TRANSFUSION SERVICES (BLOOD BANK) LABORATORY

Introduction

ChristianaCare maintains Transfusion Service Laboratories on its Christiana and Wilmington campuses. This document is designed to inform the clinical staff of services provided by our hospital Blood Bank laboratories and general guidelines associated with transfusion. The current "Circular of Information for the Use of Human Blood & Blood Components" is available in either Blood Bank Laboratory for consultation and additional information, as needed.

Indications for Transfusion Therapy

Transfusion therapy with red blood cells (RBCs) is indicated for restoration of oxygen carrying capacity and correction of anemia. Platelets are indicated for correction of significant thrombocytopenia with bleeding, for prophylaxis in profound thrombocytopenia and/or patients with platelet dysfunction. FFP and cryoprecipitate may be indicated for correction of coagulation defects in certain circumstances.

Ideally, all transfusion decisions should involve integration of the clinical information and laboratory data. Benefit versus risk of transfusion should be evaluated and discussed with recipients prior to treatment, whenever feasible. A blood consent is required for each admission that includes a transfusion event.

Links to ChristianaCare Transfusion Guidelines (adult patients) are as follows:
Final RBC Guidelines.pdf
Final platelet guidelines.pdf
Final Plasma Guidelines July 2019.pdf
Final cryo guidelines.pdf

Link to ChristianaCare Transfusion Guidelines (neonates) are as follows:
NICU Transfusion Guidelines. Apr 2019.pdf

Definitions and Explanation of Common Terms

Autologous blood donation- when a person donates their own blood in advance of a procedure that is likely to require blood transfusion. ChristianaCare does not collect whole blood for transfusion. Patients wishing to donate autologous blood are referred to the Blood Bank of Delmarva. A physician order is required. Units are clearly marked “Autologous” and include the patient’s name and date of birth. Can only be dispensed to this patient.

Blood Bank- A laboratory which is responsible for the collection, processing, manufacture, and storage of human blood and its components.

Blood Request Checklist- electronic means of requesting a unit of blood be dispensed from the Blood Bank laboratory and sent to the care area via the pneumatic tube system.

Directed donation- intended for a specific patient, usually donated by a family member or friend of the patient. A tag marked "Designated Donation" and the patient's name and date of birth will be attached to the bag. ChristianaCare does not collect whole blood for

transfusion. Directed donors are referred to the Blood Bank of Delmarva. A physician order from the intended recipient's provider is required.

EMR- Electronic medical record.

Order - Formal written instructions from a physician which appear on a patient chart or on a prescription form requesting testing services and/or blood products. Orders for blood placed in the EMR by the provider automatically print in the blood bank laboratory.

Massive Transfusion Pack (MTP)- physician order for 6 RBCs, 6 Plasma and 1 Plateletpheresis to support transfusion needs of a hemodynamically unstable adult patient.

Transfusion Reaction - Any untoward effect resulting from a transfusion. All suspected reactions must be reported to the patient's physician and the Transfusion Service Lab (Blood Bank) and/or IV nurses at the time it is noted.

Transfusion Service - A laboratory responsible for testing patient samples, storage of blood products, and issuing products for transfusion.

Transfusion Therapy - The infusion of blood or one of its components for therapeutic purposes.

Transfusionist - A physician or registered nurse specially trained in transfusion practices who starts a transfusion of a blood component. Only the transfusionist should spike the unit.

Unit Label - The non-removable label on the front of the blood or blood component containing information regarding the contents of that unit. The ISBT label format contains 4 barcodes which include: Donor Identification Number, Product Code, Expiration Date and Donor Blood Type.

Verbal Request - The act of asking Blood Bank laboratory to supply products or services as a result of the physician's order.

Guideline for the Collection of Type and Screen (Blood Bank) Specimens for Pretransfusion Testing Purposes

Safe transfusion therapy relies on proper patient identification at time of specimen collection and immediately prior to transfusion. The following guidelines were designed to ensure positive identification of the patient and reduce the possibility of errors occurring. These guidelines apply to all pre-transfusion specimens collected for use in the Blood Bank Department. For adult patients, a properly labeled EDTA purple top (10ml preferred) specimen is required for pretransfusion testing. For neonates, a properly labeled EDTA cord blood or pediatric venous specimen is required.

Prior to specimen collection, a requisition for the ordered test(s) must be:

1) created using a manual (paper) Transfusion Services Requisition [Form #18821 S] and labeled or handwritten with the proper patient information
   -OR-
2) printed from the patient electronic medical record (EMR)
   -OR-
3) available for viewing on a handheld phlebotomy device (positive patient identification)

Minimum identification required on all specimens and requisitions includes:

- Patient full name (includes assigned trauma M/F number)
- Medical record, financial or social security number
- Date and time of collection
- Identity of the phlebotomist on the test requisition and identity of phlebotomist on the specimen label (i.e. initials)

The patient must have a hospital identification bracelet securely fastened on the wrist or ankle prior to collection of specimens. This applies to all inpatients and to any outpatient having specimen(s) drawn for potential transfusion. Outpatients having only diagnostic tests performed (non-transfusion specimens) do not need an identification bracelet.

> NOTE: If, immediately prior to transfusion, it is discovered a patient identification bracelet has been removed for any reason, the patient must have an identification armband reapplied and a new specimen must be recollected and laboratory testing repeated before transfusion of the patient can occur.

The phlebotomist must ensure an EXACT match between the patient identification information on the armband AND the patient identification information on the test requisition. Any discrepancies must be corrected prior to specimen collection. Further, patient identification verification of the specimen label must be completed at the bedside (in the presence of the patient) and the verified label must be placed on the specimen before leaving the patient bedside.

- Use of an electronic positive patient identification system for specimen collection, allows for the comparison of two patient identifiers using a handheld device against the patient armband in lieu of a paper requisition. Use of such an electronic positive patient identification system allows for real-time patient barcoded label generation that includes phlebotomist id; negating the need for the phlebotomist to sign and submit the requisition with the sample to the Blood Bank Laboratory.
- When not using an electronic patient identification system, a paper requisition MUST be utilized to verify patient identity at time of specimen collection.
    - For perioperative areas only: A 'Time-Out for Type and Screen' may be performed at time of specimen collection which requires confirmation of patient identity and specimen labeling by two licensed individuals at the patient bedside. A 'Time-Out for Type and Screen' powerform must be completed at the time of specimen collection. A test requisition must be signed by one of the two caregivers involved in the time-out and is to be submitted with the properly labeled blood sample to the Blood Bank laboratory.

All specimens for compatibility testing must be accompanied by a test requisition (either paper or electronic), as indicated above. The caregiver collecting a Type and Screen (Blood Bank) specimen must sign his/her name on a paper requisition to document the patient identification procedure was conducted according to policy.

Specimens submitted to the Transfusion Service Lab may be collected by a physician, staff nurse or member of the phlebotomy team.

Specimens should be submitted directly to the Transfusion Service (Blood Bank) Laboratory.

Specimens are routinely utilized for compatibility testing for three full days. (Date of collection is considered day zero; with specimen expiration defined as 23:59 of the third day.) Refer any questions to the Transfusion Service Laboratory.

Requisitions

All Transfusion Service Laboratory (TSL) tests can be ordered by using a manual Transfusion Service Laboratory Requisition (the red and white form #18821 S) or by the Clinical Care System (CCS).

All manual requisitions must be labeled with the patient demographic label (patient full name, MRN and/or financial number, patient date of birth) or the information must be legibly handwritten. The physician's order must be transcribed in the space provided on the requisition for requesting blood and blood components.

Both types of paper requisitions (manual and CCS) include a space for the signature of the phlebotomist and collection date/time. Each specimen submitted to the Blood Bank must be accompanied by a paper requisition. The only exceptions to this rule are as follows:

- Type and Screens collected using an electronic positive patient identification system in which a barcoded patient label (full patient demographics with identity of phlebotomist) is generated at time of collection and affixed to sample at the patient bedside.
- Immunology only testing ordered through the CCS.

No testing will be performed unless a properly labeled specimen and a properly signed requisition (as needed) have been received and all patient identification information match.

Testing/Services Provided by the Transfusion Service Lab

ABO/Rh Type

Blood Typing includes ABO group and Rh type determination of a patient. The ABO grouping consists of:

1) 'Forward Typing' to assess presence or absence of the A and./or B antigens on the surface of a patient's red blood cells through the use of specific reagent antisera.
2) 'Reverse Grouping' to assess the presence or absence of anti-A and/or anti-B antibodies in the patient plasma through the use of reagent red blood cells.

The Rh type test determines the presence or absence of the Rh(D) antigens on the surface of a patient's red blood cells through the use of specific reagent antisera.

Antibody Identification

Complex testing performed using patient plasma to identify the specificity of unexpected red cell antibody demonstrating in the sample. Numerous reagent red blood cells of known phenotype are required for individual testing to definitively identify the antibody specificity(ies) in the sample.

Antibody Titer

Titration is a semi-quantitative measurement of the amount of antibody contained in a serum; the higher the titer, the more antibody present. The test procedure involves the serial dilution of patient serum in saline; each dilution to be tested against an identical concentration of an antigen positive cell source. The titer is reported as the reciprocal of the highest reactive dilution.

The most frequent use of the antibody titer is to follow/monitor antibody production of clinically significant (IgG) antibody during a pregnancy. If an antibody titer increases over time, it is assumed the baby is likely antigen positive and the possibility for Hemolytic Disease of the Newborn (HDN) exists. Rh antibodies are most often associated with severe HDN.

NOTE: More advanced diagnostic techniques such as doppler ultrasound and/or peri-umbilical blood sampling (PUBS) technologies often play a greater role in the evaluating the potential for HDN of the developing fetus.

ABO antibody titer(s) testing of specific prospective recipients can provide clinical data relevant to donor selection.

Antigen Typing/Antigen Profile
Common blood group/system to which antigen structures on red blood cells can serologically be identified include ABO, Rh, Kell, Kidd, Duffy, MNS, Lewis and P. Patients whose red blood cells are shown to lack antigen(s) in any of these systems have the potential to produce an immune response [i.e. antibodies] against those antigens when exposed [via transfusion or pregnancy] to red blood cells expressing antigen(s) not expressed by the patient. When testing reveals the patient has developed unexpected red cell antibody, antibody identification procedures include typing the patient's cells for the corresponding antigen. The ability to conduct accurate antigen testing on a patient may be reduced when the patient has a positive direct antiglobulin test (DAT). An antigen profile is suggested for anyone expected to receive serial transfusions over a long period of time such as patients with sickle cell anemia or other hemoglobinopathy, renal disease, malignancies and/or chronic anemia.

Cold Agglutinin
The test procedure involves the serial dilution of warmed patient serum in saline; each dilution to be tested against an identical concentration of an antigen positive cell source. The titer is reported as the reciprocal of the highest reactive dilution. Cold antibodies are usually complete (IgM) antibodies with a blood specificity of Anti-I. Titers less than or equal to 32 are of no significance. Elevated cold agglutinin titers are also seen in primary atypical pneumonia.

Cord/Neonatal Typing
Tests performed include ABO, Rh, and DAT. These tests are routinely performed on cord bloods or heel stick specimens submitted on infants less than four months of age.

Crossmatching/Compatibility Testing
An exercise conducted in the laboratory to assess compatibility of a blood product containing red blood cells prior to a transfusion event

- Electronic Crossmatch can be conducted when a patient meets the following criteria:
    - No history or current evidence of clinically significant red cell alloantibody production
    - Two blood type determinations have been performed on the patient
        - From a single sample collected utilizing an electronic positive patient identification system

- From two separate samples from separate phlebotomy events

Electronic Crossmatch involves assignment of theoretically compatible red cell units to a patient via a computer system that has been validated to ensure assignment of only ABO compatible red cell units based on the patient's confirmed blood type.

At ChristianaCare, the overwhelming majority of patients qualify for use of Electronic Crossmatch prior to transfusion. For that reason, red cell units are not routinely crossmatched in advance of an order for transfusion at ChristianaCare. For those patients that do not qualify for electronic crossmatch and who are undergoing surgery, two units are typically crossmatched in advance and held. In these cases, other crossmatch techniques must be employed which include:

- Immediate Spin Crossmatch testing must be performed to ensure ABO compatibility when uncrossmatched blood is released emergently; prior to the completion of patient testing or whenever a second blood type specimen is unavailable to confirm patient type.
- Full Crossmatch is reserved for patients with history of or current evidence of clinically significant unexpected red cell antibody production. The full crossmatch, by definition, simulates the transfusion (*in vitro*) prior to the actual transfusion by mixing the patient serum with a sample of the specific donor red blood cell selected for transfusion. The full crossmatch includes incubation at 37°C, followed by antiglobulin (AHG) phase testing according to SOP.

Crossmatch compatible units will always be provided for transfusion, whenever feasible. All red cell units issued by the Blood Bank will be (at a minimum) theoretically ABO compatible with the patient. In rare instances, autoimmune disorders and/or urgency of patient need may necessitate the issuance of 'least incompatible' or retrospectively incompatible red cell unit(s) to the presence of history of unexpected red cell antibody unknown at the time of product dispense. Such cases will be reviewed for approval by the Transfusion Service Medical Director.

Direct Antiglobulin Test (DAT)

The DAT is used to detect globulins immunologically bound to the patient's red cells in vivo. The test is often used in the diagnosis of hemolytic disease of the newborn, autoimmune hemolytic anemia, investigation of transfusion reactions, and diagnosis of drug-induced red cell sensitization reactions. An eluate may be performed when the DAT is positive in order to determine the specificity(identity) of antibody coating the cell. The test technique involves treatment of fully washed/packed aliquot of the patient antibody coated red blood cells. The red cells are treated in a manner that causes dissociation of the antibody from the cell surface into a solution. This solution is referred to as the "eluate". Several techniques are available and the technique used will depend on the circumstances of the case. After an eluate is prepared, it is tested in the same manner as serum to detect the absence or presence (and specificity) of antibody specific to RBC antigen. This test is also used in investigation of transfusion reactions if the DAT becomes positive after the patient has been transfused.

HLA ABC and DR typing

The primary purpose for human leukocyte antigen testing for HLA Class I (A, B and C) and HLA Class II (DR) is to match organ and tissue transplant recipients with prospective donors.

HLA Cytotoxic Antibody Testing
HLA cytotoxic antibody testing may be performed on patients undergoing platelet transfusion therapy if it is suspected the patient may be refractory (developing HLA and/or anti-platelet antibodies) as a result of donor exposures through platelet transfusion. In patients with cytotoxic antibodies, HLA-matched platelets may be requested to help increase the intended benefit to platelet transfusion.

Neonatal Alloimmune Thrombocytopenia
The Blood Bank can facilitate Neonatal Alloimmune Thrombocytopenia (NAIT) testing through the American Red Cross when post-transfusion purpura is suspected. The majority of PTP cases are associated with anti- PL^{A1} antibodies, although other specificities do occur. NAIT is caused by passive transfer of maternal antibody to platelet antigen expressed in the newborn. The mother's serum is tested against the platelets of the father and a panel of known, typed platelets.

Rh Immune Globulin (RhIG) Evaluation
This work-up is performed to evaluate the need for giving Rh Immune Globulin (RhIG) and consists of an ABO and Rh and antibody screen. All pregnant Rh Negative women should be evaluated as candidates to receive RhIG in the following settings: antepartum (approximately 28 weeks gestation), amniocentesis (invasive procedure or event capable of creating exposure to fetal blood), upon termination of a pregnancy and/or upon successful delivery of an Rh Positive baby (post-partum).

After delivery, the newborn's blood type should be determined. If the baby is Rh negative, the mother does not need a RhIG Evaluation. If the baby's type is Rh positive or cannot be determined, the mother is a RhIG candidate and a postpartum sample must be collected. This sample will be used to conduct a qualitative Fetal Screen test to determine if the mother should receive more than one dose of RhIG. 'POSITIVE' Fetal Screen samples will be referred to Flow Cytometry for a quantitative determination of hemoglobin F in the post-partum maternal sample.

Transfusion Reaction Evaluation
Any patient who develops symptoms [including but not limited to: fever, chills, headache, pain (at injection site, chest or flank), dyspnea, respiratory distress, hypotension and/or urticaria] within six (6) hours from the initiation of a transfusion, should be suspected of experiencing a transfusion reaction. Suspected transfusion reactions must be reported to the ordering physician and the Transfusion Service Lab for investigation. The provider should order a Transfusion Reaction Evaluation, as indicated. Post transfusion samples must be drawn immediately. The investigation is a stat work-up consists of: 1) a clerical check for errors, 2) inspection of plasma for hemolysis, 3) a DAT, 4) visual inspection of a post transfusion urine specimen, plus any additional testing as indicated.

Type and Screen
This is not an order to perform compatibility testing, but to perform all testing required (ABO, Rh, and Antibody Screen) which are prerequisites to request compatibility testing. The antibody screening test is designed to detect the presence of antibodies to red cell antigens that may be circulating in the patient. Samples yielding 'POSITIVE' Antibody Screen results will automatically be reflexed for Antibody Identification. Compatibility tests will only be

performed upon a physician's order for transfusion at any time during the 3-day lifespan of the sample. *See Crossmatch/Compatibility section.*

Type and Crossmatch
This test includes ABO, Rh, antibody screen, and crossmatch of blood for transfusion. The physician's order/intent to transfuse the patient must be written and present on the chart. If a transfusion order has not been placed, only 'Type and Screen' testing will be performed.

THERAPUETIC TRANSFUSION PRODUCTS
See "Circular of Information for the Use of Human Blood and Blood Components" (prepared in partnership by AABB, America's Blood Centers and American Red Cross).

- **Red Blood Cells (Leukoreduced)**

The red blood cells (RBCs) from a unit of whole blood that have been filtered to remove >99% of donor leukocytes. Leukocyte reduced RBCs are used routinely for all RBC transfusions at ChristianaCare and are considered "CMV-safe". Storage may be up to 42 days at 4ºC depending on the anticoagulant used during collection of the unit.

  - **Red Blood Cells (Washed)***

The red cells from a unit of whole blood that have been washed and resuspended in normal saline. Washed cells contain little to no serum proteins. After a unit has been washed, it can be stored for only 24 hours at 4 ºC. *This specialty product may only be ordered after consultation with the Blood Bank Medical Director.

  - **Red Blood Cells (Deglycerolized)***

The red cells from a unit of whole blood that have been glycerolized and stored frozen up to ten years. Freezing of red blood cells is typically reserved for 'rare' donor units. Prior to transfusion, the unit is thawed, deglycerolized, and washed. Deglycerolized cells contain reduced numbers of leukocytes and little or no serum proteins. After deglycerolization, the unit can be stored for only 24 hours at 4ºC. *This specialty product may only be ordered after consultation with the Blood Bank Medical Director.

- **Platelets, Apheresis leukoreduced (and also HLA-matched plateletpheresis**)**

Platelets for transfusion are obtained by donor platelet pheresis. For adults, ABO-compatible platelets are preferred, but are not essential. Most platelets received at ChristianaCare are routinely be stored for up to five days after collection at room temperature (20-24°C). In some instances, plateletpheresis products are produced and shipped from the manufacturer with 7-day expiration from date of collection. ChristianaCare can accept all plateletpheresis products manufactured by Blood Bank of Delmarva and its affiliates.

Platelet pheresis products can be 1) manufactured and processed in a manner that renders the product sterile -OR- are 2) cultured for bacteria and found to be negative prior to distribution of the product from the Blood Bank of Delmarva.

Platelet pheresis is an effective way to harvest a therapeutic adult dose of platelets from one individual donor. Platelet pheresis should contain $3x10^{11}$ platelets, and the plasma volume varies between 200 and 500 ml.

- HLA matched platelet pheresis may be requested by a provider for a patient demonstrating refractoriness to platelet transfusion. The products are obtained by the blood bank from Penn Jersey American Red Cross. Supervisory coordination is required to plan transfusions based on product availability. **A preliminary patient HLA Class I (A, B, and C typing) and current HLA cytotoxic antibody testing is typically required.

  Following transfusion of an HLA-matched platelet product, a one (1) hour post-transfusion platelet count is recommended. The count is used to calculate a platelet increment resulting from transfusion, helping determine efficacy.

When Rh POSITIVE platelets are transfused to Rh NEGATIVE females of childbearing age (<50 y/o), Rh Immune Globulin prophylaxis is indicated to prevent Rh immunization which could occur due to the small amount of red cells in the product. At ChristianaCare, Rh Immune Globulin is dispensed by Pharmacy.

- **Fresh Frozen Plasma (FFP)**

The plasma removed from a unit of whole blood and/or apheresis donation which is frozen within a time period required from the manufacturer's instructions of the blood collection set. This product can be stored up to one year at <-18ºC from the date of collection. Upon thaw, FFP and can be stored and available for dispense for up to 24 hours at 1-6ºC. At ChristianaCare, use of this FFP is primarily restricted to neonates.

- **Plasma**

Plasma can be removed from a unit of whole blood and/or apheresis which is frozen up to twenty-four (24) hours from time of collection. This product can be stored up to one year at -18ºC from the date of collection. Upon thaw, it can be labeled as 'Thawed Plasma' and can be stored and available for dispense for up to 5 days at 1-6ºC. At ChristianaCare, thawed plasma is routinely used to fulfill requests for plasma of any adult patient.

A small inventory of low-titer (<1:100) Type A plasma thawed plasma is actively maintained on the Christiana Campus for rapid provision of a Massive Transfusion Packs to our Level 1 Trauma Program. Low-titer A plasma has been demonstrated in scientific literature to be safe to transfuse to patients of any (or unknown) blood type.

- **Cryoprecipitated AHF**

A blood component derived from a unit of whole blood. This product is prepared by thawing Fresh Frozen Plasma at 4ºC and separating the plasma cryoprecipitate from the thawed plasma. Individual bags are not assayed for factor content. Theoretically, each individual unit should contain more than 80 units of Factor VIII in a volume of approximately 30 ml. Each unit also contains approximately 150 mg or more of

fibrinogen. This product can be stored up to one year at <-18ºC from the date of collection.

Once thawed, an individual cryoprecipitate unit can be stored and available for dispense for up to 6 hours at room temperature. An individual unit of cryoprecipitate is often sufficient for neonatal transfusion.

If "pooling" multiple cryoprecipitate units to create an adult dose, a pooled cryo product can be produced on-site in the laboratory, on demand. On demand pooled cryo can be stored and available for dispense for only 4 hours at room temperature.

Pre-pooled cryoprecipitate (in groups of 5) is manufactured and available from most blood suppliers. ChristianaCare routinely inventories pre-pooled cryoprecipitate. Upon thaw, pre-pooled cryoprecipitate can be stored and available for dispense for up to 6 hours at room temperature.

- **Granulocytes***

Use of this product is controversial. It is most often used in the treatment of patients with documented infections (bacterial and fungal) unresponsive to antimicrobial therapy in the setting of neutropenia. The product is obtained by leukocytapheresis of a donor (potentially stimulated) in which granulocytes are removed. The product contains not less than 1×10^{10} granulocytes in 50-100ml of plasma and hydroxyethyl starch (HES). The product can be stored for only 24 hours, however transfusion as soon as possible after collection is recommended. Pretransfusion compatibility testing is performed the same as for red cell transfusion. *This specialty product may only be ordered after consultation with the Blood Bank Medical Director.

- **Whole Blood [leukoreduced/ low titer (<1:100)]**

Low-titer Group O Whole Blood is made available for use in trauma at ChristianaCare. Four (4) low-titer Group O whole blood are routinely maintained in the trauma refrigerator. Two (2) low-titer Group O whole blood are also currently available for use in the prehospital setting by the aeromedical transport team based at Christiana Hospital. Intended use is for hemodynamically unstable trauma patients.

ORDER PRIORITY

The following testing priorities are recognized:
ROUTINE- Orders should be marked "ROUTINE" whenever transfusion is not imminent.

STAT - Orders should be checked "STAT" only when blood product(s) is/are needed for transfusion as soon as possible. All requests from the Emergency Department are considered STAT. In most instances, products will be ready in less than one hour, however, products may be issued prior to completion of compatibility testing (see Uncrossmatched Blood).

Patients presenting with historical and/or current compatibility problems will often require extended testing which will take additional time no matter what the priority of blood orders.

UNCROSSMATCHED BLOOD

When a patient requires STAT transfusion and the clinical circumstances do not warrant waiting for completion of STAT testing procedures in the Blood Bank laboratory, group O blood can be immediately issued from the Blood Bank. A physician requesting uncrossmatched blood must sign a "Release for Emergency Issue of Blood Products" form and a blood specimen from the patient must be promptly provided to the Transfusion Service Laboratory.

EMERGENCY DEPARTMENT/ TRAUMA ARMBANDS

Any patient assigned a trauma ID/armband in the Emergency Department must keep that Emergency Department identification bracelet on for 3 days. Otherwise, products that were made available to that patient identification will need to be retested with a new specimen.

Remote blood refrigerators are maintained on both Christiana and Wilmington Campuses and monitored/managed by the Blood Bank laboratories at each location.

- Christiana Hospital Trauma Bay blood refrigerator: 4 OPOS WBs; 4 ONEG RBCs
- Christiana Anesthesia Work Room blood refrigerator: 4 POS RBCs; 4 ONEG RBCs
- Wilmington Hospital ED blood refrigerator: 2 OPOS RBCs; 2 ONEG RBCs

NOTE: The laboratory at the Middletown Emergency Department maintains a blood refrigerator containing 4 ONEG RBCs available for emergency release, if requested.

The Emergency Department should notify the Transfusion Service Lab when a patient requiring transfusion will be transferred. The ChristianaCare blood bank can prepare blood products for transport with the patient, as needed. The lab should also be utilized to convey any clinical transfusion related data pertinent to the receiving facility's blood bank laboratory team.

Likewise, if blood product(s) are received with a patient transfer from another institution, those products should promptly be sent to the ChristianaCare blood bank laboratory. Additional patient transfusion support should be coordinated directly with ChristianaCare's blood bank laboratory.

BLOOD ADMINISTRATION

As applicable, refer to systemwide policies contained in the Policy Manager application:
"Blood Product Transfusion Policy"
"Cerner Bridge and Downtime Transfusion Process"

"Blood and/or Blood Products: Guidelines for Patients that Refuse or Restrict"
"Massive Transfusion Christiana Hospital (Level I Trauma)"
"Massive Transfusion Wilmington Hospital (Level III Trauma)"

Positive patient identification (preferably electronic) MUST be achieved immediately prior to transfusion between the patient and the intended blood product in accordance with policy.

MONITORING FOR PATIENT ADVERSE REACTION TO TRANSFUSION

Patients should be monitored for signs/symptoms of a potential transfusion reaction in accordance with the systemwide "Blood Product Transfusion Policy" maintained in Policy Manager.

If a transfusion reaction is suspected:

1) STOP the transfusion. KVO with normal saline.
2) Notify the ordering provider.
3) Notify the Blood Bank Laboratory.
4) Initiate a Transfusion Reaction Work-Up, as directed by provider/policy.

TRANSFUSION RATES

The rate of infusion depends upon the clinical condition of the patient being transfused. The flow rates listed in the table will normally result in complete transfusion of the unit as indicated by the transfusion time.

Product	Rate ml/hour (first 15 min)	Rate ml/hour (15 min- to END)	Typical Transfusion Time
Red Blood Cells	60-120	180-240 or as tolerated	1-2 hours
Platelets	60-120	300 or as tolerated	30 minutes- 1 hour
Thawed Plasma/FFP	60-120	300 or as tolerated	30 minutes- 1 hour
Granulocytes	60-120	120-150 or as tolerated	1-2 hours
Cryoprecipitate	No restriction: As rapidly as tolerated		15-30 minutes
Whole Blood	Trauma Only: As rapidly as tolerated		Not applicable

CHARTING THE TRANSFUSION

Blood Administration should be documented for any/all transfusion events either:

- Electronically- through use of Cerner Bridge application
- Manually- by completing the Transfusion Tag attached to product and placing in chart

Refer to "Cerner Bridge and Downtime Transfusion Process" in Policy Manager.

OUTPATIENT TRANSFUSION

Providers can set up outpatient transfusion(s) [Monday-Friday] for patients through:

- Infusion Services- available on both Christiana and Wilmington campuses.
- Oncology Express Unit- accessible for cancer patients at Helen F Graham Cancer Center
- ED Observation Unit- as needed only (back-up if Infusion Services cannot accommodate)