

EXCHANGE TRANSFUSION

WITH HOTLINE FLUID WARMER

Definitions

- An exchange transfusion involves removing aliquots of patient blood and replacing with donor blood in order to remove abnormal blood components and circulating toxins whilst maintaining adequate circulating blood volume. It is primarily performed to remove antibodies and excess bilirubin but can be used to remove other toxins like ammonia. A term baby's circulating blood volume is approximately 80-90 mL/kg. Aliquots used in exchange transfusion should be equal to approximately 10% (or slightly less) of the baby's total blood volume.
- Exchanges may be either partial, single volume, or double volume.
- **Partial** – Baby's blood volume only partially exchanged. Usually used for polycythemia, with replacement as normal saline, albumin, or plasma.
- **Single volume** – 1 x circulating blood volume exchanged; replaces approximately 60% of the blood volume (because blood added as blood removed, so not all blood removed is old blood).
- **Double volume** – 2 x circulating blood volume; replaces approximately 85% of the blood volume and should cause a reduction of bilirubin by about 50%
- In all cases, only very small volumes of blood (often 5-10 mL at a time) are removed and given over 1 minute periods, (i.e. 1 minute to remove, 1 minute to inject) to avoid significant pressure changes in the blood vessels.

Indications

- Alloimmune hemolytic disease of the newborn – to remove circulating bilirubin and replace antibody-covered red cells with antigen-negative red blood cells
- Significant unconjugated hyperbilirubinemia when intensive phototherapy unsuccessful
- Antibodies in maternal autoimmune disease
- Polycythemia – to reduce hematocrit, usually via partial exchange using NS, plasma, or albumin

Contraindications

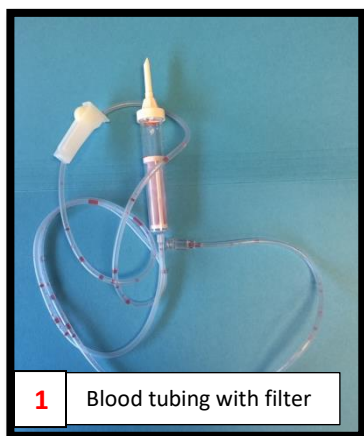
- Hemodynamic instability, sepsis, or otherwise unable to tolerate fluid shifts (should be corrected first)
- Severe hypocalcemia (should be corrected first as exchange may worsen hypocalcemia)

Materials

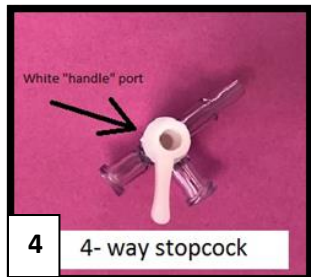
- If umbilical line not in place already:
 - *Exchange transfusion sterile tray (for umbilical line insertion)*
 - *Umbilical line insertion kit (from intervention cart) – contains swabs, scalpel, bridge, etc.*
 - Exchange transfusion kit (Vygon)
 - Male-to-male luer lock adapter
 - Blood transfusion tubing
 - Medtronic EVD collection bag
- Extra pieces needed to create new sterile dump bag.
Found attached to exchange transfusion kits.
- Hotline Fluid Warmer
 - Hotline Fluid Warmer Set (found on top of shelves at back of CSR)
 - Blood products or solution that will be infused as replacement
 - Masks & hairnets for all
 - Sterile gloves (for sterile nurse, line inserter & helper)

- Sterile gown (for line inserter & helper)
- Exchange transfusion documentation sheet (DM C-1329)

Materials – Key Components of Exchange Transfusion Kit



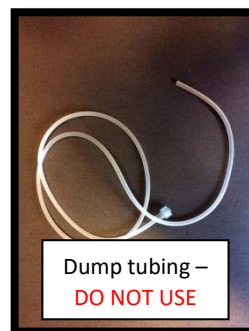
1 Blood tubing with filter



4 4- way stopcock



8 Large bore umbilical line



Dump tubing –
DO NOT USE



Dump bag –
DO NOT USE

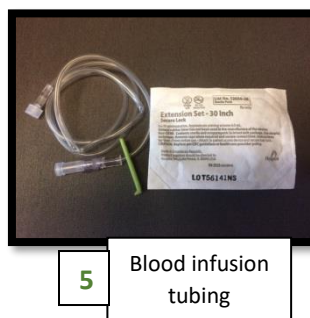
Materials – Extra Pieces Required (attached to Exchange Transfusion Kits)



6 Male-to-male luer lock adapter



7 Medtronic EVD bag



5 Blood infusion tubing

Materials – Key Components of Hotline Fluid Warmer



2 Hotline Fluid Warmer



3 Hotline Fluid Warming Set

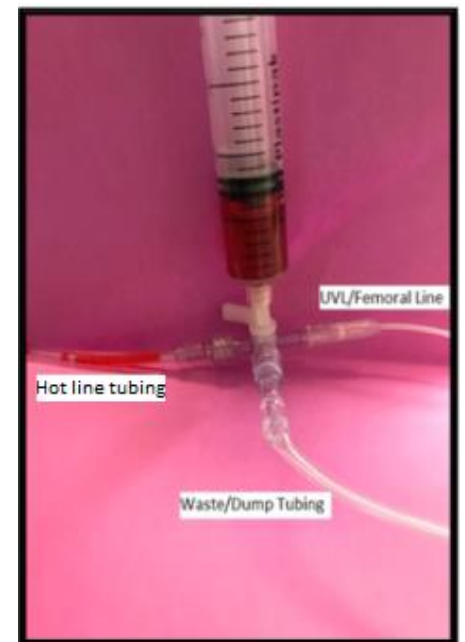
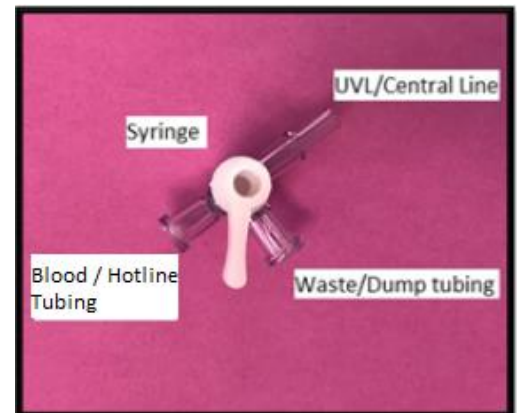


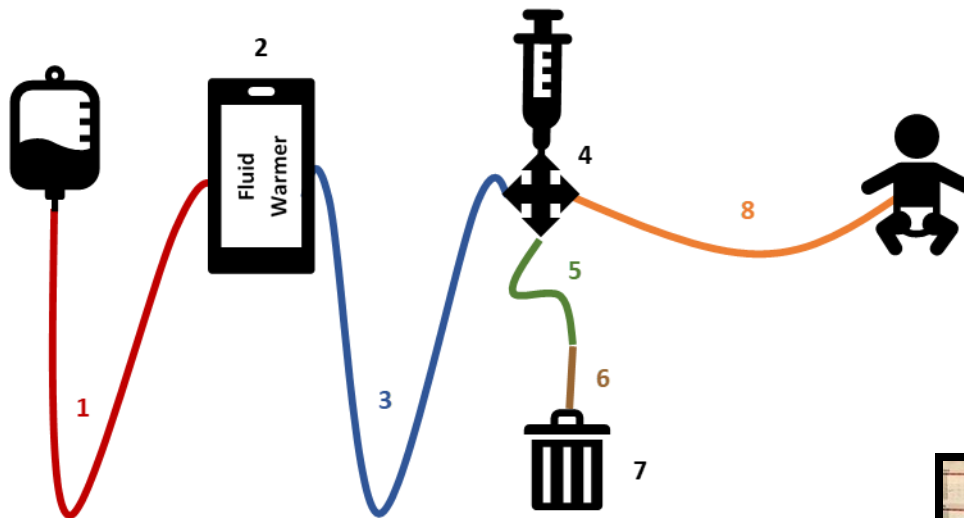
Procedure – Preparation of Baby

1. Infant should be supine in an isolette with ISC probe on. Cardiac monitor, oxygen saturation monitor, and blood pressure cuff should be in place.
2. Baby needs a large bore intravenous access. This must be placed by medical team/interventional radiology/general surgery either as a **UVL** or a **femoral line**.
3. Baby should be placed NPO during exchange transfusion to prevent hypoperfusion/reperfusion injury to the gut.
4. Ensure the baby has a second IV access to be used in case of emergency (can be central or peripheral).
5. Ensure that the blood taken at the beginning of the procedure (first blood removed after the catheter is placed) is sent to the lab quickly (usually for glucose, bilirubin levels, calcium). Check with physician if no tests are ordered. Think about genetic bloodwork and PKU.

Procedure – Tubing Setup

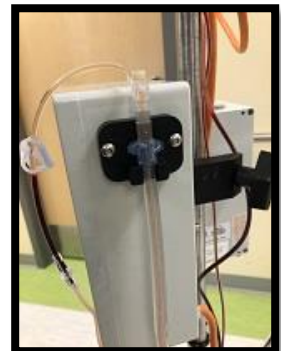
1. Order blood via Traceline as per MD/NNP order. Please indicate on Traceline that blood to be transfused is **IRRADIATED WHOLE BLOOD** and not PRBC as PRBC are too concentrated to be given in volumes required for exchange transfusions.
2. Ensure that an appropriate-sized line (UVL or femoral line) is inserted before sending the yellow pick-up slip to blood bank.
3. When blood arrives, double check blood against product sheet (green) and patient's ID bracelet as per hospital protocol.
4. One nurse should be designated as **sterile** and one as **non-sterile**. *All tubing and attachments connecting to stopcock must remain sterile*
5. The **non-sterile** nurse can open the exchange transfusion kit while the **sterile** nurse puts on sterile gloves.
6. The **sterile** nurse attaches an appropriate size syringe to white "handle" port of the 4-way stopcock.
7. The **sterile** nurse takes the blood transfusion tubing, clamps the line and holds the distal end of the tubing while **non-sterile** nurse takes the other end and spikes the blood bag.
8. The **non-sterile** nurse opens the Hotline Fluid Warmer Set onto the sterile field.
9. Ensure that the Fluid Warming Set is clamped. The **sterile** nurse connects blood tubing to the female end of the Hotline Fluid Warming Set. The male end of the Hotline Fluid Warming Set is attached to one port of the stopcock (see picture for example).
10. The **non-sterile** nurse primes the whole tubing by gravity then clamps the blood tubing.
11. The **non-sterile** nurse can then open the EVD bag, male-to-male luer lock adapter and blood infusion tubing onto the sterile field. On the front-facing port of the stopcock, the **sterile** nurse sets up the waste/dump line. First, attach the blood infusion tubing to the stopcock. On the distal end of blood infusion tubing, attach the male-to-male luer lock adapter. On the other end of the adapter, attach the EVD bag.
12. Ensure that Hotline Fluid Warmer in set up before connecting stopcock to patient's venous access device. This allows for priming of Hotline Fluid Warming Set before connection to ensure there are no leaks of warming fluid into IV pathway.





Procedure – Hotline Fluid Warmer Setup

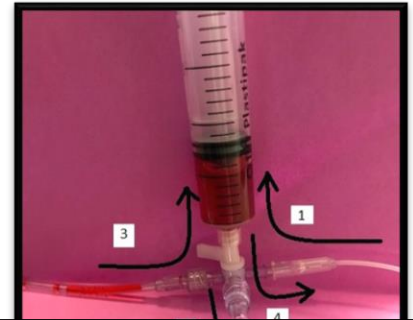
1. First, ensure that the water bath reservoir is filled to at least halfway between the MIN and MAX markings. If not, fill with a mixture of Hydrogen Peroxide and Distilled water
2. Ensure the switch in the OFF position before plugging Hotline into power source. If not off when plugged in, liquid will spurt out of reservoir.
3. Plug Hotline Fluid Warming Set into socket on the side of the Hotline Fluid Warmer. There is only one way to plug in tubing – if you try the other way, it will not fit.
4. Activate the power switch on the side of the Hotline.
 - a. The circulating water path will automatically prime when the machine is turned on.
 - b. The green ‘system operational’ line will turn on and displayed temperature of circulating fluid will begin to increase. The circulating fluid should reach 37° C in about 4 minutes.
 - c. Inspect the patient end of the Hotline tubing for leaks.
5. Once displayed temperature of circulating fluid reaches 36.5-37.0 °C, the MD can begin the transfusion process as ordered.



6. Ensure that the Hotline Fluid Warming Set is never kinked as this may compromise the fluid warming process.
7. When finished the transfusion, turn power switch to OFF position, unplug Fluid Warming Set and dispose of all blood products and tubing as per usual procedure.
8. Bring Hotline to dirty utility room to be cleaned for next use

Procedure - Exchange Transfusion

1. Check and validate your exchange transfusion order.
2. Take baseline vital signs (HR, RR, SpO₂, BP and T^o).
3. The order of operations in an exchange transfusion is as follows:
 - a. Remove prescribed volume of blood from baby via syringe (1)
 - b. Empty wasted blood into the waste/dump system (2)
 - c. Draw up prescribed volume of fresh blood into syringe (3)
 - d. Infuse fresh blood into baby at prescribed rate (4)
 - e. Between each step you must turn the handle of the stopcock to the correct position. Handle over port means port is OPEN. The movement of the handle should occur in a clockwise fashion as setup was done as indicated in the previous page.
 - f. Repeat steps until prescribed volume of blood has been exchange
4. Monitor and document HR, RR, and BP q 5 minutes throughout procedure.
5. Monitor and document T^o q 15 minutes throughout procedure.
6. Assess baby continuously for irritability, restlessness, crying, vomiting, cyanosis, change in heart rate/rhythm or respiratory rate/pattern. Report any of these signs immediately as they may be early signs of complications.
7. Record all blood removed and given with exact times (see example of sheet below). Also document any medications given on the exchange transfusion record (as well as on CMAR).
8. As exchanged products may contain anticoagulants that bind ions such as calcium, Calcium Gluconate 10% may be given at intervals during the transfusion to prevent hypocalcaemia.
9. Post-transfusion blood tests are often required at the end of transfusion (the last aliquot of blood removed may be used to send to the lab). Check with the physician what tests are requires (commonly: bilirubin, calcium and glucose).




NOTE: Unlike our usual stopcocks, the 4-way stopcock can only be open in ONE direction at a time. The 'handle' of the stopcock indicates in which direction the fluid will go. Make sure you rotate handle at each step to ensure blood goes to the right place.

Procedure – Care and Monitoring Post-Transfusion


1. Assess and record vital signs (T^o, HR, RR), and the baby's condition immediately after the procedure.
2. Repeat observations, HR, RR, q15min x 3, then q1h x 3, then according to baby's regular routine.
3. Watch especially for irritability, restlessness, crying, cyanosis, tremors, lethargy (signs of hypocalcaemia, hypoglycemia), and other signs of complications.
4. If umbilical line was used, observe site frequently for bleeding for 3-4 hours (transfused blood contains anticoagulants). Umbilical line may be removed and another more stable catheter inserted.
5. Baby must be put back on phototherapy as ordered post exchange transfusion.
6. If baby was feeding prior to procedure, resume feedings when stable. Restarting feedings should be discussed with the physician and feedings should be restarted very slowly (watch carefully for necrotizing enterocolitis).
7. Repeat bilirubin as per physician's orders.

Appendix I. Exchange Transfusion Documentation Sheet (DM C-1329)



Centre universitaire de santé McGill
McGill University Health Centre

HME
MCH
 HNM
MNH
 HGM
MGH
 ITM
MCI
 HRV
RVH
 CL
LC



Bb X
1234567

Soins intensifs néonataux/ Relevé d'exsanguino transfusion
Neonatal intensive care/ Exchange transfusion record

Poids du bébé/ Baby's weight : 3.5 kg
Date/ Date (AAYY/MM/JD) : 2017/05/29

Numéro de dossier / Unit number / Nom du patient / Patient's name

Signature des infirmières et initiales / Nurses signatures and initials : [Signature]

Heure/ Time (00 :00)	Quantité sortie/ Amount out	Quantité entrée/ Amount in	Total sorti/ Total out	Total entré/ Total in	Fréquence cardiaque/ Heart rate	Fréquence respiratoire/ Respiratory rate	Tension artérielle/ Blood pressure	Température/ Temperature	Commentaires/ Comments	Initiales/ Initials
16:00	10 ml		10 ml		155	36	65/45	36.2 °C		
16:02		10 ml		10 ml				°C		
16:04	10 ml		20 ml		160	35	63/47	36.3 °C		
16:06		10 ml		20 ml				°C		
16:08	10 ml		30 ml		157	38	69/51	36.3 °C		
16:10		10 ml		30 ml				°C		
16:12	10 ml		40 ml		162	30	69/43	36.2 °C		
16:14		10 ml		40 ml				°C		
16:16	10 ml		50 ml		155	35	65/43	36.4 °C		
16:18		10 ml		50 ml				°C		
16:20	10 ml		60 ml		160	35	65/40	36.4 °C		

DM-C1329 (REV 2010/07/07) CUSM Repro MUHC cont'd →