Institutional Handbook of Operating Procedures Policy 09.13.29	
Section: Clinical	Responsible Vice President: EVP & CEO Health System
Subject: General Clinical Procedures and Care	Responsible Entity: Nursing Services

I. Title

Transfusion of Blood Components

II. Policy

A. An informed patient consent for blood component(s) transfusion must be obtained prior to a transfusion (Form #6549).

1. A new consent must be obtained for each admission for inpatients.
2. A new consent must be obtained at least once every 12 months for outpatients.
3. For emergent situations, follow IHOP - 09.03.17 - Consent - Overview and Basic Requirements.

B. A physician order for transfusion must be present in the medical record.

C. Compatibility samples must be drawn prior to transfusion. Compatibility testing is to be repeated every 3 days, as indicated. The type and screen sample expires at midnight on the 3rd day after it was drawn. EXCEPTION for infants: A type and screen is valid for a neonate until discharge or until they reach 4 months of age. At 4 months of age, compatibility testing must be repeated every 3 days as indicated.

D. Only a Registered Nurse (RN) or a Licensed Independent Practitioner (LIP) may initiate the administration of blood components.

E. Patient transport while blood component is infusing should be avoided unless absolutely necessary. If transport is necessary, the patient must remain under the observation of an RN or LIP. It is critical to notify the Blood Bank of the patient's new location if additional blood components are ordered.

F. For ECMO patients, the perfusionist or specially trained respiratory care practitioners may initiate and administer blood components.

G. Uncrossmatched units of Group O red blood cells may be given only in life-threatening emergency situations when ordered as medically necessary by a licensed physician. The ordering physician must sign an Emergency Release of Blood Products waiver. A waiver may be found on the Blood Bank Division Primary Request form (Form BB10). A pre-transfusion sample for compatibility testing should be obtained prior to the initiation of the uncrossmatched transfusion. Send this specimen to the Blood Bank as soon as possible.

H. If Rh positive blood has been transfused to an Rh negative female of childbearing potential (<55 years of age), the Blood Bank physician will advise the patient's physician about the treatment

options, including possible administration of an appropriate dose of Rh immune globulin within 72 hours of transfusion.

III. Procedure: Pre-Transfusion

A. Compatibility Testing

1. Blood sample(s) for compatibility testing may only be collected by RNs or LIPs. Exceptions may be made in special circumstances with prior approval of the Blood Bank Medical Director.
2. Samples should be drawn in lavender top EDTA tubes and labeled with the patient's identifiers matching their attached armband. Any accompanying paper order must be also compared to the armband and sample label to ensure matching name and MRN. Labeling should be completed at the bedside immediately following collection. Infants less than 4 months of age: submit two EDTA microtubes to provide a total sample of at least 1 mL.
   a) **Blood Bank specimen tube label must include:**
      (1) Patient's full name (first and last)
      (2) Patient's medical record number
   b) **The Blood Bank request form must include:**
      (1) Patient's full name (first and last)
      (2) Patient's medical record number
      (3) Date/ time of collection and signature (initials) of the person collecting the specimen must be provided either on the specimen label or on the Blood Bank request form.

   EPIC Beaker labels will not be accepted for Blood Bank testing.

3. For any patient that does not have a historical blood type on file in the Blood Bank, an ABORh confirmation sample will be required. The Blood Bank will immediately notify the patient's nurse when a confirmation sample is required and provide a pink top EDTA tube for the second sample. The second sample must be drawn at a different time than the initial type and screen sample. The same specimen labeling requirements apply for confirmation samples. Exception: neonates less than 4 months of age will receive only O negative packed red blood cells and AB plasma. No second sample is required.

B. Dispensing Process

1. Blood component(s) must not be picked up from Blood Bank until consent for administration has been verified and the RN or LIP is ready to start the transfusion (except when issued in a Blood Bank cooler). Pre-transfusion vital signs should be taken before picking up blood components within 30 minutes before the start of the transfusion (see assessment and monitoring below).

2. Each transporter may only pick up blood product for one patient at a time.

3. The transporter must be an on-duty UTMB employee and display badge at all times.

4. The dispense request form will be submitted in person to the Blood Bank with the following information:
   a) Patient's full name (first and last)
   b) Patient's medical record number
   c) RN or LIP signature (if using downtime dispensing sheet)
   d) Blood Component(s) to be dispensed
   e) Transporter's name

f) Transporter's employee ID number

5. Once dispensed, blood component(s) must be immediately transported directly to the RN or LIP requesting the component for transfusion. If the blood is not in a cooler and the transfusion cannot be initiated immediately, return the component(s) to the Blood Bank.

C. **Verification process**

1. Prior to transfusion, confirm the presence of an order to transfuse. Also confirm a consent for blood component(s) administration has been duly signed and witnessed.

2. Prior to transfusion, verify the component(s) ordered and any special processing needs for the component(s). Example: irradiated or leukocyte reduced. Neonates and infants under 12 months of age will receive leukocyte reduced (same as CMV-safe) and irradiated cellular blood components. Psoralen treatment or gamma irradiation are both acceptable methods to prevent transfusion associated graft versus host disease (TA-GVHD). A psoralen-treated platelet may be administered when an irradiated platelet is ordered.

3. A bedside or chairside verification process will be conducted by 2 individuals (RNs and/or LIPS) who will be responsible for administering the blood component(s) to the patient.

4. During the 2 person bedside/chairside verification process, the following will be confirmed:
   a) The patient identifiers on the transfusion tag attached to the blood component match the patient identifiers on the armband attached to the patient:
      (1) Patient's full name (first and last)
      (2) Patient's MRN

      The patient should participate in identification if possible.
   b) The information on the transfusion tag attached to the blood component matches the blood component(s) label:
      (1) type of blood component: packed red blood cells, platelets, plasma, cryoprecipitate
      (2) donor unit ID#
      (3) expiration date and time of blood component(s)
   c) The blood component to be transfused is compatible with the patient's blood type. Refer to Transfusion Service Compatibility Chart (See Appendix A).
   d) The interpretation of crossmatch tests, if applicable.
   e) The dual sign-off is completed:
      (1) in the EPIC Blood Product Administration Module or
      (2) using the downtime workflow if needed.
         i. Both sign, date, and time the Blood Transfusion Record Tag.
         ii. This tag should then be placed in the patient's medical record once the transfusion is finished and all documentation is complete. If the downtime workflow is not used, the tag may be discarded in the blue bin for patient protected information. The tag may be discarded in the red biohazard bag along with the unit if in the OR.

5. Unit tag is to remain attached to the unit until transfusion is complete.

*NOTE: If there is any doubt in verification process, do not administer the blood component(s) and notify the Blood Bank immediately.

IV. Procedure - Blood component(s) administration

A. Initiate the transfusion

1. Blood components should be transfused without delay upon arrival to unit (except when issued in a Blood Bank cooler).

2. Acceptable administration routes:
   a) Adult and pediatric: Blood component(s) will be administered intravenously (unless otherwise specified by provider order) through a 14 to 24 gauge lumen.
   b) Neonatal: Peripheral IV with a 22 or 24 gauge lumen is an acceptable route of administration. For non-exchange transfusions, umbilical artery catheter (UAC) is for packed red blood cells only. The umbilical venous catheter (UVC) – second port, may be used with faculty physician order. The second port of the UVC can be used for cryoprecipitate, plasma, platelets and packed red blood cells. Peripherally Inserted Central Catheter (PICC) lines are <u>never</u> to be used for blood component transfusion in neonates.

3. All components will be transfused through a standard Y-type blood administration set with a 170-260 micron filter. Exception: blood syringes have been pre-filtered with a 150 micron filter in the Blood Bank so no additional filtration is needed. Neonates only: Use Baxter extension tubing (34") volume 3.9 mL (larger than microbore tubing) for administration.

4. The blood administration set can be used for up to 4 units or no more than 4 hours whichever occurs first. Exception: With blood supplied in a syringe from the blood bank, a new tubing set is used with each syringe.

5. Only 0.9% NaCl or Plasmalyte should be used for priming and administering blood component(s). Lactated Ringers Solution should never be used for blood administration.

6. Do not infuse blood components into lines also infusing medications or IV fluids.

7. No medications will be added to the blood component(s) or administered through the administration tubing set. If medication must be administered while blood components are infusing and a separate line is not available, stop the transfusion. Flush the line, administer the medication, flush the line again and then restart the transfusion.

8. Do not piggyback blood components.

9. With the exception of rapid infusions in OR and emergent situations, the transfusion flow rate should be slower during the first 15 minutes. If the patient exhibits no reaction signs or symptoms, the rate should be increased after 15 minutes to ensure the product is completed within the 4 hour window. See below chart for recommended adult flow rates. For recipients at risk of fluid overload, a slower flow rate should be used (as low as 1 mL/kg/hour).

Suggested Maximum Adult Flow Rates		
Product	**First 15 minutes**	**After 15 minutes**

Red blood cells	1-2 mL/minute	240 mL/hour or as tolerated
Plasma	2-5 mL/minute	300 mL/hour or as tolerated
Platelets	2-5 mL/minute	300 mL/hour or as tolerated
Cryoprecipitate	As rapidly as tolerated	As rapidly as tolerated

Adapted from AABB Technical Manual, 19th edition

B. **Assessment and Monitoring**

1. Vital signs will be taken and recorded prior to transfusion (within 30 minutes prior to initiation) and 15-20 minutes after beginning transfusion.

2. Patients receiving a transfusion will be continuously assessed at the bedside for signs and symptoms of transfusion reactions and complications for the first 15 minutes and re-assessed with each set of vital signs.

3. Additional vital signs during the transfusion are per unit routine or more frequently as condition warrants. Neonates and pediatrics are as outlined below.
   a) Neonates: Vital signs will be taken at 15-20 minutes, then hourly until completion of the transfusion.
   b) Pediatrics: Vital signs will be taken at 15-20 minutes after transfusion start, then every 15 minutes for the first hour, every 30 minutes for the second hour, then hourly until completion of the transfusion.

4. A final set of vital signs will be taken and recorded within 30 minutes of the conclusion of the transfusion.

C. **Complete the transfusion**

1. Transfusion must be completed within 4 hours of the start of the transfusion.

2. When the blood component(s) transfusion is complete, flush the tubing.
(Neonates: Flush with 1 to 3 mL of 0.9% NaCl. Do not use ¼ or ½ strength saline).

3. Before disposal, ensure the patient information tag from the component is removed and placed in the blue recycle bin for patient protected information or covered with an identity-concealing privacy label. Then discard the empty blood bag and tubing or blood syringe in a biohazard receptacle if no additional blood is to be infused and no transfusion reaction is suspected.

4. Documentation expectations for blood component administration
   a) Vital signs including:
      (1) Temperature
      (2) Pulse
      (3) Respiration rate
          Exception: neonatal patients requiring High Frequency Oscillator Ventilation
      (4) Blood pressure

      Note: monitoring oxygen saturation is also recommended.
   b) Type of blood component
   c) Use of a blood warmer (if applicable) and temperature
   d) Donor unit ID number
   e) Date/time initiated and completed

f) Blood component volume given
g) Volume of 0.9 % NaCl or Plasmalyte given
h) Description of any suspected transfusion reaction symptoms, notification of physician, and interventions taken.

5. During downtime workflow, the Blood Transfusion Record tag must be completed and placed in the patient's chart. The following must be recorded and initialed:
   a) start time
   b) stop time
   c) pre-transfusion vitals
   d) 15 minute vitals (may be taken between 15-20 minutes after transfusion start)
   e) post-transfusion vitals
   f) volume transfused
   g) any signs or symptoms consistent with a possible transfusion reaction
   h) dual signature verification

D. **Patient/ Family Education**

1. Patient / family education will be completed and documented on the appropriate patient records. Written instructions concerning adverse events are provided to the patient and/ or responsible caregiver if a transfusion was administered.

V. Procedure - Suspected Transfusion Reaction

A. **MANAGEMENT of Suspected Transfusion Reaction**

1. If a reaction occurs, it usually manifests within the first 15 minutes of the transfusion. However, transfusion-related adverse events can occur hours to days after the transfusion is complete.

2. Some common signs and symptoms associated with transfusion reaction include:
   a) Fever (Increase in temperature by 2°F or 1°C from baseline)
   b) Urticaria (hives)
   c) Hemoglobinuria (urine turns red or dark brown)
   d) Arthralgias
   e) Chills/ rigors
   f) Shortness of breath
   g) Flank pain
   h) Hypotension or hypertension

3. For a full list of transfusion reaction signs and symptoms and recommended actions, refer to the Transfusion Reaction Sign/ Symptoms and Action Chart (Appendix B).

4. If a suspected transfusion reaction occurs during the transfusion:
   a) Stop the transfusion and maintain adequate vascular access. Change the IV set and KVO with a new bag of 0.9% NaCl or Plasmalyte.
   b) Notify the patient's physician and the Blood Bank.
   c) Perform an immediate bedside clerical check reviewing the blood component, patient identification information and medical record for correctness. If a discrepancy is discovered, notify the Blood Bank immediately.
   d) Monitor and record post-transfusion vital signs.
   e) Take any measure(s) necessary to stabilize/ support the patient throughout the event

f) Obtain sample(s) for transfusion reaction investigation workup. Provide a lavender EDTA tube of at least 3 mL to the Blood Bank and provide a urine sample of at least 4 mL to the Chemistry division. For neonates and pediatric patients, two EDTA microtubes may be submitted for the blood sample (at least 1 mL total) and a urine sample of at least 0.5 mL will be acceptable.
g) Monitor urinary output.
h) Document reaction symptoms and actions taken.
i) Return the following to the Blood Bank:
   (1) Blood component with the patient information label attached.
   (2) Attached blood administration set and any IV solutions connected.
   (3) Post-Transfusion sample(s)
   (4) Contact the Blood Bank physician if assistance is needed in the evaluation or treatment of the patient.

5. If symptoms of a potential transfusion reaction are recognized after the transfusion is completed, the event should still be reported to the Blood Bank for further investigation.

VI. Related UTMB Policies and Procedures

Nursing Policy 7-12-10 Perioperative Autologous Blood Collection and Administration

UTMB Nursing Practice Standards 7-16-20 Administration of Packed Red Blood Cells and Whole Blood to ECMO Patients

Nursing Policy 7-16-8 Storage of Blood for Emergencies with ECMO Patients

UTMB Nursing Practice Standards 7-16-21 Administration of Platelets to ECMO Patients

IHOP - 09.13.24 - Patient Identifiers

IHOP - 09.03.17 - Patient Consent - Overview and Basic Requirements

IHOP - 09.03.18 - Consent for Treatment of a Minor

Pathology Policy 1.02 Specimen Labeling

VII. Additional References

Mosby's Skills: Blood Products Administration

Mosby's Skills: Blood and Blood Component: Administration (Pediatric)

Inpatient Transfusion Checklist

ED Transfusion Checklist

VIII. Dates Approved or Amended

Originated: 09/17/2014	
Reviewed with Changes	*Reviewed without Changes*
3/18/2015	
01/11/2017	
09/26/2017	
07/07/2020	

06/07/2022	

IX. Contact Information

GAL - Blood Bank	LCC - Blood Bank	ADC – Blood Bank	CLC - Blood Bank
(409) 772-8284	(832) 505-3114	(979) 864-8149	(832) 632-7014

Appendix A

TRANSFUSION SERVICE COMPATIBILITY CHART

Recipient's Blood Type	Packed Red Blood Cells	Plasma**	Pooled Platelets*	Single Donor Platelets*	Cryoprecipitate**
O	O	Any Type	Any Type	Any Type	Any Type
A	A or O	A or AB	Any Type	A or AB preferred, any type	Any Type
B	B or O	B or AB	Any Type	B or AB preferred, any type	Any Type
AB	Any Type	AB	Any Type	AB preferred, any type	Any Type
Rh+	Pos. or Neg.	Pos. or Neg.	Pos. or Neg.	Pos. or Neg.	Pos. or Neg.
Rh-	Negative	Pos. or Neg.	Pos. or Neg.	Pos. or Neg.	Pos. or Neg.

All neonate ≤ 4 mo of age will receive the products indicated below:

Baby's Blood Group	Leukoreduced Irradiated pRBCs	FFP**	Cryoprecipitate** (single units only)	Platelets* (listed in order of preference)
O Pos	O -	AB	AB	any
O Neg	O -	AB	AB	Any Rh-, any
A Pos	O -	AB	AB	A+/- or AB+/-, B+/-, O+/-

A Neg	O -	AB	AB	A- or AB-, B-, O-, A+ or AB+, B+, O+
B Pos	O -	AB	AB	B+/- or AB+/-, A+/-, O+/-
B Neg	O -	AB	AB	B- or AB-, A-, O-, B+, AB+,
AB Pos	O -	AB	AB	AB+/-, B+/-, A+/-, O+/-
AB Neg	O -	AB	AB	AB-, B-, A-, O-, AB+, B+, A+, O+
Unknown	O -	AB	AB	AB-, B-, A-, O-, AB+, B+, A+, O+

*Platelets – Rh negative recipients can receive Rh positive platelets. If the recipient is an Rh negative female of childbearing potential (<55 years of age), the Blood Bank medical director may elect to recommend 1 vial of Rh Immune Globulin.

**Rh is not taken into consideration when transfusing plasma or cryoprecipitate.

Appendix B – Transfusion Reaction Sign/ Symptoms and Action Chart (on next 2 pages)

Acute Transfusion Reactions

Suspected Transfusion Reaction Signs & Symptoms		Immediate Action	Additional actions/Recommendations	Possible Etiology/Cause
Fever > 38°C and ↑ of at least 1°C (2°F) from baseline	Fever with chills or rigors	✓ **STOP** the transfusion ✓ **CHANGE** IV set and start a new infusion of KVO 0.9% NaCl or Plasmalyte ✓ **RECORD** vital signs and continuously monitor and take measures necessary to stabilize/support patient ✓ **NOTIFY** physician and Blood Bank ✓ **MONITOR** urinary output if indicated ✓ **DOCUMENT** reaction symptoms and actions taken ✓ **RETURN** the following to the Blood Bank:*** 1) Blood component with the patient information tag attached	**DO NOT RESTART TRANSFUSION** • May give acetaminophen • Consider use of leuko-reduced for future transfusions	**Febrile Non-hemolytic Transfusion Reaction (FNHTR)** • Antibodies to leukocyte antigens (mostly HLA); cytokines
	Fever with chills, rigors, hypotension, shock, nausea, vomiting, headache		**DO NOT RESTART TRANSFUSION** • May give acetaminophen • If bacterial contamination is suspected (≥2°C [3.5°F] increase in temperature from baseline), order blood cultures and urinary analysis and give antibiotics as indicated • Vasopressors if indicated	**Bacterial Contamination** • Most commonly caused by platelets which are stored at room temperature. Contamination can occur during donation.
	Fever with chills, rigors, pain at IV site, nausea, vomiting, flank pain, red or dark brown urine, bleeding, sensation of chest tightness, anxiety. May progress to shock or renal failure.		**DO NOT RESTART TRANSFUSION** • Monitor for urinary output and signs of shock • Observe for signs of Disseminated Intravascular Coagulation • Support medical therapies to reverse the patient's untoward circumstances	**Acute Hemolytic Transfusion Reaction (AHTR)** • Usually due to ABO incompatible blood
Urticaria (Hives) or Rash	Rash, pruritus, hives ONLY *** not indicated for this reaction		**STOP TRANSFUSION – SEE NOTE BELOW** • Administer antihistamines for mild reactions – itching • NOTE: with mild reactions, it may be possible to restart if no other cause or symptoms are found and there is relief of itching after antihistamines.	**Allergic – Mild** • Antibodies to plasma proteins
	Hives, wheezing, laryngeal edema, respiratory distress, hypotension, tachycardia, nausea, vomiting, abdominal pain, circulatory collapse, anaphylaxis		**DO NOT RESTART TRANSFUSION** • Consider epinephrine/corticosteroids for severe anaphylactic reactions • For severe respiratory distress, call Rapid Response/Code • Provide supportive treatment as indicated • Avoid future reactions with pre-medications	**Allergic – Moderate to Severe** • Antibodies to plasma proteins including IgA
Dyspnea, ↓ oxygen saturation	New onset or exacerbations of 3 or more of the following: acute respiratory distress, ↑BNP, ↑CVP, evidence of left heart failure, evidence of positive fluid balance, x-ray evidence of pulmonary edema		**DO NOT RESTART TRANSFUSION** • Administer diuretics • For severe distress, call Rapid Response/Code • Provide supportive treatment as indicated • For subsequent transfusions in patients with cardiac history, reduce rate and consider diuresis prior to or between transfusions • Place patient in semi-Fowler or upright or sitting position to increase venous resistance • Auscultate lung sounds (crackles present)	**Transfusion-Associated Circulatory Overload (TACO)** • Rapid infusion in patients with limited cardiac reserve, renal failure or impaired tolerance to fluids • Can be caused by excessive quantity

	No prior evidence of acute lung injury <u>prior</u> to transfusion. No evidence of circulatory overload. Symptoms include: fever, hypoxia, hypotension, pulmonary edema, normal pulmonary capillary wedge pressure.	2) Attached blood administration set and any IV solutions connected 3) Post-transfusion samples	**DO NOT RESTART TRANSFUSION** • Auscultate lung sounds (crackles will be absent) • For severe distress, call Rapid Response/Code • Order chest x-ray • Provide other supportive treatment as indicated • If symptoms occur <u>POST</u> transfusion and TRALI is suspected, contact the Blood Bank	**Transfusion-Related Acute Lung Injury (TRALI)** • Donor antibodies reacting to the recipient's white blood cells; or recipient antibodies to donor white blood cells

Adapted from: Hemovigilance Module Surveillance Protocol v2.5.2, AABB Primer for Blood Administration (rev. December 2018), and AABB Circular of Information for the Use of Blood and Blood Components (rev. October 2017), AABB Technical Manual 19th edition (rev. 2017).

Delayed Transfusion Reactions/Other Associated Reactions

	Suspected Transfusion Reaction Signs & Symptoms	Additional actions/Recommendations	Possible Etiology/Cause
Delayed	Symptoms such as rash, diarrhea, fever, hepatomegaly, liver dysfunction, and a decreased white blood cell count, 2-6 weeks post transfusion	• Physician to notify Blood Bank for follow-up investigation when clinical syndrome is apparent	**Transfusion-associated Graft vs. Host Disease** • Transfused donor lymphocytes become engrafted in tissues and bone marrow of recipient, donor lymphocytes proliferate and destroy patient cells
	Post-transfusion anemia and decreasing benefit from transfusion. Symptoms may also include mild jaundice, fever, and hemoglobinuria (red/brown urine). Typically seen 5-10 days after transfusion.	• Physician should notify Blood Bank for follow-up investigation • Will require additional time to provide antigen-negative compatible RBC products for patient	**Delayed Hemolytic Transfusion Reaction (DHTR)** • Stimulation of antibody development by foreign red cell antigens
	Signs and symptoms of infection typically occur weeks to months after transfusion. Disease/infection may include bacterial, viral, parasitic, or other agents	• Physician should notify Blood Bank for follow-up investigation	**Transfusion Transmitted Infection (TTI)** • Pathogens transmitted by the donor
	New clinically significant antibodies against red blood cells occurring between 24 hours and 28 days after a transfusion. Signs of hemolysis not present.	• Usually detected in the Blood Bank when a new Type and Screen or additional units are requested • Will require additional time to provide antigen negative, compatible RBC components	**Delayed Serological Transfusion Reaction (DSTR)** • Significant antibodies against red blood cells
	Thrombocytopenia. Typically a decrease in the platelet count between 20-80% from pre-transfusion counts occurring 5-12 days following the transfusion of platelets or red cells.	• Alternative explanations for thrombocytopenia are likely but transfusion as a cause should be ruled out • Physician should notify Blood Bank for follow-up investigation	**Post Transfusion Purpura (PTP)** • Alloantibody in the patient directed against HPA or other platelet specific antigen
Other	Tingling in fingers, cramps, hyperactive reflexes, convulsions, laryngeal spasm, respiratory distress	• Infuse slowly if possible but no longer than 4 hours • Consider calcium supplement when multiple units are being transfused • Monitor calcium levels	**Hypocalcemia/Citrate intoxication** • May occur in massively transfused patients or those with liver dysfunction and the inability of the liver to metabolize citrate that may be present in banked blood

	Nausea, diarrhea, muscular weakness, bradycardia, anxiety, cardiac arrest	• Take steps to return potassium to normal levels • Monitor potassium levels • Washed or fresh blood if patient is at risk	**Hyperkalemia** • Electrolyte imbalance usually associated with massively transfused patient or those with renal failure
	Chills, decrease in body temperature, irregular heart rate, cardiac arrest	• Use fluid/blood warmer for patients requiring multiple blood products within a short period of time	**Hypothermia** • Usually a result of the administration of multiple blood products.

Adapted from: Hemovigilance Module Surveillance Protocol v2.5.2, AABB Primer for Blood Administration (rev. December 2018), and AABB Circular of Information for the Use of Blood and Blood Components (rev. October 2017), AABB Technical Manual 19th edition (rev. 2017)