TAYSIDE GUIDE TO MASSIVE TRANSFUSION/BLOOD LOSS

This local guide should be used in conjunction with the guidelines published by the British Committee for Standards in Haematology.

Definition:

Massive transfusion can be defined as the replacement of the patient’s total blood volume in less than 24 hours or the acute administration of more than half the patient’s blood volume in less than 3 hours. It may be prudent to use this guide if there is an anticipation of massive blood loss.

Management:

1. **ABC**. Ensure a clear airway, high flow oxygen, adequate ventilation and large bore intravenous cannula (take blood for cross-match). Control haemorrhage if possible. Blood Samples should be taken for a base line FBC, Coagulation Screen (including fibrinogen) and Crossmatch. A porter should take the cross-match sample directly to the BTS lab.

   Do not rely on the vacuum tube system. May require O Neg, Group Specific or Electronic/Xmatched blood depending on circumstances.

   Electronic issue from previous G&S can take as little as 5 – 10 minutes, Group specific blood can be issued in 20 minutes. A full crossmatch can take 40 minutes.

   Inform BTS of urgency. O Neg blood should only be used if cannot wait for Type specific or Xmatch blood.

2. **Call for help**. A senior anaesthetist and surgeon should be informed.

3. **Contact BTS** especially if large ongoing losses and coagulopathies are likely. Phone Ext 32953 (N/W), Ext 13338 (PRI) or Page 5122 out-of-hours PRI, and inform the MLSO. Contact the on-call BTS consultant (or Consultant Haematologist in PRI) if additional advice regarding transfusion support is required.

4. A shock pack (4 units type specific RBCs, 4 units FFP and 1 unit platelets) is available, but can only be ordered by senior trainees and consultants. A blood sample should be sent to the laboratory as soon as possible to confirm that patient’s blood group and antibody status. **This service must not be abused and is monitored closely**. A ruptured AAA is the commonest reason to access the shock pack. If ordered in PRI, platelets will not be immediately available (delay approximately one hour). Please advise BMS immediately if shock pack is no longer required.

### Location of O negative blood stocks:

<table>
<thead>
<tr>
<th>Location</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ninewells</td>
<td>East block theatres - 4 units O neg in blood fridge</td>
</tr>
<tr>
<td></td>
<td>A&amp;E – 2 units O neg + box of 4 units O neg</td>
</tr>
<tr>
<td></td>
<td>Maternity fridge, Level 6 (BTS) - 2 units O neg</td>
</tr>
<tr>
<td>PRI</td>
<td>Theatre 2 units O neg, Blood Bank 2 units O neg</td>
</tr>
<tr>
<td>Stracathro</td>
<td>4 units O neg + 4 units O pos</td>
</tr>
<tr>
<td>Montrose</td>
<td>Arbroath &amp; Fernbrae each have 2 units O neg</td>
</tr>
<tr>
<td>NB</td>
<td>Further transfusion support of patients with massive haemorrhage can only be provided in Ninewells or PRI.</td>
</tr>
</tbody>
</table>

NB Further transfusion support of patients with massive haemorrhage can only be provided in Ninewells or PRI.
5. After a Shock Pack has been issued and is being used, if the haemorrhage continues and further blood is required, then **for each unit of RBC ordered, a unit of FFP should also be requested.** Further platelet therapy should be directed by FBC results. **Aim to keep platelets above 100 x 10⁹/l.**

6. Blood and blood components are cold and therefore should be warmed using a blood warmer. A core temperature of less than 35°C will start to derange coagulation. **All blood products must be given according to NHS Tayside’s protocol on the administration of blood and blood products.**

7. Coagulopathies are a complication of massive blood transfusion. Regular and frequent monitoring of the patient’s coagulation screen, fibrinogen, FBC, U&Es (inc. Ca²⁺) and ABGs is required to help target therapy. An emergency potassium result can be obtained using the NHS Tayside Emergency potassium Protocol. The Protocol is at Annex A. Avoid hypothermia. The treatment of coagulopathies can be complex and we have access to experts (Haematologist or BTS) so involve them. Their job is easier if they have up to date information on the patient’s FBC, fibrinogen and coagulation screen. Hb > 8g/dl will help with haemostasis. **Coagulation factors should be maintained so that PT & APTT ≤ 1.5 x control, fibrinogen ≥ 1.0g/l and platelets ≥ 100 x 10⁹/l.**

8. Tranexamic acid should be used in bleeding trauma patients. The recent CRASH 2 study used a loading dose of 1g over 10 minutes followed by an infusion of 1 g over 8 hours.

9. Calcium should be administered through a separate intravenous line- suggestion is every 5 units of blood.

10. Further pharmacological intervention requires discussion with the on-call Haematologist or BTS Consultant.

11. Ensure appropriate monitoring is in place. Plan for patient destination e.g. HDU, ICU.
There are other complications of rapid, massive transfusion:

<table>
<thead>
<tr>
<th>Complication</th>
<th>Transfusion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypocalcaemia</td>
<td>~1ml/kg/min</td>
</tr>
<tr>
<td>Hyperkalaemia</td>
<td>~0.3ml/kg/min</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>1 unit ↓ temp by 0.4°C</td>
</tr>
<tr>
<td>Acidosis</td>
<td>1 ml/kg/min</td>
</tr>
<tr>
<td>Hypomagnesaemia</td>
<td></td>
</tr>
</tbody>
</table>

Implementation date: 30.03.2011
Review date: March 2013
MASSIVE TRANSFUSION PROTOCOL

Step 1 - Patient at risk of requiring massive transfusion support

- Major trauma - multiple limbs, chest, abdo and pelvis
- Major vessel rupture - aortic aneurysm
- Major GI bleed - GU/DU bleed, oesophageal varices
- Major Bleeding from any other source, e.g. obstetric

Step 2 – Initial management

- Manage ABC, call for help (senior surgeon & anaesthetist)
- Patent airway, high flow oxygen/100%FiO2, adequate ventilation
- Large bore IV cannula (x2), sample for Xmatch, FBC, coagulation screen and fibrinogen, U&E, Ca²⁺
- IV fluids as indicated, control haemorrhage
- Early surgical intervention as required
- Contact BTS - N/W 32953, PRI 13338 (or Page 5122 out of hours in PRI)
- Give clear details of case and degree of urgency
- O neg blood should only be used if cannot wait for type specific

Step 3 – Activate Massive Transfusion Protocol

Request ‘shock pack’
**Step 4 - Requirement for Massive Transfusion Support continues:**

**Laboratory Issues a “SHOCK PACK”:**

- 4 units of RCC (preferably group specific or fully cross matched depending on time frame)
- 4 units of FFP (group selected)
- 1 unit of platelets

**Laboratory prepares to Issue:**

- 4 units RRC
- 4 units of FFP

**Clinicians:**

- Actively warm the patient and give RCC and FFP through rapid infuser warming device
- Consider Tranexamic acid 1g bolus followed by infusion of 1g over 8 hours
- Repeat blood samples for U&Es, Ca^{2+}, FBC, coag screen, fibrinogen, ABGs
- An urgent Potassium can be requested using the Emergency Potassium Protocol
- Actively liaise with BTS consultant in order to optimise therapy
- Platelets are not routinely held in Perth, but can be supplied if needed

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**Step 5 - Requirement for MT continues**

**Laboratory Issues on request:**

- 4 units of group selected RCC
- 4 units of FFP

**Laboratory prepares to issue:**

- Platelets – dosage being dependent on FBC results. Each Adult Equivalent Dose of platelets can be expected to increase the platelet count by 30 – 40 x 10^{9}/l.
- Cryoprecipitate – dosage dependent on fibrinogen result (see note 4)

Laboratory actively manages blood stocks and request urgent resupply if appropriate.

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**Step 6 – Requirement for MT continues**

Repeat Step 5
Notes:

1. The first 10 units of RBC issued must, as soon as possible, be retrospectively cross matched.

2. It may be appropriate, during high tempo operations, or following notification of the imminent arrival of a severely injured casualty, for the laboratory to anticipate the need for a Massive Transfusion defrost 4 units of FFP (and hold them for up to 24 hours at 4°C). This approach will result in increased wastage, but supports the aggressive approach required.

3. The laboratory may need to suspend non-urgent testing during a MT situation.

4. The dosage of cryoprecipitate given should, where possible, be modified depending upon the results of the Fibrinogen tests so that unnecessary donor exposure is avoided.

5. There is no requirement to fully cross match RCC after the first 10 units have been transfused in a MT situation UNLESS the patient has a clinically significant antibody. All patients should be converted to Rh(D) positive units at this stage (to conserve Rh(D) negative stock) UNLESS they are FEMALE of CHILD BEARING AGE. If the patient has a clinically significant antibody it may be necessary to deliberately select incompatible units during the mid-phase of a massive transfusion in order to preserve the compatible blood for use once haemostatic control has been achieved.

6. There is no clear threshold beyond which blood use is futile. There is, however, a need to ensure that blood stocks are not exhausted in the futile effort to salvage an irrecoverable casualty.
EMERGENCY POTASSIUM PROTOCOL- November 2010

Introduction

In rare clinical situations (e.g. severe cardiac arrhythmias and diabetic ketoacidosis with ECG changes) and massive transfusion situations there is a need for a rapid turnaround of potassium estimation only – ideally within 15 minutes. There has been an agreed protocol in place with Ninewells A&E for some time to access such analysis and it has now been agreed that this should be expanded to also include the following areas: NW Ward 15, ICU, CCU, Renal Unit and PRI A&E, Ward 4, ICU, CCU and Renal Unit.

The following procedure MUST be followed to request an Emergency Potassium:

1. At Ninewells: the requesting officer (request initiated by Senior trainee or Consultant only) must contact ext 36666 (0900-2100) or Bleep 4027 (all other times) to inform the laboratory that the sample is being sent
   At Perth: the requesting officer (request initiated by Senior trainee or Consultant only) must contact Bleep 5122 at all times to inform the laboratory that the sample is being sent

2. The sample type is a green topped, lithium heparin tube (yellow topped tubes are not acceptable)

3. The request (EK) should be made using Central Vision whenever possible and should be sent on its own with no other requests made for that sample. Other requests required at the same time must be made under a different number and sent in a separate bag.

4. An ‘URGENT’ sticker must be attached to the sample bag or form before transport to the lab

5. The sample must be sent without delay via the vacuum tube or by porter. If the vacuum tube is unavailable or very busy, a porter must be called to take the sample to the lab.

6. The result will be phoned back to the requestor or clinical area by the laboratory. Target turnaround is 15 minutes of sample receipt. Samples will be manually checked in the laboratory for haemolysis; visibly haemolysed samples will not be analysed and a repeat will be requested.

Failure to follow the above protocol may lead to a delay in the availability of the result