Blood Products and Transfusion

Advancements have enabled the efficient use of various blood components, including packed red blood cells (PRBCs), individual factor concentrates, fresh frozen plasma (FFP), platelet concentrates, and cryoprecipitate (Lotterman et al., 2023). This pocket card reviews the different types of blood products as well as nursing tips for transfusions.

Blood Products (Lippincott Advisor, 2023)

Blood Products		
Product and details	**Indications**	**Administration**
Whole blood • Consists of all blood components • 450 – 500 mL/unit • Each unit raises the hemoglobin (Hgb) by 1 g/dL (about 3%)	Rare cases of blood loss from hemorrhage to rapidly restore blood volume	• Y-type IV set with 10-micron filter (unless 20- to 40-micron filter ordered) • Transfuse slowly, within 4 hours of initiation.
Red Blood Cells (RBCs) • Whole blood with 80% of plasma removed • 250 mL/unit	• Symptomatic anemia • Acute anemia due to trauma, acute or surgical blood loss, or chemotherapy • Chronic anemia related to cardiovascular decompensation	• Y-type IV set with 10-micron filter (unless a 20- to 40-micron filter is ordered) • Transfuse slowly, within 4 hours of initiation.
Leukocyte-reduced RBCs • RBCs with 95% of leukocytes removed • 200 mL/unit	Patients at risk for reactions caused by leukocyte antibodies with any of the following: • Symptomatic anemia • Immunocompromised • Acute anemia caused by trauma, surgical blood loss, or chemotherapy • Chronic anemia related to cardiovascular decompensation	• Straight-line or Y-type IV set • Infuse over 1½ to 4 hours. • Use 40-micron filter for hard-spun leukocyte-poor RBCs.
White blood cells (WBC) or Leukocytes	Sepsis unresponsive to antibiotics, if patient has blood cultures positive for sepsis or a persistent fever greater than 101° F with	• Straight-line IV set with standard blood filter

• Whole blood with all RBCs and 80% of plasma removed • 150 mL/unit	granulocytopenia (granulocyte count less than 500/μL)	
Platelets • Fragments of large bone marrow cells that help with clotting • 35 to 50 mL/unit	• Control or prevent bleeding due to decreased or malfunctioning platelets • Increase platelet count in patients who require an invasive procedure	• Drip set to infuse 100 mL over 15 minutes. • Avoid microaggregate filters. • Transfuse as quickly as tolerated, within 4 hours of initiation.
Fresh Frozen Plasma (FFP) • Noncellular portion of blood that is separated and frozen after donation; contains coagulation factors and proteins • 200 to 250 mL	• Temporarily reverses warfarin • Plasma exchange thrombotic thrombocytopenia • Factor deficiency (if concentrate is unavailable) • Treat abnormal coagulation prior to invasive procedures • Liver disease with protein synthetic defect • Dilutional coagulopathy • Consumptive coagulopathy	• Straight-line IV set to rapidly administer FFP • Transfuse over 30 to 60 minutes.
Albumin • Small plasma protein prepared by fractionating pooled plasma • **5%** (buffered saline) 12.5 g/250 mL • **25%** (salt-poor saline) 12.5 g/50 mL	• Replace volume lost due to shock from burns, trauma, surgery or infection • Prevent significant hemoconcentration • Treat hypoproteinemia (with or without edema)	• Straight-line IV set
Factor VIII • Insoluble portion of plasma recovered from FFP • 30 mL freeze-dried	• Treat hemophilia A (standard dose is 15 to 20 units/kg) • Control bleeding associated with factor VIII deficiency • Replace fibrinogen or deficient factor VIII	• IV set supplied by manufacturer • Administer with a filter.
Factors II, VII, IX and X complex	• Congenital factor V deficiency	• Straight-line IV set

• Lyophilized, commercially prepared solution drawn from pooled plasma • Prothrombin complex	• Disorders associated with an acquired lack of factors II, VII, IX, and X	
Cryoprecipitate Antihemophilic Factor • Portion of plasma rich in clotting factors • 15 – 20 mL/unit	• Prevent or control bleeding • Hemophilia (lack factor VIII) • Low levels fibrinogen, von Willebrand factor, factor XIII, and fibronectin	• Use a pyrogen-free transfusion set with correct filter. • Infuse immediately after thawing over 15 to 30 minutes.

Transfusion Tips (Lippincott Advisor, 2023)

- Informed consent should be obtained unless the transfusion is an emergency.
- Verify that the patient's religious beliefs don't conflict with blood transfusion therapy.
- Ensure patient has adequate intravenous (IV) access with 20 gauge (G) to 24G catheter. For rapid transfusion, a larger catheter (18G or 20G) should be inserted.
- Obtain baseline vital signs. If the patient's temperature is 99.5° or greater, notify the practitioner and ask if the transfusion should be postponed until the temperature is within normal limits.
- Perform physical assessment; note abnormal or adventitious lung sounds.
- Administer blood products within 30 minutes of its arrival from the blood bank. Don't store blood in a non-blood bank refrigerator. If there is a delay longer than 30 minutes, send the blood back to the blood bank for storage.
- Check the expiration date and assess for abnormal color, consistency, bubbles, or other materials. Return any expired or suspicious products to the blood bank.

  Consult your facility's policy regarding blood transfusion. Most institutions require two nurses or practitioners to identify the patient using two criteria and to double-check blood product compatibility before transfusion to prevent errors and a possible fatal transfusion reaction.

- Check the following:
  - Compare name and medical record number on the patient's identification band with the blood product container label.
  - Verify blood product label identification number, ABO blood group, and Rh compatibility.
  - Compare the patient's blood bank identification number with the number on the blood bag.
- Documentation may include name and volume of blood product, blood product ID number, date, and time of transfusion.
- Prior to WBC administration, premedicate the patient with diphenhydramine, as ordered.

- Prior to administration of factors II, VII, IX, and X complex, draw blood for a coagulation assay, as ordered.
- Administration sets should be sterile and pyrogen-free.
- Remember to prime the line with normal saline before and flush with normal saline after the transfusion. ***Only normal saline is compatible with blood products.***
    - Infusions containing calcium can cause clotting in the tubing.
    - Excess glucose causes hemolysis and shortens RBC life.
- Begin administration flow rate slowly, no more than 2 mL/minute for the first 15 minutes of the transfusion and observe closely for transfusion reaction (e.g., change in vital signs, facial color, and any patient complaints).
- If the patient develops a reaction to the blood product:
    - Immediately stop the transfusion.
    - Record the patient's vital signs.
    - Infuse normal saline through a new or different IV line at a keep-vein-open rate.
    - Notify the practitioner.
    - Save the blood product bag and return to the blood bank.
    - Send patient urine and blood samples to the laboratory.

See NursingCenter Pocket Card: Blood Type Compatibility and Transfusion Reactions

- If no sign of transfusion reaction within 15 minutes, increase flow rate as ordered (or per your facility's policy).
- Continue to monitor the patient every 30 minutes during the transfusion and check the IV insertion site for infiltration.
- Once the transfusion is complete, flush the administration set and IV with normal saline.
- Monitor the patient for signs of a delayed transfusion reaction for 4 to 6 hours after completion of the transfusion.
- Repeat lab tests as ordered:
    - Citric acid in FFP products bind to calcium. Large-volume FFP transfusion may cause hypocalcemia requiring calcium supplementation.
    - Factor VII has a half-life of 8 to 10 hours. Repeat transfusion may be needed at specific intervals to maintain levels.

The most recent guidelines recommend a restrictive approach for transfusion of red blood cells for stable patients with non-hemorrhaging anemia (Lotterman et al., 2023).

- Transfuse for a hemoglobin less than 7 g/dL in asymptomatic healthy patients
- Transfuse for a hemoglobin less than 8 g/dL in patients with coronary artery disease or those undergoing orthopedic surgeries.
- Transfusion of red blood cells in patients with active or acute bleeding and patients with symptoms related to anemia, including tachycardia, weakness, dyspnea on exertion, is indicated if hemoglobin is less than 8 g/dL (Lotterman et al., 2023).

- Unless the patient is actively bleeding, it is recommended to transfuse 1 unit of packed red cells at a time, which will typically increase the hemoglobin value by 1 g/dL and hematocrit by 3%.

Exceptions to the restrictive threshold for transfusion of red blood cells include (Carson et al., 2024):

- Symptomatic patients: Symptomatic anemia should be treated with transfusion in patients with hemoglobin less than 10 g/dL, regardless of the hemoglobin level, provided that the symptoms are severe enough and are clearly related to the anemia rather than the underlying condition.
- Acute MI: For patients with preexisting cardiac disease, it is recommended to use a restrictive transfusion threshold of 8 g/dL, with the caveat to consider using a liberal transfusion strategy depending on the overall clinical status of the patient, extent of cardiovascular disease, presence of cardiovascular symptoms, vital signs, and patient preferences.
- Massive transfusion: Threshold-based transfusion is not appropriate for patients requiring massive transfusion, such as with trauma or serious gastrointestinal bleeding. Estimated blood loss and hemodynamic status should guide the need for transfusion.
- Hemoglobinopathies: In sickle cell disease and thalassemia, and other chronic transfusion-dependent anemias such as myelodysplastic syndromes (MDS), transfusions help to maintain oxygen delivery, such as reducing the concentration of sickle hemoglobin, suppressing ineffective erythropoiesis, and improving quality of life.
- Other chronic anemias: Bone marrow failure can cause patient to become dependent upon RBC replacement and then cause iron overload. RBC transfusion in patients with acquired or congenital hemolytic anemia is more complex because transfusion also suppresses erythropoiesis.

Reference

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