Transfusion support during Mass Casualty Events

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Overview

• Planning for blood transfusion support should be part of Major Incident planning

• Pre-hospital control of haemorrhage is a key element in patient care

• Recent experience shows that the average use per admission is 3 units RCC.

• Patients needing massive transfusion are few but require timely transfusion

• Plans and practice with the blood bank are essential to optimise transfusion support
Stop the bleeding

Pre-hospital haemorrhage control and prevention of shock is key to reducing risk of the coagulopathy associated with trauma.
Transfusion support

Blood transfusion support aims to provide temporary oxygen carrying capacity and haemostasis support. Transfusion support is one element of an integrated support to resuscitation for the critically injured. However, most patients in mass casualty events only need red cell support.
International experience

• In Terrorist attacks - Relationship between mechanism/ injury severity and blood use.

• Overall 2-3 RCC per casualty. 6 units RCC per critically injured. May be less RCC if other components or WB used

• Modern planning assumes blood components (or \textit{whole blood}) for the most severely injured

• Red cells, 2/3 (62-74%) used within first 4hr, 27% Group O, un-crossmatched

\textit{Glasgow et al 2013. A comprehensive review of blood product use in civilian mass casualty events. J Trauma Acute Care Surg 75, 3.}
A past Israeli survey of 1645 attacks involving 7497 casualties (Shinar et al, 2006) suggested:

- 13% death at scene with
- 8% severe (p1) and
- 12% (p2) moderate casualties,
- i.e. a total of 20% who may need blood.

### Twin terrorist attacks in Norway July 2011: Bombs and bullets

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Died at scene</th>
<th>Admitted to Trauma centre</th>
<th>Designated to Trauma team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombs</td>
<td>106</td>
<td>8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Bullets</td>
<td>129</td>
<td>68</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>235</td>
<td>76</td>
<td>31</td>
<td>7</td>
</tr>
</tbody>
</table>

Twin terrorist attacks: Massive transfusions

7 cases received ‘massive transfusions’

<table>
<thead>
<tr>
<th>Component</th>
<th>Mean use per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red cells</td>
<td>7.6</td>
</tr>
<tr>
<td>Octaplas (200ml)</td>
<td>5.6</td>
</tr>
<tr>
<td>Platelets (Pools of 4)</td>
<td>2</td>
</tr>
</tbody>
</table>

7 cases received massive transfusions = 2.9% of 235 injured/4.4% survivors

Comment from authors: the use of blood during first 24 hr did not represent a massive challenge to the blood bank. Note 83% required repeated surgery
BOSTON 2013

http://www.history.com/topics/boston-marathon-bombings/videos#
Lessons identified

- 22% patient transfused
- Mean RCC use = 6 units/24hr
- Lesson 1: Patient identification (including gender)
- Recm: Trauma patient number
- Lesson 2: Tracking blood
- Recm: Transfusion co-ordinator

Blood use 2/6 Level 1 units

| TABLE 1. Blood component utilization at two hospitals after the Boston Marathon bombing |
|-------------------------------|-------------------|
| Hospital A | Hospital B |
| Number of patients in ED | 32 | 26 |
| Number of patient specimens in blood bank | 12 | 11 |
| Number of unXM’ed group O units issued | 96 | 72 |
| Number of patients transfused | 5 | 8 |
| Number of MTP activations | 1 | 1 |
| Number of patients who received MTP | 0 | 1 |
| Number of unXM’ed O units transfused | 15 | 33 |
| Total number of RBC units transfused in 24 hr | 28 | 52 |
| Number of AB plasma units transfused | 8 | 9 |
| Total number of plasma units transfused in 24 hr | 15 | 20 |
| Total number of RBC units transfused in 7 days | 43 | 74 |
| Total number of plasma and PLTs transfused in 7 days | 18/8 | 26/5 |

unXM’ed = un–cross-matched or emergency release group O blood; MTP = massive transfusion protocol.

K Quillen and CJ Luckey
Manchester blood orders

6 hospitals in Manchester ordered stock over night (00.45hr – 06.10hr).

The total order for the MCE in these 6.5 hours was:

- 334 Red cells (SAGM)
- 58 FFP
- 18 packs of platelets
- 12 pools of MB cryoprecipitate.

Manchester: First 24 hr blood component use

Immediate blood survey describes 75 patients treated for injuries

• 23 patients received RCC
• 4 received plasma
• 2 patients received plts;
• 2 received cryoprecipitate

Initial reports stated 112 injured this was later amended to 250.
23/75 admitted = 30% transfused
23/112 = 20% injured transfused.
23 patients received a total of 89 units of RCC

Mean RCC use = 3.9 units per patient
- Min = 1
- Max = 15
- Mode = 2

3 patients received MT ≥ 10 units

Multi-trauma accounted for the majority of red cells used
Hospital organisation

Alert the Blood bank early

Senior haematology and transfusion staff sent forward to support:

- Emergency Department
- Trauma theatres
- Roles include:
  - Transfusion triage
  - Traceability of blood units
  - Transfusion sample security

Exercising the role of a forward transfusion co-ordinator in Ex Pandora, University Hospitals Birmingham 2017.
Identification and information

• Emergency patient identification should include:
  – Non sequential Unique Identifier Number
  – Gender (male/female)

• Additional information:
  – Treatment priority
  – ? Pre-transfusion

‘Labelling of transfusion samples from unknown patients in emergency situations’ Transfusion Medicine 2013, 23, Suppl 2. White J, Milkins C, Rowley M.

See future Patient Safety Alert
Universal ABO and RhD blood groups for components

- RCC – Prioritise group O RhD for children and females <50
- FFP – Group A (HT neg)
- Platelets – Any, if pooled in Platelet additive solution (PAS)

Most patients will be able to receive group identical blood. It is important to collect baseline blood samples before starting transfusion to support accurate blood ABO RhD grouping.
Hospital stock management in Major Incidents

- Activate Blood Bank Major Incident Plan.
- Clarify casualty numbers and type
- Review blood stocks. Estimate immediate and early requirements.
- Recover issued stock (from wards) Consider cancellation of surgery
- Pre-thaw plasma if P1s – consider sending RCC and FFP to ED with staff
- Place blood orders to blood supplier – NHS Blood and Transplant

Regional Incident response plans

Hospital planning assumptions and stock should be guided by the pre-determined first hour JRB casualty regulations and capability chart from the regional plan. Broadly:

• P1s to Major trauma centre

• P2s to Trauma units

• The local NHSBT centre (Stock Holding Unit) assumes that most MTUs and TUs will be alerted and will plan to re-supply all within the region. The national network will be activated to back-fill regional stock.
NHS blood and Transplant

Bottom-up planning for incidents

- Number of casualties x
- Amount of blood required x
- Red cell demand: use ratio = x 3

Assumptions

- Early use of blood components
- Increased use of ‘universal components’ (75% group O RCC)
- Few casualties should require massive transfusion
- Consider nature of incident and need for continuing support and repeat surgery

Donor management

Donors are managed to maintain continuity of supply.

It is important for donors to keep future appointments.
Summary

- Transfusion support is one part of a co-ordinated response to the Major Incident
- Planning should be guided by Regional Incident Response plans and international experience
- Regional activation should include NHS Blood and Transplant