

Transfusion Emergency Preparedness for Mass Casualty Events



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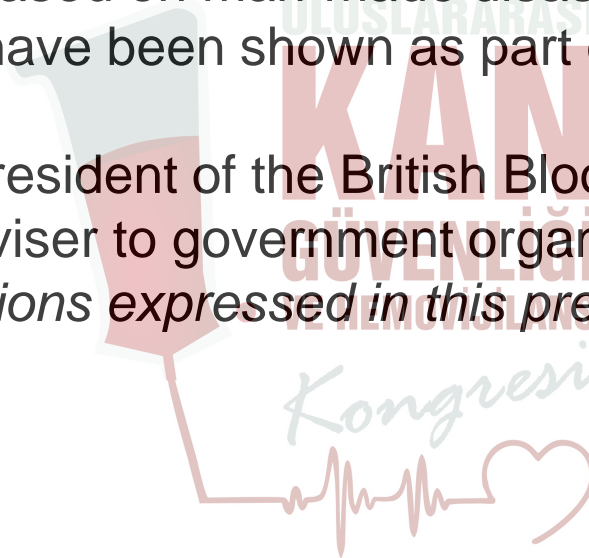
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Faculty Disclosure

The author has no conflict of interest to declare

- The experience is based on man-made disasters
- Many of the slides have been shown as part of previous teaching material
- I am currently the president of the British Blood Transfusion Society and serve as an adviser to government organisations
- *The views and opinions expressed in this presentation are those of the author*



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- Mr Richard Rackham and the NHSBT Business Continuity team



Content

- Introduction
- Transfusion for trauma
- Demand planning
- Future directions



INTRODUCTION



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Mass casualty events – need for transfusion services to prepare



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Increasing awareness of the need for transfusion support in trauma and Mass Casualty Events

- Major Incidents require extraordinary measures – especially the use of resources
- Where major incidents are associated with mass casualties - the demand for blood may exceed local/immediate stocks
- Preparedness required to organise and move stock to meet a surge in demand
- Plans and practice essential to reduce risks associated with transfusion

Aims of Transfusion Emergency Preparedness (NHSBT aims)

To protect and if possible enhance the reputation of organisation by effective incident management

To strive for a recovery to Business As Usual (BAU) in the shortest possible time

To protect as far as is reasonably practicable the delivery of key products and services



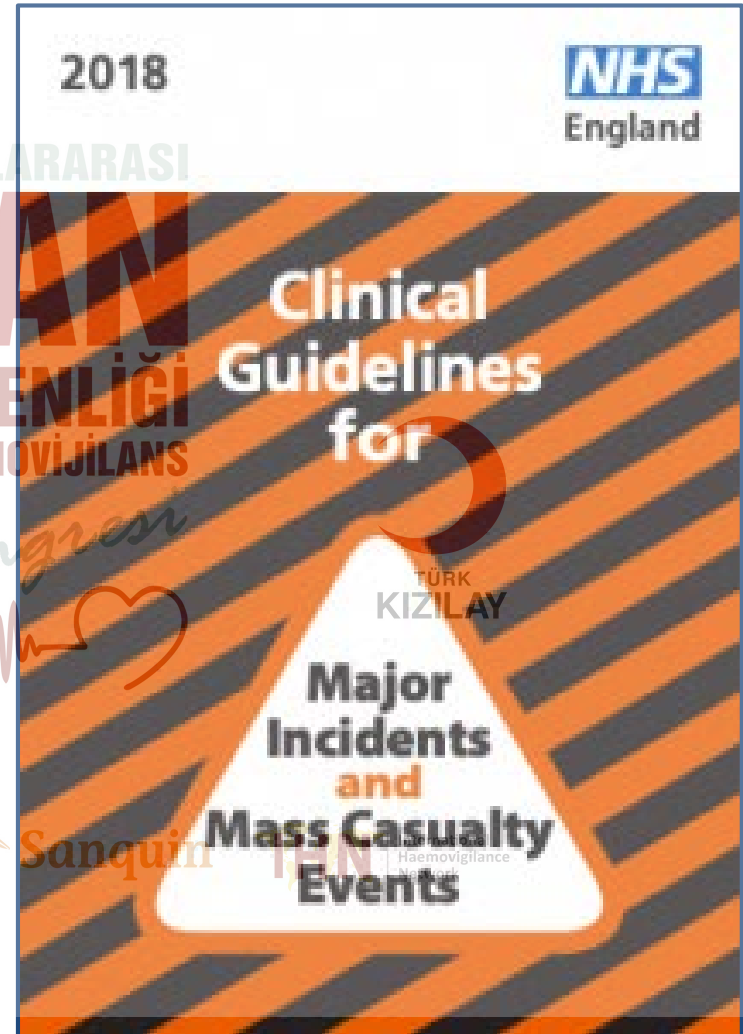
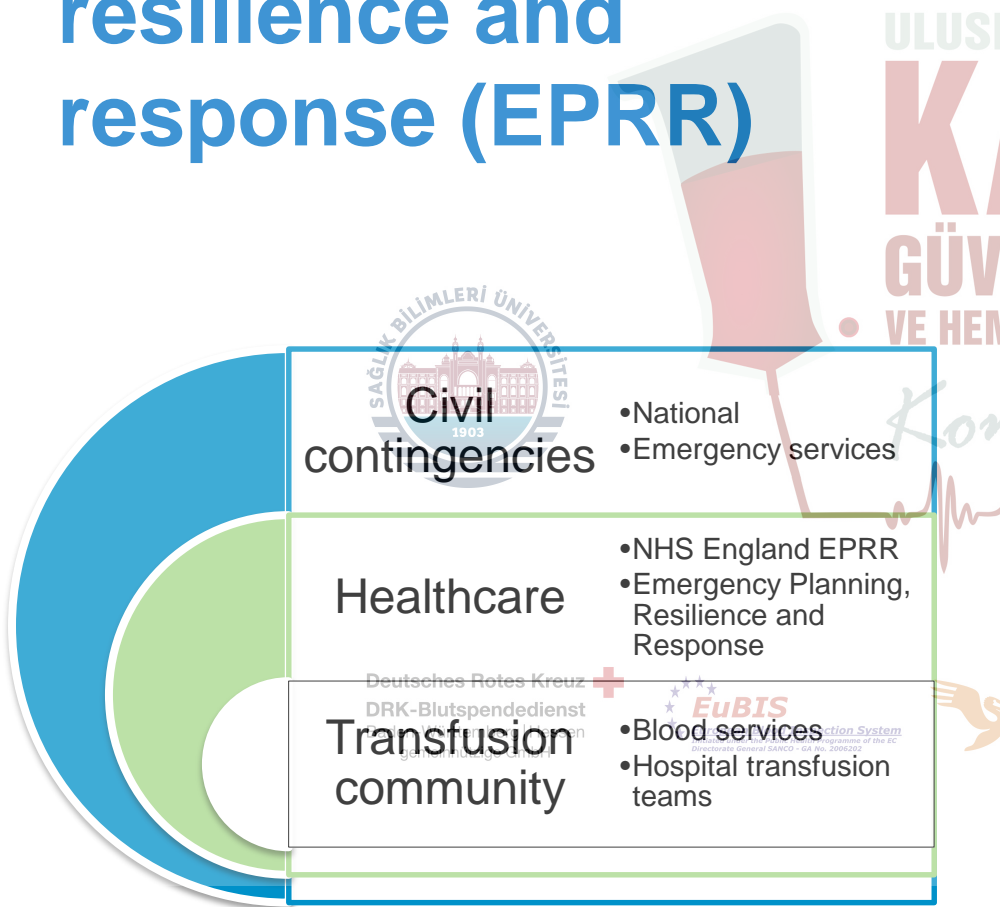
To safeguard, as far as is reasonably practicable the health, safety and welfare of our donors, staff and visitors

*To manage the incident within the constraints of regulatory and legislative requirements



*Our Business Continuity framework is BSI ISO22301.
ISO 22301 specifies the requirements for a management system to protect against, reduce the likelihood of, and ensure your business recovers from disruptive incidents*

Emergency preparedness, resilience and response (EPRR)



Transfusion Emergency Preparedness:



Doughty, H., Glasgow, S. & Kristoffersen, E. (2016). Mass Casualty Events: Pre-Hospital Care and Emergency System Preparedness across the Continuum of Care. *Transfusion*, 56(S2): S208-S216.

Preparation of the Public

citizen AID™
Public Immediate Actions

For multiple casualties from a shooting, stabbing or a bomb

SAGLIK BILIMLERI UNIVERSITESI
1903

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T. J. Hodgetts
K. M. Porter
P. Mahoney
A. Thurgood

You can save lives!

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Uluslararası
NPCC
National Police Chiefs' Council

İN THE RARE EVENT OF
a firearms or weapons attack
VE HEMOVİJİLANS
RUN HIDE TELL

TÜRK KIZILAY

RUN to a place of safety. This is a far better option than to surrender or negotiate. If there's nowhere to go, then...

HIDE. It's better to hide than to confront. Remember to turn your phone to silent and turn off vibrate. Barricade yourself in if you can. Then finally and only when it is safe to do so...

TELL the police by calling 999.

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TRANSFUSION FOR TRAUMA

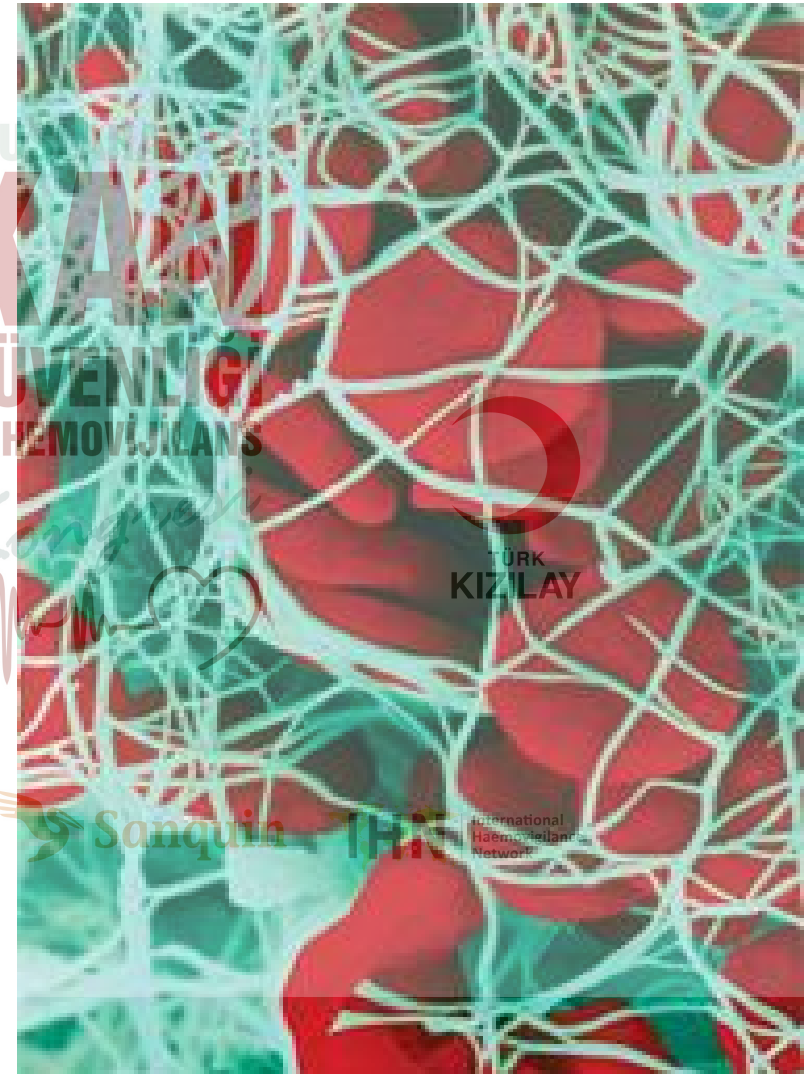
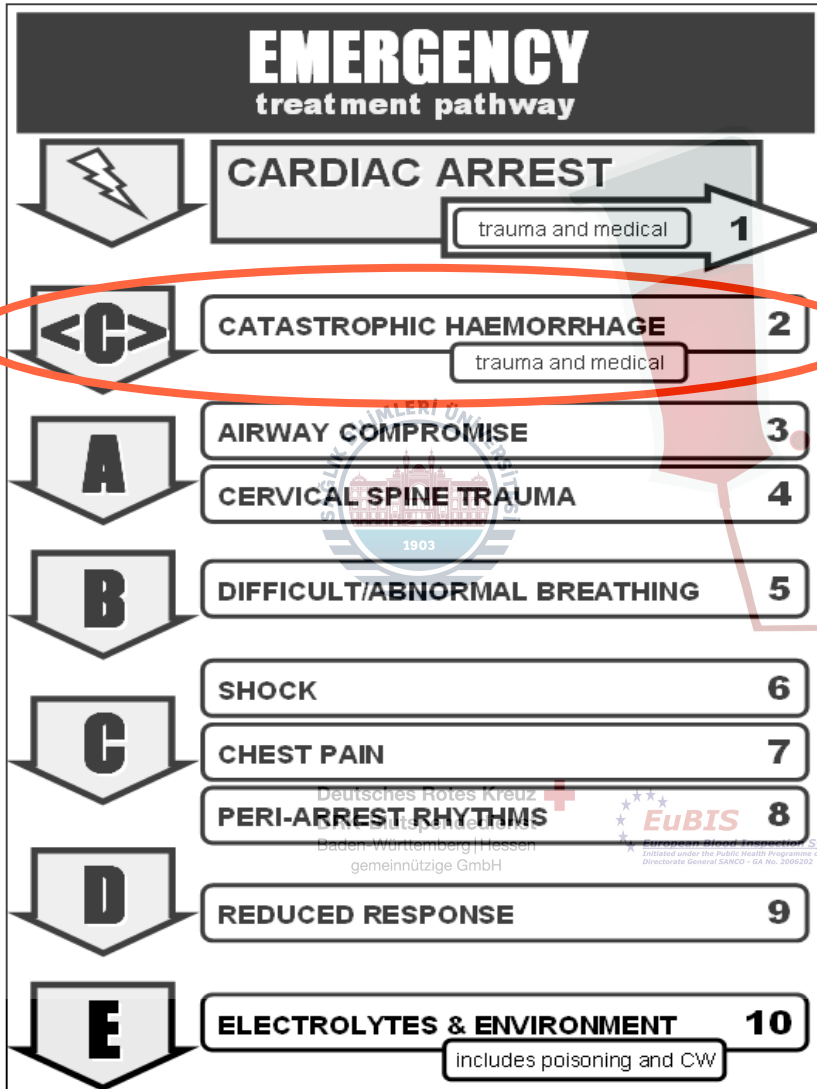
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Stop the bleeding



'Shock/ATP' Packs and blood group substitutes



Yazer, M.H., Delaney, M., **Doughty, H.** et al. (2019). It's time to reconsider the risks of transfusing RhD negative females of childbearing potential with RhD positive red blood cells in bleeding emergencies. *Transfusion*. 18 October 2019 <https://doi.org/10.1111/trf.15569>

*Use group A (HT neg) plasma.
Note alternative plasma –
Octaplas, Lyophilised plasma.
Consider Pre-thawed*

Massive transfusion versus Mass casualty event

Massive Blood Transfusion

Mass Casualty Events



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Transfusion and triage

Transfusion support in MCEs includes:

- Donation
- Distribution
- Diagnostics
- Direct care



Casualty triage (adult)

Introduction

- ▶ The aim of primary major incident triage is to identify those in need of life-saving intervention (see table overleaf).
- ▶ When using Modified Physiological Triage Tool 24 (MPTT-24), some casualties will be over-triaged and early secondary assessment from a senior clinician is required.

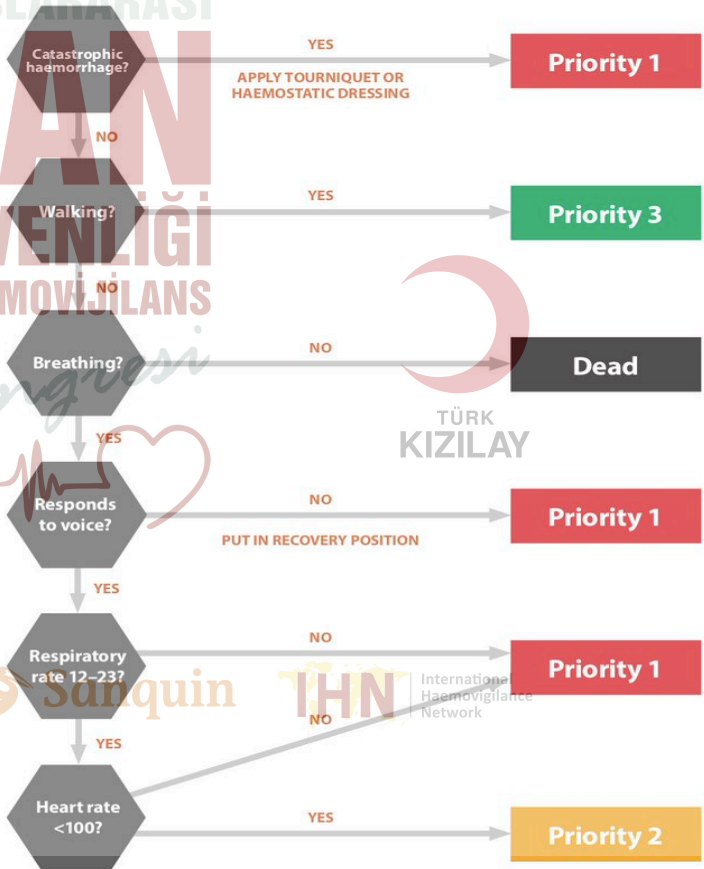


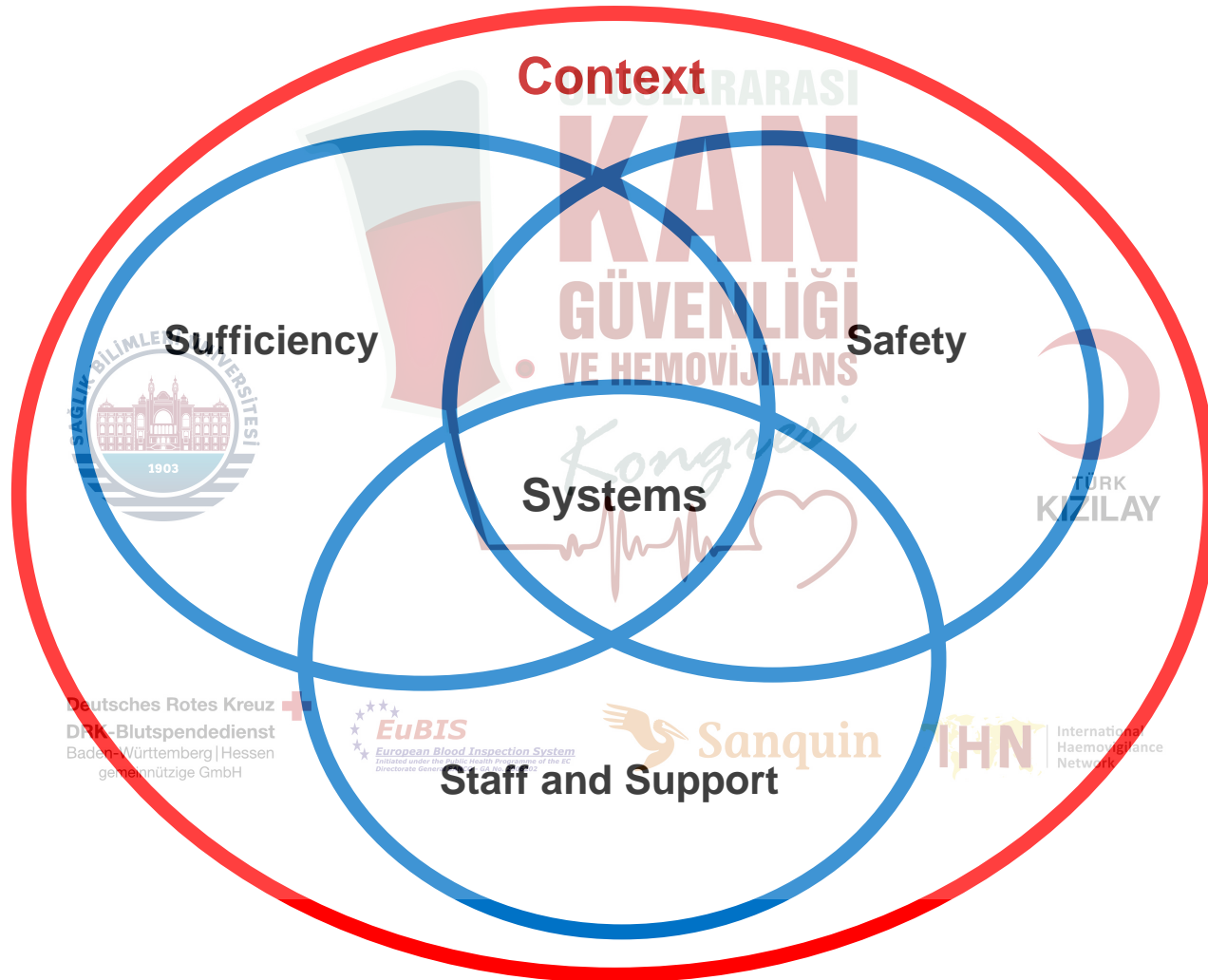
Figure 1: Modified Physiological Triage Tool 24 (MPTT-24). Vassallo 2017 CC BY 4.0

Rationale for the MPTT-24

- ▶ Can be completed by inexperienced personnel in 30 seconds
- ▶ The MPTT-24 is designed to minimise under-triage.

Doughty, H. and Rackham, R. (2019). Transfusion emergency preparedness for mass casualty events. *ISBT Science Series*. 14(1): 77-83.

Balancing the risks



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Israeli experience



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%)

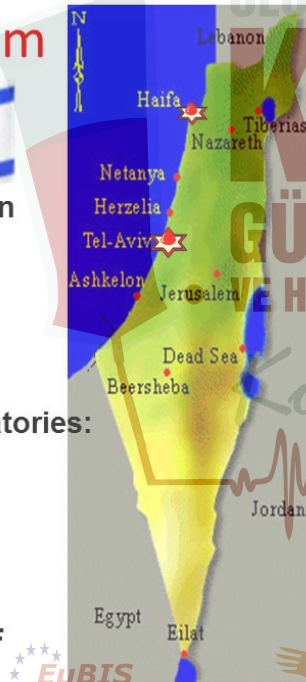
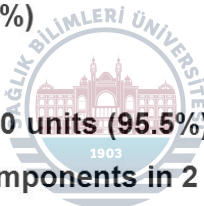
Preparation of blood components in 2 laboratories:

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.

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

UK Planning assumptions

Bottom-up planning for incidents

- Number of casualties (P1 and P2) x
- Amount of RCC required x
- **Red cell demand: use ratio x3**

Assumptions

- Early use of other 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

Recent literature reviews (2013 and 2017)

- 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 required if other components or Whole Blood used
- Red cells, 2/3 (62-74%) used within first 4hr, 27% Group O, un-cross-matched

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

The image shows the cover of the journal article. At the top left is the 'VoxSanguinis' logo, with the tagline 'The International Journal of Transfusion Medicine'. At the top right is the 'ISBT International Society of Blood Transfusion' logo. Below the journal title is a red horizontal bar. Underneath that is a black box with the text 'ORIGINAL PAPER'. To the right of this bar, the text reads 'Vox Sanguinis (2017) 112, 648-659' and '© 2017 International Society of Blood Transfusion DOI: 10.1111/vox.12564'. The main title of the article is 'Blood component transfusions in mass casualty events' in a large, bold, black font. Below the title is the author's name 'G. Ramsey^{1,2,3}' with an ORCID icon. At the bottom, there are three footnotes: ¹Department of Pathology, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA; ²Department of Pathology, Northwestern Memorial Hospital, Chicago, IL, USA; ³Blood Bank, Northwestern Memorial Hospital, Chicago, IL, USA. The background of the cover features a faint graphic of a hand holding a heart, with a red blood cell and a pulse line.

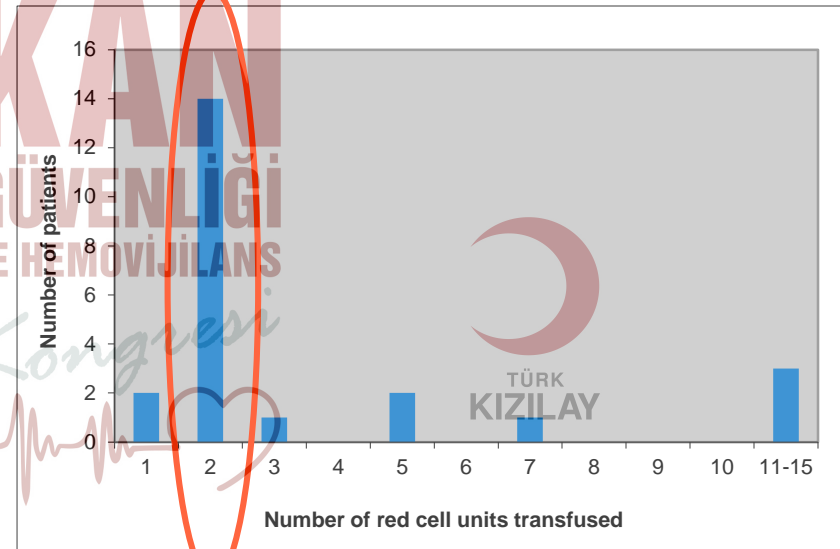
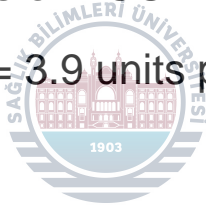
Manchester Arena Bombing UK 2017

23 patients (30.7% of 75 admitted) were transfused (20% of 112 originally reported physically injured)

A total of 89 units of RCC were used

Mean RCC use = 3.9 units per patient

- Min = 1
- Max = 15
- Mode = 2



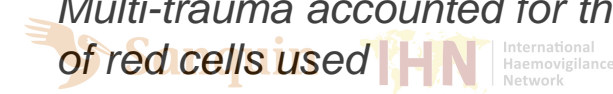
3 patients received MT ≥ 10 units (*4 = 5.3%)

5 patients received ≥ 5 units (*6 = 8 %)

*Corrective factor for children (aged >19) using 50th centile on UK weight charts

Many young females leading to O neg use

Multi-trauma accounted for the majority of red cells used



Doughty, H., Watkins, E. and Pendry, K. (2018). Blood service support following the 2017 Manchester concert bombing. *Bloodlines* 127: 28-32.

Christchurch mass shootings 2019



- One tertiary hospital
- 46 patients triaged, 96% male
- 45% ISS ≥ 15
- Close range, high velocity, hollow point bullets
- RBC Tx U median 2/ mean 7.6 (1 patient-199 units)
- 8 Massive Transfusion Protocols in 12 hr
- Labelling problems ➡ O pos RCC and group A plasma

Oral Abstracts: O131A M Chui et al. O131B S Mercer, O131C S Warrington et al.

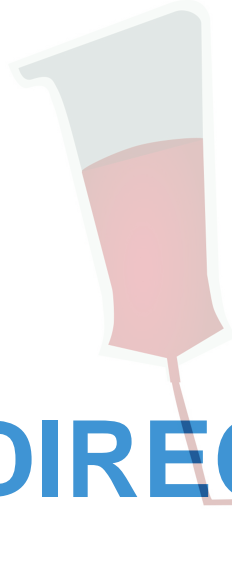
Transfusions in MCEs: Recent Trends (Ramsey 2019)

Proposed “75th-Percentile Rules of Thumb” for blood providers

- RBC : plasma : platelets - units per admission:
- “**4** : 1 : 0.25” for blood centers [event-wide needs]
- “6 : 4 : 0.5” for trauma centers

Recent MC trends:

- Plasma usage trending up
- Intensive platelet use in mass shootings



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FUTURE DIRECTIONS



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Emergency Planning working group (UK)

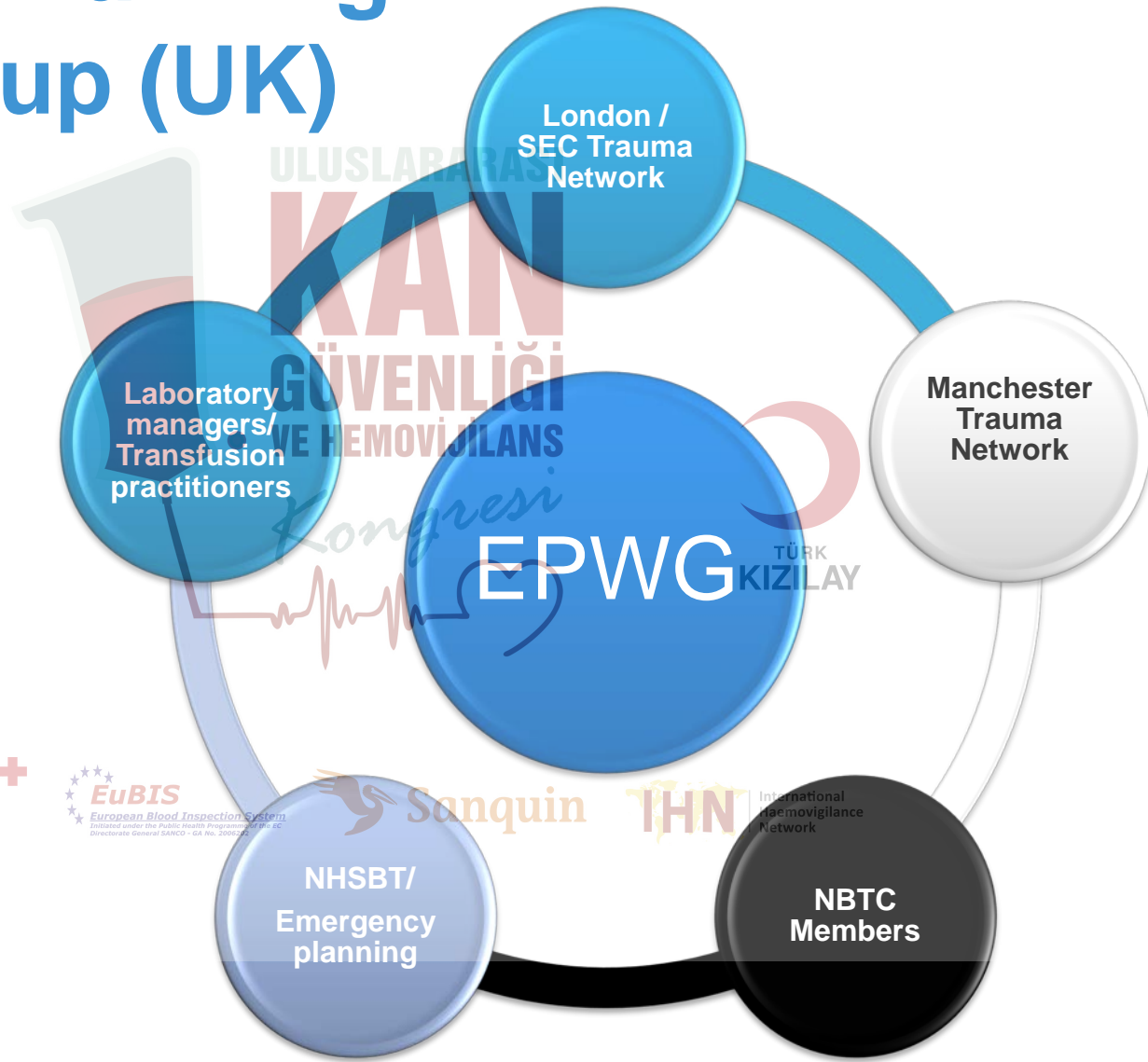
- National Blood Transfusion Committee



- Recent experience

- Multi-disciplinary

- Integrated with wider planning



Current UK guidance for transfusion planning

Hospital planning assumptions and stock holdings should be guided by the **pre-determined** casualty regulations and capability chart from their regional MI plan.

- P1 to Major Trauma Centres,
- P2 to Trauma Units

General guidance is 3 RCC per casualty admitted and 7-8 RCC with components for the more severely injured with haemorrhage



Doughty, H. et al. (2019) Emergency Preparedness, Resilience and Response guidance for Hospital Transfusion Teams. <https://www.transfusionguidelines.org/uk-transfusion-committees/national-blood-transfusion-committee/working-groups#Emergency>

New roles and responsibilities



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

Consider sending haematology and transfusion staff forward to support:

- Emergency Department
- Trauma theatres
- Roles could include:

- *Transfusion triage and issue*
- *Traceability of blood units*
- *Transfusion sample security (second transfusion samples and changing ID)*
- *Haemovigilance*

Whole blood ?

Offers simplified donation, logistics and speed of delivery

Considerations:

- Demand for group O neg
- Inventory management
- Platelet sparing leucodepletion
- Cold platelets
- Haemolysins
- Staff training and support



Doughty, H. and Strandenes, G. (2019).
Whole blood in disaster and major incident planning. *ISBT Science Series*. 14(3): 323-331.

Endnote – the Human Factor



- Plan
- Prepare
- Prioritise
- Practice
- Communicate
- Care**

Working together

- Hospitals
- Blood services
- Healthcare agencies
- Volunteers and donors
- Emergency responders
- Military medicine and academia
- The international transfusion community

