NHS
Blood and Transplant

Transfusion support during Mass Casualty Events

Dr Heidi Doughty
Consultant in Transfusion Medicine

NHS Blood and Transplant Birmingham

Hon Senior Lecturer in Transfusion Medicine, Dept of Clinical Trauma, University Hospitals Birmingham

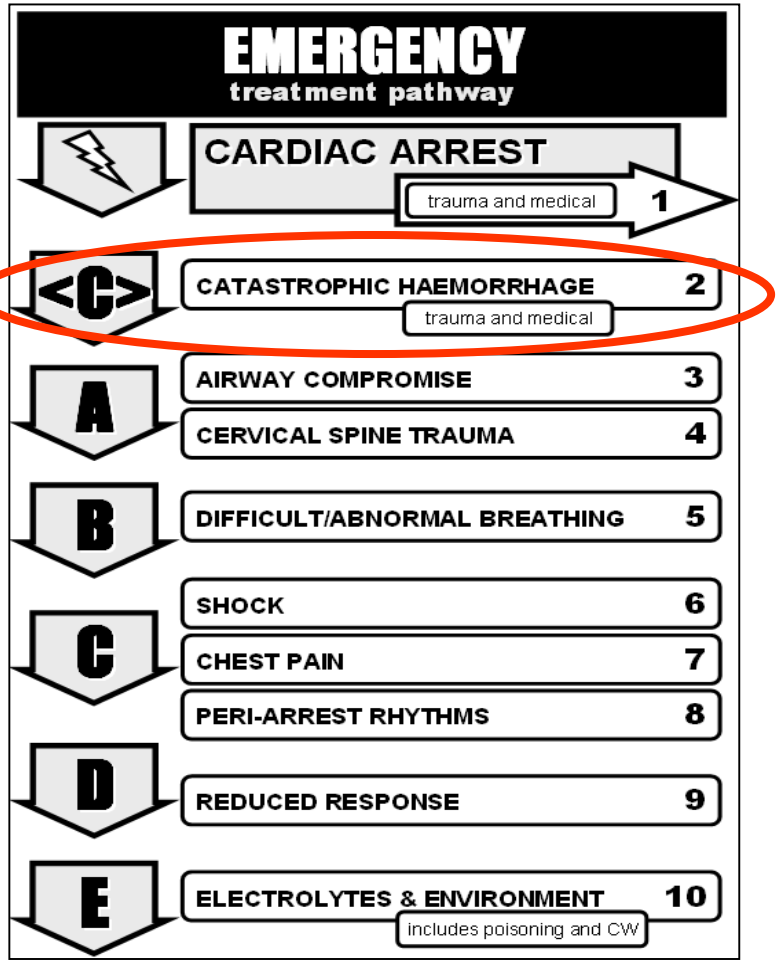
October 2017

heidi.doughty@nhsbt.nhs.uk

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.

NHS
Blood and Transplant

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.*

NHS Blood and Transplant

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 whole blood*) for the most severely injured
- Red cells, 2/3 (62-74%) used within first 4hr, 27% Group O, un-crossmatched

Glasgow et al 2013. A comprehensive review of blood product use in civilian mass casualty events. J Trauma Acute Care Surg 75, 3.

Israeli experience

MAGEN DAVID ADOM IN ISRAEL

Israel blood program

Area: 20,770 Square Km

Population: 8.3 million

Total blood donations collected nationwide in 2015: 265,000 units (3.2%)

MDA responsibilities:

Blood collection: 253,000 units (95.5%)

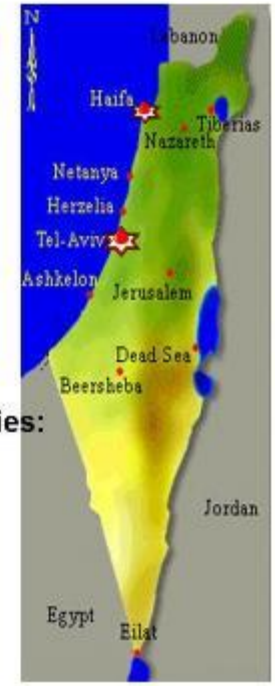
Preparation of blood components in 2 laboratories:

Tel Hashomer: 80% of production

Haifa: 20% of production

MDA 1 testing laboratory (Tel Hashomer)

Daily supply of blood to all hospitals and IDF



- 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.

Shinar E et al. (2006) Meeting blood requirements following terrorist attacks: the Israeli experience. Current Opinion in Haematology. 13(6): 452-456.

NHS Blood and Transplant

Twin terrorist attacks in Norway July 2011: Bombs and bullets

	Number	Died at scene	Admitted to Trauma centre	Designated to Trauma team
Bombs	106	8	10	
Bullets	129	68	21	
Total	235	76	31	7

Gaarder et al. *J Trauma Acute Care Surg.* 2012;73: 269–275.

NHS Blood and Transplant

Twin terrorist attacks: Massive transfusions

7 cases received ‘massive transfusions’

Component	Mean use per patient
Red cells	7.6
Octaplas (200ml)	5.6
Platelets (Pools of 4)	2

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

NHS
Blood and Transplant

BOSTON 2013


The Boston Globe

Marathon terror

AMID SHOCK, A RUSH TO HELP STRANGERS

A MOTHER REELS AS 2 SONS LOSE LEGS

3 killed, 130 hurt by bombs at finish line; area locked down

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

NHS Blood and Transplant

Blood and bombs: blood use after the Boston Marathon bombing of April 15, 2013

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

1202 TRANSFUSION Volume 54, April 2014

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.

Doughty, H., Cowdrey,T., Dawson, D., Rogan, P., Gogarty, G., Massey, E. & Pendry, K. (2017) Blood and Bombs: Blood Service support following the 2017 Manchester Concert Bombing. Transfusion Medicine 27 (Supplement 2): 6. S107.

NHS Blood and Transplant

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.

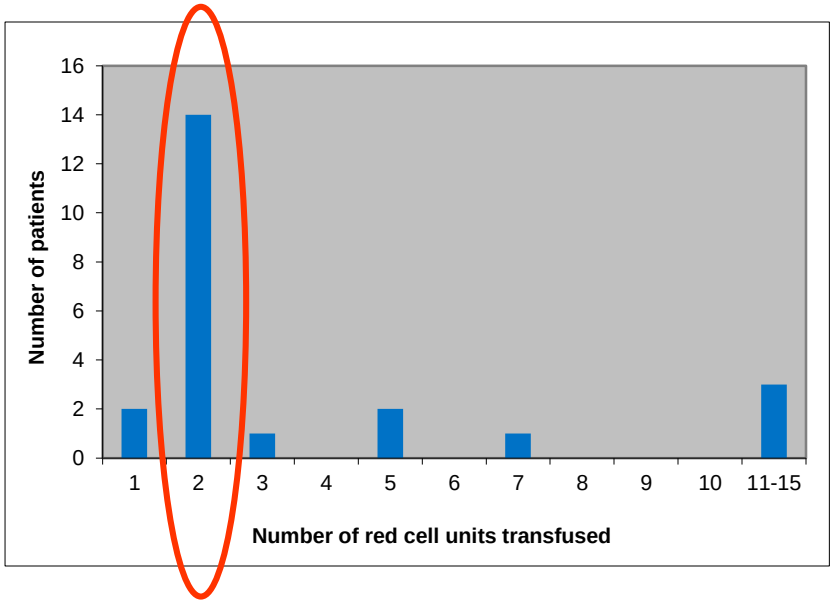
Red cell use (24hr)

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

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

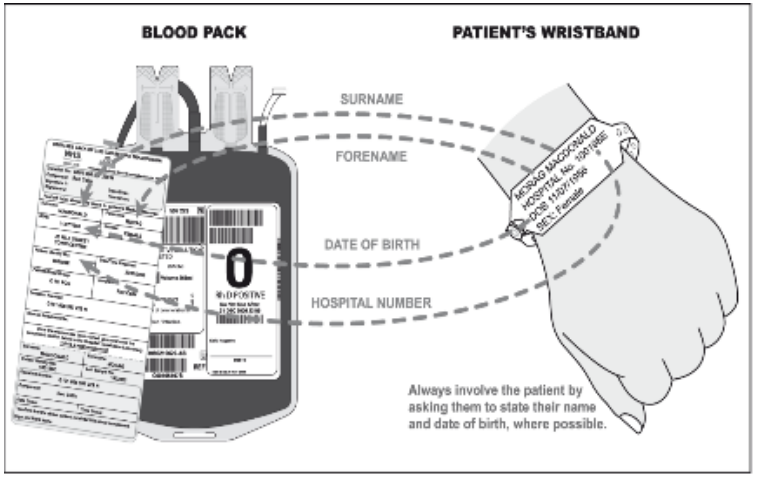
Alert the Blood bank early

Senior haematology and transfusion staff sent forward to support:

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

NHS Blood and Transplant

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.

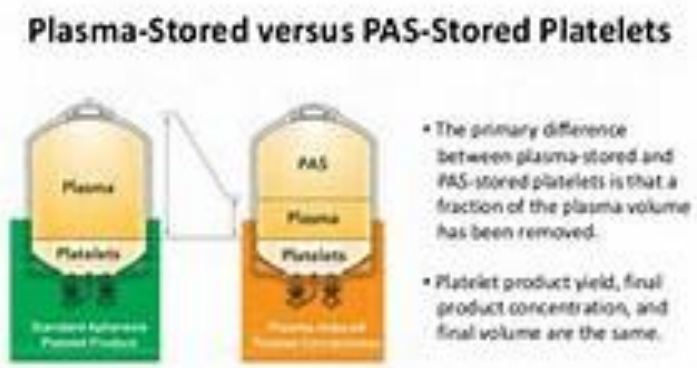
See future Patient Safety Alert

NHS Blood and Transplant

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

NHS Blood and Transplant

- 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

H. A. Doughty & S. Allard (2006) Responding to Major Incidents – Lessons Learnt from July 2005 London Bombings. *Blood Matters (NHS Blood and Transplant)*, **20**, 14 - 15.

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

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

Glasgow SM, Allard S, Doughty H, Spreadborough P, Watkins E. (2012) Blood and bombs: the demand and use of blood following the London Bombings of 7 July 2005--a retrospective review. Transfusion Medicine. 22(4):244-50

NHS Blood and Transplant

Donor management

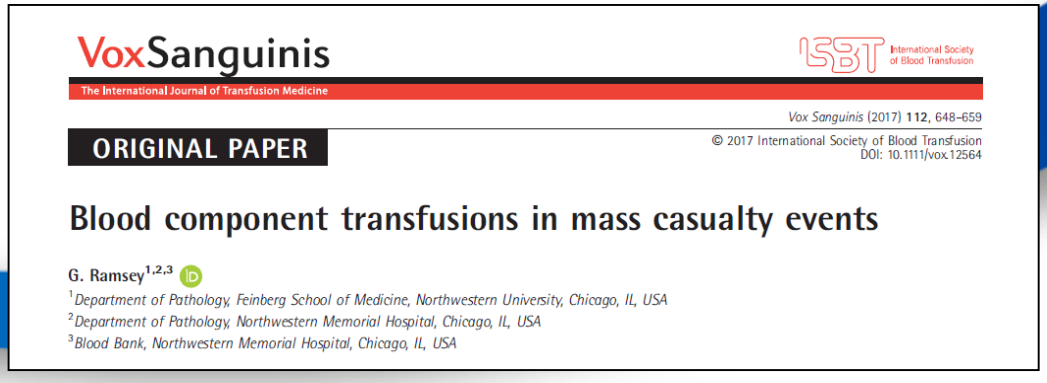
Donors are managed to maintain continuity of supply

It is important for donors to keep future appointments

NHS Blood and Transplant

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



VoxSanguinis

The International Journal of Transfusion Medicine

ISBT International Society of Blood Transfusion

Vox Sanguinis (2017) **112**, 648–659

ORIGINAL PAPER

DOI: 10.1111/vox.12564

Blood component transfusions in mass casualty events

G. Ramsey[1,2,3]

[1] *Department of Pathology, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA*
[2] *Department of Pathology, Northwestern Memorial Hospital, Chicago, IL, USA*
[3] *Blood Bank, Northwestern Memorial Hospital, Chicago, IL, USA*