Lab-BB-3.003 Transfusion services customer agreement

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CLERICAL CORRECTIONS

Approval and Periodic Review Signatures

Type	Description	Date	Version	Performed By	Notes
Approval	Final version	8/17/2018	1.1	Leon Su	
Approval	Final version	8/15/2018	1.1	Maria Motta	
Approval	Supervisor Review	8/13/2018	1.1	Valerie Fredlake	
Approval	Medical Director-Blood Bank	8/10/2018	1.0	Leon Su	
Approval	Blood Bank QA/Traning Coordinator	8/8/2018	1.0	Maria Motta	
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Version History

Version	Status	Type	Date Added	Date Effective	Date Retired
1.1	Approved and Current	Minor revision	8/13/2018	8/13/2018	Indefinite
1.0	Retired	Initial version	7/23/2018	8/10/2018	8/13/2018

Linked Documents

- std 1.6 Customer Focus
- std 4.2 Agreements
- std 4.2.1, 4.2.2 Agreement Review

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Blood Bank Policy

TRANFUSION SERVICES CUSTOMER AGREEMENTS

PRINCIPLE

This document outlines the current service levels and performance standards based upon available resources provided by the Phoenix Children's Hospital Transfusion Service/Blood Bank. It is meant to provide end users/customers of blood and blood components measurable outcomes of service provision as well as allow end users to anticipate saturation of blood bank resources when caring for patients.
Blood and blood components are critical in caring for many of our patients. The transfusion service strives to support all patients in an accurate, efficient and rapid manner, however, transfusion service resources are not unlimited and may not, for a multitude of reasons, be able to serve all our patients, providers and caregivers with the level of service we aim to deliver. In these circumstances patients will be triaged by acuity.

TRANSFUSION RELATED SOPs –POLICY IQ

Indications for Transfusion Policy IQ PCH2741
Blood Product Administration Policy IQ PCH601
Massive Transfusion Policy IQ PCH929
Blood Bank Test Menu (APPENDIX A)
Selection of Blood Components (APPENDIX B)
Blood Products -Inventory Levels (APPENDIX C)
Blood Bank Alert Values (APPENDIX D)

CUSTOMERS

1. Inpatient-General
2. Trauma
3. CVICU
4. NICU
5. PICU
6. Hemonc- Inpatient & outpatient
7. Surgery
8. Apheresis
9. BMT Transplant
10. Solid Organ Transplant
11. Outpatient other
12. ECMO

CATEGORIES

- Common Services
- Specialized Transfusion Service Support by Clinical Department
- Transfusion Medicine Provider (TMP) SCOPE
- APPENDIX A – Test menu and expected turn around times
- APPENDIX B – Selection of blood components
- APPENDIX C – Inventory levels
  APPENDIX D – Alert Values

COMMON SERVICES

The blood bank provides immunohematologic testing and provision of blood and blood

components to PCH patients. In addition, the blood bank provides coagulation testing through thromboelastography (TEG) testing.

Process	Description
Specimen Collection	Specimens MUST be collected in compliance with Lab-BB-2.190 Positive Patient Identification for Compatibility Testing and Policy IQ 601 Blood Product Administration. *No exception to this policy will be granted*
Ordering	Test menu and expected turnaround times see Appendix A Test Priority definitions See Policy IQ 2753 *Please contact the blood bank if a desired test is not listed in SCM* Indications for transfusions see Policy IQ 2741
Testing	Test turnaround times and testing priority can be found in Appendix A If TEG testing is desired, please contact the BB prior to drawing the sample as number of concurrent TEG tests is limited.
Delivery	See Blood Administration Policy PCH601 on Policy IQ.
Administration	See Blood Administration Policy PCH601 on Policy IQ.
Special Circumstances	Selection of Blood and Components Appendix B **Massive Transfusion Policy IQ 929** ******NOTE***Massive transfusion and Emergency release require a written physicians order or counter-signed order. This may be provided after the transfusion event.*** *While all personnel may initiate a massive transfusion, advanced providers are not allowed to sign for emergency release blood according to the FDA Code of Federal Regulations which states: FDA requirement – 21 CFR 606.160(b)(3)(v) - Emergency release of blood, including signature of requesting physician obtained before or after release. And also 21 CFR 606.151(e): Procedures to expedite transfusion in life-threatening emergencies. Records of all such incidents shall be maintained, including complete documentation justifying the emergency action, which shall be signed by a physician.* Rh positive platelets may be provided to an Rh negative patient due to limited availability or emergent medical need. If the patient is a female under the age of 50, Rh Immuneglobilin should be provided as soon as possible following the transfusion of the Rh positive platelets. ▪ Physicians may order: "WinRho for Rh neg patients that receive Rh positive platelets" for every 1-2 Rh positive platelet(s) transfused. ▪ If required, the transfusion medicine physician is available to assist in managing this situation. See the on-service schedule for the Apheresis/Transfusion Medicine physician on call on PCH4U for the appropriate individual to contact. In emergent situations group A plasma may be provided to non-group A patients. This is generally regarded as safe in larger children and adults but patients should be monitored for hemolysis. Rapid submission of blood bank samples will allow for group compatible plasma to be provided. **Platelet Refractory Assessment and Product selection** • Testing for refractoriness to platelets is a send out to a local reference laboratory.

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	• Guidance on testing to be performed may be found in Appendix A. Contact a transfusion medicine physician for additional guidance. • Crossmatched and HLA platelets typically take 48 hours to obtain and may take longer if the patient is highly refractory or has an uncommon HLA type.
Limitations to the provision of services	Maximum workload threshold ▪ Staffing is performed to address daily transfusion recipient requirements. Typically staffing is as follows: • Weekday 0600-1000 is two certified Medical Laboratory Scientist (MLS) • Weekday 1000-1500 is two certified MLS and one Lab Assistant (LA) • Weekday 1500-2030 one certified MLS and one LA • Weekday 2030-0500 one certified MLS • Weekend 2030-0800 one certified MLS • Weekend 0800-2030 one certified MLS and one LA ▪ A backup system is available to increase staffing levels as needed, but the response is dependent on availability of off-site staff and travel times to the hospital. . ▪ Competing priorities may alter the rapidity with which some patients are served. However, when demand exceeds the blood banks ability to provide services patients are triaged by acuity. Keep the blood bank apprised of changes in patient acuity. Inventory and Storage of Blood Products (Inventory Levels) ▪ Inventory levels are stocked to address daily transfusion requirements and support two initial massive transfusion events. ▪ Additional components are ordered by BB staff when inventory levels hit resupply levels but may take up to two hours to be delivered. ▪ In the event of multiple massive/emergency transfusions inventory may become rapidly depleted (and staff ability to provide it maximally saturated). Anticipating transfusion requirements and communicating future needs to the blood bank will improve the ability of the blood bank to provide continuous service in such situations. See Appendix C

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SPECIALIZED TRANSFUSION SERVICE SUPPORT BY CLINICAL DEPARTMENT

Includes the services listed above plus additional services specific for clinical situations.

CUSTOMER	LIMITATION OR SPECIAL CIRCUMSTANCE
TRAUMA	Limitations: Simultaneous massive transfusions greater than two, ECMO emergent circuit changes, and other emergency circumstances requiring blood may reduce the blood bank's ability to provide timely blood products. ▪ Massive transfusion may be ordered by phone with written order follow-up (see note above) ▪ Trauma and special transfusions are triaged to first priority. ▪ Security will deliver blood components from the BB to the trauma. ▪ ED refrigerator • Available immediately after calling the BB and requesting code and providing patient information. • Refrigerator will be restocked as soon as possible but when multiple traumas are present staff may not be able to restock immediately. ▪ Massive transfusion packs are standardized. The amount and timing of each product transfused is determined by the trauma physicians and providers.
CVICU/PICU/NICU	Limitations**:** multiple patients on (ECMO,VAD,CRRT, ETC) reduce TAT of all services. Blood Bank will triage with the information available; Massive transfusion and other emergency circumstances may further reduce this capacity. Special Circumstances ▪ Reconstituted blood (red cells and plasma) is available for neonatal exchange transfusion. *May take up to three hours to prepare.* ▪ Thromboelastography testing requires communication between the floor and BB to ensure a test platform is available when the patient sample arrives. Stagger draw times and coordinate with Blood Bank for routine TEGs.
ECMO-on hold BB protocol	Special Circumstances ▪ RBC prime – 2 units • If irradiation is indicated clinical team need to decide if patient condition allows for irradiation time ~ 15 minutes • Cooler must be retrieved from BB ▪ RBC on hold for hemoglobin maintenance ▪ 1 Platelet dose on hold

	▪ TEG availability may be limited when supporting multiple patients on ECMO
SURGERY	Special Circumstances ▪ Same day surgery Type & Screen and Type & Cross testing • Every attempt will be made to accommodate day of surgery testing ▪ Type and screens may be extended up to 1 month prior to surgery as long as there is documentation that the patient has not been transfused or pregnant within 3 months of the sample draw date. Patients with known antibodies or difficult crossmatches will require additional time, occasionally substantial amounts of time, to complete testing and locate compatible units. These patients should have BB testing drawn two days prior to the surgical procedure to ensure blood will be available.
HEMATOLOGY/ONCOLOGY AND GASTROENTEROLOGY	Special circumstances ▪ Frequently transfused patients are more difficult to find compatible blood. Services may enter Type & Cross on outpatients to alert the blood bank of an upcoming appointment so they can begin to locate compatible units.
TRANSPLANT	Special Circumstances ▪ Isohemagglutinin and other antibody titers are provided to both solid organ and bone marrow transplant programs. • Note that isohemagglutinin titers are only performed during day shifts and other shifts on an on-call basis for solid organ transplant. ▪ Transfusion medicine physicians will determine appropriate blood products based upon organ/marrow and recipient type compatibility. ▪ Blood components may be washed to provide compatibility and/or minimize passive isohemagglutinin administration. This is available with approval.

TMP SERVICES

Transfusion Medicine Physician Clinical Support
A transfusion medicine physician (TMP) is available 24/7 to provide transfusion therapy clinical support. The TMP on-call can be reached through contact numbers in the on-service schedule, through the hospital operator or by calling the blood bank. Services provided by the TMP include:

- *Application of "special requirements"*
  - *All blood components are leukoreduced. Prior to TMP review cellular blood components will be irradiated (unless requested emergently) and antigen negative units provided when appropriate such as in the chronically transfused*

patient or those with antibodies. Following TMP review component attributes will be appropriately modified by the TMP based on the patient's condition. This usually manifests as removal of irradiation for patients that don't require irradiation, however, other attributes (washing, phenotypically similar, etc) may be added.

- *Guidance for blood component selection*
- *Guidance for blood administration*
- *Transfusion Reaction Investigation*
- *Consultations - The TMP is available for consultation in the following areas:*
  - *Transfusion reactions*
  - *Granulocytes*
  - *Thromboelastography (TEG) interpretation*
  - *Suspected Platelet refractory patient*
  - *Immunohematology evaluation for autoimmune hemolytic anemia*
  - *Anticoagulation monitoring for patients on ECMO or with a ventricular assist device*
  - *Apheresis – Therapeutic plasma exchange, red cell exchange, therapeutic cytapheresis, extracorporeal photopheresis, and peripheral blood stem cell collection*.

REFERENCES

Standards for Blood Banks and Transfusion Services, Current edition, aaBB, Bethesda, MD.
Technical Manual, Current edition. aaBB. Bethesda, MD.

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APPENDIX A: TESTS AND TURN AROUND TIME (LAB-BB-2.005)

Immunohematology Testing - Patient

	SCM Test Name	Order in SCM	Turn Around Time & Other specimen requirements	Specimen Volume/Tube		Other Information
1	Type and Screen	Y	STAT- 40 min ASAP- 1-2 hours Routine: 4 hours	Lavender (EDTA) with **Blood Bank ID Form** < 4m 4m-4y > 4y	 0.5 mL 2 mL 4 mL	Smaller samples accepted if enough plasma to perform all testing.
2	Antibody ID- (Reflex from positive screen)	N	1-4 additional hours if able to resolve in house	TYSC sample		May require additional specimen. If a send out is necessary to a reference lab additional days may be required.
3	Direct Antiglobulin Test – Polyspecific DAT	Y	STAT – 10 min ASAP – 1-2 hours Routine – 4 hours	0.5 mL- Lavender (EDTA)		Clotted tubes are acceptable if not refrigerated. DAT should be run within 24hrs of specimen collection.
4	DAT – IgG Reflex from positive DAT or Antibody ID.	N	See DAT	See DAT		See DAT- Patients < 4 months old receive only IgG DAT instead of Poly DAT).
5	DAT – Complement Reflex from positive DAT	N	See DAT	See DAT		See DAT
6	Eluate- not orderable in SCM May reflex from positive IgG DAT	N	1-4 hours, if able to resolve in house	Lavender(EDTA)		20 drops of packed rbcs preferred-
7	Heart Transplant Isohemagglutinin Titer	Y	Routine 24 hrs STAT- 1-2 hrs	3-4 mL Lavender (EDTA)		1.5 mL of Plasma needed. 3 mL ok if HCT is 50% or less. Remaining plasma is frozen for future parallel.
8	BMT Isohemagglutinin Titer	Y	24 hrs	3-4mLs Lavender (EDTA)		1.5 mL of Plasma from a needed. 3 mL ok if HCT is 50% or less. Remaining plasma is frozen for future QC.
9	Sickle Cell Screen (patient)	Y	STAT-20 min	50µL Lavender top (EDTA)		Patient should not be transfused within last 3 months.
10	RBC Serologic Phenotyping- Order on downtime requisition	N	1 hour 24 hours	50µL Lavender top (EDTA)		Patient should not be transfused within last 3 months.
11	RBC Molecular Genotyping- Order on downtime requisition	N	2 Weeks sent to IRL	1-4mL- Lavender top (EDTA)		Check with IRL on low weight patients

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Immunohematology Testing- Transfusion Reactions

	SCM Test Name	Order in SCM	Turn Around Time & Other specimen requirements	Specimen Volume/Tube	Other Information
12	Transfusion Reactions- anything other than Urticarial	N	Performed immediately- TAT depends on workup	1-4mL Lavender top (EDTA)	Depending on the initial work up the transfusion Service may request additional samples recommended by the Transfusion Medicine Physician
13	Transfusion reactions- Urticarial Only	N	24hr	None	N/A

Units Testing/Special Requirements (Ordered through Blood Product Orders)

	Test Name	Turn Around Time
14	Unit Antigen Typing: Rh and Kell or other available in house.	1-4 hrs
15	UBS Antigen Typing: Duffy, Kidd, MNS, multiple antigens and other rare phenotypes.	At least 2-4 additional hours. Depending on the rarity of the units TAT could be days.
16	Sickle Cell Screen - unit	20 additional min
17	Irradiation	Performed Right Before Issue- 15 min
18	Washing	45 min per unit
19	Splitting	15 minutes

Other Sendout Immunohematology Testing

	Downtime Test Name	Turn Around Time	Specimen Volume	Other Information
20	Profile H Testing-	Results sent to main lab	Call Main Lab or BMT coordinator 2 Lav & 1 Red	Ordered by Main Lab
20	Platelet Refractory Panel ➢ Platelet Crossmatch ➢ Platelet Antibody Screen- Sent out through Main Lab ➢ Platelet associated IgG (Platelet DAT) ➢ HLA class I antibody screen/ID ➢ HLA A, B (IR) typing ➢ HLA matched donor search	Preliminary: 1-2 days Final: 1 week	Platelet Crossmatch -4ml Red top Platelet associated IgG (Platelet DAT) HLA class I antibody screen/ID HLA A, B (IR) typing HLA matched donor search	Notify TMP On Call If these tests are needed IRL may freeze additional sample for future crossmatch.
21	Cold antibody work up- ➢ Donath Landsteiner ➢ Thermal Amplitude ➢ Cold Titers	Preliminary: 1-2 days Final: 1 week	Donath Landsteiner- 4ml Red top only- (60 drops of Serum) Thermal Amplitude- 4ml Lavender or Red Top (6 drops of Plasma)	• Ordered/processed by main lab. **Samples must be maintained at 37C immediately after collection until separation.**

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			Cold Antibody Screen/Titer 4ml Lavender or Red Top (16 drops of plasma for screen, 0.6 mL for titer)	
22	Extended Antibody workup ➢ ABO/Rh Discrepancy ➢ Antibody ID ➢ Elution/Adsorptions ➢ Serologic phenotyping	Preliminary: 1-2 days Final: 1 week	Depends on workup. Call IRL to get sample requirements	Notify TMP on call or Supervisor when preliminary results are reported from IRL and any final results that differ from originally reported results.

Thromboelastography

	SCM Test Name	Turn Around Time	Specimen Volume	Sample Tube and other collection information
23	TEG and TEG w/Heparinase	Tracing available through Remote Viewer.	Min 1.8mL	• Blue top (3.2% Sodium Citrate tube) • Must be filled to the line. • Must be run within 10m-2h of collection.
24	Rapid TEG and Rapid TEG w/ Heparinase	Tracing available through Remote Viewer.	Min 1.8mL	• Blue top (3.2% Sodium Citrate tube) • Must be filled to the line. • Must be run within 10m-2h of collection.
25	Platelet Mapping – must have a TEG with Heparinase	2 hours	Min 2 mL	• Non-gel heparin vacutainer tubes with >14.5 IU heparin/ml blood. • Lithium or Sodium Heparin • Must be filled to the line. • Must be run within 10m-2h of collection
		Tracing available immediately through Remote Viewer.	Min 1.8mL	• Blue top (3.2% Sodium Citrate tube) • Must be filled to the line. • Must be run within 10m-2h of collection.
26	TEG Pathology Interpretation	Call TMP on Call immediate need	N/A	N/A

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Blood Product Transfuse Orders – Main Campus

	SCM Test Name	Turn Around Time	Delivery
27	Transfuse RBC	Uncrossmatched ED – < 5 min	ED Call BB for Pin Code
		Uncrossmatched BB – 5 min	Ready in BB (Security/Floor to pick up BB cooler)
		STAT- 0.5-2hr	Send after all required tests/processes completed
		ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	
		Exchange – call for TAT	Pick up BB cooler when available
28	Transfuse Platelets	Trauma Stock	Ready in BB (Security/Floor to pick up)
		STAT- 0.5-2hr	Send after all required tests/processes completed
		ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	
29	Transfuse Plasma	Trauma Stock	Ready in BB (Security/Floor to pick up BB cooler)
		STAT- 0.5-2hr	Send after all required tests/processes completed
		ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	
		Exchange – call for TAT	Pick up BB cooler when available
30	Transfuse Cryo	STAT- 0.5-2hr	Send after all required tests/processes completed
		ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	
31	Transfuse Granulocyte	Schedule based on need and donor availability	Pick up in BB with Patient Name and MRN TMP to consult with clinician.
32	Continuous Platelet Transfusion	ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	
33	Continuous Plasma Transfusion	ASAP- 2-4hr	Order Modified for Delivery required for PTS or Pick up in BB with Patient Name and MRN
		Routine- 4-18hr	

Blood Product Transfuse Orders – East Valley and Avondale Outpatient HEMONC

	SCM Test Name	Turn Around Time	Delivery Method
34	Transfuse RBC	2-4 hrs depending on workup	Place Courier order to pick up BB 1-6 C cooler
35	Transfuse Platelets	2-3 hrs	Order from UBS to deliver directly to EV or SWV
36	Transfuse Cryo	1-2 hrs	Place Courier order to pick up BB 20-22C cooler
37	Transfuse Plasma	1-2 hrs	Place Courier order to pick up BB 1-6 C cooler

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Blood Product On Hand/Communication Orders – Main Campus

	SCM Test Name	Definition	Blood Bank Responsibility
38	Type and Cross Blood On Hand	Communicates how much product is needed on hand for procedure. Type and Screen auto generated if no current exists.	Blood Bank Reviews Patient History and sets up or orders product needed for the date listed on order. If patient history suggests product may not be available by date notify the TMP on call.
39	TMP Special Requirements	Transfusion Medicine Physicians (TMP) review all patients requiring Blood Products for diagnoses/conditions that may indicate the need for special requirements.	Blood Bank reviews Special Requirement Order and updated the Patient BAD File and Dashboard.
40	Physician request for review of special Requirements	Clinical team request review when they want additional requirements then listed in the Special Requirements Order.	Blood Bank Notifies the TMP on call to review and documents call on printout. Blood Bank updated the Patient BAD File and Dashboard if any changes are indicated by TMP.
41	ECMO Potential	Communicates the patient has the potential to need an ECPR.	Blood Bank reviews Patient History and ensure 2 RBCs are available for ECMO prime. If TYSC is not current Blood Bank notifies the Clinical Team.
42	ECMO administration	Communicates the patient has been placed on ECMO	Blood Bank keeps two RBCs and a Platelet on hand at all times until ECMO is discontinued.
43	iABO Heart Potential	Communicates the patient may be listed for an incompatible Heart transplant and needs products that will limit their isohemagglutinins.	Blood Bank Updates BAD File
44	BMT/SCT SCM Communication	Road Map Fax initially sent indicating the BMT/SCT information including treatment course and transplant ABO type. SCM Communication informs Blood Bank that patient is in patient and receving BMT/SCT.	Blood Bank receives the roadmap, reviews the roadmap and updates the BAD file. Blood Bank receives the SCM Communication they ensure the raod map information has been received and updated in the BAD file.
45	Chronic Transfusion	Communicate the patient is a Hemoglobinopathy needing Phenotypically matched blood for Chronic Transfusions.	Blood Bank Updates BAD File and performs phenotyping if able.
46	Sickle Cell Patient	Communicate the patient is a Sickle Cell Disease Patient needing Phenotypically matched and Hgb S Negative blood for Chronic Transfusions.	Blood Bank Updates BAD File and performs phenotyping if able.
47	Least Incompatible	Communicates LIP Approval for the release of Least incompatible RBCS.	Blood Bank ensures TMP has been notified and releases product
48	Massive Transfusion	Communicates patient has major, uncontrolled hemorrhage with anticipation or presence of abnormal hemostasis secondary to dilution and/or Trauma. Includes Emergency release of uncrossmatched O Negative RBCS (See next line)	MT pack is made according to Massive Transfusion Policy PCH929 The clinical team transfuses in ratios based on recipient weight to mimic whole blood. Blood bank to stay one order ahead until deactivated by an ordering physician and/or designee.
50	Emergency Release uncrossmatched O Negative RBCs	Physician approves Uncrossmatched O Negative RBCs before pretransfusion testing is complete because withholding or delaying transfusion for the completion of compatibility testing would seriously jeopardize the patient's chances for recovery	Blood Bank releases O Negative RBCs Conspicuously Marked as Uncrossmatched.

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APPENDIX B: SELECTION OF BLOOD COMPONENTS (LAB-BB-2.050)

ABO/Rh:
When products of the patient's type are not available, make substitutions according to this guideline:

Patient Type 1st Choice	Packed Red Cells		Platelets		Plasma/Cryo	
	2nd	3rd	2nd	3rd	2nd	3rd
O Pos	O Neg	None	A Pos	B Pos	A	B
O Neg	**O Pos***	None	A Neg	B Neg		
A Pos	A Neg	O Pos	A Neg	AB Pos	AB	None
A Neg	O Neg	**A Pos***	AB Neg	**A Pos****		
B Pos	B Neg	O Pos	B Neg	AB Pos	AB	None
B Neg	O Neg	**B Pos***	AB Neg	**B Pos****		
AB Pos	A Pos	B Pos	AB Neg	None	None	None
AB Neg	A Neg	B Neg	None	None		

- Whole blood must be type specific or low titered type O.
- Platelet Note: The platelet's plasma must be ABO compatible with the recipient's red cells. Platelet ABO compatibility is more critical than observing the Rh.

***When Rh negative RBCs are not available, the patient's licensed provider or Transfusion Service physician must approve the use of Rh positive products.**

**** Rh Negative Platelets should be prioritized for female patients.**

1. **When inventory is low, Rh Positive platelets may be allocated to male patients without the approval of the patient's licensed provider.**
2. **If the patient is female or a BMT/SCT patient, notify the Transfusion Medicine Physician.** (Rh immune globulin to prevent alloimmunization may be appropriate.)
3. **In Trauma situations Rh positive platelets may be issued.** If a Rh Positive platelet is given to a Rh Negative patient then notify a Transfusion Service Physician. (Rh immune globulin to prevent alloimmunization may be appropriate.)

Condition and Age:	The patient's age, diagnosis or scheduled procedure may dictate the selection of products.
CMV:	All patients will receive CMV-reduced-risk blood products, i.e. leukoreduced blood products. This is in accordance with the standard universal leukoreduction policy at the local blood supplier. Exceptions may occur if a rare or special blood product is imported from an outside facility that does not practice universal leukoreduction or when an outside facility

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	transplant program requires CMV seronegative products. CMV-reduced-risk products: Cellular blood products that are leukoreduced or test negative for CMV antibodies (CMV seronegative) are considered to be CMV- reduced-risk blood products. Both methods have been shown to reduce the risk of TT-CMV transmission by up to 92-93% and are appropriate for the high-risk patients listed above.[2,3] Non-leukoreduced blood products (ie Granulocytes) will be CMV Seronegative for patients that are CMV Seronegative and that are at risk for TT_CMV. CMV seropositive or untested granulocytes may be provided, with Transfusion Medicine Provider approval, in situations where CMV negative donors are not available.
1. Irradiation	Irradiation of components containing lymphocytes is performed in order to render those cells incapable of reproduction and to reduce the likelihood of transfusion associated graft vs. host disease (TA-GVHD). TA-GVHD is a rare but devastating complication of transfusion that has a very high mortality rate and no routinely available effective treatment. Prevention is the best management of TA-GVHD. AABB Standards require irradiated blood be provided to recipients at risk of TA-GVHD, recipients receiving blood products from relatives, and recipients receiving HLA-matched or crossmatched blood components. a. Irradiated cellular blood products should be given to, but not limited, to patients with the following: • Transfusions from blood relatives • HLA-matched transfusions • Granulocyte transfusions • Intrauterine transfusions • Congenital immunodeficiency (ie DiGeorge Syndrome) • BMT and stem cell transplantation • Hodgkin disease • NHL • Therapy with purine analogue drugs
Washed RBC and Platelets	Indications are (but not limited to): a. Patients with history of severe allergic reactions b. Patients receiving RBC transfusions of greater than >20mL/kg who cannot tolerate the increased potassium lesion of RBCs irradiated longer than 6 hours. • Neonates • Trauma/Massive Transfusions • Renal insufficiency c. iABO solid organ recipients (not candidates) d. IgA deficiency with the presence of anti-IgA. e. Presence of maternal anti-HPA-1a in directed maternal blood components

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Providing Specially Selected Platelet Products

Platelet transfusion refractoriness is defined as a less-than-expected increase in a patient's platelet count on two occasions, one hour after the transfusions. This is a common occurrence in thrombocytopenic patients that have had multiple transfusions (incidence of 20-70% in highly transfused patient populations). The causes for platelet refractoriness are diverse but frequently divided into immune and non-immune causes. Non-immune causes are provided below and will not be discussed here

Common Causes of Platelet Refractoriness

Immune	Non-Immune
Alloantibodies to HLA antigens	DIC
Alloantibodies to platelets specific antigens	Sepsis
Autoantibodies (ITP, etc)	Fever
	Bleeding
	Sequestration
	Drugs (including Amphotericin B)

Determining if a Patient is Refractory to Platelet Transfusion

Patients must have documented evidence of poor response to platelets with post infusion platelet counts on at least two occasions. Ideally, the freshest available and group specific platelets should be used to determine refractoriness.

Formula for Calculation of the Corrected Count Increment

$$CCI = \frac{BSA(m^2) \times PCI \times 10^{11}}{\text{No. of platelets transfused}}$$

BSA = body surface area; PCI = platelet count increment

For example, a 70kg patient has a body surface area of $1.8m^2$, a pre-transfusion platelet count of 5,000/µL, and is transfused with an apheresis platelet containing 3.2×10^{11}. The post transfusion platelet count is 30,000/µL. The CCI would be calculated as follows:

$$CCI = \frac{1.8m^2 \times (30{,}000/\mu L - 5{,}000/\mu L) \times 10^{11}}{3.2 \times 10^{11}}$$

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$$CCI = \frac{1.8m^2 \times 25{,}000/\mu L \times 10^{11}}{3.2 \times 10^{11}}$$

$$CCI = 14{,}000 \text{ platelet} \times m2/\mu L$$

The CCI should be determined shortly after transfusion usually 10 – 60 minutes. A CCI greater than 7,500 platelets x m^2 BSA/µL is considered acceptable. Platelet counts taken later in the course of therapy (12-24 hours later) are of less value in determining alloimmunization as they may be indicative of consumption or peripheral destruction.

Providing Compatible Platelets for the Immune Refractory Patient*

The method selected for the provision of special platelet products is dependent upon many, usually complex, factors. The TM physician will select the appropriate method for the patient's condition, available testing and available products.

Platelet crossmatching is typically the first method used to find compatible platelets for patients that are suspected or documented to have anti-HLA or anti-platelet antibodies.

HLA-matched platelets may also be used for patients with anti-HLA antibody mediated refractoriness. Platelets bear the HLA-A and HLA- B Class I antigens. Donor platelets are selected that most closely approximate or match the recipients

Table 11.4 Match Grades for HLA-matched Platelets

Grade	Antigen Matches
A	4 antigen match
B	2 or 3 antigen match (Unmatched antigens are unknown or cross-reactive)
B1U	1 antigen unknown or blank
B1X	1 cross-reactive group
B2UX	1 antigen blank and 1 antigen cross-reactive
B2X	2 antigens cross reactive
C	1 mismatched antigen
D	2 or more mismatched antigens

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	Ideally, provide an A match; however, some B grade matches such as B1U or B2U generally provide an adequate response. In general grade C and D matches do not provide a response greater than an unmatched product and the additional expense for an HLA-matched product does not justify their use. The antibody specificity prediction (ASP) method takes the opposite approach of HLA matching. In this approach donors lacking the antigen (or cross-reactive antigens) to the antibody that patient presents are selected. This method appears to be equally efficacious to HLA-matched platelets.
Refractoriness to Platelet Specific Antigens	The selection of compatible platelets is similar to the ASP method for HLA induced platelet refractoriness; that is select a donor negative for the antigen to which the patient has developed the antibody. Unmatched platelets may be used in emergent situations or when antigen negative platelets are unavailable
Continuous Platelet Transfusion	Continuous platelet transfusion is reserved for patients that are actively bleeding or at high risk of bleeding secondary to severe thrombocytopenia (<5-10/uL) that isn't corrected by episodic transfusion. If the patient is actively bleeding, a standard transfusion (bolus) should be provided. Patients must have documented evidence of poor response to platelets with post infusion platelet counts and should have an evaluation for alloimmune refractoriness to platelet antigens. A transfusion medicine provider should be notifed of new continuous platelet transfusion orders and evaluate for appropriateness. Goal of therapy is to provide a readily available pool of platelets for hemostasis. The platelet count may not increase during a continuous infusion. A continuous platelet transfusion should provide approximately 5mL/kg over a four hour period. The blood bank will split the platelet units so that the amount dispensed can be completely infused within 4 hours. Split volumes of 100 or 150 allow for utilization of entire units most easily. This is equivalent to infusing either 25mL/hour or 37mL/hour.
<u>Granulocytes:</u>	Apheresis Granulocytes are typically used in the treatment of patients with documented infections (especially gram-negative bacteria and fungi) unresponsive to antimicrobial therapy in the setting of neutropenia [absolute granulocyte count <0.5 × 109/L (500/μL)] with expected eventual marrow recovery. A trial of broad-spectrum antimicrobial agents should be used before granulocyte transfusion therapy is initiated. In addition to neutropenic patients, patients with hereditary neutrophil function defects (such as chronic granulomatous disease) may be candidates for granulocyte transfusion therapy.

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Apheresis Granulocytes contain numerous leukocytes and platelets as well as 20 to 50 mL of red cells. The number of granulocytes in each concentrate is usually >1.0 × 10E10. The final volume of the product is 200 to 300 mL including anticoagulant and plasma as indicated on the label

Granulocytes are

- ABO/Rh Compatible
- Irradiated
- CMV Negative, if patient is CMV Negative and CMV negative donor is available
- HLA Matched if patient is HLA allo immunized and HLA matched donor is available
- Antigen negative for any antibodies the patient has alloantibodies is preferred but medical exception may be made if donor availability is limited
- Crossmatched
- Transfused as soon as possible
- Stored at 20ºC to 24ºC, without agitation, for a maximum of 24 hours after collection.
- Administered using standard blood component recipient set with standard filter.
- Not be administered within 12 hours of drugs known to interfere with granulocytes such as Amphotericin.

Request:

b. Granulocytes requests must be approved by the TMP.
c. UBS Form BS736 must be filled out by the provider or TMP with a patient label attached to the form. Form can be found in the SCM Granulocyte Order set.
d. When completed Blood Bank is to fax the form and order Granulocyte using UBS online Special order.
e. United Blood Service (UBS) coordinates selection and stimulation of donors. Infectious disease testing is performed when the donor presents for predonation stimulation to facilitate rapid release of collected component following documentation of ABO/Rh type. Infectious disease testing is repeated on day of donation but results are not available until after transfusion occurs. Unit should arrive 8-10 hrs after collection by UBS.

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APPENDIX C: INVENTORY LEVELS (LAB-BB-2.160)

Pediatric Stock					
Product	Rh	Group O	Group A	Group B	Group AB
Red Cells	+	20	15	4	
	-	15*	4	4	
FFP	+/-	10	15	15	8*
Cryo	+/-	10	10	10	10
Cryo 5 pack	+/-	3	3	3	3
Plt	+/-		2*		1*
Neonatal Stock < 5 days old					
O Neg RBC Drawn into CPD or AS-3 Anticoagulant : 2					
O Neg RBC Drawn into AS Anticoagulant: 2					

1. In Blood Bank the following are stocked in preparation for Level 1 Trauma:
   A. 15 units of O Negative Red Blood Cells
   B. 3 Thawed units of plasma, Two Group AB, one Group A
   C. 3 pheresis platelets (1 Type AB and 2 Type A or AB)

   Note: If critical blood shortage prevents blood bank from maintaining stock levels, the trauma surgeon on call is notified by a Transfusion Medicine Physician (TMP). Obtain the name and number of the surgeon from the Emergency Department at 3-1950 and notify the TMP on call. The total number of O Negative RBC available includes the fresh neonatal products.
2. The blood bank maintains 2 units of O Negative red blood cells pre-tagged for emergency issue in the ED Trauma Fridge. Inventory levels may fluctuate depending on usage and blood availability.

APPENDIX D: ALERT VALUES (LAB-BB-3.320)

The follow Alert Values are reported to the Transfusion Medicine Provider On-Cal:

1) Suspected Transfusion Reaction abnormal findings
2) Blood Shortages
3) Incompatible Crossmatch or delays in transfusions
4) Abnormal findings after emergency release of blood components.