

# *Blood Matters*

Information for hospitals served by NHS Blood and Transplant

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## Editorial

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When driving a car, who isn't tempted to go a little faster to make the trip shorter? Now all drivers know the Highway Code and have passed a driving test, but human nature seems destined to bend the rules to achieve a more desirable aim. We take a risk that there will be a low chance of an accident or a speeding ticket, and put it to the back of our minds.

And so it is with blood transfusion – we all know the rules (and if we are not sure, there is lots of advice at [www.transfusionguidelines.org.uk](http://www.transfusionguidelines.org.uk) to help us). We know that blood transfusions save lives, but also can have adverse effects in patients. We know the number of donors is falling and supplies are limited. We have in place various safety systems to ensure the right patient receives the correct blood products, but SHOT data shows us we don't always get it right. We know we need to use alternatives to reduce transfusion need, but surveys show that implementation of these measures is patchy.

This edition of *Blood Matters* will help highlight progress in some of these areas and may give you new ideas which could be adopted in your own clinical area. Making blood transfusion safer and more appropriate will only come from the introduction of several improvements all along the chain from donor to recipient.

Things are getting better – the Chief Medical Officer's National Blood Transfusion Committee (NBTC) has conducted two questionnaire surveys on the implementation of the Better Blood Transfusion Health Service Circulars (Transfusion Medicine 2005; 15:453-460). In 2005, three quarters of hospitals have transfusion practitioners who have made an enormous contribution to transfusion practice within hospitals. This is discussed in more detail in Catherine Howell and Tanya Hawkin's article. Somewhat disquieting are the anecdotal reports, received by the National Blood Transfusion Committee, of posts that have been withdrawn as hospital trusts have struggled to balance their finances.

Blood bank staff have been busy in the last year grappling with the implications of the Blood Safety and Quality Regulations (2005) and in some cases preparing for inspection by the Medicines and Healthcare products Regulatory Agency. The quality management systems and traceability required will undoubtedly improve standards. A different level of external policing is now present, with rapid inspection, monitoring adverse reports. Practical guidance on managing transfusion reactions has been provided by Jonathan Wallis.

Children are not just small adults and their special needs in relation to red cells are discussed by Helen New and Gordon Nicholson. The difficult and contentious issue of Predeposit Autologous Blood for children is discussed by Sarah Morley.

One thing that last year taught us is: *to expect the unexpected*. Experience for dealing with the London bombings arose from managing previous major incidents in the capital. The lessons from the

bombings are now being disseminated and need to be considered at a local and national level. A summary is provided by Heidi Doughty and Shubha Allard. The NHS is considering other major emergencies such as an influenza pandemic – this would clearly have an immediate affect on the supply of blood donors. Since the National Blood Service is part of the new organisation NHS Blood and Transplant (NHSBT), it is fitting that we hear how other components, such as eyes, are collected.

Of course the best way to prepare for potential blood shortages is to reduce our current dependence on it. The UK still transfuses patients more often than other countries and we could do more to prevent the need for transfusion. Optimising the haemoglobin prior to surgery, reducing blood loss during surgery and recycling the patient's blood (cell salvage) are all obvious methods which were discussed at the Department of Health Stakeholders Workshop in November 2005. The big question is why are these measures not universally adopted? The answer lies partly in the nature of our hospitals where major reconfiguration of patient pathways (e.g. adapting pre-admission clinics) or moving money between budget lines are necessary to achieve a change in practice. It is always worth remembering that a budget is only a plan of how resources (usually money) are to be used, and as such, is very amenable to change (just like a map route)!

So where are we trying to go? We need to recognise that, the supply of blood will fall as new safety measures are introduced, and that it is likely to become more expensive to pay for new safety measures, e.g. prion filters. Regulation and inspection is likely to increase. Better patient information is likely to lead to more discussion of alternatives to transfusion. These need to be developed to cope with the falling supply. Technology may help with some of these issues, but most systems are in the developmental phase. There is no hospital in the UK with fully operational laboratory, tracking, patient identification and e-learning computerisation in place. These issues will be prominent in a new Better Blood Transfusion health circular planned for early next year.

Hopefully this edition of *Blood Matters* will give you some new ideas on how to take things forward - it gives you something to think about when you are sitting in a traffic jam!

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## ***The Transfusion Practitioner Role – Past, Present and Future?***

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The 2002 Health Service Circular: Better Blood Transfusion – Appropriate Use of Blood detailed actions required of NHS Trusts to improve transfusion practice. One of these actions was the establishment of a Hospital Transfusion Team, which includes a Transfusion Practitioner as one of its members. The

*continued on page 3*

Transfusion Practitioner role has been instrumental in addressing the actions required by the Circular. The remit of this role includes education, policy development and implementation, audit and driving the introduction of alternatives to transfusion.

A 2004 survey of Trust compliance with the Health Service Circular highlighted that 68% of respondents had a Transfusion Practitioner in post. The survey showed that 98% of respondents had a policy for blood transfusion and training was being delivered to all disciplines including 60% of medical staff. The appointment of Transfusion Practitioners has increased participation in both local and national audit and as a result, changes in practice to support the safe and appropriate use of blood have been implemented. Over the last 6 years there has been more than a 15% reduction in demand for red cells and a decrease in the number of ABO incompatible transfusions. The Transfusion Practitioner role has been a contributing factor to this success story.

The Transfusion Practitioner role has significantly developed over the last few years. Whilst originally perceived as a nursing role, Transfusion Practitioners are now employed from a range of professional backgrounds and the knowledge and expertise amongst this group has broadened as a result of this change. The introduction of the NBS Transfusion Liaison Nurses in 2003 has helped strengthen communication between Transfusion Practitioners and has facilitated the sharing of best practice. Training aids, education materials and information for patients developed by this team have helped to deliver consistent messages about safe practice and helped limit duplication of effort. The NBS Transfusion Liaison Nurses have been a valuable reference point for new Transfusion Practitioners, supporting their induction and ongoing development during the early stages of appointment.

However, the Transfusion Practitioner role is not without its challenges. Engaging clinical staff and Trust management is difficult, with the competing demands on individuals' time. The current financial status of the NHS is having an impact on the release of staff for training. The general perception that blood is relatively safe and the blood supply secure makes the introduction of changes difficult. The ever increasing rates of change, press Trusts to continually explore new ground and they are faced with doing more with less. Many Transfusion Practitioners are facing dilution of their role with pressure to do 'hands on' clinical and laboratory work to help ease staff shortages. The introduction of the 2005 Blood Safety and Quality Regulations has further changed the focus of the Transfusion Practitioner role in many Trusts. The increased involvement in activities to support compliance e.g. following up the fate of blood components is often undertaken at the expense of delivering training and participation in audit.

It is a concern that there are threats to the future of this role. It is worrying that where experienced Transfusion Practitioners are leaving, vacant posts are being frozen. A questionnaire survey of Transfusion Practitioners is being conducted to better understand the number and remit of Transfusion Practitioners in post in the UK. Supported by the National Blood

Transfusion Committee, this survey will help inform the work of a UK Group that is developing guidance on the professional identity of the Transfusion Practitioner. Results from the survey will be made available to Regional Transfusion Committees.

Continuation of the Transfusion Practitioner role is imperative to help support a continued drive for the safe and appropriate use of blood. There is a lot more to do. Building a high-performing transfusion team is not just about people's skills, abilities or knowledge; it is also about their commitment. Commitment, if it is to be sustained, must reach beyond the Transfusion Practitioner role and that of the Hospital Transfusion Team. The publication of a further Health Service Circular (anticipated early 2007) must help to refocus transfusion as an important issue within healthcare.

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#### **References**

1. Department of Health (2002) Better Blood Transfusion: Appropriate Use of Blood, Health Service Circular 2002/009
2. Murphy MF, Howell C. Survey of the implementation of the recommendations in the Health Service Circular 2002/009 'Better Blood Transfusion' on behalf of the National Blood Transfusion Committee. *Transfusion Medicine*. 2005; 15: 453-460.

## **Department of Health Stakeholder Workshop (Winchester November 10th 2005)**

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In 2004 the Blood Stocks Management Scheme undertook a survey to try and identify areas of change in hospital practice which may have influenced the reduction in red cell use. Three areas were identified where practice had improved the appropriate use of blood, namely raising awareness, introduction of certain alternatives to transfusion and changes in laboratory practice.

Representative hospital transfusion teams were asked to produce abstracts for presentation at this workshop, which covered the three areas mentioned above, to share best practice ideas. A fourth area was also identified, namely Preparing Patients for Surgery (PPS), that had been specifically recommended in the BBT2 circular and did not appear to have been implemented in an effective way.

The rest of this report summarises the findings of these four workshops and makes recommendations of good practice in each of these areas which can be found on page 5.

## **WORKSHOP 1: Raising awareness**

Presentations from four hospitals (three large hospitals and one specialised hospital) demonstrated how they were successful in reducing blood use, through raising awareness. There was agreement by all hospitals that the drivers for 'Better Blood Transfusion' were: patient safety, the potential for blood shortages, and the variation in the use of blood between clinical teams and hospitals.

Key factors identified were:-

- Local guidelines agreed with relevant clinical staff.
- Training.
- Audit/feedback of data to clinical teams.
- Monitoring the effectiveness of interventions.

Problems identified by the hospitals, in raising awareness about good transfusion practice, included limited resources for training and insufficient data.

## **WORKSHOP 2: Introduction of alternatives to blood transfusion**

This focused on three key points – (1) Lowering haemoglobin triggers, (2) Cell salvage, and (3) Antifibrinolytic therapy.

### **(1) LOWER HAEMOGLOBIN TRIGGERS**

The 'transfusion trigger' has increasingly been used in the management of patients, particularly in the postoperative setting.

Dr Sue Knowles presented orthopaedic data from South Thames, demonstrating that evidence based guidelines could reduce transfusion rates for major joint replacements. They illustrated that progressive lowering of transfusion triggers, supported by the findings of a BMJ 'practice improvement' paper, could reduce transfusion rates to approximately 10% for hip and 5% for knee replacement.

Dr Eric Watts (Basildon & Thurrock) presented an approach led from the blood transfusion laboratory, which showed that agreeing protocols with clinicians, introducing electronic issue for major surgery, and then 'policing' blood requests has significantly reduced red cell usage across the hospital, particularly in orthopaedic surgery.

Key points in implementing change through lowering haemoglobin (Hb) triggers include:

- Agreeing transfusion triggers for specific types of patients at a local level.
- Developing protocols/guidelines and regular audit against these.
- Emphasising the target Hb (max value) as well as the transfusion trigger (min value) and accepting the practice of using single unit transfusions.
- Outcomes other than blood use, such as severity of anaemia at hospital discharge and related complications, such as ischaemic heart disease,

should be monitored if possible to ensure that a restrictive transfusion practice is safe in the target population.

### **(2) CELL SALVAGE**

The NHS Plan 2000 led by the Modernisation Board envisaged 'putting patients and people' at the heart of the NHS. The theatre programme details excellent arrangements for PPS and it is essential that blood transfusion and blood conservation are considered. The School of Health and Related Research (ScHARR) covering England and North Wales, estimated that utilising cell-salvage in procedures where more than 1 litre of blood loss was expected, would result in saving 160,000 units of red cells.

Suitable elective surgery patients include cardiac, vascular and some orthopaedic patients. Use in obstetrics has been covered by recent NICE guidelines, while use in infected and malignant operating fields should be based on local guidelines that address the balance of risks.

### **(3) 'THERAPEUTIC'**

This section dealt with the use of drugs like Antifibrinolytics, Erythropoietin and Iron.

The benefits of Aprotinin have been easier to prove in cardiac surgery than in other specialities, possibly because of the presence of a large group of patients undergoing a relatively standard procedure (coronary artery bypass grafting).

Despite presentations showing that Aprotinin significantly reduced blood loss and the need for transfusion, particularly in redo operations:

- Only one third of UK cardiac centres are using Aprotinin routinely.
- One third prescribe Aprotinin for high risk cases (redo procedures, patients on Aspirin or Clopidogrel).
- The final third use no antifibrinolytic therapy.

Of note, more recently a paper was published in the NEJM (Mangano 2006) which advised caution on the use of this agent. These conclusions are being investigated further.

## **WORKSHOP 3: Changes in practice within the laboratory**

### **(1) NEAR PATIENT TESTING (NPT)**

In current practice, anaesthetists now have access to rapid haemoglobin measurements, and in many settings performing complex surgery, also have access to platelet and coagulation measurements. The use of near patient testing in cardiac surgery has shown the importance of identifying whether bleeding is associated with platelet defects, coagulation abnormalities or increased fibrinolysis. This has enabled appropriate blood component treatment and has also enabled limitation of donor exposure by preventing blood loss.

## (2) TRADITIONAL LABORATORY SUPPORT

Various scenarios were identified, where laboratories can facilitate the blood transfusion process:

- Locally setting standards for cell salvage.
- In most hospitals there is high volume testing with automation. And analysers can flag clinical states where transfusion may not be required (e.g. iron deficiency), or highlight abnormal results to clinicians. In times of severe blood loss, good communications between clinicians and laboratory staff can facilitate the appropriate use of blood products.
- The use of a dedicated blood porter / MLA can be invaluable, as this frees up blood transfusion staff from organising blood deliveries to the wards and theatres.
- FFP can be thawed and kept refrigerated for other patients for up to 24 hours.

### **WORKSHOP 4: Preparing patients for surgery**

Iron deficiency anaemia and iron depletion are a major public health issue. The assessment of iron status in both medical and surgical patients and the appropriate

management of iron deficiency, would reduce the need for blood transfusion and reduce the risk of donor exposure. Both oral iron tablets and intravenous iron sucrose are inexpensive products compared to the transfusion of red cells or the use of erythropoietin (EPO). The SchARR report (covering England and North Wales) estimates that 246,000 fewer units of red cells would be used.

The use of recombinant human erythropoietin (rHuEPO) has become standard treatment in anaemia of chronic renal failure. EPO levels can be low in patients with malignancy. There is now a wealth of literature in the scientific press supporting the use of EPO in some groups of patients with malignancy to alleviate the symptoms and signs of anaemia. In many cases a reduction in the need for blood transfusion has been demonstrated, however the recent NICE review does not currently support the view of EPO usage in the anaemia of malignancy.

### **Next Steps**

The Chief Medical Officer is aware both of the tremendous work already done to improve the appropriate use of blood and the recommendations made at this meeting. He is also aware that most of this has been in surgery and that we now need to identify good practice in medical transfusions.

## KEY RECOMMENDATIONS

*New initiatives are needed for the education and training of clinical staff involved in transfusion as well as the patients.*

*A national solution should be identified to provide blood usage data using information technology.*

*There should be local guidelines with agreed transfusion triggers and target Haemoglobins. Outcomes and processes should be audited.*

*Widespread Intra-Operative Cell Salvage (ICS) should be readily available 24/7 in all large and moderate acute Trusts. They should follow this recommendation, which will also be included in Better Blood Transfusion 3.*

*Studies to determine the evidence base for the efficacy of Aprotinin in a range of surgical specialties should be explored.*

*The benefit of using Aprotinin should be communicated to all cardiac centres (and haematologists) providing that the risk benefit profile is safe.*

*Laboratory staff should be trained, empowered and have appropriate resources to facilitate the appropriate use of blood with appropriate consultant backing.*

*Near Patient Testing should be encouraged in an environment where best practice can be maintained.*

*Hospital staff should be both trained and educated in the transfusion process and have their competency assessed.*

*Preoperative clinics should be encouraged and resourced, with an aim to address the assessment of iron status in medical/surgical patients, and manage cases of iron deficiency accordingly.*

*Patients who are iron deficient should be prescribed iron, namely pregnant women and possibly those with chronic bleeding.*

*Cancer patients should have access to EPO (note this will reduce the life-time donor exposure to a lot of individuals) as long as this does not increase relapse risk. This also reduces the risk of transfusion dependent patients developing red cell antibodies.*

This is not a time for complacency; there will be a need to further reduce red cell use. It is also a well known fact that the donor base is shrinking faster than the reduction in usage, thus putting added stress on the blood stock levels.

A third symposium focussing on Better Blood Transfusion will take place early next year and further advice from the CMO will be issued. Communication with the organising committee should be addressed to BBT3@dh.gsi.gov.uk.

*Full Stakeholders Workshop report can be found on the Department of Health Blood Transfusion Toolkit.*

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#### **Acknowledgements**

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#### **Links / References**

1. Blood Transfusion Toolkit,  
<http://www.transfusionsguidelines.org.uk>
2. SchARR Report,  
<http://www.dh.gov.uk/assetRoot/04/08/95/12/04089512.pdf>
3. NICE Guidelines for Cell Salvage in Obstetrics. IP Guidance Number: IPG144.  
<http://www.nice.org.uk/page.aspx?o=IPG144guidance>
4. Guidelines for the use of Fresh Frozen Plasma, Cryoprecipitate and Cryosupernatant. British Journal of Haematology 2004; 126, 11-28
5. Mangano DT *et al*. The Risk Associated with Aprotinin in Cardiac Surgery. New England Journal of Medicine Vol 354: 353-365 January 2006
6. Whitfield *et al* (2000). Comparing the cost of elective surgical procedures in 13 European Countries. ISBN 1900752 20 4.

## **Good Practice Guidance for the Dissemination of Patient Information Leaflets on Blood Transfusion**

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The 'Patients' Charter 1992' states that we all have the right "To be given a clear explanation of any treatment proposed, including any risks and any alternatives before you decide whether you will agree to the treatment." The Health Service Circular (2002/009) Better Blood Transfusion - Appropriate Use of Blood backed this up, requiring hospitals to provide better information to patients and the public about blood transfusion. The generic consent forms produced by the Department of Health also now include an area for the patient to consent to the use of blood components, and for consent to be valid, it needs to be informed.

However, it is not mandatory in this country for patients to sign a consent form before receiving a transfusion.

In 2004 an audit was conducted on the adult patient information leaflet 'Receiving a blood transfusion' (produced by the National Blood Service for NHS use). The objectives were to try to establish the effectiveness of the leaflet, ensure that written information on blood transfusion was being given in a timely manner, and that the information it contained was at an appropriate level. It concluded that although the leaflet is widely distributed, it is not always getting to patients before they receive a blood transfusion. The audit findings recommended that good practice guidance for the dissemination of patient information leaflets on blood transfusion be developed.

The following principles were drawn up with the help of the Transfusion Practitioners involved in the original audit and following further consultation with other practitioners through the SPOT website and having taken into account existing guidance (References 1,2,3).

### **Principles for effective leaflet dissemination**

- The Hospital Transfusion Committee (HTC) should be responsible for agreeing a strategy for dissemination and audit of the use of patient information leaflets for transfusion.
- Ensure the leaflets are widely available across the Trust. Place them in hospital reception areas, out-patient waiting areas, clinics, in patient information libraries and on all in-patient wards.
- Consider sending the leaflet out with letters about relevant out-patient appointments, or as part of 'pre-admission packs' or give them to patients on admission as part of their 'welcome pack'.
- Patients must receive the leaflet at an appropriate time, not just before the transfusion is to begin. Patients and their carers need time to think about what is going to happen to them and be able to discuss the issues or enquire about alternatives to transfusion.
- Advertise the availability of the leaflets in pre-operative clinics using the NBS poster 'Will I need a blood transfusion?'
- Ensure staff are aware of the mechanism for ordering additional stock, perhaps by putting a sticker on the back of the leaflet with relevant contact details.
- Store the leaflets with transfusion paperwork, e.g. prescription sheets in clinical areas, to remind staff to hand them out to patients when transfusion is being considered.
- Ensure there is a designated section on the care plan/pathway/transfusion record form, that staff have to sign to say the patient has been given a leaflet, before a transfusion is given.
- Consideration must be given to minority groups, such as those whose first language is not English. Non-English versions of leaflets are available on the NBS hospitals website:  
[www.blood.co.uk/hospitals](http://www.blood.co.uk/hospitals)

Also consider patients with disabilities e.g. those with hearing, or visual impairment or those with learning difficulties. Remember the leaflet is designed to act as a precursor to discussion about blood transfusion with a registered health care professional, and not used in isolation.

- Phlebotomists could hand out the leaflet to patients when taking blood samples for crossmatch/group and save, but they should not be responsible for discussing the contents of the leaflet.
- Educate nurses and doctors about the existence of the leaflets, how they should be used and when they should be given out.
- Raise awareness of the leaflet on the hospital Intranet.
- Ensure the PALS (Patient Advice Liaison Service) staff have a supply.
- Enrol the assistance of local charity or support groups for patients to promote awareness and distribution.
- Send leaflets to local medical schools and universities.
- Ensure all old outdated versions of the leaflets are removed to avoid confusion.

The 'Receiving a blood transfusion' leaflet is currently being reviewed. The new version will incorporate feedback from patients interviewed in the original audit.

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#### **References**

1. 'Informing Patients: An assessment of the quality of patient information materials' (1998) Coulter A, Entwistle V and Gilbert D.
2. 'Toolkit for producing patient information' (2003) Department of Health
3. 'Producing Patient Information: How to research, develop and produce effective information resources' (2003) Duman M. Kings Fund

## **Transfusion Reactions: A Clinician's Bedside View**

We receive reports of reactions in our trust for about 1 in every 1000 units of red cells transfused in our trust. The majority of reports are of mild febrile or mild allergic reactions. Severe reactions to red cells occur in less than 1 in 30,000 units red cells transfused. Severe reactions to platelets and FFP are more common. Distinguishing the common and trivial reaction from the rare but serious reaction is usually easy but sometimes not. In addition, hypotensive shock is common to ABO incompatible haemolysis, bacterially infected blood, transfusion related acute lung injury (TRALI), and anaphylaxis. Accurate diagnosis in the acute situation may be difficult and initial investigations of severe reactions should cover all possibilities.

**Bacterially infected red cells** are now very uncommon but usually present with very rapid onset of shock. Infected platelets are more common, though last year no cases were reported to SHOT. It should be noted that infected platelets may produce a

delayed reaction compared to infected red cells with clinical symptoms beginning up to 30 minutes or more after the infusion. We take cultures from the patient and the blood bag in all but minor reactions so as to avoid missing a case. We often grow harmless contaminants but by this time the clinical picture has become clearer and we are not left ruing a failure to take cultures at the time. If the unit is heavily infected a gram stain will give a quick answer, and in the worst cases the smell of the infected blood may be both diagnostic and highly unpleasant.

**TRALI** is rare since the introduction of male donor FFP, but we have seen cases with plasma reduced red cells and one case with optimal additive red cells. Hypotension is an important feature but the predominant symptom is breathlessness due to pulmonary oedema. Fever is variable. Clinical examination, chest X-ray and blood gasses aid diagnosis. Cases occurring with red cells mostly occur when the blood is being transfused very rapidly, such as during an operation with bleeding. In these cases the anaesthetists usually have the wherewithal to measure left atrial pressures (Pulmonary artery wedge pressure or oesophageal Doppler) and so can exclude cardiogenic pulmonary oedema. Underfilling of the heart and hypovolaemia are typical of TRALI in contradistinction to cardiac failure. Another characteristic feature is the presence of large volumes of frothy tracheal exudate that once seen is rarely forgotten. Laboratory tests are of limited use acutely but the finding of marked monocytopenia in the peripheral blood should increase suspicions of TRALI.

**ABO incompatibility** causing acute haemolysis is, hopefully, a once in a lifetime event for most hospital staff but early recognition may prevent transfusion of more incompatible blood with lethal results. ABO incompatibility may cause no symptoms at all. On the other hand, initial symptoms of pain in the drip arm, hypertension and chills, followed shortly by loin pain, haemoglobinuria and hypotensive shock can lead rapidly to death. In the conscious patient these symptoms and signs are difficult to miss, but in an anaesthetised and bleeding patient other causes may be blamed. Have a high level of suspicion. Stop the transfusion. Recheck the group on the bag and the recorded group of the patient (most ABO incompatible transfusions are due to the wrong blood being put up). Manage the acute symptoms and send a fresh blood sample from the patient and the discontinued bag to the blood bank to confirm the group of both patient and donor. Check for Disseminated Intravascular Coagulation (DIC) and haemoglobinuria. If there is a possibility that the patient has been misgrouped but continued transfusion is vital, revert to group O blood until reassured.

**Severe anaphylaxis** may cause hypotensive collapse followed by cardiorespiratory arrest without any traditional allergic signs and symptoms. Tryptase levels (taken at about 6 hours) will help confirm the nature of the reaction in retrospect. Also check for IgA levels and presence of Anti-IgA antibodies in the patient.

**Acute haemolytic reactions** are rare with good antibody screens now used. However, antibodies to rarer antigens such as Kp<sup>a</sup> or Wr<sup>a</sup>, which have not been included on the screening cells may occur. This is very uncommon but is easily missed. The urine and serum may contain free haemoglobin and a retrospective serological crossmatch between unit and recipient will be positive.

Some reactions are moderately severe but no clear cause is ever established. It is important to report these cases to SHOT/MHRA so that a developing pattern of reactions can be detected.

When a severe reaction is identified, contact the local NBS urgently in case other units from that donor need to be withdrawn. Transfusion reactions are usually mild but have a high level of suspicion to avoid missing a more serious problem.

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## **Alloantibodies Reactive at 37°C That Are Not Clinically Significant**

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### **Background**

As a general rule red cell antibodies that do not react *in vitro* at 37°C are regarded as being clinically insignificant, as they do not lead to a significantly shortened red cell survival *in vivo*. However, not all red cell antibodies active at 37°C are clinically important, as clinical experience has shown that several alloantibodies reactive in laboratory tests at 37°C do not cause significant *in vivo* haemolysis of serologically incompatible cells.

It is standard practice in pretransfusion testing to determine the specificity of a 37°C-active red cell alloantibody, so that a decision can be made about its likely clinical importance, and if necessary, the selection of suitable blood for transfusion. Antibody identification may be difficult when a high proportion of red cells in an identification panel is reactive, when the pattern of reactivity is clear but does not match the antigen profiles of panel cells, or when the reactivity of the antibody with panel cells is variable. The latter situation may indicate the presence of an antibody that will not cause a shortened survival of transfused red cells. This article briefly summarises some of the issues that arise when pretransfusion testing reveals the presence of an antibody that is unlikely to be of clinical relevance.

### **Identification**

Although an apparent variability in reactivity with panel cells may give a clue that an antibody of doubtful clinical significance is present, care must be taken to exclude clinically important antibodies that are weak or show dosage, rare clinically significant antibodies such as anti-Vel that may show variable strength reactions, and mixtures of clinically important

antibodies. Knops system antibodies, and anti-Cs<sup>a</sup>, are typical examples of clinically unimportant alloantibodies showing variable strength reactions. They are notoriously troublesome to identify because of the difficulty in constructing a panel of antigen negative red cells, and because of their variability in reactivity. A method called monoclonal antibody-specific immobilisation of erythrocyte antigens (MAIEA) may be employed to confirm whether the antibody specificity is directed against CR1, the carrier molecule for the Knops system antigens, but the technique is very time-consuming.

Antibodies to antigens of the Chido/Rodgers system are also not uncommon, and often give variable strength reactions. Because the carrier molecule for these antigens is the C4 component of complement, the antibodies can sometimes be easily inhibited using random pooled plasma, and will react strongly with C4 coated red cells. Antibodies to Chido/Rodgers antigens do not cause haemolytic transfusion reactions, although exceptionally they have been implicated in anaphylactic reactions following the transfusion of blood components containing plasma.

Antibodies reactive to HLA Class I antigens on red cells (often called the Bg antigens) may show variable strength reactions with red cells. Although the antibodies are not uncommon, they do not cause regular problems in pretransfusion testing because red cells used in antibody screening should be selected to be non-reactive. Bg antibodies are not clinically significant.

Confirmation that an antibody has a specificity unlikely to be associated with accelerated destruction of red cells is not sufficient in itself. Every effort must be made to exclude the presence of *additional* red cell alloantibodies that are clinically significant. Phenotyping the patient's red cells is helpful in determining which alloantibodies the patient could produce.

### **Crossmatching**

Even when a sample has been shown to contain a 37°C active antibody that is not considered to be clinically significant, crossmatching is nonetheless problematic, as blood donations may be serologically incompatible by Indirect Antiglobulin Test (IAT). However, provided that the specificity of the antibody has been confirmed beyond reasonable doubt, and the presence of clinically significant alloantibodies has been definitively excluded in a suitably recent sample<sup>1</sup>, blood can be safely issued following an immediate spin crossmatch to check ABO compatibility; electronic issue should not be possible, as electronic issue algorithms should require that there is a negative antibody screen. In these situations, if an IAT crossmatch is performed, the patient's plasma may show variable strength reactions, and it is usual practice to select units that give the weakest reactions by IAT, although there is no evidence that this practice significantly increases red cell survival when antibodies such as anti-Kn<sup>a</sup> or anti-Ch1 are the cause of the serological incompatibility. There is therefore no value in these cases in selecting blood that has previously been phenotyped as 'antigen negative', and in any case phenotyping reagents are unlikely to be available for this purpose.



The risk of the patient producing further antibodies can be reduced by selecting Rh and K matched blood, as is recommended for all patients requiring long term transfusion support.

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### **Reference**

1. BCSH. Guidelines for compatibility procedures in blood transfusion laboratories. *Transfusion Medicine*, 2004, 14, 59-73.

## **Getting To Know You – The Use of Patient Identification Bands in the Administration of Blood**

In 2005 the National Comparative Audit of Blood Transfusion, a comparative audit programme run by the NBS in collaboration with the Royal College of Physicians, looked at the practice of the administration of blood in 2005. The audit looked at, among other aspects of practice, the use of patient identification bands in in-patients and out-patients undergoing blood transfusions in 269 hospitals in England, Wales and Scotland. Over 8000 patients in a variety of clinical settings were audited and hospitals were from both the NHS and the independent sector.

The purpose of auditing the wearing of patient identification bands was to assess the degree of safety in the blood administration process – guidelines currently in use suggest that such bands should be worn by all patients undergoing transfusion.<sup>(1)</sup> 7535 (94%) patients were wearing an identification band for their transfusion, leaving 516 (6%) who were not. Of the 516 cases with no band, 50 had other forms of identification, leaving 466 or 5.8% with no identification. The lack of identification was widespread with the 466 cases found within 160 or 59% of the 269 participating hospitals. Specialities with the highest rates for no identification were Paediatrics (27%, 32/119), Special Care Baby Units (26%, 11/42), Post-operative recovery (10%, 4/41), Oncology (8%, 47/554), ITU/CCU (8%, 36/457), Haematology (7%, 122/1636), and A&E (7%, 3/42). These though, account for a small number of all the patients with no identification. Interestingly, patients without identification bands were found in both the in-patient and out-patient population. The importance of a patient wearing an identification band cannot be overstated. Patients without bands are at risk of being misidentified because they may be unable to respond to questioning about their identity for a number of reasons or they may inappropriately respond when being asked to confirm their identity. Identification bands do not just serve the transfusion process. They are the means by which patients are identified for drug therapy, physical therapies, investigations and surgery, so the implications for the unidentified patient can be widespread.

The audit had the opportunity to ask why patients were not wearing an identification band. In 47% of patients, the band was not put on by nursing staff, while in 15% the band had been removed by staff but not replaced. In 10% of cases the patient was either deemed unable to wear an identification band, or had removed the band themselves.

Where the band was not put on by nursing staff, the most commonly stated reason was that the patient was well known to the staff and/or use of a band was not day unit policy. In addition, it was occasionally because the nurse had forgotten, had not got round to it or had been too busy. In three cases (in different hospitals) it was because the unit/department had run out of bands. Bands were occasionally not put on, or removed, because of dermatological conditions or oedema of the wrists. One patient had only one arm, and another had both arms in plaster. Several patients were said to be allergic to the plastic. Bands were occasionally refused by patients, or removed by them – usually due to confusion or agitation. The reason for babies not wearing bands was usually that the baby was too small or they had multiple intravenous access lines in place. In these patients the band was often on, or in, the incubator.

The presence of an identification band alone is, of course, inadequate for assuring safe patient identification. Bands must contain enough information to make the distinction between one patient and another indisputable, and this relies upon having discrete and unique identifying information. Guidelines suggest that forename, surname, date of birth, gender and hospital identification number is the dataset required for safe and positive patient identification, but a great many hospitals have a policy to not include the patient's gender. The audit found that 9% of patients with an identification band did not have all four data items (surname, date of birth, gender and hospital identification number). Reducing the amount of data available for positive identification must increase the risk of misidentification, since many people with the same names are admitted to hospital, and many have the same date of birth, with this being seen prominently in paediatric and neonatal settings. The one unique identifier that might prevent patient misidentification is the hospital identification number, yet the audit found that in 5% of cases this number was missing from the identification band.

Nurses are comfortable with patient's identity because there is an assumption that in-patients or regular out-patients are in the system and are therefore 'known', but without the ability to independently corroborate the patient's identity, irrespective of the patient's ability to communicate, the patient is put at risk of receiving an incorrect blood transfusion. 'Getting to know you' has never been more important!

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### **Reference**

1. Guidelines for the administration of blood and blood components and the management of transfused patients. British Committee for Standards in Haematology. *Transfusion Medicine* 1999;9,227-239

# Planned New Red Cell Specifications for Neonatal Large Volume Transfusions

## Introduction

Most neonatal red cell transfusions are small volume top-up transfusions (10-20 mls/kg), using packed cells in SAG-M in 'paedipak' splits. However, large volume transfusions are given in situations such as neonatal cardiac surgery, extracorporeal membrane oxygenation (ECMO), and for exchange transfusion (two blood volumes, around 160ml/kg, may be given in this situation). Over the last couple of years, much work has been done within the NBS to standardise and update the red cell products for neonatal large volume transfusions. There have been several reasons for this:

1. To limit the exposure to UK plasma to try to reduce the risk of vCJD transfusion transmission
2. To produce red cells with a very tight haematocrit (Hct) specification for neonatal exchange transfusions
3. For the first time to produce products of neonatal specification for large volume red cell transfusions other than neonatal exchange transfusions.
4. To standardise red cell production processes, including making CPD red cells in all centres rather than some using CPDA1

## Limiting exposure to plasma in red cell components: CPD vs SAG-M

Until now, red cells for neonatal cardiac surgery have either been suspended in SAG-M or in CPD and there has been variation in choice of product by different UK paediatric cardiac centres, with no reported differences in outcome. There are potential concerns with aspects of both red cell products:

- **CPD:** the plasma volume is about 115 mls, compared to 6 mls for those in SAG-M (if BAT units are used); this may significantly increase the estimated risk of vCJD.
- **SAG-M:** there are potential toxic effects to neonates of adenine (renal toxicity), and mannitol (renal and neurotoxicity; see New, 2006 for review).

Despite the theoretical concerns, there is no direct evidence of toxicity of additive solutions such as SAG-M in neonatal cardiac surgery, and a recent randomised trial of whole blood vs red cell concentrates has provided evidence that they may be safe in this situation (Mou et al, 2004).

Therefore, in view of the current UK concerns over transfusion transmission of vCJD, it is felt that the greater plasma volume in CPD as compared to SAG-M blood is significant when balanced against both the unproven risk of the additives in SAG-M and the apparent safety of blood in these additives in neonatal cardiac surgery. We are encouraging paediatric cardiac centres already using SAG-M blood to continue to do so and those using CPD blood to switch

to SAG-M. This strategy was endorsed by an amendment to the BCSH guidelines Transfusion Task Force in Dec 2005

([www.bcshguidelines.com/pdf/amendments\\_neonates\\_091205.pdf](http://www.bcshguidelines.com/pdf/amendments_neonates_091205.pdf)).

For other large-volume transfusions such as neonatal resuscitation or non-cardiac surgery, it also seems reasonable to use SAG-M blood where possible in order to reduce exposure to UK plasma.

*In order that units of SAG-M blood for neonatal cardiac surgery or other large volume transfusion should be of neonatal specification, they will start to be produced for general use during the latter part of 2006. They will be BAT units to reduce the volume of plasma to a minimum, less than 5 days old, and available for all infants up to 1 year of age (see Table 1 for details). For those centres wishing to continue using CPD blood, there will be a parallel product available in CPD.*

## Red cells for neonatal exchange transfusion: changed haematocrit specification

Neonatal exchange transfusion is carried out for severe hyperbilirubinaemia and/or anaemia, commonly due to haemolytic disease of the newborn. Currently, red cells for neonatal exchange transfusion are provided in CPD at a Hct of 0.5-0.6, although in the past some units have been issued with Hcts higher than this. There has been controversy as to whether this is the optimal product, in particular whether whole blood (Hct 0.30-0.45) would be better, and audits of opinion have provided conflicting results. Some neonatologists are concerned about raising the baby's Hct too rapidly by using concentrates of higher Hct. However, the disadvantages of whole blood are that it is less likely to be effective in exchange transfusions for anaemia, and it is not as consistent a product as red cell concentrates. As it is operationally difficult to routinely provide both whole blood and CPD concentrates, due to the restricted supply of blood of neonatal specification, it is desirable to produce a single product with an intermediate Hct for standard use that would be acceptable to the majority of neonatologists.

*There will therefore be a new specification neonatal exchange transfusion unit, with a tightly controlled Hct of 0.5-0.55, such that only those units within this range will be issued for this purpose. The narrow range of Hct will help neonatologists plan exchange procedures to produce the desired Hct in the baby. The exchange units will be in CPD as before, rather than changing to SAG-M, as it is uncertain as to how far the evidence for safety of SAG-M in neonatal cardiac surgery can be extrapolated to exchange transfusions in potentially very sick pre-term babies (see Table 1 for details).*

## Standardisation of processing

The standardisation of processing methodology for these components is currently underway and is being approached in two phases. The first is the replacement of CPDA1 red cells with CPD red cells which was timed to coincide with the renewal of the national blood pack contract. As a result, the

*continued on page 11*

NBS has recently completed the transfer to CPD units and CPDA1 units are no longer available. The management of the production of CPD units is very different from the way in which CPDA1 units are obtained and this has allowed us to significantly reduce the number of units of red cells in plasma going into the general recipient population by default.

The second phase of the change is to begin manufacturing exchange units to the new tighter Hct (0.5 – 0.55) range and also to introduce the new components for large volume transfusion as described above. These changes are in planning at the moment and it is hoped that they will be introduced by the end of 2006.

**Conclusions**

Overall, the proposed changes will provide better products for both neonatal cardiac surgery and exchange transfusion. All will have a tightly controlled Hct, which should give clinicians confidence in planning procedures, particularly in the case of neonatal exchange transfusions. For cardiac and other large volume surgery, the SAG-M and CPD products will have a neonatal specification for the first time, rather than simply being fresh adult blood. Both will be available for infants up to 1 year of age, and this will therefore be in line with the recommendations in the BCSH guidelines for blood component specification for neonates and older children (2004).

Once the new red cell products are in production it will be important to audit their use. This will give a better

**Table 1.**

New specifications for different types of red cells for large volume neonatal transfusions

	<b>Red cells for neonates and infants, leucocyte depleted</b>	<b>Red cells additive solution for neonates and infants, leucocyte depleted</b>	<b>Red Cells for neonatal exchange transfusion</b>
Anticoagulant	CPD	CPD	CPD
Storage	CPD	SAGM	CPD
Donor selection	Tested within previous 24 months	Tested within previous 24 months	Tested within previous 24 months
ABO	Group specific as far as possible	Group specific as far as possible	Group O
RhD	Pos and neg	Pos and neg	Pos and neg
Kell	Neg	Neg	Neg
CMV	Neg	Neg	Neg
Sickle test	Neg	Neg	Neg
PANTS screen	Yes	Yes	Yes
High titre testing	Yes	Yes (in case gp O used for other groups)	Yes
Hct	0.50-0.60	0.50-0.60	0.50-0.55
Hct range on label	Yes	Yes	Yes
Total volume (ml)	324	250 BAT units only	Will be similar volumes as for 'large volume CPD' product, but no data yet as not yet made
Plasma volume (ml)	116	6	"
CPD volume (ml)	26	1	"
SAG-M volume (ml)	N/A	100	N/A
Irradiated	No	No	Yes (obligatory prior to NBS issue)
Shelf life	5 days for infants (PULSE controlled)	5 days for infants (PULSE controlled)	24 hours post irradiation. Must be less than 5 days old.

idea than currently available, of the pattern of use of different products for different types of neonatal large volume transfusions. This information will be of value to both users and producers.

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#### **References**

1. British Committee for Standards in Haematology. Transfusion guidelines for neonates and older children. *British Journal of Haematology* 2004;124:433–453.
2. Mou SS, Giroir BP, Molitor-Kirsch EA, Leonard SR, Nikaidoh H, Nizzi F, Town DA, Roy LC, Scott W, and Stromberg D. Fresh whole blood versus reconstituted blood for pump priming in heart surgery in infants. *N Engl J Med.* 2004;351:1635-44.
3. New HV. Paediatric transfusion. *Vox Sang.* 2006;90:1-9.

## **Should Children be Offered Predeposit Autologous Transfusion?**

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Autologous transfusion practices are promoted, despite the continuing improvements in allogeneic blood safety, because of concerns regarding the transmission of infection by, and the costs and potential immunomodulatory effects of, allogeneic transfusion. Autologous transfusions are those where the blood to be transfused is obtained from the recipient (either before or during a procedure), as compared to allogeneic transfusion where the blood is obtained from a donor. The advantages of autologous transfusion for children might be considered to be greater than for adults in view of their non-exposure to food borne vCJD and their long life expectancy. Currently, children who receive allogeneic blood will also be excluded from the future donor pool. Pre-operative autologous donation (PAD) is a process whereby a patient, scheduled to undergo surgery that is likely to entail a need for blood transfusion, can donate their own blood for the procedure. If blood is donated a sufficient time before surgery, the patients' red cells should regenerate allowing them to come to surgery with a greater red cell mass (with a proportion stored in the transfusion laboratory). PAD has been shown to decrease the requirement for allogeneic blood transfusion in many surgical procedures, but is this sufficient reason for using it more widely in children?

The evidence base for PAD is relatively small and almost all the studies have been carried out in adults. A recent systematic review found that PAD significantly reduced the probability of receiving an allogeneic blood transfusion but that the overall transfusion rate

(allogeneic or autologous) was increased<sup>(1)</sup>. The increased overall transfusion rate probably derives both from the lower preoperative haemoglobin found in those who pre-donated and also because prescribers see reinfusion of the subject's 'own blood' as a low risk intervention. In fact, PAD does not protect patients from the most serious hazards of transfusion such as being given the wrong unit (clinical or clerical error) or bacterial contamination of blood during storage.

Children are particularly susceptible to iron deficiency and anaemia through PAD as they generally have lower haemoglobin levels and iron stores than adults. Preoperative haemoglobin can be somewhat protected during PAD cycles by using recombinant erythropoietin and iron to promote erythropoiesis. The safety profile of erythropoietin in young children has not been established for routine use and the financial costs are substantial.

Autologous donors are much more likely to have severe reactions to donation than allogeneic donors, especially if they are elderly or have pre-existing illness. There is some evidence that adverse reactions to donation are also higher in children<sup>(2)</sup>. Certainly in young children, many centres conducting PAD use concurrent fluid infusions to compensate for the intravascular fluid loss. Although this may decrease the risk of hypovolaemia, it exposes the child to a second intravenous cannula and to the risk of incorrect fluid administration. The safe donation volume limits for children are not firmly established and would likely be variable according to body weight and state of health. This produces extra difficulties since blood cannot be drawn into standard adult blood packs but requires the provision of size adjusted packs with correct anticoagulant doses for the expected donation volume.

Taking blood and inserting cannulae in young children can cause great distress. There are national guidelines which dictate where and by whom such clinical interventions may be undertaken. Effectively, this means that all children must be cared for within paediatric centres with appropriately trained staff rather than in standard donor programmes.

PAD requires an accurate prediction of blood losses to allow collection of an optimal volume of blood. Overcollection is wasteful and reduces cost effectiveness and under collection means the patient will be exposed to allogeneic blood in any case. The date of surgery must be exact since PAD frequently requires multiple donations to achieve the desired volumes and autologous blood is subject to the same storage time limits as allogeneic blood. Thus, PAD can only be used for elective surgery and excludes those needing urgent treatment.

Another inequality generated by PAD, centres around the selection of suitable donors. Consent issues in children are more complex than in adults. Ideally both parents and the child should consent to the procedure since it would be inappropriate to attempt an elective intervention such as PAD against a child's wishes. Obtaining informed consent in the very young or those with learning difficulties is difficult, if not impossible. These children may not be offered PAD, even though they are the most likely to need surgery.

It is clearly possible to envisage an 'ideal' PAD programme which is tailored to the needs of children. The cost of provision of such a service would be much greater than a similar service for adults and any benefits are likely to be limited to a small number of children in specific patient groups. Couple these facts with the higher overall transfusion levels in those entering PAD programmes, and the cost:benefit ratio for PAD in children appears unacceptable in the current setting (in the United Kingdom) of increasing safety of allogeneic transfusion and adequate blood stocks.

**The Chief Medical Officer's National Blood Transfusion Committee has recently recommended that PAD should not be used routinely for children in the United Kingdom but be reserved for exceptional circumstances such as the presence of rare red cell antibody/antigen combinations or where there is a genuine severe prolonged shortage of blood.**

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#### References

1. Carless, P, et al., *Autologous transfusion techniques: a systematic review of their efficacy*. *Transfus Med*, 2004. **14**(2): p. 123-44.
2. Murto, K.T. and W.M. Splinter, *Perioperative autologous blood donation in children*. *Transfus Sci*, 1999. **21**(1): p. 41-62.

## **'The Eyes Have It' : How NHS Blood and Transplant (NHSBT) Helps Patients With Eye Diseases**

The first successful corneal transplant from a cadaveric donor took place in 1906. There are now 3,500 corneal grafts performed in the UK each year and 80,000 worldwide. Corneal grafts from elderly people are as useful as those from younger donors. Once harvested, the corneas can be stored *ex vivo* for up to one month. Prior to transplantation, the cadaver blood is tested for the usual mandatory microbiological markers. Recipients of corneal grafts do not normally require immunosuppressive drugs and there is a 90% one year survival and a 60% ten year survival for such grafts. Failure of engraftment can result when there are insufficient metabolically active ocular endothelial cells. Other causes of failure include allograft rejection and recurrent corneal disease. Some patients reject multiple grafts and HLA Class 1 matching of donor to recipient may be helpful in preventing this.

Serum eye drops are beneficial for patients who have ocular surface diseases where there is a failure of tears to lubricate the eyes or a persistent epithelial defect. Patients with dry eyes may become sensitive to the preservative in 'artificial tears' (usually sterile saline and 0.5% hypromellose). Serum eyedrops have many of the properties of natural tears. *In vitro* tests have shown that ocular epithelial cells are more healthy when serum rather than artificial tears are

used. Serum eyedrops are more likely to promote healing than artificial tears and may be used after surgery for this purpose. Short courses of serum eyedrops may be valuable post operatively after surface reconstruction techniques, after limbal grafts, or together with amniotic membrane grafts. For patients who are not fit enough or are not suitable to donate autologous serum, eyedrops prepared from donor serum are being considered as a possibility.

Collection and processing of autologous serum eye drops within the NBS was pioneered in Leeds. The programme has now expanded to the rest of the country. A donation of blood is collected from the patient into a dry pack and tested for mandatory markers. The serum is separated and diluted with an equal volume of normal saline. Then the diluted serum is dispensed in 3ml aliquots into dropper bottles in a clean room environment. Bacteriology tests are performed on a small number of the aliquots and the donation, consisting of approximately 150 dropper bottles, is released after quality clearance. The patient receives a package of trays of dropper bottles, vacuum packed, which should be stored in a domestic freezer. Each aliquot is thawed out for use as required and the thawed product must be discarded after 24 hours.

For collection of amniotic membrane, pregnant women who are to have a planned caesarean section are interviewed and informed consent is obtained. Women with immune disease or malignancy are excluded. Theatre staff collect the placenta and blood samples for testing of mandatory markers, are obtained from the umbilical cord and from the mother. Under clean room conditions, the membrane is dissected off and washed. Samples are sent for bacteriology and the membrane is stretched on a grid and incubated with antibiotics. The grafts are frozen in vials at -80°C until validated for release. Further maternal blood samples are tested six months after delivery. When all tests are confirmed negative, the membrane may be issued.

Amniotic membrane is thin and semi transparent. It does not carry HLA antigens. It has been used to cover the eye following severe chemical or thermal burns, following surgery for reconstruction of conjunctival defects, in glaucoma to stop the leak of fluid from around the tube used to relieve the glaucoma, in bullous keratopathy where there is recurrent blistering and ulceration of the eye surface and in limbal stem cell deficiency. Limbal stem cells may be grown on the amniotic membrane before it is applied to the eye. The graft may be used as a bandage to promote epithelial healing and it may have an anti-inflammatory effect. Sometimes the membrane dissolves into the tissues or it can be integrated and remain semi permanently. Results of the use of amniotic membrane have been mixed. One publication reported 71% healing of conjunctival defects, another that healing occurred in only 31% of cases. One study reported 85% healing in 13 cases of chemical/thermal burns but at Moorfields Eye Hospital less than 50% of cases showed improvement.

In summary, corneal transplantation is an established and successful procedure and a continuing supply of donors will be required. Autologous serum eyedrops are a promising therapeutic product and their use is likely to increase. A trial of the use of donor serum

eyedrops has been proposed. Amniotic membrane appears to be of benefit for some cases of severe eye injury and disease, but further studies are needed.

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## **Responding to Major Incidents – Lessons Learnt from July 2005 London Bombings**

### **Introduction**

On 7th July 2005 the London Transport Network was subjected to a series of terrorist attacks. The bombings led to 56 fatalities and 700 injured people. Many hospitals activated their Major Incident (MI) plans. There are limited publications describing the experience and lessons identified by blood services following major incidents. Schmidt (2001)<sup>(2)</sup> summarised the number of red cell units collected and transfused in five U.S. disasters including 9/11. Darvall (2003)<sup>(1)</sup> described the impact of the 2002 Bali bombings and identified the need for a group O bank and problems with patient identification and sample labelling. This short article describes the demand and use of blood, components and skin following the London Bombings. We also describe the main lessons learnt for hospital transfusion practice.

### **Blood demand and use**

The NBS issued a total of 1455 units of blood and blood components with 18 emergency deliveries from three blood centres. Blood and platelet stocks were good and normal deliveries were restarted the same afternoon. Approximately 360 casualties were received and 110 admitted to five hospitals. By midnight, 23 patients, 3% of total injured, had required transfusion with 338 units of red cells, 103 units of FFP, 235 pools of cryoprecipitate and 31 adult doses of platelets. Blood requirements continued over several weeks with small peaks at day 5 and day 7.

### **Group O Blood**

Seventy percent of all blood requested was group O and 23% was Group O RhD negative compared to the normal issue for the latter of around 10%. ORhD negative blood is a limited resource and should be prioritised for women <60 years or if the gender is unknown. Group specific blood should be used as soon as the patient's own group has been confirmed. Factors leading to high usage of Group O blood included massive haemorrhage at presentation, problems with MI identification systems and sample labelling. Failure to state gender on transfusion requests resulted in greater use of Group O RhD Neg blood.

## **Donor Response**

There was a massive response from the British public to donate blood. Many telephoned the hospitals increasing the burden on already busy switchboards. The NBS National Contact Centre saw the highest ever total of calls for one day with 10,046 contact attempts. As far as possible donors were given future appointments. Valuable lessons have been learnt from the US experience following the attacks on September 11, 2001 where 475,000 units of blood were collected, but only 258 units used (Schmidt, 2001)<sup>(2)</sup>. The challenge for a blood service is to always hold adequate bloodstocks but also to harness the spirit of public altruism following a MI.

### **The need for skin**

NHSBT provides all donated skin for the UK. Following the London bombings, skin was required to cover burns and extensive soft tissue injuries. A deceased donor can donate 2,000-4,000cm<sup>2</sup> and it takes approximately 100 days to convert a donation to grafts ready for issue. The average adult patient with severe burns uses 2,000 – 9,000cm<sup>2</sup> per grafting but may need 2-3 grafts with a 1-3 day gap between each operation. The London bombings resulted in requests for 31,090cm<sup>2</sup> to one hospital alone. NHSBT is currently building up a buffer stock of 400,000cm<sup>2</sup> of skin to treat severely burned patients.

### **Conclusions**

The key learning points are summarised in the tables below. While a relatively small proportion of patients in a MI may need blood or skin, individual requirements can be very high. The challenges for the transfusion community are timely communication, accurate patient identification together with staff and stock management.

#### **Learning Points – Communication**

- The pathology MI plan must be an integral part of the hospital MI plan. The policy should consider:
  - Early alert of the Hospital Transfusion Laboratory
  - Ongoing communication with all key personnel including stand down
  - Alternative modes e.g. walkie-talkies and runners if failure of switchboard/mobiles/emails
- The Hospital Transfusion Laboratory must have a dedicated external phone & fax line to NHSBT.
- MI policies should include
  - When and how to place emergency blood orders
  - Early communication to the NBS of the potential need for blood, components and tissue
  - Handling of potential donor enquiries

### Learning Points - General

- Guidance for the management of Massive Haemorrhage should be incorporated into MI policies. Policies should cover surgical and medical control of bleeding.
- Blood samples should be taken as early as possible. Care must be taken to label samples correctly. Gender must be included with default to female if unidentified.
- Patient MI Identification must be compatible with other IT systems including Blood Bank.
- Group specific blood should be issued once the blood group is known and identification is confirmed.
- Systems must maintain blood traceability and the cold chain in the MI setting.
- Policies should cover the organisation of Transfusion Laboratory Staff. Staff must have identification to enter restricted areas where needed.
- Key personnel must be aware of the NBS Antidote service.
- Plan to maintain essential services and to restart normal services as soon as possible.

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### References

1. Darvall J. The Royal Darwin Hospital Blood Transfusion Laboratory's experience of the Bali bombing disaster, 13th October 2002. Topics in Transfusion Medicine 2003, vol. 10, No 2, 4-13
2. Schmidt P. Blood Disaster – Supply and demand. N Engl J Med 2001;346:617-620

## Pandemic Influenza and the Blood Supply

### Human Pandemic Flu

There has been a great deal of media attention under the headings of 'Bird Flu', 'Avian Flu' and 'Pandemic Flu'. Avian Flu is a disease of birds which is potentially very damaging to the poultry industry. Any new Human Pandemic Influenza virus is likely to originate in the bird population with the H5N1 virus circulating mainly in SE Asia considered a likely source. Hence the link between Avian and Human Flu.

The Department of Health, NHS and UK Blood Services are preparing their response to 'Human Pandemic Flu'. To cause a human pandemic, a new influenza A virus must emerge to which there is little immunity. There were three major human influenza pandemics in the previous century. All were highly disruptive to healthcare and took many lives worldwide. Scientists and the Chief Medical Officer consider that another Human Influenza Pandemic is "highly likely" and "only a matter of time."

### Impact and Response Areas

The impact of a potential human influenza pandemic on the blood supply could be severe. Whilst blood services share much in common with other organisations, they also face some specific and unique challenges. When planning for human pandemic flu, the major impact and response areas to be considered by blood services are:

- Transmission of influenza through blood service activity
- Changing need for blood
- Maximising and managing the blood supply
- Donor availability
- Employee availability
- Supply chain resilience

At peak, a severe influenza pandemic will place enormous burdens on the whole healthcare system. The demand for blood may fall because of a reduction in elective surgery and other blood-using treatments. Overall, however, we anticipate that the available blood supply is likely to fall acutely due to a larger adverse impact on blood donation.

### Strategy and Approach

The demand for blood components and services will considerably exceed capacity to meet it. Blood services, therefore, plan to maximise their ability to deliver essential activities. Their aim is to avoid a lack of components and services placing an additional constraint on a stretched health care system. Nevertheless, in pandemic influenza, blood shortages are a real possibility and blood services will therefore also work with hospitals to prepare for that eventuality so that loss of life due to lack of blood can be minimised.

### Transmission of Influenza through Blood Service Activity

At present, it is considered that the risk of additional transmissions of influenza through blood itself is low, although this position is under constant expert review. Proportionate measures need to be planned for blood collection to ensure that we create an environment that is as infection free as possible. Key measures will include revised invitation processes, notices, discouraging unwell donors from attending, good hygiene practices and revised pre-donation screening and post donation advice.

## **Changing Need for Blood and Services**

Most international predictions of reduced red cell demand reduction range between 10 and 25%. The UK expects only a small reduction due to progress made on appropriate use of blood. Little change in the demand for platelets is expected. A long shelf life, normally healthy stocks and relative flexibility of supply of frozen components should mean fewer concerns here. Stretched NHS capacity will lead to some reduction and/or timing adjustments in the demand for some laboratory services.

## **Maximising and Managing the Blood Supply**

Effective and timely communication with blood donors, hospital customers and suppliers will be crucial to maximising the blood supply during the pandemic. Blood services need to actively connect 'influenza' with 'a blood supply at risk' in the minds of the donating public. Focusing stretched resources where they can maximise platelet donation and convert a greater proportion of whole blood into platelets will be further focal points. Stocks are managed nationally and tools are being built that will help to predict near future stocks in a real pandemic. These will help give advanced warning of blood supply shortfalls, improve communications and provide an evidence base for some inevitably difficult decisions.

In the event of actual or predicted blood shortages the 'Integrated Blood Shortage Plan for the National Blood Service and Hospitals' will be used to help allocate available blood according to patient need.

## **Donor Availability**

Blood donors will be infected by pandemic influenza to the same extent as the general public (25-50% symptomatic over one (worst case) wave). They will become ill; they will need to care for others; they may modify their normal social behaviour. Donors will therefore be less likely to donate blood. In addition, donor selection requirements mean that donors cannot give blood until two weeks after making a full recovery (i.e. two weeks later than they might return to work, for example). Those who have been in close contact with an infectious disease are also normally ineligible to give blood for seven days.

These donor selection criteria are being carefully reviewed and may be changed depending on pandemic severity. However, large reductions in donor availability are being anticipated. There may also be significant changes in donation patterns in advance as the WHO pandemic alert level rises. Blood services will aim to increase blood stocks in advance of the pandemic and, throughout, will seek to encourage recovered donors to come forward to donate as soon as possible after recovery.

## **Employee Availability**

Encouraging employees who are fit and well to attend work and creating a climate of 'business as usual' will be very important. Blood services will work with their staff to maximise flexibility so that limited resources can be targeted where most needed. Department managers will identify and prioritise the most essential and time critical activities and be prepared to seek help from and help out other departments. It will be essential to maintain a healthy work environment and to raise the level of hygiene and good health practice, not least by requiring all staff who feel unwell to stay at home. Peak staff absence rates could be between 20% and 35%.

## **Supply Chain Resilience**

Key suppliers are being asked about their plans to maintain services to Blood Services during a pandemic. Appropriate stock cover for identified critical consumables is held.

## **Emergency Planning System**

The National Blood Service has a comprehensive and integrated Emergency Planning system that is regularly tried and tested. Pandemic influenza plans are being built on this foundation.

The UK Blood Services work together on Emergency Planning. These planning processes are also linked to the Pandemic Flu planning team at the Department of Health and blood services' plans are being compared internationally.

## **Pandemic Influenza and Blood – Check List for Hospitals**

- Do you know how your hospital is planning for pandemic flu?
- Is blood transfusion support specifically identified in that planning process?
- Does your plan identify the blood supply as a pandemic flu risk?
- Has your hospital transfusion committee considered blood shortages in pandemic influenza?
- Are you up to speed with the 'Integrated Blood Shortage plan for the National Blood Service and Hospitals' and your role within it?

Over the coming months, we will be firming up our plans, preparing our organisations and communicating further to ensure that everyone understands our plans and their inevitable limitations.

### **Richard Bedford**

Chair, UK Blood Services Emergency Planning Group

Email: [rbedford@btinternet.com](mailto:rbedford@btinternet.com)



## ***The SHOT / NBTC Annual Update meeting will be held at***

The Royal College of Physicians on 20th November 2006.

SHOT are pleased to announce that the keynote speaker will be  
Professor Harold Kaplan from Columbia University, USA.

For further information please contact the SHOT Office on 0161 251 4361 or visit the SHOT website at [www.shotuk.org](http://www.shotuk.org)

### ***BCSH Guidelines***

The following guidelines for transfusion have been published on the website of the British committee for Standards in Haematology (BCSH)

(<http://www.bcshtguidelines.com/guidelinesMENU.asp>).

- *Guidelines for the use of prophylactic anti-D immunoglobulin (posted June 2006)*
- *Guideline for blood grouping and antibody testing in pregnancy (posted June 2006)*
- *The specification and use of Information Technology (IT) systems in Blood Transfusion Practice (posted April 2006)*
- *Guidelines on the management of massive blood loss (posted August 2006)*
- *Guidelines for policies on alternatives to allogeneic blood transfusion (posted August 2006)*
- *Addenda to guidelines on (1) the use of fresh frozen plasma, cryoprecipitate and cryosupernatant and (2) transfusion guidelines for neonates and older children.*

When entering this site, click on 'Blood Transfusion'. Alternatively, entry to the BCSH website may be gained by typing in 'bcsht' to a search engine such as 'google' and following directions.

These guidelines are produced by the Transfusion Task Force of the British Committee for Standards in Haematology (BCSH) which is currently chaired by Dr Frank Boulton, and for which Dr Dorothy Stainsby is Honorary Secretary. Guidelines are produced following identification of relevant topics: each topic is assigned to a writing group which has to contain at least one member of the Task Force. All writers are required to

complete a 'Declaration of Interests'. The Guidelines are then drafted, submitted to a Sounding Board, re-submitted to the Task Force and to other BCSH members for any further modifications and checked within the full BCSH committee for consistency.

The BCSH is a sub-committee of the British Society for Haematology. The British Blood Transfusion Society has up to two representatives on the Transfusion Task Force, on which also sit hospital clinicians and at least one hospital-orientated nurse.

BCSH guidelines are usually published in a peer-reviewed journal; for transfusion these are usually either the *British Journal of Haematology*, or *Transfusion Medicine*. The above guidelines are due for publication in the near future.

### ***NBS Education and Training Programmes***

Each year NBS Scientific and Technical Training arranges a programme of courses in Transfusion Medicine across the country. These are open to healthcare professionals in the NHS. Last year 1,025 hospital staff participated in them including scientists from transfusion laboratories, transfusion nurses, transfusion practitioners and haematology trainees. Courses range from basic, such as 'Introduction to Pre-transfusion Testing', to specialist, such as 'Intermediate Transfusion Medicine'. They aim to support specific professional qualifications such as the BBTS Specialist Certificate in Transfusion Science for laboratory staff and MRCPPath Part 1 examinations for Specialist Registrars.

Further details can be found on the website: <http://www.blood.co.uk/hospitals/training/index.htm>

# CPD Questionnaire

## Q1. Blood sample labelling (True or false for each part)

- a) Should include patient gender.
- b) If casualty is unidentified, should default to female.
- c) Most hospitals include gender as part of positive patient identification as a matter of policy.
- d) Identification wristbands will always have the unique identification number.

## Q2. Major Incidents (True or false for each part)

- a) Most casualties will require blood products.
- b) Only a relatively small proportion of casualties requires blood products.
- c) Individual requirement for blood products can be very high.
- d) Blood products are only required up to 3 days post-event.

## Q3. Major Incidents (True or False for each part)

- a) One donation of skin is adequate for a single patient with severe burns.
- b) Demand for skin grafts may continue for ten days after the event.
- c) Up to 4000cm<sup>2</sup> of skin graft can be donated from a single donor.
- d) Most severe burns only require one skin graft episode.

## Q4. Pandemic Influenza and the Blood Supply (True or False for each part)

- a) Red Cell usage will significantly fall in an episode of pandemic influenza.
- b) Up to 50% of donors could be unavailable.
- c) Frozen components are likely to be available as at present.
- d) Little change in the demand for platelets is expected.

## Q5. Hospital Transfusion (True or False for each part)

- a) By 2004 over 70% of trusts had a Transfusion Practitioner in post.
- b) By 2004 less than 5% of Trusts did not have a policy for Blood Transfusion.
- c) Introduction of the 2005 Blood Safety and Quality Regulation has changed the role of Transfusion Practitioners.
- d) A third symposium focusing on Better Blood Transfusion will take place.

## Q6. Hospital Transfusion (True or False for each part)

- a) Lowering transfusion triggers can reduce transfusion rates in hip and knee replacements.
- b) Possibly 160,000 units of Red Cells could be saved by utilising cell-salvage.
- c) FFP can be thawed and kept in a blood refrigerator for up to 24 hours.
- d) Possible 246,000 less units of Red Cells could be used if anaemia was corrected by iron replacement.

**Q7. Hospital Transfusion (True or False for each part)**

The NBS adult patient information leaflet 'Receiving A Blood Transfusion'

- a) Is only available in English.
- b) Is sufficient on its own, without further discussion.
- c) Always is available to patients prior to receiving a blood transfusion.
- d) The hospital transfusion committee has a responsibility for agreeing a strategy for dissemination.

**Q8. Paediatrics (True or False for each part)**

- a) Pre-operative autologous donation should not be used routinely for children in the UK.
- b) Adverse reaction to donation is higher in children.
- c) Most Red Cell Transfusions to neonates are small top-up transfusions.
- d) Red Cells stored in SAG-M have a large (> 100ml) volume of Plasma.

**Q9. Clinical Transfusion (True or False for each part)**

- a) All Red Cell antibodies active at 37°C are clinically important.
- b) Antibodies showing dosage may have variable strength reactions.
- c) Some rare clinically significant antibodies, such as anti-Vel, show variable strength reaction in a panel.
- d) Rh or K matched blood is recommended for all patients requiring long term transfusion support.

**Q10. Clinical Transfusion (True or False for each part)**

- a) Severe reaction to Red Cells occur in more than 1 in 1000 units of Red Cells transfused.
- b) TRALI has reduced since the introduction of male donor FFP.
- c) Only severe reaction with a known cause needs to be reported to SHOT/MHRA.
- d) Cultures from both the recipient and from the component should be taken, if bacterial contamination is suspected as a cause of a severe transfusion reaction.

## DIARY DATES

### 2 November 2006:

HACS Meeting (Haematology Associated with Cardiac Surgery), The Association of Anaesthetists of Great Britain, London. For more information, contact Dr Kanchan Rege, Consultant Haematologist at [janet.wildber@hinchingsbrooke.nhs.uk](mailto:janet.wildber@hinchingsbrooke.nhs.uk)

### 4 November 2006:

Blood Bank Technology & NEQAS, Royal Society of Medicine, London. For further information: [www.eventsforce.net/neqas](http://www.eventsforce.net/neqas)

### 6 - 8 November 2006:

Advanced Transfusion Medicine Training Modules for MRCPATH Part 2 - Red Cell Immunohaematology, West End Donor Centre, London. For more information and application form contact: Wendy Sewell, Tel. 020 8258 2734, [email: wendy.sewell@nbs.nhs.uk](mailto:wendy.sewell@nbs.nhs.uk)

### 7 November 2006:

Joint NBS & UKT Clinical Audit & Research Conference, Hulme Hall, Manchester University. For more information contact Karen Sutcliffe, Tel. 0113 2148611 [email: karen.sutcliffe@nbs.nhs.uk](mailto:karen.sutcliffe@nbs.nhs.uk)

### 9 November 2006:

Advanced Transfusion Medicine Training Modules for MRCPATH Part 2 - Blood Products-Day 1, BPL, Elstree. For more information and application form contact Wendy Sewell, Tel. 020 8258 2734 [email: wendy.sewell@nbs.nhs.uk](mailto:wendy.sewell@nbs.nhs.uk)

### 10 November 2006:

Advanced Transfusion Medicine Training Modules for MRCPATH Part 2 - Blood Products-Day 2, West End Donor Centre, London. For more information and application form contact Wendy Sewell, Tel. 020 8258 2734, [email: wendy.sewell@nbs.nhs.uk](mailto:wendy.sewell@nbs.nhs.uk)

### 15 November 2006

Joint BATB & BBTS Stem Cell & Immunotherapies SIG Meeting The Congress Centre, Great Russell Street, London. For more information contact Regina Johnston, [regina.johnston@nbs.nhs.uk](mailto:regina.johnston@nbs.nhs.uk)

### 18 November 2006:

United Colours of Transfusion, Royal Society of Medicine, London. For more information and application form contact Wendy Sewell, Tel. 020 8258 2734 [email: wendy.sewell@nbs.nhs.uk](mailto:wendy.sewell@nbs.nhs.uk)

### 20 November 2006:

The SHOT / NBTC Annual Update Meeting, The Royal College of Physicians, London. For further information please contact the SHOT office on 0161 251 4361 or visit the SHOT website at [www.shotuk.org](http://www.shotuk.org)

### 9 - 12 December 2006:

48th ASH Annual Meeting & Exposition, Orlando. For more information: [www.hematology.org/calendar.cfm](http://www.hematology.org/calendar.cfm)

### 12 - 14 March 2007

Advanced Transfusion Medicine Training Modules for MRCPATH Part 2, West End Donor Centre, London. For more information and application form contact: Wendy Sewell, Tel. 020 8258 2734, [email wendy.sewell@nbs.nhs.uk](mailto:wendy.sewell@nbs.nhs.uk)

### 12 - 15 April 2007

Blood Group Serology - Reading 2007, Reading University. For more information: [www.bgsreading.org](http://www.bgsreading.org) or email: [jane@bgsreading.org](mailto:jane@bgsreading.org)

### 19 - 20 April 2007

Sanquin Spring Seminar, Amsterdam. For more information: [www.sss.sanquin.nl](http://www.sss.sanquin.nl) or Seminar Secretariat Tel: +31 20 679 3411 or [sanquin@eurocongres.com](mailto:sanquin@eurocongres.com) or [www.eurocongres.com](http://www.eurocongres.com)

### 21 - 22 April 2007

8th Annual NATA Symposium on Transfusion Medicine & Alternatives. Budapest, Hungary. Deadline for abstract submission: 1 December 2006. For more information: [nata.secretary@lms-group.com](mailto:nata.secretary@lms-group.com)

### 30 April - 2 May 2007

British Society for Haematology - 47th Annual Scientific Meeting, Bournemouth International Centre. For information: [www.b-s-h.org.uk](http://www.b-s-h.org.uk)

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