Criteria for Transfusion
University of North Carolina Hospitals
Chapel Hill, NC
(Pediatrics)

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

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

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. The standard consent form (the Request and Consent for Procedure – HIM#248s) includes the transfusion of blood. Should a patient receive a transfusion alone, the transfusion itself can be indicated as the procedure. Consent should be obtained with the Request and Consent for Procedure (HIM#248s) by the patient's Licensed Independent Practitioner (LIP).

IT IS RECOMMENDED THAT TRANSFUSIONS SHOULD BE DOCUMENTED IN THE PATIENT'S CHART AS TO INDICATIONS AND OUTCOME. SPECIFIC NOTATIONS MUST BE MADE WHEN EXCEPTIONS TO THESE CRITERIA EXIST.

Red Blood Cells

A. When to Transfuse Packed Red Blood Cells

1. **Newborn infants less than four months of age:**

PRBCs FOR INFANTS </= 4 MONTHS OF AGE	
Hct 20% and reticulocyte count < 5% *or* Hgb </= 7 g/dL	• Healthy premature infants
Hct < 20-30% or Hgb < 7-10 g/dL	• Moderate or severe apneas • Poor weight gain • Sustained tachycardia • Oxygen requirement
Hct < 30-36% or Hgb < 10-12 g/dL	• Moderate cardiopulmonary disease • *(CPAP or high flow nasal cannula)* • Major surgery up to 48 hours post-operative
Hct < 36-40% or Hgb < 12-13.5 g/dL	• Term infant < 24 hours old and history of acute blood loss • Term infant with cardiopulmonary failure
Hct < 40-45% or Hgb < 13.5-15 g/dL	• Severe cardiopulmonary disease *(mechanical ventilation; FiO2 >0.35)* • Acute, symptomatic congenital heart disease

Other reasons for transfusion may include:

Intra-partum or neonatal hemorrhage
Exchange transfusion for severe hemolytic disease of the newborn.

2. **Pediatric patients > 4 months of age:**

a. Acute blood loss with symptoms and signs of hypovolemia.

b. Intraoperative blood loss of more than 15% blood volume.

c. Significant preoperative anemia (< 7 g/dl) in emergency surgical cases or in non-emergency cases when an alternate, effective therapy for anemia (e.g. iron therapy in a child with iron deficiency anemia) is not clinically appropriate.

i. Patients that are symptomatic, bleeding, clinically unstable, or at increased risk for bleeding with the procedure may require a higher hemoglobin level prior to surgery

d. Patients with congenital heart disease:
i. Non-cyanotic heart disease – Hgb < 7 g/dl
ii. Cyanotic heart disease – Hgb < 10 g/dl

e. Children that require extracorporeal circulation, consider transfusion for hemoglobin < 9 g/dl (Neonates < 10 g/dl)

f. Children with severe pulmonary disease and require supplemental oxygen and assisted ventilation or CPAP, consider transfusion for hemoglobin < 7 g/dl

i. Patients on an oscillator ventilator or have developed ARDS may require a PRBC transfusion with a higher hemoglobin threshold.

g. Chronic congenital or acquired anemia without an expected satisfactory response to medical therapy (e.g. iron therapy in a child with iron deficiency anemia) and

i. a hemoglobin level less than 7.0 g/dl OR
ii. symptoms and signs of anemia (tachycardia, mental status changes, ischemic signs and symptoms, or impairment of growth attributable to anemia).

h. Sickle cell anemia and

i. cerebrovascular accident
ii. aplastic crisis
iii. acute chest syndrome
iv. splenic sequestration
v. pre-operative preparation for surgery with general anesthesia
vi. multisystem organ failure
vii. hepatic sequestration
viii. intrahepatic cholestasis
ix. symptomatic anemia

i. Children with chronic or congenital red blood cell disorders (sickle cell disease, thalassemia, Diamond Blackfan) on chronic transfusion regimens should be transfused per protocol.

j. Children receiving treatment for cancer - In a child recovering from therapy-induced anemia, red cell transfusion is indicated
i. Patient is symptomatic
ii. Hemoglobin < 7 g/dl
iii. The patient's hemoglobin is anticipated to drop to < 7 g/dl prior to next visit

k. Patients with aplastic anemia
   i. Try to avoid PRBC transfusions
   ii. Transfuse if patient is symptomatic

l. Severe iron deficiency that is symptomatic or has ongoing bleeding symptoms.

m. For all other asymptomatic patients, consider transfusion if hemoglobin < 7 g/dL.

B. How much to transfuse PRBCs?

Neonates < 4 months – 15 ml/kg unless the infant is volume sensitive

Children > 4 months, but < 20-25 kg– 10 ml/kg

Children > 20 kg – 1 unit

Goal – target a post-transfusion hemoglobin between 7.0 – 9.5 g/dL

Notes on Usage:

When possible, patient's hemoglobin should be determined within 24 hours prior to transfusion and within 24 hours after transfusion if the patient remains hospitalized.

Platelets

1. Premature infants (gestational age < 37 weeks):

   a. Blood platelet count less than 50 x 10^9/L (50,000/µl) in an unstable premature infant.

   b. Blood platelet count less than 100 x 10^9/L (100,000/µl) in a stable (non-bleeding, without cardiac/vascular or respiratory problems) premature infant.

2. All other cases:

   a. Blood platelet count less than 10 x 10^9/L (10,000/µl) in a stable, non-febrile (>24 hours) patient or less than 20 x 10^9/L (20,000/µl) in an unstable or febrile (<24 hours) patient or in an outpatient.

   b. Blood platelet count less than 50 x 10^9/L (50,000/µl) with active bleeding.

   c. Blood platelet count less than 50 x 10^9/L (50,000/µl) and invasive procedure, or less than 100 x 10^9/L (100,000/µl) when neurosurgery is anticipated.

   d. Active or anticipated bleeding with evidence/suspicion of platelet dysfunction (e.g. metabolic disorder, drug effect, or cardiopulmonary bypass).

   e. Life-threatening autoimmune thrombocytopenia (transfusion of platelets for autoimmune thrombocytopenia under routine conditions is generally ineffective).

   f. In massive blood loss with clinically abnormal bleeding.

Granulocyte Concentrates

1. Severe infection in a neonate less than two weeks of age and with an absolute neutrophil count less than 3 x 10^9/L (3,000/µl) and capable of marrow recovery.

2. Severe infection unresponsive to antimicrobial therapy in a child greater than two weeks of age and absolute neutrophil count less than 0.5×10^9/L (500/µl) and capable of marrow recovery.

3. Documented infection unresponsive to antimicrobial therapy in a child with a proven or highly suspected qualitative neutrophil defect regardless of the absolute neutrophil count and otherwise capable of recovery.

TRANSFUSION OF GRANULOCYTES MUST BE ARRANGED IN CONSULTATION WITH TRANSFUSION MEDICINE.

Fresh Frozen Plasma (FFP)

1. Bleeding or invasive procedure with 1) documented significant deficiency of a plasma clotting protein, and/or 2) marked prolongation of the PT and/or PTT (> 1.5x the upper limits of normal).

2. Treatment of anti-thrombin, Protein C or S deficiencies.

3. Therapeutic plasma exchange for disorders in which FFP is documented to be appropriate replacement fluid, e.g. thrombotic thrombocytopenic purpura (TTP).

4. See adult criteria for expanded indications.

Note on Usage: Expect 10-15 ml/kg to raise a clotting factor approximately 15% post transfusion.

*Other plasma components, such as Plasma Frozen Within 24 Hours (FP24) or Thawed Plasma, may be issued when FFP is ordered.

Unacceptable criteria

For nutritional supplementation
For volume replacement

Cryoprecipitate

1. Bleeding or invasive procedure in patients with von Willebrand Disease for whom the use of DDAVP (Desmopressin) is insufficient (if a more satisfactory concentrate is not available).

2. Bleeding or invasive procedure in patients with primary or secondary hypofibrinogenemia, e.g. hypofibrinogenemia in association with DIC when fibrinogen < 150 mg/dl. If an alternative fibrinogen threshold is utilized, contact Transfusion Medicine to communicate this.

3. Bleeding or invasive procedure in patients with Factor XIII deficiency.

4. Bleeding or invasive procedure in patients with uremia.

Special Considerations for Transfusion

1. Cytomegalovirus: All allogeneic cellular products available at UNC are leukocyte reduced and are considered CMV safe.

2. Irradiation: A minimum irradiation dose of 2500 cGy to all cellular blood products – red blood cells, granulocytes and platelets.

    a. Severely immunodeficient patients who are at risk of developing transfusion-associated graft versus host disease (TA-GVHD)

b. Patients with hematologic malignancies

c. Bone marrow transplant recipients

d. Congenital immunodeficiencies affecting cellular immunity

e. If blood donor and recipient are relatives

f. Granulocyte transfusions

g. All neonates <4 months old

Once ordered, Transfusion Medicine will continue to provide irradiated blood products for a particular patient until requested to discontinue this service or until patient is >4 months old in cases of neonates without another indication.

3. Leukocyte Reduction: All products are leukocyte reduced unless contraindicated.

4. Washed Blood Products: All indications for red cells or platelets as previously indicated in addition to severe allergic/anaphylactic reactions to plasma-containing blood products (e.g., those with the need for IgA-deficient red cells and platelets).

References

Transfusion in **Pediatric Patients**: Review of Evidence-Based Guidelines.
Mo YD, Delaney M.Clin Lab Med. 2021 Mar;41(1):1-14. doi: 10.1016/j.cll.2020.10.001.PMID: 33494878

Consensus Recommendations for RBC **Transfusion Practice** in **Critically Ill Children** From the Pediatric **Critical** Care **Transfusion** and Anemia Expertise Initiative.
Valentine SL, Bembea MM, Muszynski JA, Cholette JM, Doctor A, Spinella PC, Steiner ME, Tucci M, Hassan NE, Parker RI, Lacroix J, Argent A, Carson JL, Remy KE, Demaret P, Emeriaud G, Kneyber MCJ, Guzzetta N, Hall MW, Macrae D, Karam O, Russell RT, Stricker PA, Vogel AM, Tasker RC, Turgeon AF, Schwartz SM, Willems A, Josephson CD, Luban NLC, Lehmann LE, Stanworth SJ, Zantek ND, Bunchman TE, Cheifetz IM, Fortenberry JD, Delaney M, van de Watering L, Robinson KA, Malone S, Steffen KM, Bateman ST; Pediatric Critical Care Transfusion and Anemia Expertise Initiative (TAXI); Pediatric Critical Care Blood Research Network (BloodNet), and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network.Pediatr Crit Care Med. 2018 Sep;19(9):884-898. doi: 10.1097/PCC.0000000000001613.PMID: 30180125

The **ASH-ASPHO Choosing Wisely Campaign**: 5 hematologic tests and treatments to question.
O'Brien SH, Badawy SM, Rotz SJ, Shah MD, Makarski J, Bercovitz RS, Hogan MS, Luchtman-Jones L, Panepinto JA, Priola GM, Witmer CM, Wolfson JA, Yee M, Hicks LK.Pediatr Blood Cancer. 2021 Aug;68(8):e28967. doi: 10.1002/pbc.28967. Epub 2021 May 28.PMID: 34047047

Guidelines for the **diagnosis** and **management** of **adult aplastic anaemia**.
Killick SB, Bown N, Cavenagh J, Dokal I, Foukaneli T, Hill A, Hillmen P, Ireland R, Kulasekararaj A, Mufti G, Snowden JA, Samarasinghe S, Wood A, Marsh JC; British Society for Standards in Haematology.Br J Haematol. 2016 Jan;172(2):187-207. doi: 10.1111/bjh.13853. Epub 2015 Nov 16.PMID: 26568159