TRAINING UPDATE

Lab Location:	SGAH	**Date Implemented:**	5.17.2013
Department:	Blood Bank	**Due Date:**	5.20.2013

DESCRIPTION OF PROCEDURE REVISION

Name of procedure:

Neonatal Exchange Transfusion

Description of change(s):

- Updated SOP to include ISBT-128 instructions.
- Blood component prep code to reconstitute whole blood is "R" followed by the E code of the RED CELL. For example, if you reconstitute a product using red cell E0224 and plasma aliquot E####, your BCP code will be RE0224.
- We must print new blood product labels for reconstituted products using the HemaTrax system (training in progress).
- In the HemaTrax system, this product is "red blood cells with plasma added." The label prints as a reconstituted product.
- **You can ONLY use CPDA-1 red cells from a whole blood donation for reconstituted whole blood unless you remove the supernatant. We only built CPDA-1 red cells into our system.**
- When reconstituting whole blood, you must perform these steps **in order.** Failure to perform these steps in this order will result in LIS failure for the process.
    - Thaw the plasma unit (physically and in LIS)
    - Aliquot the plasma unit (physically and in LIS).
    - Irradiate the red cells (physically and in LIS).
    - Reconstitute the whole blood (physically and in LIS).
    - Print a HemaTrax label.
- **DO NOT ALIQUOT reconstituted whole blood. Give the nursing unit the ENTIRE unit and tell them to only transfuse the designated amount.**
- We cannot label a reconstituted unit as CMV-negative unless both the red cells and plasma are CMV-negative. Use the label "Red cells tested negative for antibodies to CMV; plasma not tested for antibodies to CMV" which are currently on order.

Non-Technical SOP

Title	**Neonatal Exchange Transfusion**	
Prepared by	Rowena Vince Cruz	Date: 12/21/2010
Owner	Stephanie Codina	Date: 12/21/2010

Laboratory Approval		
Print Name and Title	**Signature**	**Date**
Refer to the electronic signature page for approval and approval dates.		
Local Issue Date:	Local Effective Date:	

Review:		
Print Name	**Signature**	**Date**

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1. PURPOSE

Neonatal exchange transfusion is the treatment of choice for Hemolytic Disease of the Newborn (HDN), hyperbilirubinemia, disseminated intravascular coagulation (DIC), and occasionally the elimination of toxins, drugs, and chemicals in neonates. The procedure consists of replacing one to two whole blood volumes and has several desired effects. Removal of the infant's blood reduces antibody coated red cells, unconjugated bilrubin, and the number of unbound antibody molecules available to bind newly-formed antigen-positive red blood cells. The red cells used for replacement are compatible with the infant and/or maternal specimen and provide increased oxygen-carrying capacity. The plasma restores albumin and coagulation factors.

2. SCOPE

This procedure applies to any neonate for whom an exchange transfusion has been ordered by a physician or licensed independent practitioner (LIP).

3. RESPONSIBILITY

All blood bank staff members must understand the exchange transfusion process and know how to prepare blood products for transfusion during an exchange procedure.

4. DEFINITIONS

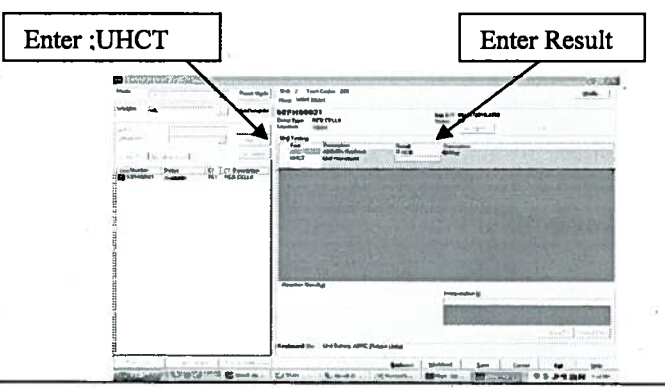
Neonate: An infant <4 months of age.

5. PROCEDURE

Summary of steps that will be performed for this procedure:

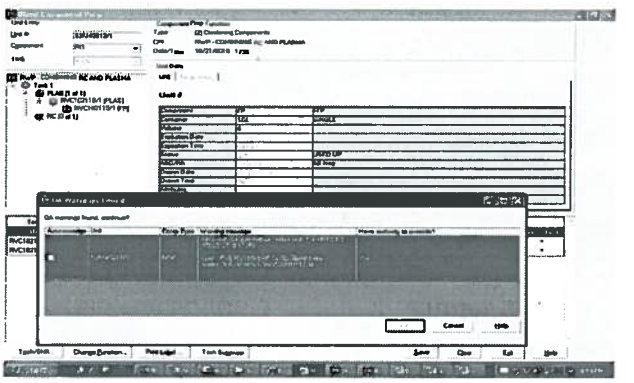
1. Determine the volume and hematocrit of the red cell. Calculate the volume of plasma to be added.
2. Physically thaw the plasma unit. BCP the unit in the LIS and relabel with a HemaTrax label.
3. Aliquot the required volume of plasma physically. BCP the product in the LIS.
4. Irradiate the red cell physically and BCP in the LIS.
5. Print a new label for the remaining plasma using the HemaTrax system.
6. Prepare the reconstituted product using the full red cell unit and the aliquotted plasma unit.
7. BCP the reconstituted product in the LIS.
8. Print a HemaTrax label for the reconstituted product.
9. Obtain a post-reconstitution hematocrit on the whole blood unit.
10. Allocate/crossmatch/issue the reconstituted product.
11. **Do not aliquot the reconstituted product. Issue the entire unit. Instruct nursing staff to only transfuse the required volume.**

Step	Action
1	An order for an exchange transfusion will consist of the following information. A. Infant's name and medical record number (Note: If blood products for an exchange transfusion are requested before an infant has been delivered, order the blood product using the mother's medical record number and type a comment stating the exchange is for an infant that has not been delivered). B. Mother's name and medical record number, if available. Often the baby is transferred to us from another hospital. C. Date and time of exchange procedure D. Specimens for T&S on the mother and TSNEO on the infant (if not already available) E. The desired hematocrit of the final product (usually 50-60%). An exact hematocrit is very difficult to achieve, so a range is generally used.
2	Order blood products from the supplier (if needed) and **emphasize delivery time**. Blood products should meet the following criteria: A. Group O (Rh-negative if the recipient is Rh-negative) B. Fresh red cells (<7 days old) to avoid high levels of potassium and to maximize red cell survival C. CPDA-1 (AS-3 red cells cannot be used for this procedure) D. CMV-seronegative E. Irradiated (note: irradiation should be performed immediately before reconstitution to minimize the potassium leak) F. Sickle-negative G. Negative for any antigens that correspond to clinically-significant maternal antibodies. H. AHG crossmatch compatible with the mother's plasma. If the mother's plasma is not available, the unit should be AHG crossmatch compatible with the infant's plasma.

Step	Action
3	Obtain a pre-hematocrit of the original unit: A. Mix the red cell unit manually by gently rotating it back-and-forth. B. Sterile dock a 150 ml transfer bag to the unit or use an attached satellite bag if available. C. Allow small sample of blood to flow into the tubing of the empty 150 ml sterile bag. Apply hemostat on the tubing toward the original unit once red cells fill up the tubing. D. Seal the tubing of the original unit first using the hematron heat sealer leaving enough tubing for the next component prep. E. It is not necessary to label the aliquot bag since the labeled segments are used for unit hematocrit testing. F. Make 3 or more segments, 2-3 inches long, label each segment with the unit number of donor identification number (DIN). Use of the labels found on the back of the original red cell unit is preferred. G. Separate the segments from the original blood product unit. H. Place one segment into a clean 12x75 mm tube. I. Deliver the sample to hematology and request STAT hematocrit testing. Instruct the hematology tech to test the specimen in duplicate and average the results. J. Save all unused segments.
4	Enter the unit's hematocrit results into the LIS. The hematocrit should be 65-80%. A. Access function "Blood Product Testing." B. At the "Unit Number" prompt, scan or type the unit number of the original unit. C. Select the correct component type from the drop-down menu if the field does not autofill. D. Click on the "Add" button. E. Click on the "Continue" button. F. In the "Test" column, type ";UHCT." G. The prompt, "Confirm adding test UHCT" will appear. Click on the "Yes" button. H. In the result column, click and press the semi-colon button twice (;;). I. Freetext the result as a percentage. For example, ";;75%." 

Step	Action
5	Select and thaw a unit of plasma. A. Group AB plasma is preferred. B. If group AB plasma is not available, select a unit of plasma that is compatible with the infant and mother's types. C. Refer to procedure, "Plasma for Transfusion." D. Plasma must be thawed fresh for this procedure (do not use a unit of thawed plasma on the shelf).
6	Approximate the volume of red cells in the primary red cell container. A. Weigh the bag of red cells. B. Subtract 100g (the approximate weight of the bag, anticoagulant, and segments).
7	Calculate the amount of thawed plasma to be added to the packed red cell unit for reconstitution per the following formulas: A. **Reconstituted Whole Blood Volume = RBC volume + Plasma Volume** B. Calculate the plasma volume. C. The hematocrit percentage must be converted to a decimal before it is plugged into the formula by moving the decimal point 2 places to the left. For example, 75% = 0.75 **Plasma Volume:** Plasma Volume = $\frac{\text{RBC Vol x RBC Hct}}{\text{Desired Hct}}$ - RBC volume **Example:** You have 200mL of packed red blood cells. The physician is requesting an aliquot with a final hematocrit of 55%. The current hematocrit of the packed red blood cell unit is 75%. Plasma Volume = [(200 x 0.75) ÷ 0.55] - 200 = (15000 ÷ 55) - 200 = 273-200 = 73 ml of Plasma needs to be added to the RBC
8	Irradiate the red blood cell (physically and in the computer BEFORE adding plasma).
9	Prepare a plasma aliquot (physically and in the computer) in the volume required for reconstitution. Refer to procedure, "Plasma Aliquot Preparation."

Step	Action
10	Add the plasma aliquot to the red cell unit. A. Use the sterile connecting device to connect the thawed plasma aliquot to the red cell unit. B. Transfer the contents of the aliquotted plasma to the red cell unit. C. Weigh the bag. D. Subtract 100g (the approximate weight of the bag, anticoagulant, and segments). E. This is the new volume of the reconstituted whole blood.
11	Prepare segments on the new, reconstituted product. A. Gently knead the bag to mix the contents. B. Allow the tubing to refill with the well-mixed reconstituted whole blood. C. Strip the blood in the remaining tubing three times back into the cell bag, mixing well each time. D. Heat seal the line beginning at the end of the tubing and moving towards the bag forming at least 4 segments. Place a double-seal next to the bag.
12	Obtain the hematocrit of the new, reconstituted product. A. Separate the segments from the original blood product unit. B. Place one segment into a clean 12x75 mm tube. C. Deliver the sample to hematology and request STAT hematocrit testing. Instruct the hematology tech to test the specimen in duplicate and average the results. D. Save all unused segments.
13	Document the post-hematocrit and volume in the LIS. A. Access Sunquest function "Blood Order Processing." B. Record the actual post hematocrit value and volume of the reconstituted whole blood unit in Sunquest "Blood Order Processing" as a free-text comment.
14	Change the volume of the remaining plasma by printing a new label from the HemaTrax system. Refer to procedure, "ISBT-128 Label Production." Have a second staff member verify the new label. The second tech must verify the following: A. Product E code B. Volume C. Prepared by and facility D. Expiration date (note: the remaining plasma will have an expiration date of 5 days)

Step	Action
15	Reconstitute the whole blood product in the LIS. A. Access Sunquest function, "Blood Component Preparation." B. At the "Value" prompt, type the blood component preparation function. Refer to appendix B. C. Press the "Tab" key twice to default the current date and time. D. Click the "Continue" button. E. At the "Unit #" prompt, scan or type the unit number of the plasma aliquot product to be combined. Press the "Tab" key and the component E code will autofill. a. You **MUST** scan the /# product number here. b. The LIS will tell you the plasma is used up. F. Return to the "Unit #" prompt and scan or type the unit number of the red cell product to be combined. Press the "Tab" key and the component E code will autofill. G. A QA failure message will appear, because the plasma and red cells do not have the same expiration date. Override the QA failure message.  H. Bring the cursor to the volume prompt. I. Enter the total volume of the whole blood (red cells and plasma combined). J. Change the expiration date of the whole blood product to 24 hours from the time the plasma was thawed. (Note: the original thawed plasma unit will have an expiration of 5 days, but we transfuse plasma to neonates within 24 hours of thaw time).
16	Store the remainder of the thawed plasma in the refrigerator until expiration. A. Use the same unit of plasma if additional plasma or reconstituted blood products are requested for the same baby within 24 hours. B. Discard the plasma per procedure, "Disposal of Blood and Blood Products" when it reaches expiration.

Step	Action
17	Label the reconstituted product (red cells with plasma added) using the HemaTrax system. Refer to procedure ISBT-128 Label Production. Note: You must add a label indicating the red cell was tested and found negative for antibodies to CMV while the plasma was not tested for antibodies to CMV. You cannot print this label from the HemaTrax system.
18	Have a second tech verify the labeling on the blood product and document the 2nd label check on the "Product Modification Form." The following will be verified. Do not issue the blood product if discrepancies exist. A. Unit number or DIN B. ABO/Rh C. Intended use (volunteer donor) D. Donation type (volunteer donor) E. E product code and description F. Expiration date and time G. Special testing label (red cell negative for CMV and plasma not tested for CMV) H. Facility information
19	Allocate the unit to the recipient using Sunquest function "Blood Order Processing." Give the entire unit to the floor; do not aliquot reconstituted whole blood.
20	Store the reconstituted whole blood at 1-6°C prior to issuing.
21	Notify the Blood Bank Supervisor or on-call pathologist if questions or issues arise.

6. RELATED DOCUMENTS

Form: Product Modification Log
SOP: ISBT-128 Label Production
SOP: Blood Component Irradiation
SOP: Plasma for Transfusion
SOP: Plasma Aliquot Preparation

7. REFERENCES

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2. Standards for Blood Banks and Transfusion Services, 2009. AABB, 26th ed. AABB Publishing, Bethesda, Maryland.
3. Circular of Information for the Use of Human Blood and Blood Components Prepared by: AABB, the American Red Cross, America's Blood Center and the Armed Services Blood Program. 2009. Bethesda, MD.
4. Code of Federal regulations, 21 CFR, Parts 200 and 600. Washington DC: US Government Printing Office, Current edition.

5. Herman JH & Manno CS. Pediatric Transfusion Therapy. 2003. AABB Publishing, Bethesda, Maryland.
6. Cutnell J & Johnson K. Physics, 4th Ed. 1998. p 308.

8. REVISION HISTORY

Version	Date	Reason for Revision	Revised By	Approved By
		Supersedes SGAH B403.00		
000	5.13.13	Section 5: Updated to include ISBT-128 information Section: Added Appendix B	SCodina	NCacciabeve

9. ADDENDA AND APPENDICES

Appendix A: Calculating RBC Volume for Reconstituting Whole Blood
Appendix B: ISBT-128 Product Codes

Appendix A
Calculating RBC Volume for Reconstituting Whole Blood

The following formula will give the exact amount of red cells needed for a specific volume of reconstituted whole blood. This formula may be used when we are limited in the amount of reconstituted whole blood we can supply because of a limited red blood cell volume. CPDA-1 units range from 225 to 350 ml in volume, depending on the hemoglobin level of the donor and the starting whole blood collection.

RBC Volume = $\frac{\text{Volume of Whole Blood x Desired Hematocrit}}{\text{Hematocrit of RBC (step 3 above)}}$

Example:
MD requested 100mL of reconstituted whole blood with final hematocrit of 50%. The hematocrit of the packed red blood cell unit is 75%.

RBC Volume = $\frac{100 \text{ cc of whole blood x } 0.50}{0.75}$ = ~67 mL of RBC

100 mL of whole blood desired – 67 mL RBCs = 33 mL of plasma

Appendix B
ISBT-128 Product Codes

Original E Codes	Component Prep Function	Final E Code
E0224 (red cell) + any plasma aliquot	RE0224	E5747