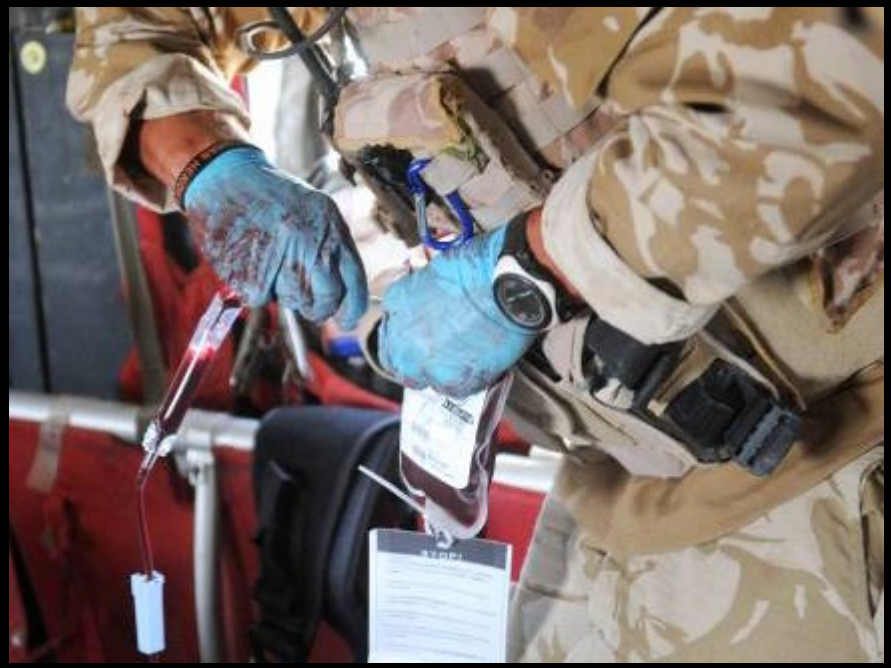
Mind the Gap:

Pre-hospital blood and the blood banker

Dr H A Doughty

OBE MBA FRCP FRCPath
Consultant in Transfusion Medicine



Version 6 June 2014

Disclaimer

The views and opinions expressed in this presentation are those of the author and do not reflect official policy or the position of NHS Blood and Transplant or the Defence Medical Services.

Aim of presentation

Pre-hospital transfusion may impact on the blood banker. Examples include:

- Legal and regulatory requirements
- Demand and stock management
- Impact on continuing transfusion care

The aim of this presentation is to explore some of the challenges and potential solutions

The military influence: Damage Control Resuscitation (DCR)

Aims of DCR include:

Minimise blood loss

Maximise tissue oxygenation

Optimise outcome

Transfusion is an integrated part of Damage Control Resuscitation
Transfusion may begin in the pre-hospital space

Blood on board:
Civilian pre-hospital practice

FEATURE REPORTS

Blood On Board!

On 6 March 2012 London's Air Ambulance (LAA) became the first UK air ambulance service to start flying with blood on board (BoB). The LAA physician – paramedic team responds to severely injured patients within the Greater London area using an aircraft and rapid response vehicles. The impetus was that of the 2000 patients attended to each year approximately 200 were suffering from serious blood loss, some dying before reaching hospital. It took over three years to come up with a solution that was user friendly and met legislative requirements.

In these serious cases it is unlikely that crystalloid transfusion will result in a return of spontaneous circulation. Traumatic cardiac arrest due to hypovolaemia has a dismal outcome in the absence of blood transfusion and damage control techniques[1]. Journey times can compound the situation when patients may not reach hospital in time to receive a transfusion.

Following extensive research, testing and validation a decision was made to use the Golden Hour box from SCA Gist Logistics. Each box contains four units of O RhD negative red cells and the relevant documentation. A data logger is kept in the box to monitor the temperature so that unused units can be returned to stock.

Standard Operating Procedures for Pre-hospital Blood Transfusion ensure that all personnel (clinical and laboratory) understand the requirements and responsibilities. No major drawbacks have been encountered and the process is now routine practice. The team have a traceability record of 100% (possibly our only area that consistently achieves this with no prompting!). All of the LAA team know that sealed blood components must be avoided at all costs as O RhD negative blood is a precious resource. So far only one unit of blood has been wasted.

Clinical outcomes

LAA have now delivered over 140 pre-hospital transfusions. Some patients were suffering from non-compressible haemorrhage, which can only be controlled by invasive techniques such as surgery or interventional radiology. On scene blood transfusion provided a 'bridge' allowing them to reach hospital.

For medical teams like those provided by LAA, which undertake open chest surgery, the ability to deliver pre-hospital transfusion will potentially increase the survival rate from this procedure. LAA have already seen patients resuscitated successfully using this technique[2]. The team believe that these patients would not have survived without blood at the scene.

Summary of patients receiving on-scene blood transfusion 6th March 2012 to 31st August 2013

Potential challenges

- Sufficient ‘universal’ blood components
- Secure cold chain – sufficient proof of compliance to return unused blood to hospital stock
- Traceability – confirm fate and ability to re-call for up to 30 years
- Haemovigilance and serious event reporting
- Confirmation of ABO and RhD groups
- Compliance with ‘national’ regulators
- Providing further evidence - RCT

Mind the gap

?

- **Safe blood**
- **Safe transfusion**
- **Safe transfer**
- **Safe systems**

Safe Blood

Hierarchy of formal blood supply: (EU model)

Blood is normally collected, tested and processed by a blood establishment

Supply to ambulance/pre-hospital groups trusts may be:

- Direct from blood service
- Indirect via blood bank

Pre-hospital group may be a facility or extension of the blood bank (if formal arrangements SLA/MOU in place)

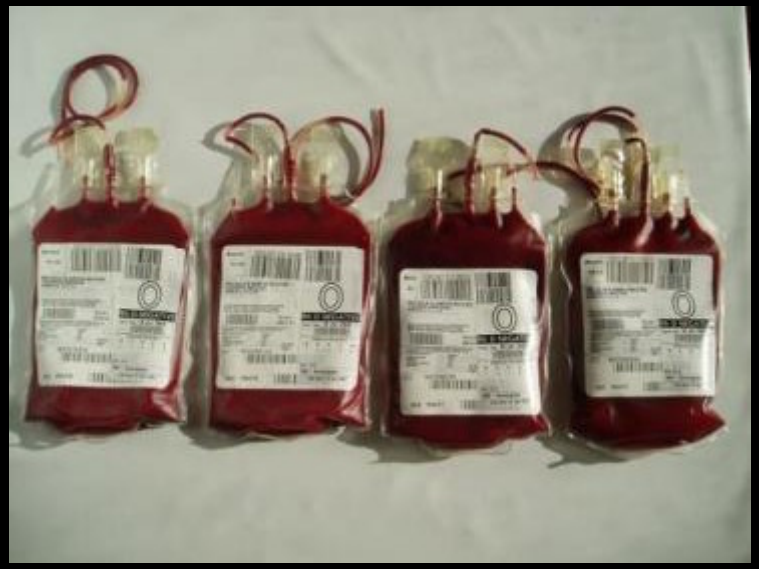
Meeting the demand for Universal Blood Components

Group O RED CELLS (RCC) can be used for all ABO groups

Group Rhesus D neg red cells prioritised for females

Group AB PLASMA used for all ABO groups (the RhD group does not matter)

Consider 'Universal plasma' or Group A Plasma with low titre anti-B



Group O RhD neg Blood and Group AB plasma are in short supply globally

Pre-hospital transfusion may have an impact on local and national blood supplies

Blood component storage and shelf-life

Component	Storage	Shelf-life	Extended shelf-life
Red cells	4°C ± 2	35 days	42
FFP	-25°C	3 years	
Thawed FFP	4°C ± 2	24 hours	5 days (if dry thaw)
Platelets	22°C ± 2 + agitation	**7 days**	

The working environment

Simulate during staff training and validation of equipment and systems

External:

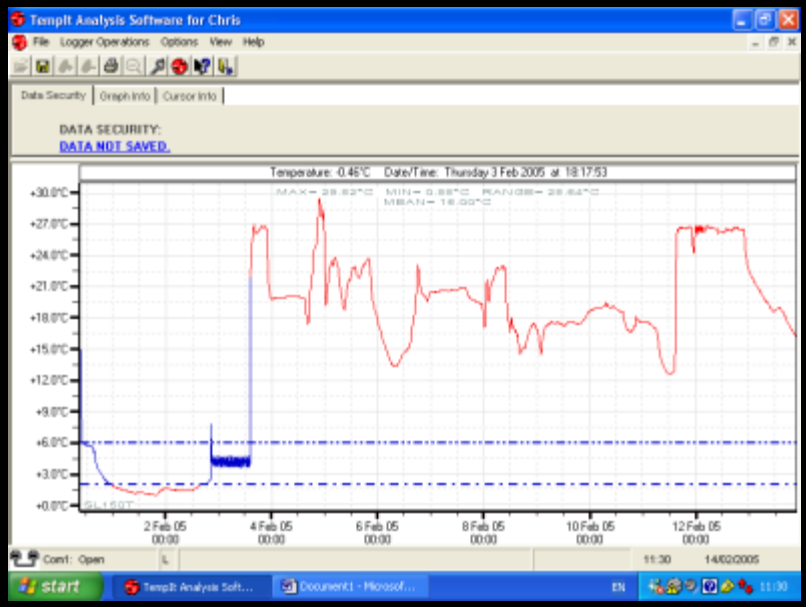
- Temperature
- Dust
- Wind
- Cold
- Wet

Internal:

- Dark
- Noisy
- Vibration
- Constrained
- Dangerous

Validate delivery systems

Monitoring the cold chain



Retain records for internal and external audit

Traceability: An example of a 3 part label

Grey - Leave on bag

Blue – put into patient record

Pink – return to blood bank

Safe Transfusion

Serious Hazards

'Risk is relative'

- Context
- Commitment to patient safety
- Consider requirement to capture both blood donor and patients events
- Challenge of recognition
- Challenge of global reporting

Risks at reception

Baseline blood sample

Switch from universal to group specific

Switch from a manual to digital system

Completion of transfusion records

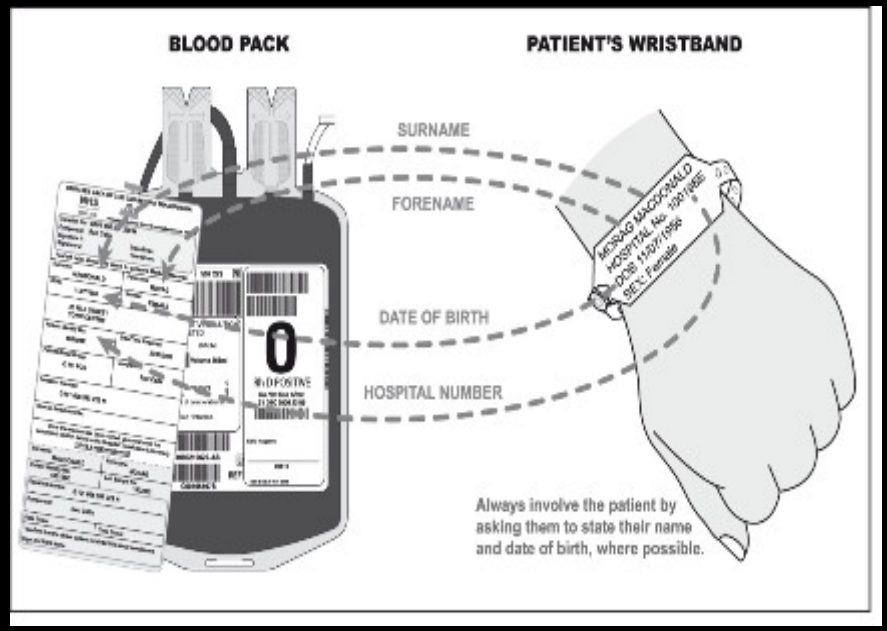
There must be a safe system to link Pre-hospital and Hospital records and ID

The biggest risk in transfusion is giving ABO incompatible blood due to human error. Risks increase during the transfer from pre-hospital to hospital care

Changing identification

Identification is required in hospital for:

- Blood sampling
- Collecting blood components
- Administration of blood



There should be compatibility between local emergency ID systems and receiving blood bank Information systems

Recognition and management of Acute Transfusion Reactions

Focus on 'C'ABC and managing physiology

Consider risks

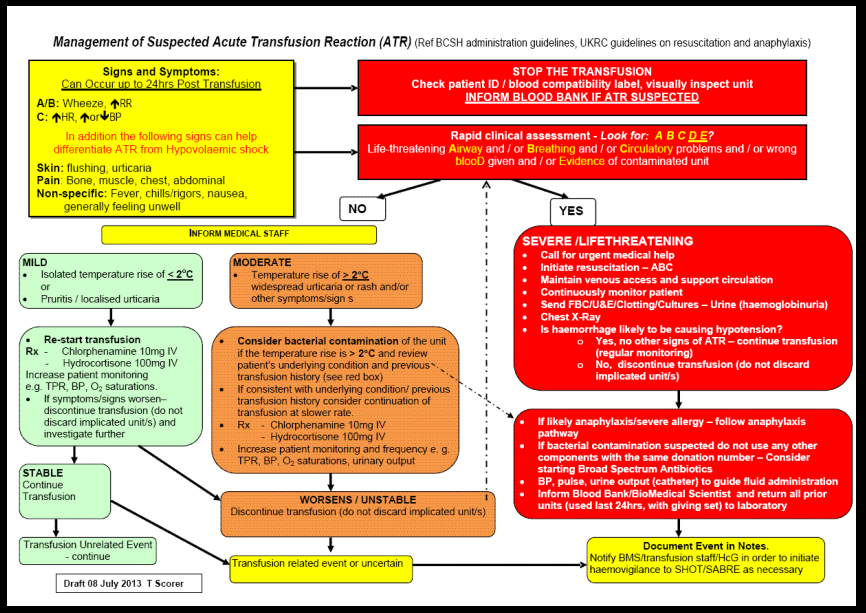
? Group O blood – then ABO unlikely

Group specific – return to group O

Previous transfusion – unknown – haemolytic reaction possible treat later

Use of plasma – manage allergic response

Continue resuscitation



Management of ATRs CGOs 2014

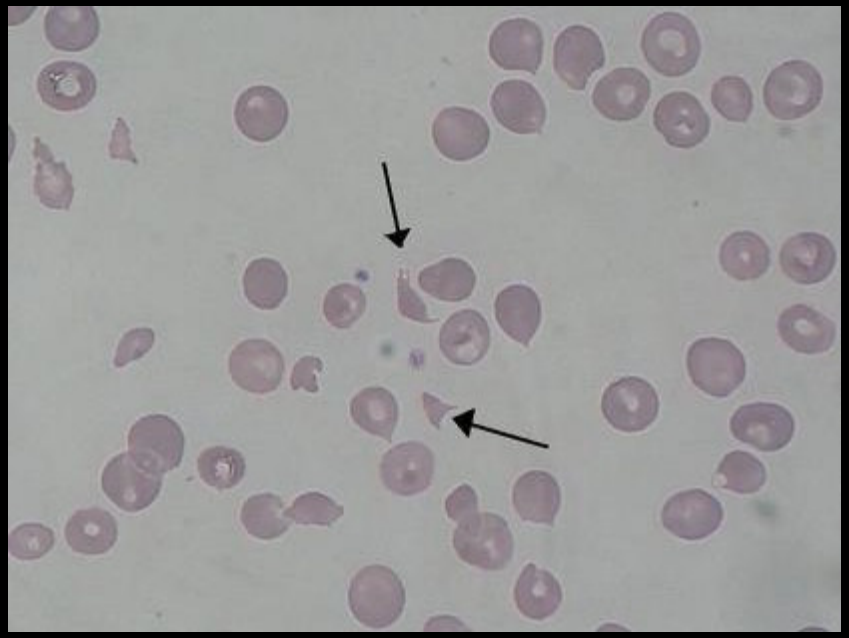
Challenge of recognition

Reactions are rarely reported in the critically ill

Some reactions may occur late (after transfer) and are may not be recognised as transfusion reactions.

Novel problems may present e.g. mechanical haemolysis and the pre-hospital treatment should be considered during investigation

Mechanical haemolysis



- Non immune haemolysis in the rapidly transfused
- Causes could include:
  - Narrowed subclavian lines (as reported in renal dialysis)
  - Administration system i.e. Rapid infusers and connectors
  - Blood forcefully given via IO devices
- Cases must be reported to national haemovigilance systems

Safe transfer

Reducing the risk at Patient transfer

Pre-hospital/Previous transfusion (and blood group if known) should be included in notification and handover

Transfusion support at receiving hospital

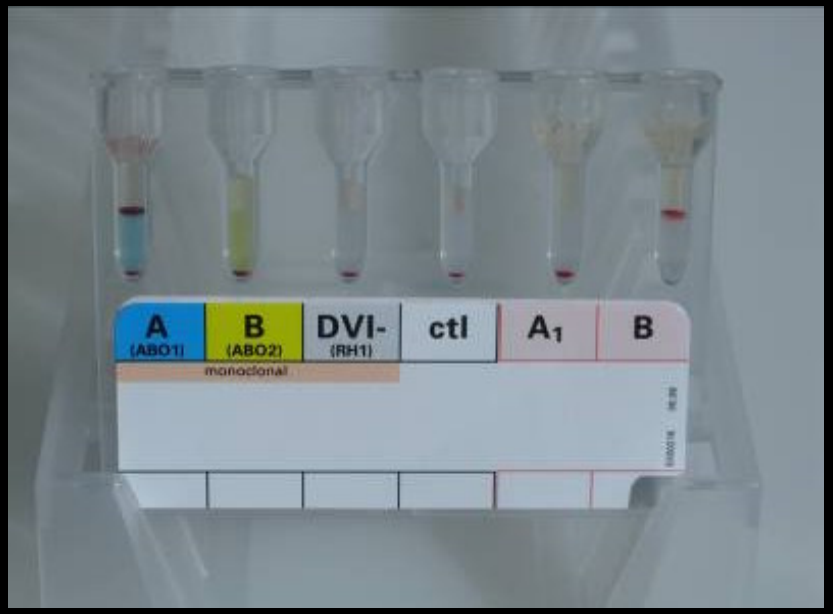
- Continue providing blood components
- Establish (or confirm) patient blood group (ABO and RhD)
- Move to group specific blood components when blood group confirmed
- Screen and identify atypical antibodies and advise
- Follow-up of untested blood, transfusion reactions or serious/adverse events
- Complete traceability and transfusion record
- *Complete research records*
- Post exposure consent to transfusion

Pre-hospital transfusion: Changing ABO groups

The use of large amounts of ABO non-identical blood may ‘obscure’ patient blood groups

Receiving hospital may have to use ‘universal components’

Transfusion history important to determine blood group and risk



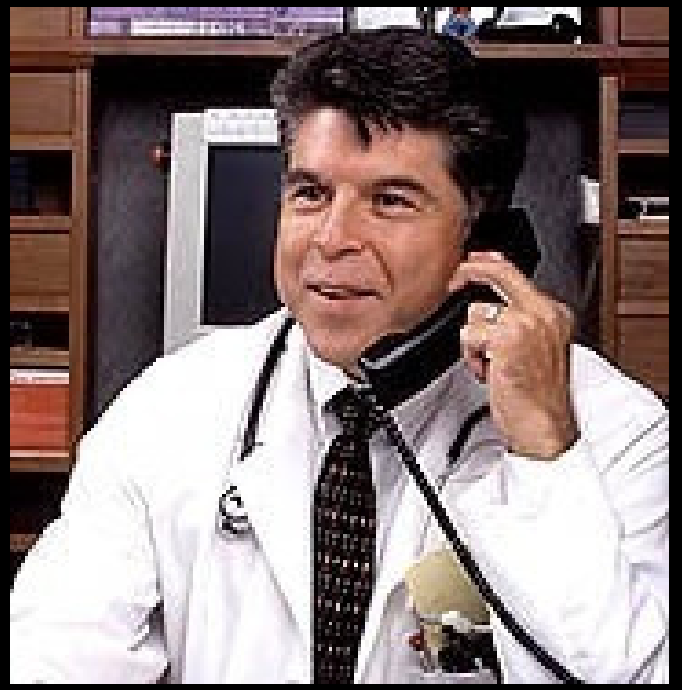
Group O cells in a group A RhD neg patient

Communication errors from bench to bedside

822 outgoing telephone calls from laboratories

29 errors were detected (3.5%)

“A significant proportion had the potential to endanger the patient”



American Journal of Clinical Pathology 121(6) 801-803 2004 J Barenfanger et al

Improving communication
Applying human factors

A small number of simple interventions would reduce errors, e.g.:

- ✧ Structured messages
- ✧ ‘Read back’
- ✧ Protocols for speaking up
- ✧ Better focussed, rather than more extensive, checking procedures




Safe systems

Blood facility compliance

An organisation which receives blood from a hospital blood bank for transfusion purposes is defined as a facility.

The 3 key tasks covered by a facility blood compliance report are

- Cold chain management
- Reporting serious adverse events
- Traceability records

Evidence provided via documentation within a quality system

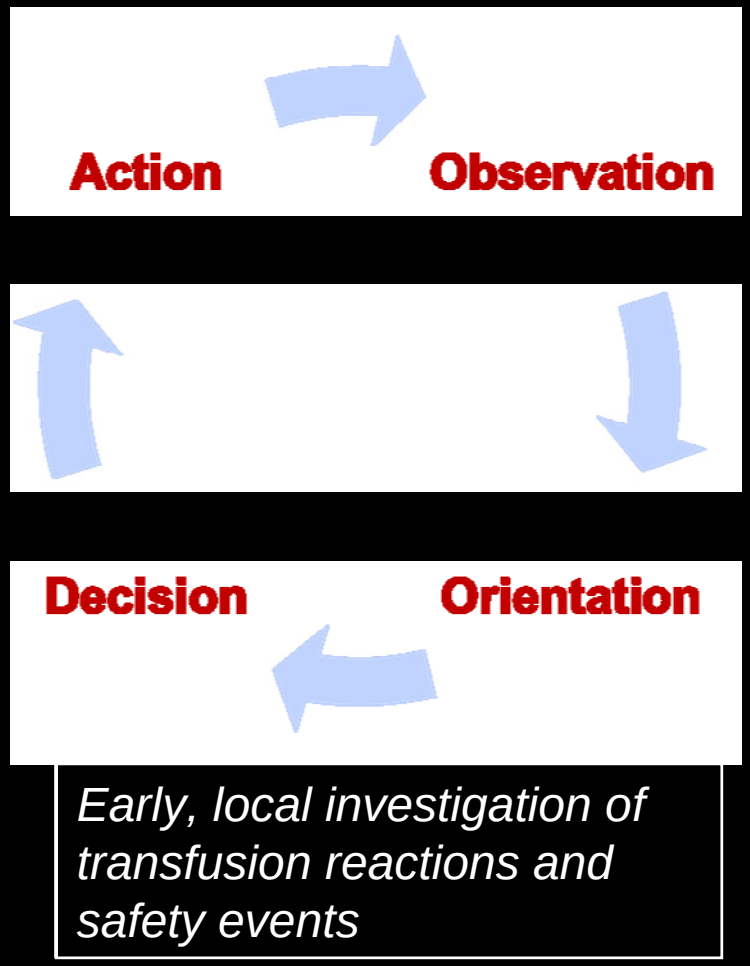
Documentation e.g. Training

All staff involved in the transfusion process should be trained.

Documents required include:

- Policy
- Roles and responsibilities
- Group and individual Training records

Clinical governance systems



- Pre-hospital representative
- Support implementation of local policy and practice
- Promote best transfusion practice through training, education and audit
- Review usage and wastage of blood and advise on stock holdings
- Review traceability statistics and investigate non-compliance
- Support investigation and management of transfusion related events

Good blood in bad places
Providing continuity of transfusion care



Allcock, E.C., Woolley, T., Doughty, H., Midwinter, M., Mahoney, P.F., Mackenzie, I. (2011) The Clinical Outcome of UK Military Personnel who received a Massive Transfusion in Afghanistan during 2009. *Journal of the Royal Army Medical Corps,* 157, 365-369.

Together – We ‘Mind the gap’