POLICY

The physician orders an exchange transfusion to decrease serum bilirubin level and replace fetal red cells with compatible blood in haemolytic disease of the newborn.

Applicability: Exchange transfusion occurs in the Neonatal Intensive Care Unit.

PROCEDURE

Gather Equipment

1. Low level disinfectant wipes (cavi-wipes)
2. Sterile gloves
3. Masks
4. Sterile gown
5. Ranger® Blood and Fluid Warming System
6. 0.9% NaCl (NS), 250 mL bag
7. Exchange Transfusion Kit (Y-Type Blood/Solution Set; 2, 4-way stop cocks-has three ports; ranger disposable warming set; Exchange Transfusion Record)
8. Alaris pump tubing
9. Exchange Transfusion Tray
10. Umbilical catheters
11. Sterile NaCl 0.9% (NS), 10 millilitre (mL)
12. Pre and post exchange specimen tubes, requisition forms
13. Packed Red Blood Cells (PRBCs)
14. White dead end caps (codan)
15. Extension Tube Medium Bore (Codan) X2

Registered Nurse (RN) x 2

- One RN to assist the physician with insertion of umbilical venous catheter (UVC) and umbilical arterial catheter (UAC)
- Second RN will set up tubings and prime fluids through the Ranger Blood Warming System

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Note</th>
</tr>
</thead>
</table>
| 1. PRBCs    | ▪ Units for exchange are routinely cross-matched with either maternal or newborn plasma  
▪ Serum from cord blood is not suitable for cross-matching  
▪ If a full serological work-up on the mother and infant has not been performed, it may take 3 hours for compatible blood available.  
▪ Transfusion blood will reconstitute packed red blood cells with plasma to create whole blood when exchange transfusion is indicated on the requisition. |
| 2. Chart baseline vitals on blood exchange transfusion sheet | ▪ Temperature, heart rate, respiration rate, oxygen saturation, blood pressure |
| 3. Check two pre-drawn doses of Calcium Gluconate (10%) are at the bedside | ▪ Refer to Physician’s orders  
▪ Medication port in Ranger disposable tubing can be used to administer medications or collect blood samples  
▪ A needle (Blunt Fill Needle #18 gauge) is required to administer medications or draw blood from Ranger set |
**Preparation** | **Note**
--- | ---
4. Attach Ranger warming system to a separate IV pole | ▪ This set up will only be used for double umbilical line exchanges  
▪ Blood for exchange must be warmed prior to administration

5. Plug in Ranger warming system

6. Attach Alaris brain and large volume module to IV pole above Ranger warming system

7. Change Alaris brain to Critical Care / OR mode

8. Attach Blood Set to Ranger disposable warming set (port with blue clamp)  

B). Attach Codan Extension Tube(s) (1-2 sets) to Ranger disposable warming set if extra length is required.  

▪ Under sterile technique connect all tubings completely before priming lines  
▪ Establish a closed system
### Preparation

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Insert Ranger disposable warming set into the Ranger blood/fluid warming system</td>
</tr>
<tr>
<td>10.</td>
<td>Clamp one y of blood set and spike NS in other y</td>
</tr>
<tr>
<td>11.</td>
<td>Invert the 'bubble trap' and prime tubing and disposable warming set with NS until ranger tubing bubble trap is full, turn bubble trap right side up and prime to end of tubing</td>
</tr>
<tr>
<td>12.</td>
<td>Place bubble trap into the holder on the warming set</td>
</tr>
<tr>
<td>13.</td>
<td>Keep cap on end of tubing to maintain sterility while priming tubing</td>
</tr>
<tr>
<td>14.</td>
<td>Clamp tubing closest to infant</td>
</tr>
<tr>
<td>15.</td>
<td>Place tubing end in sterile green towel until blood is ready</td>
</tr>
</tbody>
</table>
| 16. | Obtain blood product and complete two RN check | Two RN’s check:  
- Physician order for product, dose, rate and special requirements  
- C&W Admission Summary Record (facesheet)  
- Patient name, hospital MRUN, birth date and blood group  
- Transfusion of Blood And/or Blood Products Consent Form  
- Patient hospital ID band  
- Blood product name, unit/lot number, blood group and expiry date/time, special requirements (irradiation and CMV seronegative) |
| 17. | Clamp y-tubing to NS |
| 18. | Insert second spike of blood set into blood product, unclamp y and prime tubing to end | All blood products in bags must be filtered prior to infusing into the infant  
Ranger system requires 50 mL to prime to the end cap |
| 19. | Turn on Ranger System  
- It will take approximately one minute for system to reach set temperature of 41-42 ºC. |
<table>
<thead>
<tr>
<th>Preparation</th>
<th>Note</th>
</tr>
</thead>
</table>
| • Temperature of blood reaching the infant will be between 35 - 36 ºC.  
• Ranger system will alarm at 43 ºC  
• Ranger system will turn off at 45 ºC | |
| **20. Label Alaris pump “For Exchange transfusion only”**  
  • **No other modules will be attached to this brain**  
  • Remove immediately following the exchange transfusion or must be changed back to the NICU mode | ▪ Rate guardrails in the NICU mode will not allow the necessary rates to infuse for the exchange |
| **21. Once UVC inserted, attach 4-way stopcock to the UVC** | |
| **22. Prime the Ranger set with blood to the UVC stopcock**  
  • 20 mL syringe is connect to stopcock for safety | |
| **23. Once UAC inserted, attach 4-way stopcock and connect to waste bag** | |
| **24. Place waste bag below the level of the infant and secure to bed at two points** | ▪ No infusion can be running through the UAC |
| **25. The physician will withdraw the first 5-20 mL aliquot via the UAC slowly from the infant and discard the blood into the waste bag**  
  • 5 mL aliquot for infants < 1500 grams  
  • 10 mL aliquot for 1500 – 2500 grams  
  • 15 mL aliquot for 2500 – 3000 grams  
  • 20 mL aliquot for > 3000 grams  
  Physician announce (x-mL) ‘out’ | ▪ RN records volume out  
  ▪ Hemodynamic instability may occur during the exchange  
  ▪ Monitor for changes in neurologic status  
  ▪ The physician may request that the blood be briefly paused if the UAC withdrawal is slow. This may be seen with the 3.5 Fr UAC catheters. |
<table>
<thead>
<tr>
<th>Preparation</th>
<th>Note</th>
</tr>
</thead>
</table>
| 26. The nurse will then start the Alaris pump with the ordered rate to administer the blood via the UVC, refer to Physician’s orders | ▪ Program the total aliquot volume i.e. 20 mL  
▪ Please note that the infusion of PRBCs should be running continuously and only paused to change PRBC bag as necessary. The volume alert is used to keep track of the ins & outs of the exchange. |
| ▪ Audible volume alarm rings on Alaris pump. (i.e. 20 mLs infused). Notify MD of (x-mL) ‘in’  
▪ Restore volume and restore Alaris pump | |
| 27. The physician will then withdraw the second 5-20 mL aliquot | ▪ RN records volume out and volume in and total cumulative volumes in Exchange Transfusion Record |
| ▪ Physician announce (x-mL) ‘out’  
▪ Audible volume alarm rings on Alaris pump (i.e. 20 mLs infused). Notify MD of (x-mL) ‘in’ | |
| 28. Repeat steps 26 and 27 until the prescribed volume has been exchanged | ▪ Record on exchange transfusion sheet:  
▪ Time and date  
▪ Volume in and out (each cycle takes approximately 5 minutes)  
▪ Cumulative volume in and out  
▪ Blood pressure, pulse, respirations (minimum every 15 minutes)  
▪ Temperature every 15-30 minutes |
| 29. The exchange transfusion ends with blood administration to the infant | |
| 30. Send final blood discard to Transfusion Medicine for cross-matching for subsequent exchanges | |
| 31. Close blue clamp between the blood and the Ranger system wait 5 minutes allowing fluid to drain from the disposable set | |
| 32. Turn off Ranger blood warming system | |
| 33. Remove disposable set from Ranger system | |
| 34. Place the blood set, blood waste bag, and other tubing in a plastic biohazard bag and discarded in the biohazard boxes in the housekeeping room | |
| 35. Return Ranger warming system to the aides room for cleaning | |
| 36. Change Alaris brain back to NICU mode | |
## Preparation

<table>
<thead>
<tr>
<th>Aides:</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>37. Obtain Ranger Clean tool</td>
<td>- Clean Ranger Warming System after each use</td>
</tr>
<tr>
<td></td>
<td>- The cleaning tool is a single use item.</td>
</tr>
<tr>
<td>38. Dampen the sponge on each side of the Ranger Clean tool with tap water only</td>
<td></td>
</tr>
<tr>
<td>39. Pass the cleaning tool through the system 3 times</td>
<td>- Follow instructions on the cleaning tool</td>
</tr>
<tr>
<td>40. Discard cleaning tool</td>
<td></td>
</tr>
<tr>
<td>41. Return the Ranger Warming system to the equipment room</td>
<td></td>
</tr>
</tbody>
</table>

### DOCUMENTATION

- Bedside Information Tool (BIT)
- Exchange Transfusion Record
- Nursing Flowsheet

### REFERENCES