)".

4.3.4 Dose:
4.3.4.1 One unit is expected to increase hematocrit by 3% and hemoglobin 1 g/dl in non-bleeding adult patient (the 70 kg average).
4.3.4.2 10-ml/kg increases Hemoglobin by 3 g/dl.

4.3.5 Not indicated:
4.3.5.1 Avoid transfusion in the absence of signs and symptoms of anemia.
4.3.5.2 Avoid transfusion in asymptomatic nutritional anemia.
4.3.5.3 Transfusion in patients with chronic anemia may lead to volume overload and can be very dangerous.

4.3.6 Indications of fresh blood (rbcs) transfusion: (Commonly 5- 7 days; may extend to 14 days after donation)
4.3.6.1 Fetuses with intrauterine transfusion (Not applicable in MCH blood bank).
4.3.6.2 Premature infants.
4.3.6.3 Exchange transfusion.
4.3.6.4 Complicated patients with sickle cell disease.
4.3.6.5 Cardiac patients.
4.3.6.6 Any patient with chronic transfusion needs e.g. B thalassemia.
4.3.6.7 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.

4.3.7 Transfusion in chronic anemia:
4.3.7.1 Transfusion is much less commonly indicated when anemia has persisted for weeks or months because compensatory mechanisms have had time to work. These anemias are usually best treated through addressing their etiologies, such as replacing a nutritional deficiency (e.g. iron) or reducing the rate of auto- immune hemolysis.
4.3.7.2 Congenital hemoglobinopathies, such as sickle-cell disease, are treated according to specific disease-related protocols.
4.3.7.3 Hypoproliferative anemias, secondary to chemotherapy or end-stage renal disease, are often addressed through marrow stimulants, such as recombinant erythropoietin.

4.3.8 Transfusion of chronic recipients (like sickle cell disease and B thalassemia):
4.3.8.1 In addition to the common compatibility criteria, the following RBCs units should be selected:
4.3.8.1.1 Phenotypically matched RBCs for Rh system and K to prevent alloimmunization.
4.3.8.1.2 Sickle (Hb solubility test) negative units (as per availability).
4.3.8.1.3 Pre-storage leukoreduced units (as per availability).
4.3.8.1.4 Fresh units (≤ 7 days) as much as possible.
4.3.8.1.5 Irradiated units for patients who are candidates for stem cell transplantation (but not available in MCH blood bank).
4.3.8.1.6 Notes:
4.3.8.1.6.1 RBCs transfusion to thalassemia patients must be fresh but in case of rare phenotype or in the presence of multiple alloantibodies, old RBCs units may be used.

4.3.8.1.6.2 Phenotypically non matched RBCs bags may be released in:

4.3.8.1.6.2.1 Some cases with multiple antibodies or very rare phenotype with non-availability of full Phenotypically matched RBCs bags.

4.3.8.1.6.2.2 In emergency cases with no time for searching for phenotypically matched units.

4.3.8.2 Sickle Cell Disease (SCD):

4.3.8.2.1 In patients with sickle cell disease (SCD), chronic transfusion therapy reduces the risk of stroke by decreasing the percent of red cells containing hemoglobin S in order to reduce sickling and prevent an increase in blood viscosity.

4.3.8.2.2 Chronic transfusions can reduce the risk of recurrent stroke to less than 10% if hemoglobin levels are maintained between 8 and 9 g/dL with a hemoglobin S level less than 30%.

4.3.8.2.3 The method can be a simple, additive, or partial exchange transfusion, once every 3 to 4 weeks.

4.3.8.2.4 RBC Alloimmunization IN SCD:

4.3.8.2.4.1 Patients with SCD have the highest rates of alloimmunization of any patient group. These antibodies are commonly produced against Rh, Kell, Duffy, and Kidd system antigens.

4.3.8.2.4.2 Many sickle cell treatment centers perform phenotype analysis of a patient's red cells before beginning transfusion therapy. This testing helps to reduce the rate of alloimmunization by allowing preferential selection of phenotypically similar units. Phenotypically compatible units may be difficult to obtain.

4.3.8.2.4.3 The most common protocol followed for non-alloimmunized patients is pre-transfusion phenotypic matching for C, c E, e and K antigens to prevent alloimmunization.

4.3.8.2.4.4 For patients receiving phenotypically matched RBC units, leukocyte reduction is also used to curtail wasting a matched unit whose leukocytes might cause a febrile non-hemolytic transfusion reaction.

4.3.8.2.5 Other Complications Of Red Cell Transfusions In SCD:

4.3.8.2.5.1 Patients with SCD may also be at risk for life-threatening delayed hemolytic transfusion reactions.

4.3.8.2.5.2 Furthermore, if a patient's hemoglobin level is observed to decrease after transfusion, one may suspect a "hyperhemolytic" syndrome. This phenomenon is characterized by destruction of the patient's own red cells along with transfused cells. The mechanism is not well understood.

4.3.8.2.5.3 If hyperhemolytic syndrome is suspected, one should consider stopping transfusion and administering corticosteroids in combination with intravenous immune globulin as noted in reported case studies.

4.3.8.3 B- thalassemia:

4.3.8.3.1 B- thalassemia with severe anemia must be treated with transfusion to improve tissue oxygenation and suppress extramedullary erythropoiesis in the liver, spleen, and marrow.

Supertransfusion protocols aim for higher target Hemoglobin levels (11 to 12 g/dL).

4.3.8.3.2 Iron overload is a potential complication of this RBC transfusion protocol that cannot be prevented and must be treated with chelation therapy beginning early in childhood.

4.3.9 Leukocyte depleted blood components: see "red cells preparation and storage" policy (LB-IPP-235).

4.3.9.1 Principle and Indications: Reduction of leukocytes in transfused blood components reduce the risk of:

4.3.9.1.1 Febrile non-haemolytic transfusion reaction.

4.3.9.1.2 CMV transmission.

4.3.9.1.3 HLA allo-immunization.

4.3.9.1.4 Platelet refractoriness.

4.3.9.1.5 Immune-modulation, cancer recurrence and bacterial infections in some surgical procedures.

4.3.9.1.6 Prion disease (CJD)

4.3.9.1.7 Yersinia enterocolitica contamination of RBC's.

4.3.10 Irradiated cellular blood products: Not applicable in MCH blood bank.

4.3.10.1 Irradiation of blood and cellular components is recommended for the prevention of graft versus host disease caused by lymphocytes present in most blood products specially to the immunocompromised patients.

4.3.10.2 These patients include:

4.3.10.2.1 BM transplant recipients (blood products not BM).

42.3.10.2. BM donors receiving blood transfusion prior to and during harvest of marrow.

4.3.10.2.3 Intrauterine transfusion.

4.3.10.2.4 Post intrauterine transfusion during neonatal period.

4.3.10.2.5 Patients receiving directed donation from family members.

4.3.10.2.6 Patients with severe combined immune deficiency syndrome.

4.3.10.2.7 Aplastic anemia, acute leukemias and Hodgkins disease.

4.3.11 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

4.3.11.1 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.

4.3.11.2 For inventory considerations, an ABO-compatible rather than an ABO-identical unit should be transfused.

4.3.12 Notes:

4.3.12.1 Acute blood loss will be followed by hemodilution through shifts of fluid into the vascular space, but before this change occurs (or before resuscitative fluids are administered intravenously), hemoglobin will appear normal and will not reflect the loss in intravascular volume or red cell mass. For example, loss of 1000 mL may require more than 72 hours for complete compensation, and thus the hematocrit (or hemoglobin) cannot be followed as an indicator of the patient's status.

4.3.12.2 An acutely bleeding patient has not had sufficient time to engage all compensatory mechanisms, such as increased 2,3- DPG synthesis. Furthermore, the patient may also be suffering from concomitant hypovolemia and may have multiple organ system dysfunction to consider as well.

4.3.12.3 The primary goal of acute treatment is the restoration of blood volume through control of hemorrhage and replacement of intravascular volume. Given the hemoglobin reserve available in most patients of approximately 50% and the greater safety of non-blood solutions, resuscitation is usually performed first with crystalloid solutions.

4.3.12.4 In non-bleeding cases, the effect of transfusion on hemoglobin concentration can be estimated accurately by measurement as little as 15 minutes after transfusion.

4.3.12.5 RBCs <7 to 10 (up to 14) days old are commonly provided for neonatal or pediatric transfusions.

4.3.12.6 PRBC increase the oxygen-carrying capacity in anemic patient without a need for volume expansion.

4.3.12.7 Most patients tolerate hemoglobin concentration of 7-10 g/dl without need for transfusion.

4.4 Plasma transfusion (FFP):

4.4.1 Types:

4.4.1.1 Fresh Frozen Plasma (FFP):

4.4.1.1.1 The unit must be frozen within 8 hours of collection and must be transfused within 24 hours of thawing, thus optimizing the levels of the most labile procoagulants, Factors V and VIII.

4.4.1.1.2 It contains all the proteins (albumin and immunoglobulin) and coagulation factors.

4.4.1.1.3 One ml of FFP contains one unit of coagulation factor activity.

4.4.1.2 Plasma Frozen Within 24 Hours After Phlebotomy(PF24):

4.4.1.2.1 This component contains normal amounts of Factor V, but has somewhat reduced levels of Factor VIII.

4.4.1.2.2 It has pro-coagulant contents that are equally capable of correcting most clinical coagulopathies.

4.4.1.2.3 FFP and PF24 must be stored at ≤ - 18 °C up to 1 year. One unit contains about 200-250 ml.

4.4.1.3 Thawed Plasma:

4.4.1.3.1 It is prepared from FFP and PF24 and stored for 5 days.

4.4.1.3.2 It contains reduced levels of Factor V (>60%) and Factor VIII (>40%).

4.4.1.3.3 It can effectively be used throughout its shelf life (5 days after thawing) because the vitamin-K- dependent factors, the deficiency of which is the most likely precipitant of transfusion, are stable at refrigerator temperatures.

4.4.1.4 Solvent/Detergent-Treated Plasma (SD-Plasma):

4.4.1.4.1 Is prepared from a pool of plasma from many donors and undergoes treatment with 1% trinitrobutyl phosphate (TNBP) and 1% Triton-X for pathogen reduction.

4.4.1.4.2 The treatment has been shown to significantly inactivate lipid-enveloped viruses.

4.4.1.4.3 All coagulation factors are reduced by 10% in SD- Plasma, except for Factor VIII, which is reduced by 20%. Also, SD-Plasma contains 50% less functional protein S in comparison to the non-treated FFP.

4.4.1.4.4 SD- Plasma "OCTAPLAS" should be used for pregnant and lactating women only if alternative therapies are regarded inappropriate.

4.4.1.4.5 Also, data on the use of "OCTAPLAS" in premature babies are very limited, therefore, the product should only be administered to these individuals if the likely benefits clearly outweigh potential risks.

4.4.1.5 Note: In MCH blood bank, the only used plasma types are FFP and plasma thawed from FFP to be used within 24 hours from thawing (then expires).

4.4.2 Indications:

4.4.2.1 Control or prevention of bleeding in-patients with multiple coagulation defects such as liver disease and DIC with prolongation of PT and APTT.

4.4.2.1.1 Patients with active bleeding with prothrombin ratio >1.2.

4.4.2.1.2 Patients of liver disease with fibrinogen <100mg/ dl

4.4.2.2 Patients on warfarin requiring emergency surgery and warfarin or Coumarin overdose (to avoid delay of action of vitamin K which needs 8-12 hour to reverse Coumarin overdose).

4.4.2.3 To prevent dilutional coagulopathy (e.g. with massive transfusion).

4.4.2.4 Congenital or acquired coagulopathies (with PT: > 18 sec., APTT > 60 sec. or coagulation factor assay < 25 %).

4.4.2.5 Hypercoagulopathies:

4.4.2.5.1 Antithrombin III deficiency.

4.4.2.5.2 Protein C and protein S deficiency.

4.4.2.6 Therapeutic plasmapheresis for:

4.4.2.6.1 Thrombotic Thrombocytopenic Purpura (TTP.)

4.4.2.6.2 Hemolytic Uremic Syndrome (HUS).

4.4.3 Contraindications:

4.4.3.1 Volume expander.

4.4.3.2 Nutritional supplementation.

4.4.3.3 To enhance wound healing.

4.4.3.4 Factor replacement with the availability of commercial factor concentrates.

4.4.4 Administration:

4.4.4.1 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).

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

4.4.4.3 Infusion rate is 1-2 ml/min.

4.4.4.4 Check PT and PTT Post Transfusion.

4.4.4.5 Use ABO compatible FFP:

Patient's Blood Group	Can Receive
O	O, A, B, AB
A	A or AB
B	B or AB
AB	AB

4.4.4.6 FFP does not need to be cross-matched but should be ABO compatible (to avoid potential hemolysis caused by donor anti-A or anti-B).

4.4.4.7 Plasma components of any RhD type can be given regardless to the RhD type of the recipient.

4.4.4.7.1 Although FFP may contain small amounts of red cell stroma, sensitization following the administration of Rh D-positive FFP to Rh D-negative patients is most unlikely as stroma is less immunogenic than intact red cells.

4.4.4.7.2 No anti-D prophylaxis is required if Rh D-negative patients receive Rh D-positive FFP.

4.4.4.8 FFP which is not ABO group-compatible with the patient should only be used if it contains no high-titer anti-A and anti-B and only suitable for emergency use in adults;

4.4.4.8.1 It is preferable to use group A FFP for group B patients and vice versa.

4.4.4.8.2 Group O FFP only should be transfused to group O recipients.

4.4.5 Notes:

4.4.5.1 There are very limited data to suggest a benefit in transfusing plasma in settings other than intracranial hemorrhage after anticoagulation with vitamin K antagonists or massive transfusion.

4.4.5.2 The PT test yields the most frequently abnormal results in patients with a (potential) coagulopathy and is the test most frequently consulted when deciding whether to transfuse plasma.

4.4.5.3 The guidelines of several professional associations, including the American Society of Anaesthesiologists and the College of American Pathologists, recommend that correction of the coagulation tests by plasma transfusion before surgery or to facilitate thrombosis need occur only at the point that corresponds to an INR of 2.0.

4.4.5.4 Administration of small doses of vitamin K can achieve correction of the warfarin excess promptly (6 to 24 hours) without complicating reestablishment of proper levels of anticoagulation.

4.4.5.5 Prothrombin complex concentrates can also be used to correct the effects of warfarin rapidly.

4.4.5.6 The biological half-life of pro-coagulants must also be considered. Factor VII has the shortest half-life in vivo (≈ 5 hours), so that if correction is truly required before a hemostatic challenge, such as major surgery, the plasma should be given shortly before the procedure in order for the benefit to be present at the time of the hemostatic challenge.

4.4.5.7 The normal range of factor activity levels is approximately 50 % to 150%.

4.4.5.8 Mild or moderate deficiencies of a given clotting factor may lead to an elevated PT or PTT, but still be adequate for hemostasis. For example, 5% activity of factor VIII is usually sufficient to prevent spontaneous bleeding.

4.4.6 Thawed fresh frozen plasma (Thawed FFP):

4.4.6.1 Principle:

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

4.4.6.2 Procedure:

4.4.6.2.1 Water baths and other heating devices used to thaw blood products shall not be used for incubation of tests containing biological specimens.

4.4.6.2.2 Thawed FFP units are prepared by thawing the FFP between 30 and 37 ºC without direct contact of the water by using a protective over bag.

4.4.6.2.3 The time of thawing is labeled on the FFP unit..

4.4.6.2.4 Thawed FFP units are stored under properly controlled conditions between 1 and 6°C.

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

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

4.4.6.2.7 Requirements for FFP preparation, storage, transport and expiration apply.

4.4.6.2.8 Note: 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.

4.4.6.3 Expiration:

4.4.6.3.1 Fresh Frozen Plasma (FFP): 12 months (at ≤ –18 °C)

4.4.6.3.2 FFP (after thawing): 24 hours (open or closed system).

4.5 **Platelet concentrates transfusion:**

4.5.1 Description:

4.5.1.1 Volume for random units: 50-70 ml.

4.5.1.2 Platelet content for random units: ≥ 5.5x 10^{10} platelet. / unit.

4.5.1.3 pH: ≥ 6.2.

4.5.1.4 Storage: 20-24 °C for 5 days.

4.5.2 Acceptable criteria for transfusion of platelets includes:

4.5.2.1 Patients suffering from or at significant risk of hemorrhage due to thrombocytopenia and/or platelet dysfunction.

4.5.2.2 Recent (within 24 hours of request) platelet count <10 x 10^9/l (for prophylaxis in stable, non-febrile patient), or <20 x 10^9/l for prophylaxis with fever (in last 24 hours) or instability.

4.5.2.3 Recent (within 24 hours of request) platelet count < 50 x 10^9/l involving:

4.5.2.3.1 Documented hemorrhage or rapidly falling platelet count.

4.5.2.3.2 Planned invasive or surgical procedure.

4.5.2.4 Documented platelet dysfunction (e.g. Prolonged bleeding time > 1.5 times the upper limit of normal, platelet function tests, drug-induced, or history) with:
4.5.2.4.1 Petechiae, purpura., bleeding, and/or invasive or surgical procedure.
4.5.2.5 Unacceptable indications for platelet transfusion includes;
4.5.2.5.1 Prophylactic transfusion in TTP/HUS, or ITP.
4.5.2.5.2 Extrinsic platelet dysfunction such as renal failure, hyperproteinaemia or von Willebrand's disease.
4.5.2.6 When possible, the patient's platelet count should be determined prior to transfusion and within 24 hours after transfusion if the patient remains hospitalized.

4.5.3 Indications:
4.5.3.1 Chronic stable thrombocytopenia (No bleeding) with platelet count <10,000/ul)
4.5.3.2 Thrombocytopenia with active bleeding and platelet count <50,000/ul.
4.5.3.3 Patients with bone marrow failure due to disease, chemotherapy or irradiation with platelet count <20,000/ul.
4.5.3.4 Prophylactic transfusion:
4.5.3.4.1 Emergency surgery with platelet count <50,000/ul.
4.5.3.5 Acute leukemia patients without fever or bleeding with platelet count <l0,000/ul.
4.5.3.6 Acute promyelocytic leukemia with platelet count < 20,000/ul.
4.5.3.7 Hematopoietic stem cell transplantation with platelet count <10,000/ul.
4.5.3.8 NICU infants with platelet count <100,000/ul.
4.5.3.9 Congenital or acquired platelet functional disorders:
4.5.3.9.1 Alternative measures:
4.5.3.9.1.1 Withdraw anti platelet drugs
4.5.3.9.1.2 Correct the cause of dysfunction
4.5.3.9.1.3 Use desmopressin in patients with storage pool disease.
4.5.3.9.2 Platelets concentrate transfusion if the above fails:
4.5.3.9.2.1 Should be HLA matched (HLA matching is not available in MCH).
4.5.3.9.2.2 Preoperative in patients with Glanzmann's thromboasthenia.
4.5.3.10 Massive blood transfusion:
4.5.3.10.1 In patients with acute bleeding and platelet count < 50,000 /ul.
4.5.3.10.2 In patients with multiple trauma or CNS surgery with platelet count < l00,000/ul.
4.5.3.11 Disseminated intravascular coagulopathy (DIC):
4.5.3.11.1 First treat the cause of DIC.
4.5.3.11.2 No platelet in chronic DIC without bleeding.
4.5.3.11.3 Platelet concentrate can be given to DIC patients with bleeding and platelet count <50,000/ul.
4.5.3.12 Immune Thrombocytopenias: Transfuse platelet concentrates in:
4.5.3.12.1 Autoimmune thrombocytopenia with life threatening bleeding with support of methylprednisone and IVIG.
4.5.3.12.2 Neonatal alloimmune thrombocytopenia (NAIT): Transfuse compatible platelet as soon as possible, with HPA-1a negative and HPA 5b negative (not available in MCH).
4.5.3.12.3 Post transfusion purpura with bleeding with support of IVIG.
4.5.3.13 Other Uses of Platelets Autologous or allogeneic platelets may also be applied topically to an area of surgical reconstruction. The elaboration of platelet-derived growth factor (PDGF) through applications of platelet-rich plasma or platelet gels is thought to stimulate angiogenesis and promote more rapid tissue repair.

4.5.4 Contraindications:
4.5.4.1 TTP, ITP, Post-transfusion purpura without bleeding or heparin- induced thrombocytopenia.

4.5.4.2 Untreated DIC, thrombocytopenia. caused by Septicaemia or hypersplenisrn, unless there is active bleeding and must be under clinical monitoring.

4.5.4.3 NOTE: In cases of significant, life-threatening hemorrhage or surgery in TTP, platelet transfusion may become necessary and may be tolerated better after plasma exchange.

4.5.5 Volume-reduced platelets:

4.5.5.1 See "platelet concentrate preparation and storage" chapter (LB-IPP-192).

4.5.6 Determination of platelet response:

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

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

4.5.6.3 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).

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

4.5.6.5 Corrected count increment (CCI) (CI × BSA)/unit content (×10^{11})

4.5.6.6 Calculations Sample:

Patient mass = 80 kg: blood volume = 80 kg × 75 mL/kg = 6000 ml
Patient body surface area: 2.0 m2 (determined from a table or nomogram)
Pre-transfusion platelet count: 5000/µL
Post-transfusion platelet count:25,000/µL
So, CI = 20,000/µL
Platelet count in unit: 1.5 × 10^6/µL
Volume of unit: 267 mL
So, Unit content = 4.0 × 10^{11} platelets
CCI = (20,000/µL × 2.0 m2)/4.0 = 10,000 i.e. successful.
Successful transfusion: ≥7500
Refractory patient: Two or more transfusions with CCI <5000

4.5.7 Notes:

4.5.7.1 Given their larger size and higher density, red cells tend to occupy the central (axial) portion of the blood flow, pushing platelets to the periphery in proximity with the vessel wall. This arrangement makes sense because it is only along the vessel wall that a tear in the endothelium can occur where the platelets can then perform their hemostatic functions. In normal volunteers, reducing the hematocrit from 41% to 35% resulted in almost a doubling of their bleeding time, whereas decreasing volunteers' platelet count by a third had no effect.

4.5.7.2 IVIg should be used in allo-immune platelet refractoriness in emergency situations.

4.5.7.3 Alloimmunization:

4.5.7.3.1 Alloimmunization is suspected from poor responses to platelet transfusions not explicable on the basis of other non-immunologic factors, such as splenomegaly or sepsis.

4.5.7.3.2 This response is usually seen as:

4.5.7.3.2.1 Antibodies to HLA Class I antigens, thus leukocyte reduction (of both platelet and RBC units transfused to these patients) has proven highly effective in reducing the risk of primary HLA alloimmunization.

4.5.7.3.2.2 Some patients may form antibodies to platelet-specific antigens.

4.5.7.4 In emergency situations with unavailability of platelet units, platelet units may be released within few hours beyond their expired time.

4.5.8 Expiration Dates for Selected Blood Component:

Component	Expiration
Platelets	5 days
Pooled Platelets (open system)	4 hours

Platelets (pooled in a closed system)	Expiration date should be earliest expiration date in pool.
Platelets Leukocytes Reduced	Open system – 4 hours; closed system – no changed from original expiration date; maximum time without agitation is 24 hours.

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 Blood bank staff is responsible for thawing labelling and storage of thawed plasma until release. .
6.4 Blood bank staff is responsible for expiring of FFP units after 24 hours from thawing time.

7. APPENDICES:

7.1 N/A

8. REFERENCES:

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8.5 AABB Standards for Blood Banks and Transfusion Services, 30th edition, 2016.
8.6 Mollison's Blood Transfusion in Clinical Medicine; 12th edition, 2014.
8.7 Modern Blood Banking & Transfusion Practices, 6th edition, 2012.
8.8 Guidelines for the use of fresh-frozen plasma, cryoprecipitate and cryosupernatant. British Committee for Standards in Haematology, Blood Transfusion Task Force. The British Society for Haematology, 2004; 126: 11–28.
8.9 Good Manufacturing Practice for Blood Establishments, Version 2.0, May 2019, Saudi FDA

9. APPROVALS:

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