



University of Washington Medical Center 1959 NE Pacific Street. Seattle, WA 98195 Transfusion Services Laboratory Policies and Procedures Manual	Original Effective Date: 08-14-2018	Number: PC-0069.02
	Revision Effective Date:	
TITLE: Selection of Red Blood Cell and Granulocyte Components for Transfusion		

PURPOSE:

To provide guidance for selecting red blood cell components (RBC) for transfusion to adult, bone marrow transplant and neonatal/infant transfusions

PRINCIPLE & CLINICAL SIGNIFICANCE:

Red blood cells are indicated to improve the oxygen carrying capacity and to replace the red blood cell mass during bleeding. Most common threshold for transfusion is a hemoglobin 7 g/dL/ hematocrit 21%, but there are certain clinical situations such as hematological malignancies, active bleeding, and acute coronary ischemia, that might benefit with higher hemoglobin thresholds.

Granulocyte transfusions are indicated for neutropenic patients or patients with neutrophil dysfunction with severe refractory infections. The therapeutic benefit of granulocyte transfusions has been extensively evaluated with conflicting results.

Clinical Significance

Incompatible blood products can result in decrease product survival, alloimmunization, hemolysis and recipient death.

POLICIES:

General Policies:

- The patient’s historical record in the LIS (laboratory information system) BAD file should be reviewed for antigen/antibodies, problems, comments, and attributes prior to providing RBC or granulocyte components. All requirements specific to red blood cell components should be honored. If clinical status prohibits ability to honor all requirements, consult with a Blood Bank Medical Director for guidance. Any deviations from this procedure should be documented on a QI form and signed by the ordering TSL MD
- Review all red blood cell product requisitions for attributes and/or special requirements prior to allocating the component.
- New attributes or special requirements listed on the requisition should be added to the patient record in the LIS
- Autologous and directed components should be allocated and issued before homologous components
- All red blood cell and granulocyte components including autologous and directed components are crossmatched prior to issuing

General Pre-Transfusion Test Requirements for providing crossmatched RBCs and granulocytes:

- **Electronic Crossmatch** (refer to SOP Electronic Crossmatch) may be used if the following requirements are met:
 - Two consecutive concordant ABO/Rh results on file
 - One from an in-date eligible battery (TSCR, TSCREX, TXM) with no pending tests
 - Second ABO/Rh from an independent collection with testing performed by -the UWMC TSL
 - Current antibody screen is negative
 - No history of clinically significant antibodies
 - **Electronic crossmatch** eligibility (EXM Elig) is NOT set to “NO”
- **Immediate Spin Crossmatch** (refer to SOP *Immediate Spin Crossmatch*) should be utilized in the following circumstances:
 - Computer downtime
 - Unresolved ABO discrepancies
 - QA failure that prevents computer crossmatch and the recipient does not have unexpected antibodies
 - No history of clinically significant antibodies
- **AHG crossmatch** (refer to the specific technique SOP) should be performed for any of the following:
 - Clinically significant antibodies are present
 - Patient had a history of clinically significant antibodies at either UWMC or other facility whether the antibody is demonstrable or not

RED BLOOD CELL COMPONENTS

- **All RBC components** should meet the following requirements:
 - Leukoreduced (considered CMV safe)
 - Non-leukocyte reduced RBC component must be approved for issue by the UWMC BB Medical Director (i.e., Rare RBCs may come from frozen stock that was not leukoreduced at the time of collection)
 - Irradiated (to prevent graft-vs-host disease- refer to SOP *Irradiation of Blood Components*)
 - In the event of limited supply of irradiated RBC, patients with the following known conditions should continue to be provided irradiated RBCs:
 - Intrauterine/exchange transfusions
 - RBC exchange transfusions
 - Neonates/Infants < 4 months of age
 - Hematological malignancies (e.g., leukemia, lymphoma, Hodgkin's disease)
 - Bone marrow transplant candidates and recipients
 - Receiving high dose chemotherapy (e.g., fludarabine)
 - Cellular immunotherapies (e.g., SCID, Di George's syndrome)
- **Autologous -and Directed Red Blood Cell Components**

- Autologous and directed components must be kept segregated from allogenic/homologous inventory
- Autologous and directed units should be assigned to the intended recipient in the LIS and may not be issued any other patient
-
-
- **Universal Donor RBC components** are provided for **uncrossmatched** and bleeding emergencies when time does not allow completion of pretransfusion testing (crossmatching):
 - Group O for all patients
 - Rh type is dependent on patient age and gender
 - Rh Negative
 - Neonates/Infants <4 months old
 - Females < 50 years old
 - Males <15 years old
 - Rh Positive
 - Females ≥ 50 years old
 - Males ≥ 15 years old
 - TSL MD on-call will evaluate need for prophylaxis on Rh negative patients receiving Rh positive red blood cells
- **ADULT Patients:**
 - ABO/Rh identical crossmatched RBCs will be routinely provided when available and testing is complete
 - Substitutions will be made to reduce inventory wastage
 - ABO compatible crossmatched RBC will be provided when substitutions are made
 - Patients with clinically significant antibodies should be provided RBC components negative for the corresponding antigen (see section *Clinically Significant Antibodies*)
 - Sickle Cell, Thalassemia-, Diamond Blackfan anemia and RBC exchange patients:
 - RBCs and test requirements are the same as ADULT patients with the following additions:
 - Hemoglobin S negative
 -
 - Phenotypically matched for Rh and K antigens
 - **SCCA Patients:**
 - Leukoreduced
 - Irradiated
 - Post-BMT recipients require RBC that are compatible with both the recipient and donor ABO/Rh
- **Neonatal/Infants <4 months old and Intrauterine Transfusions (IUT)** : RBCs with the following requirements will be routinely provided
 - Group O, Rh negative RBC
 - Leukoreduced
 - Freshly irradiated
 - < 7 days old

- Hemoglobin S negative (refer to SOP *Testing and Provision of Hemoglobin S Negative Blood*)
- Neonates/Infants with a negative antibody screen will routinely be provided group O Rh negative uncrossmatched RBCs
- Neonates/Infants with passively acquired maternal RBC alloantibodies directed against the patient's own antigen should be provided AHG crossmatch compatible RBCs, negative for the corresponding RBC antigen
 - A current, in-date specimen of maternal serum may be utilized to perform AHG crossmatching in lieu of collecting additional specimens from the neonate/infant
- **Requirements for Patients with Significant Antibodies:**
 - When clinically significant red cell antibodies (refer to SOP *Antibody Identification*) are found and/or the recipient has a history of such antibodies, RBCs should be prepared for transfusion that do not possess the corresponding antigen(s) and are antiglobulin crossmatch compatible, except when clinical circumstances warrant deviation and when approved by the UWMC BB Medical Director and/or the patient's physician as applicable.
 - Historical records must be compared to current records. Any discrepancies must be investigated and resolved prior to issuing a unit for transfusion.
 - Historical antibodies that are not demonstrable should be honored and RBCs provided that are negative for the corresponding antigen
 - Patients with demonstrable warm auto antibodies and antibodies to clinically insignificant high incidence antigens should receive RBC components matched for C, c, E, e, K, Fya, Fyb, Jka, Jkb, S, s. Consult with TSL Medical Director for situations in which phenotypically matched blood is not available.
 - Patients with anti-E should be typed for c, and if negative, provided with c negative units.
 - Depending on inventory levels and availability of typing sera, donor **RBCs** may be **antigen typed** (Refer to SOP *Antigen Typing Red Cells*) by UWMC **TSL** or antigen-negative **RBCs** may be ordered from the blood supplier.
 - Antigen typed units may be ordered from the blood supplier whenever the combined incidence of the antigens is 75% or greater or there is insufficient time or inventory to screen components.
 - AHG crossmatch compatible RBCs will be provided for patients with alloantibodies to low frequency antigens, for which anti-sera is not available

GRANULOCYTES

- Granulocyte orders must be approved in advance by the UWMC BB Medical Director
- Must be
 - Irradiated
 - ABO/Rh compatible
 - Select compatible granulocytes based on the RBC compatibility tables below

INSTRUCTIONS:

- [Patient LIS Record Review](#)
- [Adult Patients \(excluding Post -BMT\)](#)
- [Post-BMT Recipients](#)
- [Neonates/Infants <4 Months of Age & Intrauterine Transfusions \(IUT\)](#)

Patient LIS Record Review

STEP	ACTION						
1	<ul style="list-style-type: none"> • Review the patient’s history in Sunquest (SQ) for the following: Required testing is complete • Needed attributes: <ul style="list-style-type: none"> ○ Irradiated ○ Washed ○ HgB S negative • Any restrictions or special requirements <ul style="list-style-type: none"> ○ Post-BMT ○ Age: Neonate/Infant < 4 months old ○ Gender • ABO/Rh of patient <ul style="list-style-type: none"> ○ Current test results ○ BAD file historical results <p>NOTE: If clinical status or current available inventory prohibits the ability to honor all patient requirements, consult with a UWMC Blood Bank (BB) medical director for guidance on component selection</p>						
2	<ul style="list-style-type: none"> • Review the product order for the following: <ul style="list-style-type: none"> ○ Attributes: <ul style="list-style-type: none"> • Irradiated • Washed ○ HgB S negative ○ Special requirements 						
3	<table border="1" style="width: 100%;"> <thead> <tr> <th style="background-color: #cccccc;">If there are</th> <th style="background-color: #cccccc;">Then</th> </tr> </thead> <tbody> <tr> <td>No discrepancies or other issues</td> <td>Go to next step</td> </tr> <tr> <td>Discrepancies between patient and order requirements</td> <td> <ul style="list-style-type: none"> • Add any attribute from the order to the patient SQ record • Resolve before selecting blood components </td> </tr> </tbody> </table>	If there are	Then	No discrepancies or other issues	Go to next step	Discrepancies between patient and order requirements	<ul style="list-style-type: none"> • Add any attribute from the order to the patient SQ record • Resolve before selecting blood components
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No discrepancies or other issues	Go to next step						
Discrepancies between patient and order requirements	<ul style="list-style-type: none"> • Add any attribute from the order to the patient SQ record • Resolve before selecting blood components 						

		<ul style="list-style-type: none"> Consult with a UWMC BB MD or manager for resolution, if needed 	
4	Go to the appropriate section: <ul style="list-style-type: none"> Adult Patients (excluding Post-BMT) Post-BMT Recipients Neonates/Infants <4 Months of Age & Intrauterine Transfusions (IUT) 		

Adult Patients (excluding Post -BMT)

STEP	ACTION									
1	If Patient BAD file ABORh is one of the following					Then				
	O NEG	A NEG	B NEG	AB NEG	NTD NEG	Go to Step 2				
	O POS	APOS	B POS	AB POS	NTD POS					
NTD and Rh is not specified					Go to Step 3					
2	Select ABO/Rh compatible RBCs or granulocyte components according to the following compatibility table ensuring all attributes and other special requirements can be met									
	RBC Compatibility Table for Adult Patients (excluding Post-BMT Recipients)									
			RBC ABORh							
			O NEG	O POS	A NEG	A POS	B NEG	B POS	AB NEG	AB POS
	RECIPIENT ABORh	O NEG	✓							
		O POS	✓	✓						
		A NEG	✓		✓					
		A POS	✓	✓	✓	✓				
		B NEG	✓				✓			
		B POS	✓	✓			✓	✓		
NTD NEG		✓								

STEP	ACTION									
	NTD POS	✓	✓							
	AB	See the following table								
	NTD	Go to step 3								
Compatibility Table for AB Adult Patients (excluding Post-BMT Recipients)										
RECIPIENT ABO/Rh		RBC ABORh								
		O NEG	O POS	A NEG	A POS	B NEG	B POS	AB NEG	AB POS	
Non-BMT	AB NEG	✓		✓		✓		✓		
	AB POS	✓	✓	✓	✓	✓	✓	✓	✓	
PRE-BMT	AB NEG	✓								
	AB POS	✓	✓							
3	Some patients may have only "NTD" listed as the ABO without a Rh type listed Select the following for these patients:									
		Select								
	ABO	Group O								
	Rh	Review the comments section of the patient BAD file								
If					Then select					
No Rh type is specified					Rh Negative					
Rh type is specified in the comments					Rh type specified					
4	Perform all additional component process and testing as required by the patient history and order									

Post-BMT Recipients

STEP	ACTION																																								
1	<ul style="list-style-type: none"> Select irradiated RBCs that are compatible with both the recipient and donor ABORH ensuring all attributes and special requirements are met Select the appropriate Rh type according to the following table: <table border="1" data-bbox="332 638 1414 1245"> <thead> <tr> <th colspan="4">RBC Rh Compatibility for Post-BMT Recipient</th> </tr> <tr> <th>Recipient Rh</th> <th>BMT Donor Rh</th> <th>BAD Rh</th> <th>RBC Rh</th> </tr> </thead> <tbody> <tr> <td>NEG</td> <td>NEG</td> <td>NEG</td> <td>NEG</td> </tr> <tr> <td>POS</td> <td>NEG</td> <td>NEG</td> <td>NEG</td> </tr> <tr> <td>NEG</td> <td>NEG</td> <td>(BLANK)</td> <td>NEG</td> </tr> <tr> <td>POS</td> <td>NEG</td> <td>(BLANK)</td> <td>NEG</td> </tr> <tr> <td>NEG</td> <td>POS</td> <td>POS</td> <td>POS</td> </tr> <tr> <td>POS</td> <td>POS</td> <td>POS</td> <td>POS</td> </tr> <tr> <td>NEG</td> <td>POS</td> <td>(BLANK)</td> <td>POS</td> </tr> <tr> <td>POS</td> <td>POS</td> <td>(BLANK)</td> <td>POS</td> </tr> </tbody> </table>	RBC Rh Compatibility for Post-BMT Recipient				Recipient Rh	BMT Donor Rh	BAD Rh	RBC Rh	NEG	NEG	NEG	NEG	POS	NEG	NEG	NEG	NEG	NEG	(BLANK)	NEG	POS	NEG	(BLANK)	NEG	NEG	POS	POS	POS	POS	POS	POS	POS	NEG	POS	(BLANK)	POS	POS	POS	(BLANK)	POS
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POS	POS	(BLANK)	POS																																						
2	<p>Select the appropriate ABO according to the following table:</p> <table border="1" data-bbox="332 1520 1414 1856"> <thead> <tr> <th colspan="4">RBC ABO Compatibility for Post-BMT Recipient</th> </tr> <tr> <th>Recipient ABO</th> <th>BMT Donor ABO</th> <th>BAD file</th> <th>RBC ABO</th> </tr> </thead> <tbody> <tr> <td rowspan="3">O</td> <td>O</td> <td>O</td> <td>O</td> </tr> <tr> <td>A</td> <td>NTD</td> <td>O</td> </tr> <tr> <td>B</td> <td>NTD</td> <td>O</td> </tr> </tbody> </table>	RBC ABO Compatibility for Post-BMT Recipient				Recipient ABO	BMT Donor ABO	BAD file	RBC ABO	O	O	O	O	A	NTD	O	B	NTD	O																						
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STEP	ACTION			
		AB	NTD	O
	A	O	NTD	O
		A	A	A, O
		B	NTD	O
		AB	NTD	O
	B	O	NTD	O
		A	NTD	O
		B	B	B, O
		AB	NTD	O
	Recipient ABO	BMT Donor ABO	BAD file	RBC ABO
	AB	O	NTD	O
		A	NTD	O
		B	NTD	O
		AB	NTD	O
	3	Perform all additional component process and testing as required by the patient history and order		

Neonates/Infants <4 Months of Age & Intrauterine Transfusions (IUT)

STEP	ACTION
1	Select Group O, Rh negative RBC with the following requirements <ul style="list-style-type: none"> • Leukoreduced • Freshly irradiated • < 7 days old

STEP	ACTION
	<ul style="list-style-type: none"> • Hemoglobin S negative (refer to SOP <i>Testing and Provision of Hemoglobin S Negative Blood</i>)
2	Perform all additional component process and testing as required by the patient history and order

CALCULATIONS/INTERPRETATIONS/RESULTS REPORTING/NORMAL VALUES/CRITICAL VALUES

Interpretation

NA

Results Reporting in Sunquest

NA

CALIBRATION:

NA

PROCEDURE NOTES AND LIMITATIONS:

- “BMT” listed in the patient’s SQ “comment” field designates the patient is a bone marrow transplant candidate. The date of transplant and donor type will be listed for SCCA patients when UWMC BB is provided this information from the SCCA TSO office. The recipient should be considered post-BMT on the day of transplant. Non-SCCA BMT recipient transplant date and donor ABO/Rh may be added if known.
- Any deviation from this procedure should be approved by the UWMC BB Medical Director and documented the deviation on a QI form (include the name of the MD who approved the deviation)
- The billing code **AUTOP** is added to the unit to bill for the processing fee when an autologous unit is not transfused. If the unit is later transfused, add the billing code **CAUTOP** to prevent charging the processing fee twice.

REFERENCES:

RELATED DOCUMENTS:

- SOP *Blood Component Processing*
- SOP *Antibody Identification*
- SOP *Electronic Crossmatch*
- SOP *Testing and Provision of Hemoglobin S Negative Blood*
- SOP *Immediate Spin Crossmatch*
- SOP *Antigen Typing Red Cells*

APPENDIX:

NA

UWMC SOP Approval:

**UWMC CLIA
Medical Director**

Mark H. Wener, MD

Date _____

**Transfusion
Service Manager**

Nina Sen

Date _____

**Compliance
Analyst**

Christine Clark

Date _____

**Transfusion
Service
Medical Director**

Monica B. Pagano, MD

Date _____

TITLE: Selection of Red Blood Cell and Granulocyte Components for Transfusion

Number:
PC-0069.02

UWMC Biennial Review:

_____ Date _____

_____ Date _____

APPENDIX:

None REVISIONS:

05/30/2021: Added policy statements requiring crossmatching of autologous and directed RBCs

TRAINING