

# Blood Components Reference Manual Table of Contents

## Puget Sound Blood Center King County Edition

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# Section B

## Administration Guidelines

### Part I: Venous Access and Equipment for Transfusion

#### Venous Access

##### Types of Venous Access

Blood or components can be administered safely through a peripheral IV line, Portacath, and most central lines. Some Peripherally Inserted Central Catheters (PICC) lines with small tubing diameters might pose problems with blood administration due to slow flow rates and clogging. Optimally, the tubing of the administration set should be connected directly to the access line and should not be piggy-backed into an existing IV line. Piggybacking increases the risk of contamination. It also may increase the risk of the blood component being infused with an incompatible IV fluid.

##### Catheter Gauge for Peripheral IV Lines

Peripheral IV access must be sufficient to maintain an adequate flow rate for the transfusion. An 18-19 gauge catheter is recommended for adults receiving red blood cell and granulocyte transfusion. Smaller gauge catheters can be used but may restrict the flow rate, lengthening the time to infuse a unit. A 23-gauge or larger catheter is recommended for administration of non-red cell components, and transfusions to children.

#### Filters

##### Use

All blood components (Whole Blood, RBCs, Platelets, Plasma, Cryoprecipitate, and Granulocytes) must be administered through a filter to remove small clots and other debris. A 170-260 micron filter is standard in most blood administration sets. The same filter that has been used to administer a red cell transfusion should never be subsequently used to filter platelets because the platelets might become trapped by the red cell debris already accumulated in the filter.

## Filters — continued

### Preparation for use

Prior to use, a filter should be primed according to the manufacturer's instructions with either the component itself or normal saline until it is completely saturated. Complete filter saturation is necessary for the filter to function properly. Drip chambers should be filled no more than half full.

### Life

A filter used to transfuse blood or components should hang no longer than 4 hours due to the risk of bacterial growth. Refer to the manufacturer's guideline and facility's policy to determine the maximum number of units that may be administered through a blood administration set.

### Size

A filter size of 170-260 microns, which is standard in most blood administration sets, is adequate for most transfusions.

See Blood Administration Sets on page B.I.4 for additional information.

## Leukocyte Reduction Filters

Leukocyte reduction filters are available for both red blood cell and platelet transfusions. Leukocyte reduction filters are absorption filters which are designed to remove most of the white blood cells. Depending on the manufacturer and proper use, current leukocyte reduction filters provide a 2-4 log reduction (reduction of 99.99% or 4 logs) of the white blood cells in a cellular blood component. Leukocyte reduced red blood cell or platelet components can be obtained from the blood bank or filtration can be accomplished at the bedside. The former is preferable because of the consistency of results and the ability to better quality control its process. Filtration soon after collection improves the efficacy of white blood cell removal.

In King County, units requiring leukocyte reduction are normally leukocyte reduced at the Blood Center. Such units will be labeled as leukocytes reduced and a leukocyte reduction filter should not be used to transfuse them. A blood administration set or a blood component recipient set containing a standard filter (170-260 micron) should be used to transfuse leukocytes reduced components.

Leukocyte reduced blood and components are indicated:

- to prevent non-hemolytic febrile transfusion reactions in patients who have experienced two or more such reactions
- as a method of decreasing the risk of transfusion related CMV transmission
- to reduce the rate of platelet alloimmunization, particularly in patients with AML

## Leukocyte Reduction Filters - continued

Correct use of leukocyte reduction filters at the bedside is necessary to ensure their effectiveness. Certain filters require priming with the blood component rather than normal saline. They may be designed for transfusion of only one unit. Leukocyte reduction filters should not be flushed with saline following the transfusion. Leukocyte reduction filters are designed differently for red blood cells and platelets; therefore, each type of filter must be used only with their intended component. Manufacturer's instructions must be followed carefully when using leukocyte reduction filters.

**Leukocyte Reduction Filters must NEVER be used for granulocyte transfusions.**

## Microaggregate Filters

Microaggregate filters have a very small pore size (20-40 microns) to filter out microscopic debris in stored blood.

The clinical value of microaggregate filters is uncertain. Microaggregate filters were previously thought to protect patients from developing occlusion of pulmonary capillaries by transfused cellular debris. However, current literature suggests that such complications are not attributable to blood component administration. A thorough review of current medical and nursing literature indicates that microaggregate filters provide no advantage over use of a standard clot screen (170-260 microns) for routine transfusion. There are some studies that suggest microaggregate filters may be indicated during cardiobypass surgery or in patients with impaired pulmonary function, although even in these situations their use is controversial. The routine use of microaggregate filters for neonatal transfusion is probably not warranted since, 1) no convincing studies exist to indicate efficacy, and 2) the relatively fresh red cell products used for most neonatal transfusion contain minimal amounts of microaggregates.

The available literature suggests, however, that microaggregate filters have some intrinsic disadvantages. Of particular concern is the administration of platelet components through microaggregate filters. A portion of the platelets themselves are trapped by microaggregate filters, diminishing the therapeutic value of the transfusion and thereby ultimately increasing the patient's transfusion requirement and donor exposure. Microaggregate filters are not nearly as effective at removing leukocytes from blood components as are the newer, "third-generation" leukocyte reduction filters designed for that purpose.

**Microaggregate filters must NEVER be used for granulocyte transfusions.**

## Blood Administration Sets

**Types - Refer to facility's policy to determine type of administration set to use for transfusion. Types include:**

1. Straight type blood administration sets contain a standard filter (170-260 microns) in the tubing and are adequate for the administration of Whole Blood, Red Blood Cells, Platelets, Plasma and Cryoprecipitate.
2. Blood component recipient sets also contain a standard filter in the tubing but have a shorter tubing length and a smaller volume filter chamber. Blood component recipient sets reduce the residual volume of component remaining in the tubing and filter at the completion of the transfusion.

Blood component recipient sets should generally only be used for one transfusion because of the smaller surface area of the filter.

3. Y-type blood administration sets contain a standard filter in the tubing with a Y-tubing above the filter to permit a dual connection for a blood component (such as Red Blood Cells) and saline. Y-type sets may be used for all blood components (Whole Blood, RBCs, Platelets, Plasma, Cryoprecipitate and Granulocytes). Since 0.9% saline may be used as a diluent (usually not required for an AS-5 or AS-3 Red Blood Cell unit as it already contains an additive solution which dilutes the unit and makes it less viscous) for Red Blood Cells when fluid volume is not restricted, the Y-tubing provides an easy access, closed system to add saline to a red blood cell unit. The saline can also be used to prime the tubing and filter before transfusing a component and/or to flush the tubing and filter when transfusion is complete.
4. For pediatric patients, your facility may allow for a blood component to be withdrawn through a neonatal blood component syringe set containing a filter into a syringe and administer the component using a syringe pump. Refer to your facility's procedure if this practice is allowed.

### Use

All blood component administration sets must be used according to the manufacturer's instructions. Most standard straight or Y-type administration sets can usually be used for the administration of 2-4 red blood cell units providing the flow rate remains adequate. Refer to the administration set manufacturer's guidelines and your institution's procedure to determine how many units may be infused through one administration set. The set should hang no longer than 4 hours due to the risk of bacterial growth. An administration set that has been used for a red cell transfusion should never be subsequently used to filter a platelet transfusion as the red cell debris caught by the filter will trap the platelets.

Blood component recipient sets should generally only be used for one transfusion because of the smaller surface area of the filter.

## Blood Warmers

### Function

Blood warmers are sometimes used in an effort to decrease the incidence of arrhythmias and cardiac arrest associated with massive transfusion of cold blood components (Whole Blood, Red Blood Cells, Fresh Frozen Plasma, Thawed Plasma).

### Use

1. Adults or children receiving multiple, rapid transfusions (i.e. administration rate > 50 mL/kg/hour in adults and > 15 mL/kg/hour in children; rates provided are general guidelines, exact guidelines cannot be provided as determination of when a blood warmer is required should be based on a number of factors including patient size, transfusion requirements, and administration rate).
2. Exchange transfusions in infants.
3. May be considered in patients with cold agglutinin disease (opinions vary).

**Blood warmers are not indicated for routine transfusion of blood components.**

### Types

There are many different types of devices that have been specifically designed to warm blood and blood components. Follow the manufacturer's instructions for use.

### Safety Features

According to AABB Standards, when warming blood is indicated, the warming device must be equipped with a visible thermometer and an alarm system to detect malfunctions and prevent hemolysis or other damage. Only blood warmers approved by the FDA or validated by the facility for this purpose may be used. Blood warmers must be properly maintained. Blood must not be warmed above the manufacturer's designated temperature limit. Manufacturer's instructions should always be followed when warming blood.

### Restrictions

Never run blood under hot water, use an unmonitored hot water bath or use a microwave oven to warm blood as these methods may cause hemolysis due to uneven heating.

## Blood Warmers – continued

### Other Considerations

Blood which has been warmed must not be re-refrigerated for later use or reissued. Warming tends to accelerate red cell metabolism producing hemolysis and may permit bacterial growth. Red blood cell units that have been warmed and are not transfused must be returned to the hospital's Blood Services area or the Blood Center clearly marked "WARMED". Before the units are returned to the Blood Center, the box on the unit record of the Transfusion Report attached to returned units must be marked "NO" after the statement "The component has been stored in a monitored device at the temperature range indicated on the component label." The person verifying this information should also sign the "Verified By" line in the box on the unit record. All units that are not transfused must be returned to the Blood Center so the patient record can accurately reflect what component(s) the patient has received.

## Infusion Devices

### IV Pumps

Electromechanical “blood infusion pumps” are designed to deliver parenteral fluids including blood components at specified flow rates. IV infusion pumps may be used following manufacturer’s instructions if the manufacturer has documented safety of use with red blood cells or other blood components. All components including whole blood, red blood cells, plasma, cryoprecipitate, platelets, and granulocytes can be transfused safely through most pumps. Refer to facility’s policy regarding use of IV infusion pumps for infusing blood components.

### Syringe Pumps for Pediatric Use

Your facility may use syringe pumps (after withdrawal of the component into a syringe through a neonatal blood component syringe set containing a filter) for small volume transfusions in pediatric patients. IV syringe pumps may be used following manufacturer’s instructions if the manufacturer has documented safety of use with red blood cells or other blood components. Refer to your facility’s procedure for further information.

### External Pressure Devices

External pressure devices make it possible to administer a unit of blood within a few minutes. These should only be used with a large gauge catheter. External pressure devices should apply pressure evenly over the entire bag, have a gauge to monitor the pressure and never exceed 300 mm Hg of pressure. Exceeding this pressure limit may cause the seams of the bag to leak or rupture. Ideally, they should also have an alarm.

### Blood Pressure Cuffs

Blood pressure cuffs should not be used as an infusion pressure device. Cuffs do not exert uniform pressure against all parts of the bag and irregularly applied pressure may cause the blood bag to leak.

## Part II: Concurrent Fluids and Medications

### Concurrent Fluids

The only IV fluid that can be given concurrently through the same line as a transfusion or added directly to the blood component is isotonic normal saline (0.9% Sodium Chloride, Injection, USP), with the approval of the patient's physician. Before AS-5 or AS-3 RBCs were available, it was sometimes helpful to add 50-100 mL of 0.9% normal saline directly to RBCs stored in CPD (if patient could tolerate the additional fluid and per physician's order), as these units could be quite viscous and the additional fluid would allow the unit to flow more easily. Because AS-5 units contain 110 mL of AS-5 Optisol® solution and AS-3 units contain 100 mL of AS-3 Nutricel® solution, these units are less viscous. AS-5 and AS-3 units normally flow without problems and do not require the added 0.9% normal saline. Lactated Ringer's or other electrolyte solutions containing calcium must never be given with blood or components as they contain an anticoagulant with citrate. Small clots may form in red blood cell transfusions mixed with calcium containing solutions. Five percent dextrose in water or hypotonic sodium solutions can also be hazardous if mixed with red blood cell units as they may cause the red cells to hemolyze. Other intravenous fluids must not be given through the same line with blood/blood components or added to blood/blood components unless there is sufficient documentation to ensure that their addition is safe and does not adversely affect the blood component or the FDA has approved their use for such.

### Medications

Medication must not be added directly to the blood component bag or in the line of a transfusion. Many medications are acidotic and/or mixed with D5W and will cause hemolysis. Administering a medication through the same IV line as a transfusion makes it difficult to differentiate a transfusion reaction, a reaction to the medication, or an incompatibility between the medication and the blood or component.

There are times when the transfusion line is the only venous access line and a medication has to be given. In these situations, the transfusion must be stopped and the tubing should be flushed with normal 0.9% normal saline before and after injecting the medication to prevent direct mixing of the blood and medication. The transfusion can then be resumed.

# Part III: Patient Preparation and Transfusion Documentation

## Informed Consent

Informed consent for transfusion means a dialogue has occurred between the patient and his or her physician discussing the specific risks, benefits and alternatives to the blood component to be transfused. The patient should be given an opportunity to ask questions and has a right to refuse or accept transfusion. Informed consent can be documented by a consent form or by charting the information discussed in the patient's chart.

Any facility transfusing blood and blood components should provide informed consent to patients and informed consent should be documented.

If a patient is unable to give informed consent, a family member may be asked to provide it. If it is not possible to obtain informed consent because the patient/family is unable to provide it or it is not possible due to lack of available time in an emergency case, these facts should be documented in the patient chart.

## Compatibility Sample Draw for Components Containing Significant Numbers of Red Blood Cells (see Compatibility Sample Draw Guidelines in Section A, Part III)

The sample for type and crossmatch (compatibility testing) is as important for patient safety as the transfusion administration itself. Correct identification of the sample is imperative in reducing a patient's risk of receiving an incompatible transfusion. Procedures must be in place for methodical sample draw with particular attention to patient identification and labeling. Some institutions may require that two trained staff verify that the patient identification information on the sample tube label is correct.

## Patient Assessment

The pre-transfusion assessment of the patient involves obtaining important medical history information, reviewing pertinent lab values and performing a physical assessment on the patient. The medical history should indicate whether the patient has ever been transfused and if so, if he or she experienced any adverse reactions. Previous history of pregnancy is another important piece of medical history that might indicate a patient is more likely to experience a reaction due to previous sensitization. Previous history of heart disease or renal disease may indicate the need for a slower rate of infusion to prevent volume overload. A slower rate of infusion may also be necessary for geriatric or pediatric patients.

## Patient Assessment - continued

The nurse should review the laboratory studies that prompted the transfusion order to verify results. The patient's electrolyte and fluid balance should also be assessed. Double-checking the physician order for transfusion including any special processing attributes requested is prudent to be sure the blood component has the ordered attributes such as CMV negative, leukocyte reduced, or irradiation.

A baseline physical assessment should include vital signs and assessment for skin rashes, shortness of breath, wheezing, pain, chills, itching or nausea. In patients with cardiopulmonary disease the lungs should be auscultated to establish a baseline for the presence of rales.

## Patient Education

Patient education is an important part of the transfusion process. Educating the patient about the steps involved in a transfusion and what to expect is important and can help reassure a frightened patient. Although transfusion is generally a safe and simple procedure, patients should be told that reactions to blood components can occur. Instructing the patient to alert the nurse of any unusual symptoms he or she might experience during or following the infusion helps ensure that symptoms indicating a possible reaction are promptly reported.

## Written Materials

A brochure designed for patient education entitled "When You Need a Transfusion" is available for staff in facilities in the Blood Center region to provide patients with further information about transfusion. Contact the Blood Center Communications Department, (206) 292-1907, to order copies of the brochure for your facility.

## Documentation

When a transfusion is administered, the following information must be documented in the patient medical record:

- identification of the transfusionist
- date and time transfusion started and ended
- name of component and unit number or pool identification number
- amount or volume infused
- vital signs taken before, during (if applicable) and following the transfusion administration
- patient tolerance or, if applicable, transfusion complications
- if applicable, nursing or medical intervention as a result of the transfusion complications

**The Chart Record of the Transfusion Report should be placed in the patient chart as a permanent record.**