University of Michigan Hospitals and Health Centers
Adult Blood Transfusion Clinical Guidelines

Statement of purpose: It is the goal of the University of Michigan Health System to provide optimal patient care in blood transfusion while judiciously managing resources. Professional organizations and accrediting organizations including AABB, The Joint Commission for Hospital Accreditation, and CMS require the establishment of procedures to assess the effectiveness and appropriateness of blood transfusions. These guidelines are intended to ensure that the most appropriate, efficient and safe use of the blood supply is achieved and to establish evidence based criteria for the transfusion of blood components. Every indication for the use of blood products cannot be anticipated. These guidelines are not intended to override physician judgment.

While the risks of transfusion-transmitted disease have been greatly reduced, transfusion continues to carry significant risks. Established risks include hemolytic reactions, febrile reactions, allergic reactions, transfusion-related acute lung injury, hypotensive reactions, bacterial contamination, volume overload and iron overload. Transfusion has also been associated with adverse clinical outcomes including wound infection, pneumonia, prolonged ventilatory support, acute coronary events, prolonged length of stay and in-hospital mortality.

Guidelines for blood component transfusion

Red Blood Cells

- Hemodynamically stable anemia without acute coronary syndrome: hemoglobin trigger less than 7 g/dL, with a transfusion goal to maintain hemoglobin 7 – 9 g/dL.
- Acute hemorrhage with evidence of hemodynamic instability or inadequate oxygen delivery
- Symptomatic (including tachycardia, tachypnea, postural hypotension) anemia (hemoglobin less than 10 g/dL) not explained by other causes
- Chronic transfusion dependent bone marrow syndromes: hemoglobin less than 10 g/dL.
- Transfusion or exchange transfusion for severe sickle syndromes.
- Hemodynamically stable anemia with ischemic heart disease: current evidence does not support routine transfusion in non-ST segment elevation acute coronary syndromes; although in ST-segment elevation myocardial infarction transfusion may be beneficial.

Platelets

- Platelet count less than or equal to 10,000/μL
- Increased risk of hemorrhage due to mucosal solid tumors, graft vs. host disease, or associated coagulopathy with platelet count less than or equal to 20,000/μL.
- Active hemorrhage with platelet count less than or equal to 50,000/μL.
- Invasive procedure with significant risk of bleeding with platelet count less than or equal to 50,000/ μL.
- Intracranial or intraocular hemorrhage with platelet count less than or equal to 100,000/μL.

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- Massive transfusion, replacement of more than 1 estimated blood volume.
- Acute trauma resuscitation in conjunction with red cell and plasma transfusion.
- Mircovascular hemorrhage with evidence of platelet dysfunction.
- Relative contraindications to platelet transfusion, regardless of platelet count include: thrombotic thrombocytopenic purpura, hemolytic uremic syndrome, heparin induced thrombocytopenia, immune thrombocytopenic purpura and transfusion refractoriness due to alloantibodies.

Plasma

- Hemorrhage with coagulation factor deficiency (factor level < 50% or INR > 1.5)
- Invasive procedure with significant risk of bleeding and coagulation factor deficiency (factor level < 50% or INR > 1.5)
- Massive transfusion, replacement of more than 1 estimated blood volume.
- Acute resuscitation in trauma
- Thrombotic thrombocytopenic purpura
- Acute reversal of warfarin

Cryoprecipitate

- Hypofibinogenemia (fibrinogen less than 100 mg/dL) without other indication for plasma transfusion.
- Hemorrhage with evidence of dysfibrinogenemia.
- Factor XIII deficiency.
- Uremic bleeding.

Clinical considerations in transfusion decision making
All transfusions

- Transfusion decisions are clinical judgments that should be based on the overall clinical assessment of the individual patient. Transfusion decisions should not be based on laboratory parameters alone.
- Routine premedication is not advised unless the patient has a history of previous transfusion reactions. Premedication has not been shown to reduce the risk of transfusion reactions.

Red Blood Cells

- RBCs should be administered as single units for most operative and inpatient indications (transfuse and reassess strategy) except for ongoing blood loss with hemodynamic instability.
- Considerations in ordering RBC transfusions include:
  - Etiology of anemia. Patients with hemoglobinopathies may have greater transfusion requirements. Hemolysis may be due to a transfusion reaction.
  - Chronicity of anemia. In longstanding anemia, physiologic compensations may ameliorate some of the symptoms of anemia; whereas in acute blood loss there may not be time for compensations to take place.
  - Current hemoglobin level, prior hemoglobin levels, and rate of decline.

- Evidence for decreased oxygen delivery and the ability of increased Hb/Hct to alleviate this condition: Oxygen delivery to tissues is dependent on hemoglobin, oxygenation, and cardiac output.
- Ability to compensate for anemia without unacceptable risk of adverse outcomes as a result of compensatory mechanisms, such as impact of underlying cardiac disease.
- Expectation of continued blood loss. If blood loss is ongoing or likely then transfusion may be indicated at a higher hemoglobin level then when there is no expectation of further blood loss.
- Expectation for hemoglobin recovery from ongoing hematopoiesis.
- Potential adverse events associated with blood product transfusions including: hemolytic, allergic and febrile reactions; volume overload, and iron overload.
- Need to acutely reverse anemia and the ability of other longer acting treatment regimens (i.e. iron or ESAs) to treat underlying cause of anemia
- Transfusions should not be used solely for volume expansion.

Platelets

- Considerations in ordering platelet transfusions include:
  - Current platelet count.
  - Etiology of thromobocytopenia. Consumptive processes such as DIC, bleeding, and GVHD will shorten post-transfusion platelet survival.
  - Current platelet function. Some medications (i.e. aspirin, Plavix) or some disease processes (i.e. uremia) may decrease platelet function.
  - Body size. Patients with body surface area greater than $2m^2$ may require a larger platelet dose.
  - Spleen size. Splenomegaly for any reason will significantly decrease the effectiveness of platelet transfusions. Splenectomized patients may have larger post-transfusion platelet increments than individuals with normal spleens.
  - Underlying conditions that may increase risk of critical hemorrhage.
  - Alloimmunization to platelet or HLA antigens.
  - Antiplatelet medications. Medications such as aspirin or clopidogrel may, but do not necessarily, contribute to hemorrhage risk. Factors influencing bleeding risk include dose, time since last dose, and individual response or drug resistance.
  - Potential adverse effects associated with platelet transfusion include: allergic reactions, bacterial contamination, transfusion-related acute lung injury and immunization to platelet antigens.
- A post-transfusion platelet count should be obtained 10 minutes to 1 hour after transfusion for best assessment of transfusion effectiveness.
- Transfusion of one platelet pool (i.e. 5-pack) or one unit of apheresis platelets will typically increase the platelet count of an adult by 20,000 – 40,000/μL.
- The patient should be reassessed after each platelet unit transfused before ordering additional units.

Plasma

- A plasma dose of 10 ml/kg will typically provide sufficient coagulation factors to achieve hemostasis. Factor levels in donor plasma are variable, but can be assumed to be approximately 1 U/ml.
- Plasma may be provided as Fresh Frozen Plasma, Plasma Frozen Within 24 Hours Of Phlebotomy, or Plasma interchangeably.
- Plasma transfusion has very little effect on mild coagulopathies (INR $\leq$ 1.5).
- Potential adverse effects of plasma transfusion include: allergic reactions, transfusion-related acute lung injury, and volume overload.

Cryoprecipitate

- Cryoprecipitated antihemophilic factor (CAF or "cryo") contains Factor VIII, von Willebrand's factor, fibrinogen, and Factor XIII. Each unit contains a minimum of 80 U of Factor VIII and typically 250 mg of fibrinogen.

Transfusion Utilization Review

The Office of Clinical Affairs, with the approval of ECCA, will establish a process for peer review of the appropriateness of transfusions. The process will include:

- A process for data collection
- A process for screening transfusion events according to these guidelines
- A process for peer review of transfusion events according to these guidelines
- A process for reporting transfusion review results to ordering physicians, the medical staff leadership, and the Transfusion Committee.

References

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