Blanchard Valley Health System

Laboratory Services

Blanchard Valley Hospital
1900 South Main Street, Findlay, OH 45840

Bluffton Community Hospital
139 Garau Street, Bluffton, OH. 45817

BVHS Transfusion Guidelines 2026 (LTR59517)

Last Approved By: Michener, Holly (Blood Bank Coordinator) (09/03/2026)

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Attention: Printed copies MAY not be the most current information. Please consult the Lab QMS for the current version.

Blanchard Valley Health System Transfusion Guidelines

Clinical Laboratory Blood Bank

Purpose and Scope

The Blanchard Valley Health System Blood Utilization Review Committee establishes these guidelines to promote safe, effective, and evidence-based transfusion practices, while ensuring responsible use of blood products and related resources. These guidelines are intended to support, not replace, sound clinical judgment by qualified medical professionals.

Policy Statement

These criteria represent the standards approved by the Blood Utilization Review Committee and will serve as the basis for evaluating the appropriateness and quality of blood product use within the facility. All transfusions must be clearly documented in the patient's progress notes, including the clinical indication and rationale.

Feedback and Oversight

Recommendations or comments regarding these guidelines should be directed to a member of the Blood Utilization Review Committee for review and consideration.

Effective Date: August 3, 2026 **Review Date:**
Version: 1.0 **Owner:** Blood Utilization Review Committee **Review Cycle:** Every year or as needed

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1. Contact Information

- **Findlay Blood Bank Main:** 419-423-5325
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2. Specimen Requirements

- Use pink-top EDTA tube for ABO/Rh typing and antibody screen.
- Label with two independent patient identifiers (full name and DOB).
- Each specimen must have the green Blood Band ID label and a blue mechanical barrier lock code label.
- Include the date and time of draw and initials of the phlebotomist if not using a Cerner generated label.
- Sample must be collected within 72 hours if the patient has been transfused or pregnant within the past 3 months.
- BVHS has a policy that requires confirmation of all patient ABO/Rh types before issuing blood that could result in a fatal reaction due to ABO incompatibility. This confirmation must be performed on a sample collected from a different phlebotomy.
- Grossly hemolyzed or under filled specimens will be rejected.

Order Verification and Site Coordination:

- Verify that the order matches the patient's age and gender, and that it corresponds to the correct facility (e.g., Bluffton vs. BVH).
- Pre-operative specimens must be collected and entered under the patient's Outpatient Multiday FIN number.
- Surgical specimens collected more than 21 days prior to the scheduled procedure must be rejected and recollected.

Unlabeled or Mislabeled Specimens:

- Mislabeled specimens (e.g., missing armband info or incorrect identifiers) will be rejected without exception.
- A new specimen must be redrawn under proper labeling conditions.

⚠ 3. Emergency Release

Clinical Significance: Emergency release of uncrossmatched red cells may be necessary for actively bleeding patients requiring immediate transfusion before compatibility testing can be completed. These units are leukocyte-reduced but are not irradiated or necessarily CMV-seronegative.

The use of uncrossmatched packed red blood cells (PRBCs) in emergency situations is often necessary to prevent life-threatening delays in transfusion. However, this practice carries several potential complications. The most significant risk is an acute hemolytic transfusion reaction, which may occur if the patient has pre-existing alloantibodies that react with antigens present on the donor red cells. Delayed hemolytic transfusion reactions may also develop in previously sensitized patients with low-level antibodies not detected at the time of emergency transfusion. Additionally, transfusion of antigen-mismatched units can lead to alloimmunization, complicating future transfusions. Although group O PRBCs minimize the risk of ABO incompatibility, this risk is not eliminated entirely, particularly if blood group determination or labeling errors occur. Furthermore, the urgency of emergency release may lead to incomplete documentation or delays in switching to crossmatched or type-specific blood once available. To mitigate these risks, clear documentation of emergency release, prompt collection of a type and screen specimen, close monitoring for transfusion reactions, and timely transition to compatible, crossmatched blood are essential.

Indication:
Emergency release should be used in patients with life-threatening hemorrhage or hemodynamic instability when type and crossmatch results are not yet available.

Process:

- The attending physician (or designee) must authorize emergency blood release.
- If needed, two units of uncrossmatched, O negative PRBCs will be requested and immediately issued.
- These units are placed in the Blood Bank trauma refrigerator after ER staff is notified.
- Units will be issued using paper requisitions
- Upon receipt of the patient's blood sample, Blood Bank staff will promptly perform ABO/Rh typing to allow type-specific uncrossmatched blood if further transfusions are necessary.
- Once the antibody screen is completed, crossmatched, type-specific units will be issued.
- All emergency-issued units require physician signature to confirm understanding of risks.
- Unused emergency units will be retrieved by the Blood Bank post-trauma.

Documentation Requirements:

- A signed "Emergency Release Form" or equivalent documentation must accompany all units issued under emergency conditions.
- All documentation (e.g., paper requisitions) is maintained until computer crossmatch is complete.
- An emergency release log is maintained by the Blood Bank.

Specimen Handling:

- Blood Bank should obtain and process a type and screen sample as soon as possible.
- Specimen labeling must follow all standard protocols, even under emergency conditions.

Transition to Type-Specific Blood:

- If the antibody screen is negative, crossmatched units can be issued immediately using electronic or immediate spin methods.

Post-Event Actions:

- A review of all emergency releases will be included in monthly Blood Utilization Review Committee audits for quality assurance.

🚨 4. Massive Transfusion Protocol (MTP)

Clinical Significance:
In response to blood loss, the body prioritizes oxygen delivery to vital organs. Mild losses may

be tolerated, but loss of >30% of blood volume leads to cardiovascular compromise, and loss of ~50% may be fatal without rapid intervention. Early MTP activation supports timely hemostatic resuscitation.

Activation Criteria: Massive transfusion protocol (MTP) should be activated when there is ongoing or anticipated blood loss of ≥25% of total blood volume, or when ≥4 units of packed red blood cells are expected to be transfused within 4 hours. The protocol may also be initiated if a Blood Bank technologist observes a trend in high-volume transfusion orders and consults with the attending physician.

Initiation of MTP is intended to provide blood components rapidly and efficiently to patients requiring massive transfusion. It is appropriate in diverse clinical settings such as trauma, major surgery (e.g., cardiovascular, spinal, liver), gastrointestinal hemorrhage, or obstetric emergencies.

The attending physician, or a designee, must notify the Blood Bank immediately when initiating MTP. If not already initiated, the Blood Bank technologist may suggest activation to the clinical team if patterns of transfusion suggest impending need.

Initial Pack:
The first issued pack includes:

- 6 units of red blood cells (RBCs)
- 6 units of fresh frozen plasma (FFP)
- 1 apheresis platelet unit

Laboratory Monitoring:
Monitoring should be both clinical and laboratory-based. It is the sole responsibility of the attending physician to maintain proper blood volume and composition during an MTP event. Suggested parameters:

- Repeat H&H, PT/INR, PTT, fibrinogen, and ionized calcium after each transfusion cycle.
- Transfusion guidance:
    - PT >18 or INR >1.6: transfuse 2 FFP
    - Fibrinogen <150 mg/dL: transfuse 1 pooled cryo
    - Platelets <100,000/µL: transfuse 1 apheresis platelet
    - Ionized calcium <1.0 mmol/L: administer calcium chloride

If laboratory data cannot be obtained in a timely manner during MTP, a formulaic approach of 1 FFP unit to be transfused following every 1 unit of PRBCs, and 1 unit of an Apheresis platelet following every 6th unit of PRBCs; with that ratio inverted in liver transplants, is recommended.

Ongoing Management:
Subsequent transfusion packs should be requested based on bleeding, lab values, and clinical response. Continue close communication with the Blood Bank to coordinate timely product availability.

Complications: Massive transfusion can result in a number of significant complications, which may arise from the transfused components themselves or from the physiological effects of rapid blood loss and replacement:

- **Coagulopathy**: Often multifactorial—caused by dilution of clotting factors and platelets, consumption during bleeding (e.g., DIC), and hypothermia. It should be addressed with appropriate component therapy and coagulation monitoring.
- **Hypocalcemia**: Citrate in transfused blood binds calcium, which can lead to symptoms such as paresthesia, nausea, muscle twitching, and depressed cardiac function. Monitor ionized calcium closely and administer calcium chloride or gluconate when needed.
- **Hypothermia**: Cold-stored blood products may lead to decreased body temperature, impairing coagulation and cardiac function. Use warming devices as appropriate.
- **Hyperkalemia**: Stored RBCs may accumulate potassium, and rapid transfusion may lead to transient or clinically significant elevations in serum potassium.
- **Metabolic Alkalosis or Acidosis**: Due to the metabolism of citrate and lactate present in stored blood products.
- **Decreased Oxygen Delivery**: RBCs stored for prolonged periods may have reduced 2,3-DPG levels, which can impair tissue oxygen unloading.

Close clinical and laboratory monitoring of coagulation status, electrolytes, temperature, and perfusion is essential to minimize risks during massive transfusion.

Termination Criteria:
The attending physician must notify the Blood Bank when MTP is no longer needed. Blood Bank staff will regularly check whether to continue. Unused products may be returned if proper temperatures were maintained:

- PRBCs/FFP: 1–10°C
- Platelets/Cryo: 20–24°C

Document termination in EMR using the MTP AdHoc and PowerForm Tracking tools.

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5. General Considerations for All Blood Components

Informed Consent:

- Informed consent must be obtained and documented by the ordering provider before initiating any non-emergent transfusion.
- The consent discussion should include:
    - The reason for transfusion
    - Expected benefits and potential risks (e.g., infection, hemolytic reactions, alloimmunization)
    - Available alternatives (e.g., iron therapy, erythropoietin)
    - The opportunity for the patient or their representative to ask questions
- Documentation of consent must be present in the medical record and is generally valid for the duration of hospitalization or a defined course of treatment.
- In emergency situations, transfusions may proceed without consent, but the provider must document the clinical rationale and circumstances justifying the omission.

Patient Monitoring:

- Obtain and document vital signs before transfusion, 15 minutes after starting, and at least hourly during transfusion.
- Observe closely for the first 15 minutes—most acute transfusion reactions occur during this window.
- Monitor patients for at least 1 hour post-transfusion, or as per institutional policy.

Infusion Practices:

- Transfuse blood components through a filter meeting AABB standards (typically 170–260 micron pore size).
- Avoid using the same IV line for medications unless confirmed compatible with the blood component.

Expiration & Administration Windows:

- Blood components should be transfused within **4 hours** of issue or removal from controlled storage.
- Platelets should be transfused **immediately after issue** and not stored on nursing units.

Medication Compatibility:

- Do not add medications to or infuse them through the same line as blood components unless verified compatible.
- Avoid calcium-containing solutions (e.g., Ringer's lactate) in the same line—they may cause clotting.

Patient Education:

- Inform the patient about possible signs of transfusion reaction: fever, chills, rash, shortness of breath, or back/flank pain.
- Instruct patients to alert staff immediately if symptoms occur.

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6. Component-Specific Guidance

A. Red Blood Cells (RBCs)

Description: Red blood cells are collected from whole blood or via apheresis and leukocyte-reduced before storage. Each unit has an approximate volume of 250 mL and is expected to raise hemoglobin by ~1 g/dL and hematocrit by ~3%. Whole blood is not available. Specialized products include irradiated, washed, and phenotype-matched RBCs, which may be ordered depending on patient-specific needs.

Special Orders: Washed, irradiated, phenotype-matched PRBCs for specific conditions.

Evidence-Based Transfusion Thresholds:

- In stable, non-bleeding adult patients, use a restrictive threshold of **Hgb <7 g/dL**.
- In patients with pre-existing cardiovascular disease, consider transfusion at **Hgb <8 g/dL**, or based on signs/symptoms of inadequate oxygenation.
- Always assess for symptoms (dyspnea, orthostasis, angina, hypotension) even if Hgb >7 g/dL.

Indications:

- **General**: Rarely indicated if Hgb >10 g/dL; almost always if Hgb <6 g/dL.
- **Stable patients**: Transfuse 1 unit at a time; reassess after.
- **Actively Bleeding**:
    - Ongoing loss >25% blood volume
    - Hgb <8 g/dL with ischemia, hypoxia, or instability
    - GI bleed with Hgb <7 g/dL
- **Non-Bleeding**:
    - Pre-op Hgb <7 g/dL
    - Cardiac: Hgb <7 with stable disease, <8 with ischemia
    - Oncology: Hgb <7 during chemo; <8 if transfusion-dependent
    - Neuro: Hgb <8 for TBI or intracranial hypertension

B. Platelets

Description: Only apheresis platelets are available from the Blood Bank. Each unit (~250–300 mL) contains >3 x 10^{11} platelets and is leukocyte reduced. One apheresis unit is equivalent to a "6-pack" of pooled random donor platelets and constitutes a standard adult dose, typically increasing platelet count by 30,000–60,000/µL. Platelets are our most limited blood resource and carry the highest risk of transfusion-transmitted infections.

In Rh-negative females up to age 50, receiving Rh-positive platelets may require Rh immune globulin (RhIg); a single dose (300 µg or 1500 IU) covers up to 7 units over a 3-week period.

Indications:

- Platelets ≤10K for non-surgery patients
- ≤50K for procedures or active bleeding
- Neurologic/ophthalmologic: ~100K threshold
- Bleeding with platelet dysfunction (e.g., meds)
- Not generally for ITP, TTP, or HIT unless life-threatening bleeding

C. Fresh Frozen Plasma (FFP)

Description: Plasma is collected from whole blood or apheresis and frozen at either ≤8 hours (FFP) or ≤24 hours (FP24). Typical volume per unit is 200–250 mL. Both forms are used interchangeably and provide clinically sufficient levels of coagulation factors. A dose of 10–20 mL/kg (3–6 units in adults) raises coagulation factor levels by ~20%. Please be aware that Plasma requires 20-30 minutes to thaw.

Indications:

- PT >1.5x normal or PTT >1.5x normal with bleeding risk
- Active bleeding due to multiple factor deficiencies
- TTP/HUS (plasma exchange)
- Urgent warfarin reversal with Vitamin K
- Rare protein deficiencies (e.g., C1-inhibitor)

D. Cryoprecipitate

Description: Cryoprecipitate is derived from thawed FFP and consists of concentrated plasma proteins including fibrinogen, Factor VIII, von Willebrand factor, Factor XIII, and fibronectin. Each unit has a volume of 10–20 mL and contains ≥150 mg fibrinogen and ≥80 IU Factor VIII. Five-unit pools are standard for adult use. One unit per 10 kg body weight typically increases fibrinogen by ~50 mg/dL.

Indications:

- Fibrinogen <100 mg/dL or Factor XIII deficiency with bleeding
- Fibrin sealant use
- 2nd-line therapy for vWD or Hemophilia A

Dosing Formula:

Cryoprecipitate dosing for fibrinogen replacement = ($fibrinogen_{desired}$ (mg/dL) – $fibrinogen_{current}$(mg/dL)) x plasma volume x (1.0 dL/ 100 mL) x (1 unit cryoprecipitate / 150 mg)

Plasma volume = weight (kg) x 70 mL/kg x (1.0-hematocrit)

6A. Pediatric Transfusion Guidelines

A. Red Blood Cells (PRBCs)

Description: See adult section 6A. O negative, Irradiated, and CMV-seronegative units prioritized for neonates and infants. Leukoreduction is standard and also reduces CMV risk. To minimize donor exposures, aliquots should be requested from single units (e.g., quint packs) when possible.

Product Augmentation: Same as adult PRBC modifications.

Clinical Considerations for Physicians and Nurses:

- Provide the exact transfusion volume in mL for neonatal or infant patients.
- Transfuse through a blood filter as outlined in the neonatal transfusion protocol.
- Monitor vitals frequently, especially in preterm or unstable neonates.
- Hemoglobin S-negative units should be requested for infants at risk for sickling complications.

Evidence-Based Pediatric Transfusion Thresholds:

- Use **Hgb <7 g/dL** for stable, non-bleeding critically ill neonates and children.
- For post-op or chronic anemias, transfusion should be guided by clinical signs of inadequate oxygen delivery rather than fixed thresholds.

Indications – Children & Adolescents:

- 5–10 mL/kg increases Hgb 2–4 g/dL
- Blood loss ≥25% of blood volume
- Hct <24% (periop/critical care or bone marrow failure)

- Hct <30% with cardiorespiratory disease or chronic symptomatic anemia

B. Platelets

Description: See adult section 6B; typical dose 10 mL/kg. Use single donor, psoralen-treated platelets when possible. ABO compatibility is preferred, but not always required in infants. CMV-seronegative preferred for neonates.

Clinical Considerations for Physicians and Nurses:

- Provide clear volume requests in mL/kg for neonates.
- Use single donor platelets to reduce donor exposure.
- Transfuse with a blood filter.
- Monitor for volume overload, particularly in neonates and infants with cardiac or renal compromise.

Indications – Neonates & Infants:

- Platelets ≤10K with hypoproliferative thrombocytopenia
- <50K with bleeding or procedures
- <100K with bleeding/DIC/coagulopathy
- Bleeding with platelet dysfunction
- Cardiac surgery with microvascular bleeding
- Not indicated for ITP/TTP/HIT unless life-threatening bleeding

C. Frozen Plasma (FP/FFP)

Description: See adult section 6C. AB plasma is preferred; CMV-negative products used if available.

Clinical Considerations for Physicians and Nurses:

- Transfuse using appropriate pediatric volumes based on body weight (10–20 mL/kg typical).
- Monitor for signs of volume overload and allergic reactions.
- Ensure blood type compatibility, especially in neonates and infants under 4 months.
- Use in line with clinical signs and coagulation lab values.

Indications:

- Rapid warfarin reversal with Vitamin K (if needed)
- Bleeding with multiple factor deficiencies or no concentrate available
- TTP/HUS (plasma exchange)

- Massive transfusion
- Rare deficiencies (e.g., C1-inhibitor)

D. Cryoprecipitate

Description: See adult section 6D. Contains concentrated fibrinogen, Factor VIII, vWF, Factor XIII, and fibronectin. Administer based on patient weight and clinical indication.

Clinical Considerations for Physicians and Nurses:

- Dose typically based on 1 unit per 10 kg body weight.
- Thawing and pooling takes approximately 30 minutes; plan accordingly in urgent settings.
- Transfuse through a filter; monitor for allergic reactions and volume status.
- Cryoprecipitate is often underutilized in pediatrics—consider for hypofibrinogenemia or bleeding.

Indications:

- Hypo/dysfibrinogenemia with bleeding or prior to invasive procedures
- Factor XIII deficiency
- Use as fibrin sealant
- 2nd-line for vWD or Hemophilia A (preferred: specific concentrates)

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7. Special Products

A. CMV-Seronegative Products

Description: Profoundly immunosuppressed patients are at increased risk for transfusion-transmitted cytomegalovirus (TT-CMV) infection. This risk can be mitigated by using either CMV-seronegative blood products or leukocyte-reduced components. All blood products at Blanchard Valley Hospital are prestorage leukocyte-reduced using standardized filtration, which significantly reduces TT-CMV risk. Evidence supports the use of these prestorage leukoreduced products as a suitable alternative to CMV-seronegative units in most situations.

CMV is a cell-associated virus and is not present in acellular products; therefore, frozen components such as cryoprecipitate and fresh frozen plasma do not pose a TT-CMV risk. CMV is also inactivated through pathogen reduction, making psoralen-treated platelets functionally equivalent to CMV-seronegative platelets.

Due to the limited availability of CMV-seronegative products—fewer than 50% of donors qualify—their use is restricted to high-risk patients. Decisions should be guided by the CMV antibody status of the patient and, when relevant, the donor (e.g., in transplantation).

Indications:

- Neonates, especially premature infants
- Intrauterine transfusion recipients
- Bone marrow or stem cell transplant recipients
- Immunocompromised patients (e.g., congenital immunodeficiency, certain oncology cases)

B. Irradiated Products

Description: Cellular blood components (RBCs, platelets) are exposed to gamma or X-ray radiation to inactivate donor T-lymphocytes. Graft-versus-host disease (GVHD) may occur whenever immunologically competent allogeneic lymphocytes are transfused into a severely immunocompromised recipient. Prophylactic irradiation of blood products inhibits lymphocyte proliferation and is the most effective way to prevent post-transfusion GVHD. Irradiation does not prevent transmission of viruses.

T-lymphocytes are also inactivated by the pathogen reduction process. Therefore, psoralen-treated platelets are equivalent to irradiated platelets. (See Platelets section for details.)

Indications:

- Intrauterine transfusions
- Infants < 4 months of age
- Neonates and pediatric patients undergoing exchange transfusions
- Infants < 1 year undergoing ECMO/ECLS
- Infants < 2 years undergoing (or listed for) heart transplant
- Pediatric hematology or oncology patients (all)
- Adult hematology or oncology patients (all)
- Patients with any of the following:
    - Cellular immunodeficiency syndromes (e.g., SCIDS, Wiskott-Aldrich, DiGeorge syndrome)
    - Aplastic anemia
    - Stem cell transplantation
    - Fludarabine, cladribine, bendamustine, clofarabine, or deoxycoformycin (pentostatin) therapy
    - Alemtuzumab (Campath, Lemtrada) therapy
- Bone marrow or HPC donor receiving allogeneic blood products

Not Routinely Indicated For:

- Solid organ transplant recipients on standard immunosuppressive therapy
- HIV/AIDS patients

If an order falls outside these guidelines, the provider must seek approval through consultation with the Medical Director.

Duration: Continue irradiation for the duration of the patient's immunocompromised status or per clinical discretion.

C. Washed Red Blood Cells

Description: RBCs are washed with sterile saline to remove >95% of plasma proteins. Not available STAT. Preparation reduces RBC count and shortens expiration to 24 hours.

Indications:

- Severe, recurrent allergic transfusion reactions despite premedication
- IgA deficiency with documented anti-IgA antibodies (when IgA-deficient products unavailable)
- Neonates with history of repeated reactions

D. Volume-Reduced Platelets

Description: Apheresis platelets centrifuged to reduce plasma volume, typically to ≤100 mL.

Indications:

- Patients at risk for transfusion-associated circulatory overload (TACO), particularly those with cardiac or renal compromise
- Patients with plasma sensitivity or severe allergic reactions to plasma proteins
- When reduced plasma volume is preferred due to volume restriction
- Should be used promptly after preparation due to reduced shelf-life (often ≤4 hours post-preparation)

E. Phenotype-Matched Red Blood Cells

Description: RBCs that are serologically matched for extended antigens beyond ABO/Rh (e.g., Kell, Duffy, Kidd).

Indications:

- Patients with multiple alloantibodies
- Sickle cell disease, thalassemia, or myelodysplastic syndromes with chronic transfusion needs
- Prior transfusion reactions or high risk for alloimmunization

Process:

- Requires coordination with Blood Bank and sometimes outside blood suppliers
- May delay availability of units

F. HLA-Matched Platelets

Description: Platelets selected for compatibility with a patient's human leukocyte antigen (HLA) type. These are used in patients who demonstrate refractoriness to standard platelet transfusions. Refractoriness can result from both immune-mediated mechanisms—such as HLA alloantibodies, platelet-specific antibodies, or autoimmune thrombocytopenia—and non-immune causes including infection, fever, active bleeding, splenomegaly, DIC, post-HSCT, hepatic VOD, and GVHD.

Indications:

- Documented platelet refractoriness with poor post-transfusion increments
- Confirmed HLA alloimmunization
- Hematology-oncology or transplant patients who require closely matched support
- Patients with multiple alloantibodies
- Sickle cell disease, thalassemia, or myelodysplastic syndromes with chronic transfusion needs
- Prior transfusion reactions or high risk for alloimmunization

Process:

1. Indicated for patients with platelet refractoriness due to alloimmunization.
2. Requires HLA typing of the patient.
3. Donors must be HLA-matched, identified through a registry or specialized donor list.
4. Advance coordination with the Blood Bank and, when necessary, external suppliers is essential due to limited availability and longer preparation times.
5. Unit availability may be delayed.

Dosing Formula:

Corrected Count Increment (CCI) Formula

$$CCI = \frac{(\text{Post-transfusion count} - \text{Pre-transfusion count [/µL]}) \times \text{BSA } (m^2)}{\text{Number of platelets transfused } (\times 10^{11})}$$

G. Packed Cells with Albumin/Colloids/Crystalloids Volume Expander

Description: In some clinical scenarios, PRBCs may be administered in conjunction with volume expanders when the primary objective is to correct hypovolemia and restore oxygen-carrying capacity, rather than address coagulopathy or thrombocytopenia. Volume expanders include:

- **Albumin**: A natural colloid that maintains colloid osmotic pressure, helping draw fluid into the vascular space.
- **Colloids**: Large-molecule solutions (e.g., starches, dextrans) that stay intravascular longer than crystalloids and help sustain volume.
- **Crystalloids**: Electrolyte-containing solutions (e.g., saline, lactated Ringer's) that rapidly equilibrate throughout the extracellular compartment.

These adjuncts are chosen based on the clinical picture, hemodynamic status, and risk factors. Caution should be taken to avoid volume overload, electrolyte imbalances, and allergic reactions.

Indications:

- Hypovolemia due to acute blood loss with:
  - Systolic BP <90 mmHg or ≥20–30% drop from baseline
  - HR 100–120 bpm with confirmed blood loss
  - Hgb <7 g/dL with hemorrhagic shock or ventilatory support
  - Estimated acute blood loss >750 mL or >15% of total blood volume, unresponsive to crystalloids alone

Process:

- Confirm patient meets criteria for acute blood loss and volume depletion.
- Select appropriate volume expander based on clinical goals.
- Coordinate administration with PRBC transfusion while monitoring hemodynamic status and potential side effects.

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8. Orders and Workflow

- All orders through EMR. Routine: ≤4 hrs; STAT: ≤1 hr.
- Label specimens at bedside.
- Notify lab if urgent or massive transfusion expected.

9. Transfusion Reaction Management

Policy: Any adverse reaction during or after transfusion of blood products (RBCs, FFP, Cryo, or platelets) must be treated as a suspected transfusion reaction. The transfusion must be stopped immediately, and the Blood Bank notified without delay. Workups must be initiated promptly and conducted to the extent deemed necessary by the pathologist.

The Blood Bank will initiate specimen collection and perform a full workup, including visual hemolysis checks, DAT, ABO/Rh retyping, and if indicated, extended testing and cultures. Abnormal results are escalated to the pathologist. Final diagnosis and documentation will be entered in the EMR.

Purpose: To determine whether a transfusion reaction has occurred, differentiate between between non-hemolytic reactions and potentially life-threatening hemolytic reactions, and implement appropriate laboratory and clinical response measures.

Nursing Procedure:

1. Stop the transfusion immediately; maintain IV access with normal saline.
2. Record patient vital signs.
3. Notify the ordering physician for further instructions.
4. It is the ordering physician's judgment and authority to call for a transfusion reaction investigation workup.
5. Contact the Blood Bank.
6. Collect a first voided urine specimen if RBCs were transfused.
7. In the EMR (Bridge), mark "Yes" to transfusion reaction—this will alert the Blood Bank.
8. Order the "Transfusion Reaction Workup" in Cerner.
9. Send to Blood Bank:
    - Remaining blood product and tubing
    - Urine specimen (if RBC transfusion)
    - Mechanical barrier lock and armband

Classification of Transfusion Reactions:

Non-Hemolytic Reactions:

- **Allergic Reaction**: Typically caused by recipient sensitivity to plasma proteins. Presents with hives, pruritus, flushing, or rash. Manage with antihistamines; consider washed products for future transfusions if reactions recur. Severe reactions may include anaphylaxis, requiring epinephrine, steroids, and airway management.

- **Febrile Non-Hemolytic Reaction (FNHTR)**: Caused by recipient antibodies reacting with donor leukocytes or cytokines. Symptoms include fever ≥1°C above baseline, chills, and rigors. Manage by stopping transfusion, administering antipyretics, and notifying the Blood Bank. May pre-medicate in future transfusions.
- **TACO (Transfusion-Associated Circulatory Overload)**: Results from excessive volume or rapid transfusion. Presents with dyspnea, elevated blood pressure, jugular venous distension, and pulmonary edema. Treated with diuretics, oxygen, and transfusion rate adjustment. Consider premedication or volume-reduced products in high-risk patients.
- **Cold Blood Reaction**: Occurs when large volumes of refrigerated blood are transfused too rapidly. Can cause chills, hypotension, or arrhythmia. Prevented by warming blood prior to or during transfusion in susceptible patients.
- **Bacterial Contamination**: Most commonly from platelets. Symptoms include acute fever, hypotension, chills, and shock. Requires immediate cessation of transfusion, broad-spectrum antibiotics, and sepsis workup. Return blood bag to lab for culture and initiate transfusion reaction workup.

Hemolytic Reactions:

Hemolytic transfusion reactions may be acute or delayed and are among the most severe transfusion-related complications. They often result from clerical errors or incompatible transfusions. Acute hemolytic reactions usually involve intravascular destruction of red cells—commonly from ABO incompatibility—and can occur after small volumes are transfused. Symptoms include fever, headache, chest or back pain, dyspnea, vomiting, and potentially shock. Hemoglobinuria may be noted due to hemoglobinemia.

Intravascular hemolysis leads to immediate red cell destruction with detectable free hemoglobin in plasma or urine. Extravascular hemolysis—associated with antibodies like Rh, Kell, Kidd, and Duffy—is typically slower and less severe, occurring in the spleen or liver. This may present after multiple units and is characterized more often by jaundice or elevated bilirubin than hemoglobinuria.

All suspected hemolytic reactions require immediate workup including clerical checks, visual plasma inspection, repeat ABO/Rh typing, DAT, antibody screen, bilirubin, haptiglobin, and LDH testing.

TRALI (Transfusion-Related Acute Lung Injury):

TRALI is a potentially life-threatening reaction, most commonly caused by passive transfer of donor HLA or neutrophil antibodies that activate recipient neutrophils in the pulmonary microvasculature. This results in acute, non-cardiogenic pulmonary edema.

Symptoms typically appear within 1–6 hours of transfusion (often within 1–2 hours) and include acute respiratory distress, hypoxemia, bilateral infiltrates on chest X-ray, and no evidence of

circulatory overload. Diagnosis requires exclusion of other causes like TACO, volume overload, and hemolytic reactions. Donor testing for HLA/neutrophil antibodies may be indicated.

If TRALI is suspected, a full transfusion reaction workup is required. The Red Cross should be notified, and a formal case report submitted to support donor investigation.

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10. Blood Handling & Returns

- When picking up units ensure that a Request for Product Pick Up was placed into Cerner before attempting to pick up units.
- Transfuse or return RBCs within 30 minutes.
- Store only in approved Blood Bank refrigerators.
- Return if temperature not exceeded 10°C.

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11. Quality Assurance & Review

- Monthly review: utilization, wastage, reaction rates.
- Staff competency assessed annually.
- CAP and AABB compliance audits conducted.

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12. Definitions and Abbreviations

ABO – A system of blood typing based on the presence or absence of A and B antigens on red blood cells.

AABB – Association for the Advancement of Blood & Biotherapies.

Alloimmunization – Development of antibodies against foreign antigens, typically following transfusion or pregnancy.

Antibody Screen – A test used to detect unexpected antibodies in the patient's plasma that may react with transfused blood.

Autologous Transfusion – A transfusion in which the donor and recipient are the same person.

CMV – Cytomegalovirus, a virus that can be transmitted via white blood cells in transfused blood.

Cryoprecipitate (Cryo) – A blood product rich in fibrinogen, factor VIII, vWF, and factor XIII, derived from thawed frozen plasma.

DAT (Direct Antiglobulin Test) – A test used to detect antibodies or complement bound to red blood cells.

FFP (Fresh Frozen Plasma) – Plasma frozen within 8 hours of collection, used to treat coagulation factor deficiencies.

GVHD (Graft-versus-Host Disease) – A rare but serious condition in which transfused lymphocytes attack the recipient's tissues.

HIT (Heparin-Induced Thrombocytopenia) – A condition in which heparin therapy induces a drop in platelets and increased thrombosis risk.

HLA (Human Leukocyte Antigen) – Proteins involved in immune recognition; used in matching donors for organ, stem cell, and platelet transfusion.

MTP (Massive Transfusion Protocol) – A standardized approach for rapidly providing large quantities of blood products in major hemorrhage.

PRBCs (Packed Red Blood Cells) – Concentrated red cells used to treat anemia or blood loss.

Rh – A blood group system involving the D antigen; important for transfusion compatibility.

TACO – Transfusion-associated circulatory overload, a non-immune complication due to volume overload.

TRALI – Transfusion-related acute lung injury, a serious non-cardiogenic pulmonary reaction.

T&S (Type and Screen) – ABO/Rh typing and antibody screening test used to prepare for possible transfusion.

Washed RBCs – Red blood cells washed with saline to remove plasma proteins and reduce allergic reactions.

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13. References & Supporting Guidelines

- Circular of Information for the Use of Human Blood and Blood Components. AABB, American Red Cross, America's Blood Centers, and the Armed Services Blood Program. Revised June 2024.

- AABB International Clinical Practice Guidelines on Red Blood Cell Transfusion: 2023 Update. JAMA. 2023;330(23):2253–2265.
- AABB Technical Manual, 21st Ed.
- Practice Guidelines for Blood Transfusion (ARC, 2007)
- UpToDate: Indications and Hemoglobin Thresholds (2014)
- Carson JL et al., Ann Intern Med (2014)
- UCSF Transfusion Medicine Guide

Blanchard Valley Hospital – Transfusion Threshold Summary Tables

Red Blood Cells

Clinical Setting	Threshold	Notes
Stable, non-bleeding adult	Hgb <7 g/dL	Restrictive strategy recommended; reassess after 1 unit
Cardiovascular disease	Hgb <8 g/dL	Consider symptoms like chest pain or hypotension
Actively bleeding	Clinical judgment	Based on hemodynamics and extent of loss
GI bleed	Hgb <7 g/dL	Transfuse based on clinical stability
Neuro/oncology/post-op	Hgb <8 g/dL	Consider signs of hypoxia or cardiorespiratory demand

Platelets

Clinical Setting	Threshold	Notes
Stable patient (prophylactic)	<10,000/µL	Routine threshold for hypoproliferative thrombocytopenia
Invasive procedure or active bleeding	<50,000/µL	Minor surgery, line placement, lumbar puncture
Neurosurgery/Ophthalmology	<100,000/µL	Maintain higher count due to critical location
Platelet dysfunction with bleeding	Any count	Includes inherited or drug-induced dysfunction
TTP/HIT	Avoid transfusion	Only if life-threatening bleeding

Fresh Frozen Plasma (FFP)

Clinical Setting	Threshold	Notes
Coagulopathy with bleeding	INR >1.6 or PT >18s	Common in trauma, DIC, liver disease
Warfarin reversal (urgent)	Elevated INR with bleeding	Give with IV/PO Vitamin K
TTP/HUS	Plasma exchange	Use plasma as exchange fluid
Single factor deficiency	Lab-confirmed; no concentrate	Treat if specific factor unavailable

Cryoprecipitate

Clinical Setting	Threshold	Notes
Active bleeding	Fibrinogen <100 mg/dL	Administer pooled cryo
Factor XIII deficiency	Confirmed diagnosis	Use when no specific concentrate is available
Invasive procedure	<150 mg/dL	Especially in liver disease or DIC
Fibrin sealant	Clinical discretion	Used topically in surgical settings