

<b>Document Title:</b>	<b>Red Cell Exchange Transfusion in adults with Sickle Cell Disease</b>		
<b>Document Purpose:</b>	This document details the procedure for red cell exchange transfusion in adults with sickle cell disease and the staff responsibilities.		
<b>Document Statement:</b>	Staff must ensure that red cell exchange transfusions are administered according to the procedure.		
<b>Document Application:</b>	All clinical areas		
<b>Responsible for Implementation:</b>	Hospital Transfusion Team, Hospital Transfusion Committee and Clinical Directors.		
<b>Main imperatives of this document are:</b>			
<ul style="list-style-type: none"> <li>• This procedure only assists in the management of adult patients with sickle cell disease.</li> <li>• Only Medical physicians will undertake this procedure.</li> <li>• It is important to keep the patient well hydrated throughout the procedure.</li> <li>• A full record of the transfusion including observations, must be made and inserted into the patient's healthcare records.</li> <li>• If you have any doubts or questions, do not hesitate to contact the haematologist on-call through the switchboard</li> </ul>			
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<b><u>Associated Documents</u></b>			
<ol style="list-style-type: none"> <li>1. Blood Transfusion Policy</li> <li>2. Blood/blood products administration procedure</li> </ol>			
<b>APPROVAL RECORD</b>			
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<b>Agreed by Specialist Group:</b>	Hospital Transfusion Committee	<b>Date: May 2012</b>	
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**DOCUMENT HISTORY****Revision History**

<b>Revision Date</b>	<b>Previous Revision date</b>	<b>Summary of Changes</b>	<b>Changes marked</b>
28/04/2008	May 2005	No changes made	
May 2012	April 2008	Format changed to remove the action and rationale section. Are there any key clinical changes in this version	None

## 1. INTRODUCTION

Exchange transfusion is a treatment that permits replacement of the major part of the patient's red cells with transfused red cells.

The main indications for exchange transfusions are:

- Complications of sickle cell disease
- Management of haemolytic disease of the newborn.

It is indicated in rare cases such as:

- severe malaria ( parasitemia >10%)
- Inadvertant administration of RhD positive blood components to RhD Negative individuals.

This procedure only assists in the management of adult patients with sickle cell disease.

The aim of exchange transfusion in sickle cell disease is to reduce the HbS to < 30%, whilst keeping the Hb below or about 10gm/ dl.

Only Medical physicians will undertake this procedure.

## 2. INDICATIONS FOR EXCHANGE TRANSFUSION IN SICKLE CELL DISEASE:

### 2.1. EMERGENCY:

Sickle cerebrovascular crisis (usually stroke)

Sickle chest syndrome: usually presents as: bilateral chest signs bilateral shadowing on CXR  
Low PaO<sub>2</sub> <11 or O<sub>2</sub> sat <90% on 40% O<sub>2</sub>

Sickle liver/spleen sequestration syndrome

Priapism >4 hours duration.

### 2.2. ELECTIVE:

Prolonged or recurrent sickle painful crises.

Pre-operatively (GA >30 minutes duration)

Pregnancy

## 3. EQUIPMENT:

Sterile gloves

Three way tap

Tourniquet

Large diameter cannula

Green needles

IV bung with rubber entry port

Large syringes (you may need to assist the backflow of blood using a Louer lock 50ml syringe)

Empty venesection bags (available from Blood Transfusion Lab)

Spring gauge for weighing blood (available from Haematology Day Unit)

Drip stand

IV saline

Standard blood administration sets

A trolley

Orange Clinical waste bags

**Note:** Organise yourself as the procedure will take at least two hours to perform. Obtain a trolley and a large orange plastic bag for waste. If you are not familiar with the priming of blood administration sets, then obtain help from a registered nurse who is competent in blood administration.

## 4. PROCEDURE

### 4.1. Venous access

- 4.1.1. The antecubital veins usually suffice if they are well developed, if not, central venous access is essential and it may be necessary to obtain the help of an Anaesthetist if there is a history of difficulties in the past.
- 4.1.2. One should insert a single lumen cannula of largest diameter.

### 4.2. Efficient replacement of HbS

Exchange transfusion starts out being very efficient, (when only Hb S containing red cells are removed), but becomes progressively more inefficient as the procedure continues, (when some of the transfused Hb A containing red cells are venesected and wasted).

- 4.2.1. For an average adult;  
4 unit exchange = Hb A to S ratio of 50:50  
10 unit exchange = ratio of 80:20.
- 4.2.2. To improve efficiency, remove Hb S containing blood at the beginning and transfuse (without venesection) Hb A containing blood at the end of the procedure (whenever indicated).

### 4.3. Management of Hydration

- 4.3.1. It is important to keep the patient well hydrated throughout the procedure.
- 4.3.2. Transfuse 500ml of 0.9% sodium chloride before the first unit is venesected.
- 4.3.3. Each unit of blood removed should have a volume of about 400ml and each unit of blood transfused will have a volume of about 200-250ml. Therefore, it will generally be necessary to transfuse an additional 150-200ml of 0.9% sodium chloride with each unit of blood exchanged.
- 4.3.4. All the blood venesected and transfused should be weighed and a fluid balance chart kept to monitor hydration. It is equally important to clinically assess the patient during the procedure by monitoring pulse, temperature, BP and urinary output.

### 4.4. Calculation of volume to exchange

- 4.4.1. The number of units to be exchanged and transfused can be calculated from the size of the patient, the initial Hb level and the target Hb level (usually 11g/dl).
- 4.4.2. In an average adult, each unit of blood exchanged will cause the Hb to rise by 0.5g/dl and each unit of blood transfused (without venesection) will result in a rise of about 1.25g/dl.
- 4.4.3. An average procedure would involve a 4 unit exchange followed by a further two unit transfusion (6 in, 4 out).

#### 4.5. Risk Management

- 4.5.1. Exchange transfusion means the administration of large volumes of blood. It is essential to ensure correct identification of the patient and the donor blood. Febrile or other allergic reactions may occur and should be treated in accordance with the blood/blood products administration procedure.
- 4.5.2. A full record of the transfusion including observations, must be made and inserted into the patient's healthcare records.
- 4.5.3. Refer to the Trust blood/blood products administration procedure for further details.

#### 5. PROCESS

- 5.1. Attach the three way tap directly to the central line or as close as convenient to the IV cannula. Attach the IV bung to one port and the 50ml syringe to the other. The final port can be used for the transfusion fluid. The venesection bags were designed for single unit venesection and come complete with a large bore needle on the blood line. When required, the needle should be inserted through the rubber bung which can be used repeatedly. The following is the sequence to be followed:
- 5.2. Transfuse 500ml 0.9% sodium chloride over 20 minutes.
- 5.3. Venesect first unit of blood. If the antecubital vein is being used, apply the tourniquet (without causing ischaemia otherwise more sickling will result) and hopefully a unit can be removed under gravity over about 15 minutes. If the flow is sluggish, try slight repositioning of cannula or it may be necessary to assist venesection using three way tap and syringe mechanism. A doctor or registered nurse must be present always while blood is flowing from the patient.
- 5.4. Attach a 3-way tap to the cannula or CVP line. Transfuse first unit of blood as fast as possible (20 mins). Flow may be sluggish for a number of reasons: the cannula is too small; the blood may be too viscous; there may be a blockage in the filter if not properly primed. The situation may improve greatly, if you infuse normal saline through one part of the 3-way tap. It will be necessary to transfuse a total of 150-200ml of normal saline with each unit of blood as explained previously.
- 5.5. Repeat steps 2 & 3 until planned exchange units administered.
- 5.6. Transfuse any remaining units over 2-3 hours each. This can be administered and monitored by the nursing staff.
- 5.7. Take a FBC for Hb estimation and HbS quantitation and weigh the venesected bags to estimate the amount of blood venesected.
- 5.8. Disconnect the I.V lines on completion of the procedure and dispose of the clinical waste in line with Trust policy.
- 5.9. Venesection packs should be sealed and clamped with the plastic clip that comes attached to the pack and then disposed in an orange clinic waste bag.
- 5.10. Record what you have done on the prescription chart, fluid balance chart and in the patient's healthcare records.

**IF YOU HAVE ANY DOUBTS OR QUESTIONS, DO NOT HESITATE TO CONTACT THE HAEMATOLOGIST ON-CALL THROUGH THE SWITCHBOARD**

#### 6. REFERENCES

Red cell exchange in sickle cell disease  
ASH education book, Jan 1 2006; Vol. 2006 No.1 page 48-53 (with some modification)