University of Washington Medical Center 1959 NE Pacific Street. Seattle, WA 98195 Transfusion Services Laboratory Policies and Procedures Manual	Original Effective Date: 03-11-16 Revision Effective Date:	Number: PC-0011.02

TITLE: **Blood Storage and Inventory Management**

PURPOSE:
To describe the policies and process for storing and managing blood inventory

PRINCIPLE & CLINICAL SIGNIFICANCE:
Principle
Storage of blood and blood components at University of Washington Medical Center Transfusion Services Laboratory (UWMC TSL) and Seattle Cancer Care Alliance Transfusion Support Service (SCCA TSS) must meet the standards mandated by the Food and Drug Administration (FDA), AABB, and any applicable blood supplier requirements related to products that are eligible for return

Inventory quantities must be sufficient to meet the routine patient needs, allow for unanticipated increases in utilization due to emergencies and minimize component outdating

Clinical Significance
Strict storage requirements are in place to assure the safety, purity, and potency of all blood components are maintained

POLICIES:
Storage of Blood Components
- Only trained UWMC TSL and SCCA Alliance Lab staff are allowed access to blood components prior to components being issued for transfusion. Access is controlled through badge access or 24/7 staff monitoring
- Blood components are stored as specified in **Table 1:** *Blood Component Storage Conditions*. Components not maintained in these storage conditions will be evaluated by the transfusion staff and disposed of as necessary.

Table 1: Blood Component Storage Conditions

Type of Component	Storage Equipment	Storage Temperature
• Red blood cells • Thawed plasma	Refrigerator	1° to 6°C
• Frozen plasma • Frozen cryoprecipitate	Freezer	≤ -18°C
• Platelets	Platelet Incubator with agitator	20° to 24°C with gentle agitation
• Granulocytes • Thawed cryoprecipitate	Platelet Incubator	20° to 24°C no agitation

- Storage equipment temperatures are monitored 24/7 using a wireless electronic monitoring system that alarms if temperatures exceed the acceptable range. Additionally, integral equipment alarms are validated, maintained, and operated as a backup system to the wireless system.
- Blood storage devices (refrigerators, freezers, platelet chambers) are connected to emergency electrical outlets (red in color). In the event of power outage, emergency outlets are powered by generators to provide uninterrupted power during an outage.
- If a storage device fails to maintain acceptable temperature, blood components must be removed to an alternate acceptable storage within 30 minutes.
    - Notify the UWMC Operations or Quality Manager immediately, if there are no alternate storage device to move the affected blood products
    - Limit opening and closing of storage devices to more than the minimum time in order to prevent unnecessary warming of the internal temperature.
    - Blood components may also be moved to appropriate blood shipping containers with coolant acceptable for the component type. The lids must remain fully closed and internal temperatures documented every 4 hours.
    - Blood components may not be stored in shipping containers overnight at the SCCA Alliance Lab (TSS)
- TSL medical director approval is required prior to placing blood components back into inventory when it is determined that required storage conditions were not maintained. When this occurs, the deviation from SOP must be documented including the reason for the deviation
- Inventory is monitored to ensure units are segregated appropriately in storage in the following manner:
    - Units are segregated by blood type and component type and may also be stored in numerical order (last 6 digits of unit number) to facilitate location of units in inventory
    - Quarantined, autologous and directed units are physically segregated from other stock
    - Units may additionally be segregated prior to issue, transport, irradiation, or while testing is in progress

Inventory Management

- Inventory levels are maintained between the minimum and par levels in order to provide prompt patient care and reduce wastage (see Appendix: Tables 1 thru 4). These levels are defined at each inventory location/facility and should be considered guidelines that can be adjusted as necessary in response to patient needs
- Inventory levels are monitored by each shift, with orders placed daily and additional orders as needed to ensure the laboratory is able to respond to patient needs in a timely manner
- Inventory quantities are reconciled daily at each site

SPECIMEN REQUIREMENTS:

NA

REAGENTS/SUPPLIES/EQUIPMENT:

Reagents:	Supplies:	Equipment:
NA	NA	NA

QUALITY CONTROL:
NA

INSTRUCTIONS:

TABLE of CONTENTS

Daily Inventory Reconciliation (UW TSL and SCCA Staff)

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td>1</td><td>Print an Inventory Report from SmarTerm
<table>
<tr><th>To print</th><th>Then</th></tr>
<tr><td>XXX Blood Bank Inventory Report (one page report)</td><td>Log into SmarTerm and enter the following:
<table>
<tr><th>Field</th><th>Enter</th></tr>
<tr><td>Function:</td><td>XXX</td></tr>
<tr><td>Which medical center (H or U)?:</td><td>U</td></tr>
<tr><td>=></td><td>Press down error to select <Lab Inquiry Functions></td></tr>
<tr><td>=></td><td>Press down error to select <Blood Bank Inventory></td></tr>
<tr><td>Hospital ID [1], or 2:</td><td>1</td></tr>
<tr><td>Area [0 for NO AREA] (0, AGNEG, BB2, EMR, EMR2, SA1):</td><td>Enter desired inventory area(s)</td></tr>
<tr><td>Printer</td><td>Printer number to print report
or
Press <Enter> to review without printing</td></tr>
</table></td></tr>
<tr><td>Blood Bank Inventory Summary (break down by product code)</td><td>Log into SmarTerm and enter the following:
<table>
<tr><th>Field</th><th>Enter</th></tr>
<tr><td>Function</td><td>BBR</td></tr>
<tr><td>Printer</td><td>Printer number to print report
or
Press <Enter> to review without printing</td></tr>
<tr><td>Select Option</td><td>13</td></tr>
<tr><td>Hospital ID:</td><td>U</td></tr>
<tr><td>• Area:</td><td>• noarea (for UW TSL only)
• SA1 (for SCCA only)
• BB2 (for UW 2nd OR only)
• <Enter> (for all areas)</td></tr>
</table></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>STEP</th><th>ACTION</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>Component type/group:</td><td>• RBCG (Red Blood Cells)
• PLG (Platelets)
• PLSG (Plasma)
• CRYG (Cryo group)
• <Enter> (for all areas)</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Count the number of red blood cell and platelet units by blood type and record the count on the Blood Bank Inventory Summary Report</td></tr>
<tr><td>3</td><td>Count the number of plasma and cryoprecipitate units by blood type and record the count on the Blood Bank Inventory Summary Report</td></tr>
<tr><td>4</td><td>Compare the physical count to the count on the SQ report, investigate and resolve any discrepancies:
<table>
<tr><th>Discrepancy</th><th>Then</th></tr>
<tr><td>None or resolved</td><td>Go to next step</td></tr>
<tr><td>Unresolved</td><td>Print a BBR2: Product File List for the component type with the discrepancy:
• Press the <Enter> key for all options until Component Type/Group
• Enter the code for the component group with the discrepancy
○ RBCG for red blood cells
○ PLG for platelets
○ PLSG for plasma
○ CRYG for cryoprecipitate
• Enter the status
○ INV to get all available, unprocessed and allocated units
• Enter the ABO/Rh: (ex: O-POS)
• Press <Enter> for all other options
• Compare all units listed on report to the units physically in inventory.
<table>
<tr><th>If discrepancy is</th><th>Then</th></tr>
<tr><td>Resolved</td><td>Go to next step</td></tr>
<tr><td>Unresolved</td><td>• Document discrepancy on a QIM and notify the TSL Lead
• Go to next step</td></tr>
</table>
</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Initial and date Blood Bank Inventory Summary reports</td></tr>
<tr><td>6</td><td>
<table>
<tr><th>If</th><th>Then</th></tr>
<tr><td>SCCA</td><td>Send reports and discrepancy paperwork to UW TSL</td></tr>
<tr><td>UW TSL</td><td>File reports and discrepancy paperwork in the appropriate location</td></tr>
</table>
</td></tr>
</table>

Restocking SCCA and 2nd Floor OR Locations (UW TSL staff only)

STEP	ACTION
1	Send blood components to the SCCA and 2nd Floor OR to meet par levels and patient needs (see *Appendix: Tables 1-3*)
2	Irradiate additional red blood cell and platelet units to maintain acceptable inventory levels (see *Appendix: Tables 1-3*)

Storage Device and Power Failure at UWMC TSL

STEP 1

Limit opening storage device doors prior to removal of blood component to slow warming of contents

STEP 2

If alternate storage device is	Then
Available	Go to next step
Not available	• Prepare blood component shipping container(s) with acceptable coolants and appropriate liquid thermometer - refer to SOP ***Packing and Shipping Blood Components*** • Notify the UW TSL Operations Manager or Quality Manager of the failure as soon as possible to determine longer term management and storage of affected inventory

Storage Temperature	Coolant
1 – 6 ºC	Wet ice
20 – 24 ºC	Room temperature stabilizers
<18 ºC (frozen)	Dry ice – contact Bloodworks NW immediately and ask for shipping containers supplied with the appropriate amount of dry ice. **CRITICAL:** Use Sunquest inventory reports to determine how many shipping containers are needed instead of opening freezer doors to count the components.

STEP 3

If components are relocated	Then
≤ 30 minutes	Move the blood components to the alternate storage device
>30 minutes	• Obtain and document the temperature of the blood components at the time of relocation. • Immediately place the blood components in the alternate storage device

STEP	ACTION
	NOTE: The component temperature should be recorded on the QI – see step 6
4	**If** / **Then** Storage device is out of service → Initiate and attach an ***Equipment Out of Service*** form to the failed device in a manner to prevent anyone from accidently using the device. Power is out → Go to next step
5	Add a note to the Communication Log to alert all staff of the event and the relocation of the contents
6	Initiate a QI documenting the event **NOTE:** The component temperature obtained in step 3 should be recorded on the QI
7	Contact the Operations and Maintenance Department (refrigeration division) for repair of the storage device or estimation when power will be restored

Storage Device and Power Failure at SCCA Transfusion Support Service

STEP	ACTION
1	Limit opening storage device doors prior to removal of blood component to slow warming of contents
2	**If alternate storage device is** / **Then** Available → Go to next step Not available → • Call the UW TSL immediately and ask for emergency delivery of shipping containers with the appropriate coolant

If storage temperature is	Coolant
1 – 6 ºC	Wet ice
20 – 24 ºC	Room temperature stabilizers

STEP	ACTION
3	**If components are relocated** / **Then** ≤ 30 minutes → Move the blood components to the alternate storage device >30 minutes → • Obtain and document the temperature of the blood components at the time of relocation. • Immediately place the blood components in the alternate storage device **NOTE:** The component temperature should be recorded on the QI – see step 6
4	Document the temperature of the blood components and immediately place the blood component in the prepared shipping container
5	Notify the UW TSL Operations Manager or Quality Manager of the failure as soon as possible for instructions on managing the affected blood inventory

STEP	ACTION
6	Initiate a QI documenting the event and send a copy to UW TSL **NOTE:** The component temperature obtained in step 3 should be recorded on the QI
7	Follow SCCA TSS standard procedure to initiate repair of the storage device or power restoration

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

CALIBRATION:
NA

PROCEDURE NOTES AND LIMITATIONS:
- Due to inventory shortages, it may not be possible to completely fill orders and adjustments may be necessary to optimize product distribution at remote storage locations
- Consult with MLS staff as necessary when short-dated and/or alternate products are offered as a substitution prior to accepting
- Special precautions may be required to prevent burns when handling dry ice. Insulated gloves must be worn when there is a risk of contact with skin. Dry ice should always be handled in a well-ventilated area and must be packaged in a manner that would allow the gas to escape as the dry ice dissipates. See the Clinical Laboratory Safety Policy for additional information and precautions regarding handling dry ice.

REFERENCES:
- Technical Manual. Bethesda, MD: AABB, current edition
- Standards for Blood Banks and Transfusion Services. Bethesda, MD; AABB, current edition

RELATED DOCUMENTS:
NA

UWMC SOP Approval:

UWMC CLIA Medical Director _____ Date _____
Mark H. Wener, MD

Transfusion Service Manager _____ Date _____
Nina Sen

Compliance Analyst _____ Date _____
Christine Clark

Transfusion Service Medical Director _____ Date _____
Monica B. Pagano, MD

UWMC Biennial Review:

_____ Date _____

_____ Date _____

SCCA SOP Approval:

SCCA CLIA Medical Director _____ Date _____
Brent L. Wood, MD

Director, Transfusion Services _____ Date _____
Terry Gernsheimer, MD

Alliance Lab Manager _____ Date _____
Elizabeth Means-Siemianski

SCCA Biennial Review:

_____ Date _____

_____ Date _____

REVISION:
07-01-2019:
Adding instructions for component blood storage in the event of power failure.

APPENDICES:

Table 1: UWMC TSL Inventory Par Levels

Leukoreduced RBC Components (~ 10% irradiated)															
O POS		***O NEG**		**A POS**		**A NEG**		**B POS**		**B NEG**		**AB POS**		**AB NEG**	
Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par
70	100	10	15	50	85	8	15	10	15	2	6				
***1 O NEG RBC, Leukoreduced unit for neonates**															
Plasma (Includes frozen & thawed, Jumbo plasma counts as two units)															
O				**A**				**B**				**AB**			
Min		Par		Min		Par		Min		Par		Min		Par	
50		100		50		100		25		50		10		20	
Pooled Cryoprecipitate												**Single Cryoprecipitate**			
Any Type												**AB only**			
30												2			
Minimum inventory = 10 pools & 1 single AB units for neonates															
Leukoreduced Platelet Inventory (~ 50% irradiated)															
O POS		**O NEG**		**A POS**		**A NEG**		**B POS**		**B NEG**		**AB POS or NEG**			
8		3		8		4		4		2		2			
Minimum inventory = 10 adult units															

Table 2: UWMC 2nd Floor Inventory Par Levels

Leukoreduced RBC Components (~ 10% irradiated)															
O POS		**O NEG**		**A POS**		**A NEG**		**B POS**		**B NEG**		**AB POS**		**AB NEG**	
Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par
10	20	5	10	10	25	2	5	0	5	0	2				
Plasma (Thawed)															
O				**A**				**B**				**AB**			
Min		Par		Min		Par		Min		Par		Min		Par	
0		2		0		2		0		0		2		4	

Table 3: SCCA Inventory Par Levels (100% Irradiated)

Leukoreduced RBC Components (100% Irradiated)							
O POS	**O NEG**	**A POS**	**A NEG**	**B POS**	**B NEG**	**AB POS**	**AB NEG**

Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par
8	18	4	8	8	15	4	8	2	6	2	4				

Leukoreduced Platelet Inventory (100% Irradiated**)**						
O POS	**O NEG**	**A POS**	**A NEG**	**B POS**	**B NEG**	**AB/ B NEG**
2	1	2	2	1	1	1
Minimum inventory = 5 adult units						

Table 4: Total Par Inventory

Leukoreduced RBC Components															
O POS		**O NEG**		**A POS**		**A NEG**		**B POS**		**B NEG**		**AB POS**		**AB NEG**	
Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par	Min	Par
88	138	19	33	68	125	14	28	12	26	4	12				

Plasma (FFP + FP24 + thawed**)**							
O		**A**		**B**		**AB**	
Min	Par	Min	Par	Min	Par	Min	Par
50	102	50	102	25	50	12	24

Pooled Cryoprecipitate	**Single Cryoprecipitate**
Any Type	**AB**
30	2
Minimum inventory = 10 pools & 1single AB units for neonates	

Leukoreduced Platelet Inventory (~ 50% irradiated**)**						
O POS	**O NEG**	**A POS**	**A NEG**	**B POS**	**B NEG**	**AB POS or NEG**
10	4	10	6	5	4	3
Minimum inventory = 20 adult units						