Transfusion Practice Guidelines
Prepared by UCHealth Transfusion Committee and the UCHealth PBM Committee
2024

Complete guidelines available at https://www.uchealth.org/professionals/uch-clinical-laboratory/

The following transfusion practice guidelines represent institutional consensus regarding general indications for transfusion of blood components. These guidelines are not intended as a substitute for clinical judgment or to curtail the need for medically necessary flexibility in clinical transfusion practice. Thus, these guidelines should not be considered a mandate to transfuse or not to transfuse. The guidelines contained herein will serve as the basis for focused transfusion practice review.

Decision to Transfuse

Transfusion of blood products carries inherent risks and should be undertaken only if it improves the patient outcome. The decision to transfuse is based not only on laboratory values, but also on the objective evaluation of a patient's current clinical condition and their body's ability to compensate for any deficiency. Therefore, the patient's age, co-morbidities, severity of illness, and the rate of bleeding should be considered prior to ordering blood products.

A transfusion trigger is defined as the laboratory value below which a transfusion may be indicated and thus beneficial to the patient. A transfusion target is the post-transfusion laboratory value thought to support the patient, (e.g., a pre-transfusion hemoglobin of 7 g/dL is commonly used as a transfusion trigger to transfuse red cells, with the transfusion target being a post-transfusion hemoglobin between 7-9 g/dL).

Consent for Transfusion

Prior to the administration of blood products, the indication(s), risks, benefits and possible alternatives of transfusion must be discussed with the patient and documented in the medical record. Transfusion indication and subsequent outcome should be documented in the patient's chart, as well. Specific documentation of appropriate exceptions to evidence-based practice should be made to assist in the utilization review process and avoid potential delays in care.

Blood Ordering

All non-emergency release blood product orders require two patient blood type determinations on record at a UCHealth facility. A crossmatch is needed only for red cell products. Plasma and platelet orders do not require a crossmatch. Order a "Type and Screen" and an "Order Red Blood Cell/Prepare RBCs" for the number of RBC units needed through the Blood Administration order set if red cells are to be given immediately or scheduled to be given within 3 days. Order a "Type and Screen" if red cells are not likely to be given; a crossmatch can be completed quickly, if needed. Special requirements such as irradiated blood products should be specified in all blood product orders.

Indications for RBC Transfusion

The purpose of red blood cell (RBC) transfusion is to provide oxygen-carrying capacity and maintain tissue perfusion. Red cell transfusion should only be employed when time or underlying pathophysiology precludes other management (e.g., iron, erythropoietin, folate, etc.). Except in emergent cases, the patient's hemoglobin and/or hematocrit should be determined prior to transfusion. Response to transfusion should be determined with a post-transfusion hemoglobin and clinical assessment of the patient, before ordering additional units of blood. In the absence of acute hemorrhage or severe anemia, RBC transfusion should be ordered and administered a single unit at a time.

There is high-quality evidence showing that a conservative approach to transfusion is safe and not associated with increased mortality compared with a liberal transfusion strategy. Thus, a restrictive strategy is strongly recommended for all patients, including surgical and critically ill patients.

Indications for RBC Transfusion	
Patient population or clinical condition	**Hemoglobin level used as transfusion trigger to consider transfusion**
Hemodynamically stable patients with symptoms of anemia Hemodynamically unstable patients with an acute bleed or hemorrhage Patients receiving cytotoxic chemotherapy with expected drop in hemoglobin*	<7g/dL
Patients with cardiovascular disease, acute myocardial infarction, or unstable myocardial ischemia **AND** Symptoms of chest pain, orthostatic hypotension and/or tachycardia unresponsive to fluid resuscitation	< 8 g/dL
Patients with chronic anemia	No clear-cut transfusion triggers have been defined. The decision to transfuse is individualized based on symptoms and functional impairment.

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N Engl J Med 1999; 340:409-417. DOI: 10.1056/NEJM199902113400601
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N Engl J Med 2013; 368:11-21. DOI: 10.1056/NEJMoa1211801

Indications for Platelet Transfusion

The purpose of platelet transfusion is to prevent or treat bleeding due to thrombocytopathy. Except in emergent cases, the patient's platelet count and/or platelet function should be determined prior to transfusion. Response to transfusion should be determined by laboratory measurements and clinical assessment of the patient, before ordering additional platelets. In the absence of acute massive hemorrhage, platelets should be ordered and administered a single unit at a time. One adult dose (one apheresis unit) of platelets is usually sufficient for prophylactic platelet transfusions. In specific cases and if clinical indications warrant, exceptions to these guidelines can be arranged in consultation with Transfusion Medicine.

Indications for Platelet Transfusion	
Patient population or clinical condition	**Platelet concentration or function used as transfusion trigger to consider transfusion**
Prophylactic Platelet Transfusion	
Stable, nonbleeding patient	< 10 x 10^9/L
Therapeutic Platelet Transfusion	
Patients undergoing placement of central venous catheters who are at risk of bleeding	< 20 x 10^9/L
Patients with active severe bleeding **OR** Invasive procedure¥ with high risk of bleeding within the next 4 hours*	< 50 x 10^9/L** TEG MA <50 mm (or below normal range)
Ocular surgery, neurosurgery	< 100 x 10^9/L TEG MA <50 mm (or below normal range)
Patients on a medication that inhibit platelet function and have active bleeding or are undergoing an invasive procedure¥ with high risk of bleeding	Any platelet function assay (PFA-100, platelet aggregometry, or viscoelastic testing) demonstrating decreased platelet function

*Patients should not be prophylactically transfused prior to surgery but given platelets during surgery if significant bleeding occurs in the setting of laboratory documented thrombocytopathy.
**If patient has active massive hemorrhage, platelet transfusion should not be held until platelet count < 50 x 10^9/L but can be given with higher counts due to anticipation of rapid loss and consumption.

Platelets are most likely NOT appropriate in patients with:

- Immune thrombocytopenic purpura (ITP), thrombotic thrombocytopenic purpura (TTP) or heparin-induced thrombocytopenia (HIT), unless there is life-threatening hemorrhage.
- Extrinsic platelet dysfunction such as renal failure, hyperproteinemia, or von Willebrand disease.
- Prior to bone marrow biopsy, placement of peripherally inserted central catheters (PICCs), removal of central venous catheters (CVC) or cataract surgery.
- In general, clinicians should not routinely correct thrombocytopenia before low-risk therapeutic paracentesis, thoracentesis, and routine endoscopy.

Each dose of platelets is expected to raise the platelet count by ~30 x 10^9/L. Store platelet products only at room temperature; do not refrigerate or place in coolers.

¥AMC Interventional Radiology: High Bleeding Risk Procedures Anticoagulation Protocol https://myuch.sharepoint.com/sites/pnp/AmbGuide/AMC%20Interventional%20Radiology%20High%20Bleeding%20Risk%20Procedure%20Anticoagulation%20Protocol.pdf

Br J Haematol. 2017 176, 365-394. DOI: 10.1111/bjh.14423

Indications for Plasma Transfusion

Currently, randomized controlled clinical trial evidence to guide plasma transfusion practice is lacking. Published guidelines based on “expert opinion” support the transfusion of plasma for active bleeding in the setting of multiple coagulation factor deficiencies (massive transfusion, disseminated intravascular coagulation), and for use as replacement fluid when performing therapeutic plasma exchange, particularly in the treatment of thrombotic thrombocytopenic purpura.

One common reason that plasma is requested is to normalize an elevated international normalized ratio (INR) before a planned surgery or invasive procedure. The faulty assumption is that the elevated INR correlates with a bleeding risk and that plasma transfusion will normalize the INR and thus reduce the perceived risk.

INR was developed for the sole purpose of monitoring patients on warfarin, to standardize variations in clotting times between institutions using different testing reagents. Use of the INR has not been validated in other patient populations or clinical situations. There are safety and efficacy concerns about the use of excessive plasma transfusions to achieve arbitrary improvement in lab values. Additionally, clinicians should not routinely correct coagulopathy before low-risk therapeutic paracentesis, thoracentesis, and routine endoscopy.

Indications for Plasma Transfusion	
Patient population or clinical condition	**Coagulation measure used as transfusion trigger to consider transfusion**
Patients with active severe bleeding **AND** Multifactor deficiency	PT or PTT > 1.5x the mean normal range TEG R time > 8 min or above normal range
Replacement fluid for apheresis in thrombotic microangiopathies (TTP/HUS)	Fibrinogen < 150 mg/dL

Blood (2022) 140 (18): 1925–1936. DOI: 10.1182/blood.2022016558
Br J Haematol. 2018 Jun;181(6):864. DOI: 10.1111/bjh.15434
Transfus Apher Sci. 2012 Jun;46(3):293-8. DOI: 10.1016/j.transci.2012.03.019
Gastroenterology. 2019 Jul;157(1):34-43.e1. DOI: 10.1053/j.gastro.2019.03.070

Indications for Cryoprecipitate Transfusion

Transfusion of cryoprecipitate is generally indicated for the treatment or prevention of bleeding associated with deficiencies related to von Willebrand factor, Factor XIII, or fibrinogen. Cryoprecipitate is a cold insoluble fraction of plasma, and each bag contains approximately 80-100 units of Factor VIII and 150-250 mg of fibrinogen. Cryoprecipitate also contains factor XIII and von Willebrand factor.

Indications for Cryoprecipitate Transfusion	
Patient population or clinical condition	**Fibrinogen level or TEG angle used as transfusion trigger to consider transfusion**
Hypofibrinogenemia **AND** active bleeding (not hemorrhage)	<100 mg/dL TEG Angle < 50° or below normal range
Hypofibrinogenemia **AND** active hemorrhage (i.e. patients with traumatic injuries or undergoing cardiovascular or solid organ transplant surgery)	<200 mg/dL TEG Angle < 55° or below normal range
Hypofibrinogenemia **AND** active obstetric hemorrhage	<300 mg/dL TEG Angle < 55° or below normal range
Acute disseminated intravascular coagulopathy (DIC)	<150 mg/dL
Bleeding in uremic patients if DDAVP and estrogens fail to improve platelet function or are contraindicated	<150 mg/dL
Patients with dysfibrinogenemia	Any fibrinogen level

J Thromb Haemost 2007; 5: 266–73. DOI:10.1111/j.1538-7836.2007.02297
J Thromb Haemost. 2020;18:1813–1838. DOI: 10.1111/jth.14882

Special Considerations for Transfusion

Modified Red Blood Cell Units

- Orders for “fresh” or “washed” RBCs are considered on a case-by-case basis as these RBCs are appropriate in very few patients (i.e., severe transfusion reactions or specific causes of potassium elevation). Please consult the Transfusion Service before ordering.

Leukoreduced Products

- All standard blood products available at UCHealth are pre-storage leukocyte reduced to decrease the incidence of febrile nonhemolytic transfusion reactions and HLA alloimmunization.
- Leukocyte reduced units are CMV-safe products with equivalent risk of CMV transmission as CMV seronegative units.

CMV-negative Products

- For nearly all patients leukoreduced blood, or CMV-safe, is equivalent to CMV-negative blood.
- CMV-negative units are not routinely stocked. Please consult the Transfusion Service before ordering.

Blood Irradiation

- This modification is used to prevent transfusion associated graft versus host disease (TA-GVHD) in susceptible patients. If a patient is thought to be at risk of TA-GVHD (refer to indications below), please order irradiated blood products.
- Irradiation does not sterilize the product or reduce the risk of transfusion reactions.

Irradiation may be appropriate in patients with:

- Hematologic malignancies
- Hematopoietic stem cell transplant recipient or scheduled for HSC transplant
- Receiving purine analogs (fludarabine, 2-CDA, etc.)
- Receiving HLA-matched products or directed donations from blood relatives
- Intrauterine transfusion
- Newborns who received intrauterine transfusions or are in the neonatal ICU
- Congenital T cell-mediated immunodeficiencies (DiGeorge’s, SCID, Wiskott-Aldrich, etc.)
- Granulocyte transfusions

Once ordered, Transfusion Medicine will continue to provide irradiated blood products for a particular patient until requested to discontinue this service.

Irradiation is most likely NOT appropriate:

- Patients with AIDS or HIV
- Solid organ transplant recipients
- Patients receiving immunosuppressive therapy or chemotherapy who do not meet above criteria
- Congenital humoral immunodeficiencies (agammaglobulinemia, hypogammaglobulinemia)

Autologous Donations

Medically necessary autologous donation may be needed to obtain compatible blood for patients with very rare blood types, when allogeneic units are not available. Donating autologous blood increases the likelihood of requiring allogeneic transfusions due to the loss of red cell mass related to blood collection. If more units are necessary for the patient beyond what was autologously collected, allogeneic units may be required.

Requests for autologous donation must be ordered by the patient's physician and approved by the transfusion service medical director and donor center medical director. Some requests may not be accommodated if not medically indicated or if a patient is not sufficiently healthy to donate. It is recommended to begin donations 4-6 weeks prior to surgery. Additional fees are required for autologous donations due to the special handling involved, even if the designated recipient does not use the blood.

Directed Donations

Medically necessary directed donations may be needed in a very limited number of circumstances. Patients who may benefit from directed donations include those receiving HLA-matched platelets, granulocytes, patients with certain forms of alloimmune thrombocytopenia, and those with very rare blood types.

Interest in directed donation is often linked to a misperception of increased safety. Directed donations are associated with an increased risk of transfusion-transmitted infection, alloimmunization, transfusion-associated graft vs host disease, treatment delay, and increased administrative burdens compared to allogeneic blood. People asked to make a directed donation may feel pressured to ensure that they are not deferred, and these donations carry a slightly higher infectious disease risk than volunteer community blood. Further, some donors may pose additional risks to patients, like their potential marrow or organ donors, male partners of persons of childbearing age, and for babies with specific illnesses who receive donations from a parent.

Directed donors must meet the same eligibility criteria as community blood donors. Additional fees are required for directed donations due to the special handling involved, even if the designated recipient does not use the blood.

Ochsner J. 2021 Fall; 21(3): 281–286. DOI: 10.31486/toj.20.0068

Recommended Blood Component Administration Rates

A transfusion rate of approximately 2 mL/kg/hr is reasonable for average-sized adult patients requiring routine transfusions, depending upon the patient's ability to manage extra volume. Patients at risk of hypervolemia and Transfusion-associated Volume Overload (TACO) should be transfused as conservatively as possible and at slower rates, especially in the first 15 minutes of transfusion. If the transfusion is well tolerated, the rate can be slowly increased with monitoring for signs of hypertension and dyspnea.

All transfusions are to be completed within 4 hours from the start of transfusion. If the recommended or tolerated rate would not be completed in four hours, the Transfusion Service should be consulted to assess need for split or volume reduced units.

	RBC	**Plasma**	**Platelets**	**Cryoprecipitate**
Routine administration	One unit (~350 mL) over 2 to 3 hours	One unit (~200-300 mL) over 1 to 2 hours	One unit (~200-300 mL) over 1 to 2 hours	One 5-pool (~150 mL) over 1 hour
Patients at risk of volume overload	1-2 mL/minute for the first 15 minutes, followed by transfusion of the remainder typically over 2 to 4 hours, as tolerated	2-5 mL/minute for the first 15 minutes, followed by transfusion of the remainder over 1-2 hours, as tolerated	2-5 mL/minute for the first 15 minutes, followed by transfusion of the remainder typically over 2 hours, as tolerated	
	All transfusions are to be completed within 4 hours from the start of transfusion			

Patient risk factors for Transfusion-associated Circulatory Overload (TACO):

- Pre-existing heart failure or cardiac dysfunction, specifically left ventricular dysfunction
- Pre-existing renal dysfunction or hypoalbuminemia
- Positive fluid balance
- Low body weight
- Extremes of age (i.e., <3 years, 60 years)
- Large transfusion volumes and/or rapid transfusion
- History of TACO

Transfusion. 2018, 28, 3–21.
Transfusion. 2011 Feb; 51(2): 338–343.
Am J Med 2013; 126:357.e29.
Technical Manual, 21st edition. AABB, 2023. p. 567.