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Blood Matters

Quarterly information for hospitals served by the National Blood Service

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Editorial

The Public and Customer Services (PCS) Directorate was developed from the realisation that the National Blood Service (NBS) needed to be much more customer focused in our dealings with all stakeholders. These stakeholders are principally donors and potential donors, hospitals, staff and Government. Also important are suppliers, patients, the media, special interest groups and the general public. In the past we have handled these differing groups variously from very well to not very well at all. As a national service we are looking to provide a consistently high level of service to each of our valued stakeholders.

PCS's role is many and varied and in some cases we are operators as we seek to recruit and retain blood donors – on the street or through direct marketing, dealing with media enquiries or providing a single point of contact for hospital customer service queries. In other cases we are facilitators as we help get to the bottom of donor complaints and pull together replies in a comprehensive and timely manner.

We are focused in our communications by publication of The Donor, Blood Matters and our Annual Report. We also set standards for handling press queries and provide tools to do the job such as providing a literature printing service.

We act as the internal NBS champion for our customers, helping to sort out service problems through hospital liaison managers (see below) and act as a conduit for information through the provision of materials in our donor mailings.

Our activities all require excellent customer service. There is some way to go to achieve this across the NBS as a whole but we have achieved much in the past eighteen months and are now set to take this agenda forward this year.

Development of the Hospital Liaison Function

In a previous edition of Blood Matters, we described how the NBS was establishing a Hospital Liaison function to ensure the NBS works in partnership with hospitals to achieve the best possible service for patients and the promotion of best transfusion practice. At the time the Head of Hospital Liaison, Stuart Penny and the National Medical Lead for Hospital Liaison, Dr Mike Murphy, were in post together with existing Hospital Liaison team members from the Midlands and South West.

The function has grown and every hospital now has a Hospital Liaison Manager (HLM) and Link Consultant working from their local centre. Details of the HLMs can be found at the end of this article. In addition we have appointed Hospital Liaison Managers to support our DDR (Diagnostics, Development and Research) Directorate.

Role of Hospital Liaison Managers and Consultants

Hospital Liaison Managers and Link Consultants are working together to provide multi-disciplinary support to hospitals. For NBS Consultants this means working primarily with hospital medical colleagues to provide support and advice in the treatment of patients and the

development of *Better Blood Transfusion*, including support for the work of Hospital Transfusion Committees.

During the past year Regional Transfusion Committees have been established. These committees which are designed to bring together learning and best practice from Hospital Transfusion Committees are managed by blood users rather than the NBS and participants are drawn from across the transfusion community. In addition the CMO's National Blood Transfusion Committee has been established and held its first meeting in December last year.

Hospital Liaison Managers are providing operational, technical and financial advice and support in the provision of blood, blood components, and diagnostic services to hospitals and other users of the NBS. To this end Hospital Liaison Managers will be making two formal visits per year to hospital transfusion laboratories to discuss the service provided by the NBS. Hospital Liaison Managers are available to attend Hospital Transfusion Committees and to respond quickly to *ad hoc* queries.

Hospital group meetings

Hospital Liaison Managers have established User Group meetings where these were not previously in place. The purpose of these groups is to provide information on developments within the NBS and hospitals, to discuss current issues and to provide hospitals with an opportunity to raise issues with the NBS.

Additionally, based on a process already established within Midlands and South West, Hospital Liaison Managers within London and South East area and the North will establish Area Transfusion Groups. At this meeting a small number of hospital representatives from each User Group/Technical Advisory Group will be invited to attend to discuss in more detail developments which are proposed to take place within the NBS and which will have an impact on hospitals.

Managing Specific Issues

The Hospital Liaison Function has also been working with hospitals to develop plans to manage specific issues. A good example of this is the ongoing work to manage the threat to the blood supply posed by vCJD (see *Blood Matters* issue no.8). Hospital/NBS working groups have been established to develop plans to improve the appropriate use of blood, investigate the use of autologous blood and alternatives to transfusion and undertake contingency planning.

Communications

One of the most common concerns raised by hospitals is the volume of written communications received from the NBS. During the last twelve months our communications have been formalised into a single national letter, which is issued monthly. This will shortly be developed into a monthly bulletin which will show clearly which pieces of information are critical and which are for information only.

In addition to this the hospital section of the National Blood Service website (www.blood.co.uk) is being developed and should be active shortly. The website will contain information on NBS activities, user groups, Better Blood Transfusion, correspondence etc. It is hoped that this will be a useful source of information for all hospitals.

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Emergency Planning

Following the tragic events in the United States on the 11th September, all government organisations have been reviewing their emergency plans, updating these where required and adapting them to face this new type of threat (now called a “Mass Casualty Incident”). The NBS has existing emergency plans which are designed to respond effectively to external events (such as train crashes and road traffic accidents) and also has disaster contingency plans to respond effectively to internal problems which may affect the ability of the NBS to provide a service, such as power cuts, fuel crisis etc. The NBS Emergency Planning Group, which manages and updates these plans, has been working closely with the Department of Health to ensure that our plans are as robust as they can be and are integrated with those of the wider NHS.

Should a mass casualty incident occur in England, one of the primary concerns is, of course, the ability of the NBS to continue to provide blood and blood components in a timely fashion. The emergency plans include arrangements to deliver blood quickly and to replenish local stocks where necessary. We are currently looking at how we might facilitate the transfer of blood from hospitals not receiving casualties to those who are receiving casualties, if the national stock became severely depleted.

Additionally, we have developed plans for managing a situation where the public may come forward and volunteer to donate in very large numbers, as happened in New York. In all these cases our plans are integrated with our National Contact Centre and with our on-call systems to ensure a 24 hour response. In the past, some hospitals have experienced operational problems as the public flooded hospital switchboards with calls and even arrived in Accident and Emergency departments wanting to give blood. We will be providing hospitals with information on the National Contact Centre for switchboards, A&E departments and public relations/communications departments to ensure donors are directed to appropriate places to donate.

Unfortunately, we have had opportunities to test our current plans in the live environment (most recently at the Great Heck rail crash) and feedback from the hospitals involved has indicated our plans have worked effectively.

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BLOOD STOCKS MANAGEMENT SCHEME UPDATE

Participants

As at 1st November 2001 there were 153 hospitals that are supplied by the NBS registered with the scheme. 20 of the 153 are not yet actively participating. Seventy four percent of possible teaching, 53% of possible district general and 22% of possible private hospitals are registered. The 153 hospitals account for 66% of red cell units issued by the NBS.

Driving changes in practice

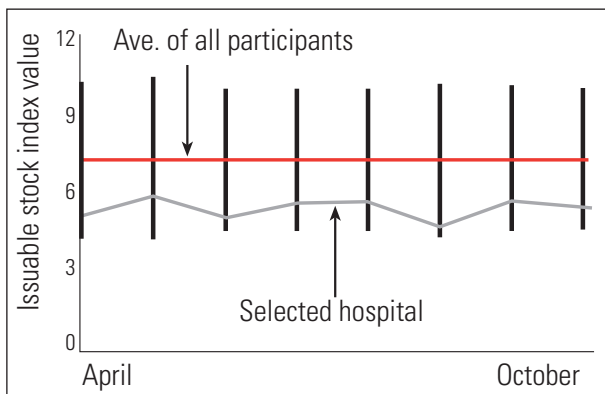
The feedback from participants is encouraging with many hospitals reporting that they are using the graphical displays to bring the hospitals' performance to the attention of transfusion staff members and hospital transfusion committees. Some hospitals are reviewing their blood stock management practice on a two or three monthly basis with a view to making improvements in performance.

Ad hoc questionnaires

An ad hoc questionnaire has been issued covering blood ordering practice and maximum surgical blood ordering schedules. In addition, allocated (crossmatched) stock data has been collected over a one-month period. Each hospital in the Scheme received a detailed six monthly report by the end of December 2001.

Graphical displays

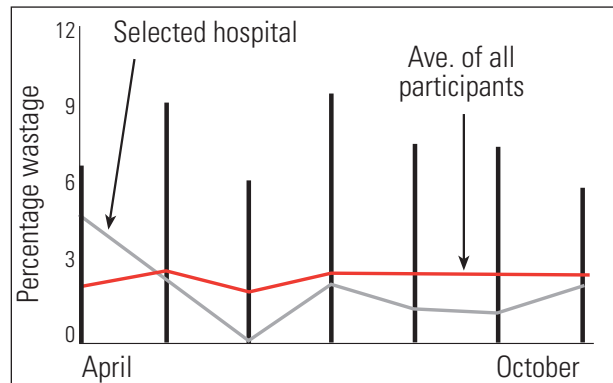
Two examples of the graphical displays are shown below:-



This graphical display shows O Neg wastage as a percentage of issues in standard deviation format for a selected hospital and all participants for the period April to October 2001.

The issuable stock index is derived from the nominal one day stock (annual issues divided by 365) and the level of issuable stock. E.g. Issuable stock = 100, Nominal one day's stock = 20 (7300 issues/365), Issuable Stock index = 5.0 (100/20) i.e. the hospital holds on average 5 days worth of stock for that group.

The next graphical display shows the issuable stock index in standard deviation format for group O Negative for a selected hospital and all participants for the period April to October 2001.



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Management Of Massive Blood Loss: A Template Guideline and Commentary

Full text and references in Br J Anaesth; **85**: 487-91
Reproduced in summarised form by kind permission of Oxford University Press.

Introduction

Complications of major blood loss and massive transfusion may jeopardise the survival of patients from many different specialities, and challenge haematological and blood transfusion resources. Avoidable deaths of patients with major haemorrhage are well recognised and locally agreed and/or speciality specific guidelines are needed to ensure effective management.

This guideline was developed following an educational symposium in December 1998 at which key principles were agreed. It is presented as a simple template (Table 1) which may be modified to take into account local circumstances, and displayed in clinical areas. Successful implementation will depend on local ownership by adaptation to local circumstances and accessibility at the point of clinical activity.

The recommendations must be regarded as Grade C, based on uncontrolled observational studies and consensus of expert opinion (Level 3 evidence).

Commentary

BACKGROUND

Massive blood loss is usually defined as the loss of one blood volume within a 24 hr period, normal adult blood volume being approximately 7% of ideal body weight, 8% to 9% in children. Alternative definitions include 50% blood volume loss within 3 hrs, or a rate of loss of 150ml per minute. Such definitions emphasise the importance of early recognition of major blood loss and the need for effective action to prevent shock and its consequences.

Priorities for treatment are

- restoration of blood volume to maintain tissue perfusion and oxygenation
- achieving haemostasis by
 - treating any surgical source of bleeding
 - correcting coagulopathy by judicious use of blood component therapy.

A successful outcome requires prompt action and good communication between clinical specialities, diagnostic

laboratories, blood bank staff and the local blood centre. Blood component support takes time to organise and the blood centre may be up to two hours away from the hospital.

Early consultation with surgical, anaesthetic and haematology colleagues is advisable and the importance of good communication and co-operation in this situation cannot be over-emphasised. A member of the clinical team should be nominated to act as co-ordinator responsible for overall organisation, liaison, communication and documentation. This is a critical role for a designated member of the permanent clinical staff. The Hospital Transfusion Committee should provide a forum in which a rapid communication cascade can be agreed and massive transfusion episodes reviewed.

RESUSCITATION

Prolonged oligoemic shock carries a high mortality due to organ failure and disseminated intravascular coagulation. Restoration of circulating volume is initially achieved by rapid infusion of crystalloid or colloid through large bore (14 gauge or larger) peripheral cannulae. The use of albumin and non-albumin colloids versus crystalloids for volume replacement has recently been the subject of debate following two controversial meta-analyses and the use of colloid is not recommended in the latest American College of Surgeons Advanced Trauma Life Support Guidelines. Further trials are required before firm recommendations can be made.

Red cell transfusion is likely to be required when 30% to 40% blood volume is lost, whilst over 40% blood volume loss is immediately life-threatening. Hypothermia increases the risk of disseminated intravascular coagulation and other complications and may be prevented by pre-warming of resuscitation fluids, patient warming devices such as warm air blankets and the use of temperature controlled blood warmers.

Blood loss is usually underestimated and it must be remembered that haemoglobin and haematocrit values do not fall for several hours after acute haemorrhage. In the acutely anaemic patient the American Society of Anesthesiologists Task Force on Blood Component Therapy have concluded on the basis of the available evidence that transfusion is rarely indicated when the haemoglobin concentration is $>10\text{g.dl}^{-1}$, but almost always indicated when it is $<6\text{g.dl}^{-1}$. Determination of whether intermediate haemoglobin concentrations justify red cell transfusion should be based on the patient's risk factors for complications of inadequate oxygenation, such as rate of blood loss, cardiorespiratory reserve, oxygen consumption, and atherosclerotic disease. Measured cardiological variables such as heart rate, arterial pressure, pulmonary capillary wedge pressure and cardiac output, may assist the decision making process, but it should be emphasised that silent ischaemia may occur in the presence of stable vital signs.

Intraoperative blood salvage may be of great value in reducing requirements for allogeneic blood, but bacterial contamination of the wound is a relative contraindication.

INVESTIGATIONS

Blood samples should be sent to the laboratory at the earliest possible opportunity, for blood grouping, antibody screening and compatibility testing, as well as for baseline

haematology, coagulation screen including fibrinogen estimation, and biochemistry investigations.

When dealing with an evolving process it is important to check parameters frequently, (at least four hourly and after each therapeutic intervention) to monitor the need for and the efficacy of component therapy.

Expert advice should be sought from a haematologist regarding appropriate investigations, their interpretation and optimum corrective therapy.

BLOOD COMPONENT THERAPY

RED CELLS

In an extreme situation it may be necessary to use Group O un-crossmatched red cells if the blood group is unknown. In an emergency premenopausal females whose blood group is unknown should be given ORh(D) negative red cells in order to avoid sensitisation and the risk of haemolytic disease of the newborn in subsequent pregnancy. It is acceptable to give ORh(D) positive cells to males and postmenopausal females of unknown blood group. Group specific red cells should be given at the earliest possible opportunity as group O blood is a scarce resource.

It is important to bear in mind that most transfusion related morbidity is due to incorrect blood being transfused. It is therefore essential that protocols are in place for the administration of blood and blood components and that these are adhered to even in an emergency situation.

PLATELETS

Expert consensus argues that platelets should not be allowed to fall below the critical level of $50 \times 10^9 \text{ .L}^{-1}$ in acutely bleeding patients. A higher target level of $100 \times 10^9 \text{ .L}^{-1}$ has been recommended for those with multiple high energy trauma or central nervous system injury. Empirical platelet transfusion may be required when platelet function is abnormal such as is found after cardiopulmonary by-pass.

A platelet count of $50 \times 10^9 \text{ .L}^{-1}$ is to be anticipated when approximately two blood volumes have been replaced by plasma poor red cells but there is marked individual variation. In assessing the requirement for platelets, frequent measurements are necessary, and it may be necessary to request platelets from the blood centre at levels above the desired target in order to ensure their availability when needed.

Fresh frozen plasma (FFP) and Cryoprecipitate

Most clinical studies and guidelines have been based on the use of whole blood or plasma reduced red cells, which contain some residual coagulation factor activity. Nowadays, red cell replacement is likely to be in the form of plasma poor red cells suspended in optimal additive solution, in which coagulation factor activity is negligible. Under these circumstances, coagulation factor deficiency is the primary cause of coagulopathy. The level of fibrinogen falls first; the critical level of 1.0g.L^{-1} is likely

to be reached after 150% blood loss, followed by the fall of other labile coagulation factors to 25% activity after 200% blood loss. Prolongation of activated partial thromboplastin time (APTT) and prothrombin time (PT) to 1.5 times the mean normal value is correlated with an increased risk of clinical coagulopathy and requires correction.

Laboratory tests of coagulation should be monitored frequently and interpreted with advice from a clinical haematologist; laboratories should have in place standard operating procedures to ensure that clinical staff are contacted appropriately. Experienced laboratory staff should be empowered to issue blood components in the first instance using a locally agreed algorithm. It may be necessary to request components before results are available, depending on the rate of bleeding and the laboratory turnaround time. Although 'formula replacement' with fresh plasma is not recommended, it has been suggested that infusion of FFP should be considered after one blood volume is lost. The dose should be large enough to maintain coagulation factors well above the critical level, bearing in mind that the efficacy may be reduced because of rapid consumption.

FFP alone, if given in sufficient quantity, will correct fibrinogen and most coagulation factor deficiencies, but large volumes may be required. If fibrinogen levels remain critically low ($<1.0\text{g.L}^{-1}$), cryoprecipitate therapy should be considered.

BCSH Guidelines on Oral Anticoagulation recommend prothrombin complex concentrate as an alternative to FFP when major bleeding complicates anticoagulant overdose.

Disseminated intravascular coagulation (DIC)

DIC is a feared complication in the acutely bleeding patient. It carries a considerable mortality, and once established is difficult to reverse. At particular risk are patients with prolonged hypoxia or hypovolaemia, with cerebral or extensive muscle damage or who become hypothermic from infusion of cold resuscitation fluids. Laboratory evidence of DIC should be sought before microvascular bleeding becomes evident so that appropriate and aggressive action can be taken to address the underlying cause. Frequent estimation of platelet count, fibrinogen, prothrombin time (PT) and activated partial thromboplastin time (APTT) is strongly recommended; measurement of fibrinogen degradation products (FDPs) or D-dimers may be useful. Prolongation of PT and APTT in excess of that expected by dilution, together with significant thrombocytopenia and fibrinogen of $<1.0\text{g.L}^{-1}$ are highly suggestive of DIC.

Treatment consists of platelets, FFP and cryoprecipitate given 'sooner rather than later' in sufficient dosage but avoiding circulatory overload.

CONCLUSION

A recent cohort study shows a significantly improved survival in massively transfused patients over a 10 year period and associates this with more effective and efficient

rewarming techniques, aggressive resuscitation and component therapy, and improved blood banking. There is a need for further studies to clarify these issues and provide firm evidence on which future recommendations can be based.

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(Please see Table 1 - page 12)

Transfusion Related Acute Lung Injury (TRALI)

The term TRALI was first used in the early 1980s to describe a rare and potentially fatal syndrome of acute non-cardiogenic respiratory failure, clinically indistinguishable from the acute respiratory distress syndrome (ARDS), which can occur as a complication of blood component transfusion¹.

CLINICAL PICTURE

TRALI is characterised clinically by dyspnoea, cyanosis, hypotension, fever and pulmonary oedema. Symptoms typically begin within 1 to 2 hours of transfusion and are usually present by 4 to 6 hours. The full blood count may reveal a leucocytosis. The majority of patients are severely affected and require mechanical ventilation, although a milder presentation has been reported which responds to oxygen therapy alone.

INCIDENCE

The incidence of TRALI has been reported as 0.02% of all units, or 0.16% of all patients transfused, though it may be under diagnosed¹. TRALI is associated with significant morbidity, with 72% of patients requiring ventilation,¹ and although rare it is a significant cause of transfusion related mortality, estimated to be 5-6% of affected patients^{1,2}. In a review of transfusion associated deaths in the USA, Sazama³ estimated TRALI to be the third most common cause of death related to blood transfusion after ABO incompatibility and non-A, non-B hepatitis. With the reduction in the incidence of the latter following the introduction of hepatitis C screening, the relative importance of TRALI is increasing.

Over the first 4 years of the Serious Hazards of Transfusion reporting system (SHOT), 68 cases of TRALI were reported^{4,5,6,7}. After review some cases were later considered not to be TRALI, which illustrates the difficulty of making a positive clinical diagnosis of the condition. In 12 cases, TRALI was thought either likely or possibly to have contributed to the patient's death. Haematological malignancy was the most common underlying diagnosis (21 patients) followed by elective surgery (including cardiac surgery - 16 patients). It is not known whether this simply reflects the large number of plasma-rich components transfused to these patients, or whether pre-disposing factors make them more susceptible.

AETIOLOGY

TRALI is generally considered to be the result of the interaction of specific leucocyte antibodies with leucocytes⁸. The antibodies are usually donor derived, although there have been occasional reports of the syndrome occurring after transfusion of donor leucocytes which have interacted with either patient derived antibodies or antibodies transfused in a second donation. Not all transfusions from donors found to have leucocyte antibodies result in TRALI and, even if there is a match of antigen and antibody specificity, overt lung injury does not always ensue. A lookback study of recipients of 44 donations from donors found to have antibodies implicated in 7 TRALI cases showed no record of any TRALI reactions⁹.

It is possible that patient factors may contribute to the development of the syndrome. The 'two-hit' hypothesis which has been proposed to explain the pathogenesis of TRALI counts the patient's pre-existing condition as the first 'hit' (hypoxia, recent surgery, cytokine therapy, active infection or inflammation, and massive transfusion have all been implicated) with the transfusion of biologically active lipids present in stored, but not fresh, cellular components as the second 'hit'¹⁰. A modified 'two-hit' hypothesis sets out that the first hit is the underlying condition of the patient and the second is the transfusion of blood containing leucocyte antibodies and/or lipid priming agents⁸. The latter hypothesis underlines the importance of the presence of donor antibodies, but the relative importance of patient-specific factors is not yet clear.

COMPONENTS IMPLICATED IN THE DEVELOPMENT OF TRALI

TRALI has been reported to occur after transfusion of all the following blood components: plasma, platelets, whole blood, cryoprecipitate, concentrated red cells and blood in additive solution. Proportionate to the numbers of different components transfused, components containing more plasma such as platelets and fresh frozen plasma (FFP) are more likely to cause TRALI, but the syndrome may also occur after transfusion of components containing smaller volumes of plasma, e.g. red cells in optimal additive solution.

Theoretically the pooling process may reduce the risk of TRALI in pooled plasma products due to dilution of donor leucocyte antibodies. One case of TRALI has, however, been recently reported after transfusion of intravenous Immunoglobulin¹¹. There have been no reports of TRALI following transfusion of solvent-detergent FFP.

INVESTIGATION OF SUSPECTED CASES

The diagnosis of TRALI is essentially a clinical one and can rarely be made with absolute certainty. Investigation should be performed in order to support the diagnosis, but the results of the investigation will not be available immediately, and in some cases no positive laboratory confirmation is found. TRALI remains largely a diagnosis of exclusion but the International Society of Blood Transfusion's Haemovigilance Group is trying to develop a diagnostic scoring system.

If TRALI is suspected, then the regional Blood Centre should be notified either directly or via the hospital blood

bank so that patients and donors can be investigated for the presence of leucocyte antibodies. Samples from the patient will be required, together with full details of all components transfused and time of transfusion related to the reaction.

The referring consultant should also report the case to SHOT. The SHOT TRALI questionnaire has recently been revised so that all appropriate clinical details will be collected. Suspected cases of TRALI reported to SHOT are independently assessed together with the results of the investigations. Grouping cases into probable, possible and unlikely will help to determine the true incidence of the condition. The aim of investigation is to look for leucocyte antibodies in both donor and patient. If on conclusion of the investigation it is considered likely that antibodies in a donor have contributed to the reaction, then the donor is removed from the donor panel.

MANAGEMENT

There is no specific treatment for TRALI. Treatment is largely supportive to allow time for lung injury to subside. Most cases require mechanical ventilation for several days. Steroids have been advocated but proof of efficacy is lacking. If patients recover from the acute event there are usually no long term sequelae, unlike in ARDS.

SUMMARY

TRALI is a serious complication of blood transfusion. Clinicians and nurses who administer transfusions should be aware of the risk of TRALI so that patients can be promptly and appropriately investigated and managed.

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Future Plans For FFP Provision – An Update

At meetings of the Department of Health's Advisory Committee on the Microbiological Safety of Blood and Tissues for Transplantation (MSBT) last year, there has been further discussion regarding the possible future sourcing of fresh frozen plasma from outside the UK, as a precautionary step against vCJD transmission. A risk analysis, modelling a number of different risk scenarios has been performed by the DoH Economic and Operational Research Group. In assessing possible non-UK sources of FFP, continuity of supply and maintaining the highest possible level of overall safety are vitally important considerations. Advice is now being drafted for health ministers, who will make the final decision. Our current thinking is to begin by procuring plasma for neonates and young children, so that these heavily transfused individuals with a long life ahead can be protected first from any potential risk.

NBS is now progressing the work of the Safer Plasma in Components project further by continuing the productive discussions we have been having with potential suppliers of non-UK plasma. Any plasma that is procured will be from voluntary, non-remunerated donors, giving at licenced Blood Centres, and selected and screened to nationally agreed standards. A detailed plasma specification has been prepared by the NBS for use with suppliers. In addition, any imported plasma will be subjected to a virus inactivation step to maintain the high standards of safety which hospitals have come to expect from NBS components.

A further important point is the critical role of appropriate blood component usage in minimising transfusion risk. New BCSH guidelines for FFP are currently being drafted, and following the Chief Medical Officers' 'Better Blood Transfusion' seminar held on 29th October, there is an expectation that hospitals will optimise usage of FFP and other components. The NBS, through its developing hospital liaison and audit functions, is set to contribute actively to this process.

Further information will be issued to hospitals following the ministerial decision.

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Responsibility For The Accuracy Of Blood Group Information On NBS Components

The NBS works to the standards required of a Pharmaceutical manufacturer, which means that:-

- The testing, labelling and issuing systems have been validated to demonstrate they perform as expected.
- The staff that operate them have been trained to use the systems.
- The systems are subject to periodic self audit by Quality Assurance and operational staff independent of the area being audited to provide an objective assessment of compliance with validated procedures.
- Opportunities are taken to learn from:
 - self audits
 - complaints
 - review of performance data to correct problems promptly and where necessary implement preventative action.
- The NBS is also subject to audit by the Medicines Control Agency. The NBS can continue to operate its blood collection, testing, processing and issuing activities by demonstrating in the MCA's audits that it complies with the Guidelines for Good Pharmaceutical Manufacturing Practice. As a result the NBS will continue to retain its operating licence.

In working to achieve and retain its licence the NBS has developed procedures which minimise the risk of error during the donation process, such as the wrong samples being associated with the wrong donation.

When returned to the testing/processing sites identification of the donations and test samples to the PULSE computer system is done electronically. This is done by scanning into the computer system the unique ISBT128 Barcode used to identify each donation, the associated records used during donor health screening and the sample tubes. PULSE can then automatically track and control data associated with a donation. This means that the most likely historic cause of issuing mislabelled units (transcription of test results and the selection of the correct group label to stick on to a bag) has been eliminated.

The equipment and procedures used for blood grouping and virology testing are designed to remove the need for manual intervention in the grouping and testing process. When this is necessary the procedures are very tightly controlled. This provides confidence that the possibility of error due to mis-dispensing test samples or reagents has been minimised.

Once testing results have been produced they are automatically transferred to the PULSE computer system. The system then performs checks to ensure that all relevant information is present to allow a component to be labelled and issued for clinical use. Once this check is completed a label unique to the produced blood component is printed identifying the blood group and expiry information. These checks are completed again after the label is applied to the component. Concatenation of the bar codes at this point ensures that the correct label has been placed on the correct component. At the time of issue the system checks the information again to confirm that the component has the expected group and that

additional medical information concerning the donor's health has not been received which might require the component to be removed from clinical use.

The PULSE computer system software and our test systems are managed to ensure that when necessary changes are made to improve either the logistics of our systems or to take advantage of newer more sensitive or extensive testing regimes the changed system is proven to still work effectively.

In this way the people and the systems they operate provide assurance that the correct blood group label has been applied to a blood component.

Over the last few years I have been surveying the number of units of red cells we have issued with an incorrect ABO and / or RhD group label. Based on this historical data the risk of issuing an incorrectly grouped labelled unit is in the order of 1 in 3.75 million, or less.

With further, more recent, improvements to software and procedures the calculated probability of this happening now is greater than 1 in 100 million. This calculation is based on the frequency of a series of internal failures, happening in combination, that would be necessary for a wrongly labelled red cell to be issued.

Whilst these numbers are reassuring, the NBS is not complacent. We are aware that an unpredicted, or as yet unencountered, failure could alter the risk calculation. Mindful of this possibility further improvements to safety and security will continue.

I can confirm that the NBS will accept responsibility for the accuracy of Blood Group information printed on the blood group labels and assure you that our Quality Assurance system will ensure this to the same high level across England and North Wales.

Alan Slopecki

Head of Quality Assurance

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The Safety Of The Electronic Crossmatch

INTRODUCTION

The serological crossmatch first consisted of a saline direct agglutination test (Ottenberg 1911). The crossmatch has since evolved through a range of techniques however some laboratories have recently eliminated the serological crossmatch in favour of electronic issue.

The serological crossmatch

For many years the safety of blood transfusion focused on the compatibility test and in particular the serological crossmatch. The crossmatch was considered the ultimate test for the detection of ABO incompatibility and antibodies against low-frequency antigens. It also acted as a double check of the antibody screening procedure. A range of techniques was used because it was thought this increased its safety. Over the years the techniques in use for the crossmatch have diminished and now most laboratories only use the indirect antiglobulin test (IAT). The IAT was considered the definitive test because it detected IgG and complement binding antibodies. Even though the serological crossmatch has always been considered to be the most appropriate test of compatibility

it is associated with several pitfalls including the unknown zygosity of the donor cells and the relative lack of standardisation.

Excluding the IAT from the crossmatch

There has been a decline from 100% to 80% in the number of laboratories including the IAT in the crossmatch (Milkins et.al. 1999). In laboratories that have eliminated the crossmatch in favour of immediate spin or electronic selection and issue the onus for the detection of clinically significant antibodies has switched to the antibody screening test. Boral and Henry (1977) reported that they detected 283 unexpected antibodies in 12848 blood specimens, eleven of these antibodies were detectable only in the crossmatch. The screening cells used were not homozygous for selected antigens. Oberman (Oberman et. al 1978) reported an incidence of 148 positive crossmatches in 13950 patient samples having a negative antibody screen however only eight were due to clinically significant antibodies. In 1984 the AABB included "the omission of the antiglobulin phase of the crossmatch if the antiglobulin test in the antibody screen was negative" in the 11th edition of the AABB standards (AABB,1984).

The antibody screen

As the emphasis for safety has moved to the antibody screening test it is important that it is as sensitive and as high a quality as possible. UK NEQAS data shows that the error rate for false negative antibody screens in UK NEQAS exercises has fallen from 6.65% in 1984/5 (Holborn and Prior 1988) to 0.07% in 1997/8 (Knowles 1999). The reasons for this improvement in antibody detection may be due to a number of factors. These are:- the use of antigen screening cells that have homozygous expression of certain antigens as recommended in BCSH guidelines, developments in IAT technology that do not require subjective reading of the test, an understanding of the requirement for validation of the technique in use and through the education aspects of participation in NEQAS.

Electronic selection and issue

The computer crossmatch was first reported by Butch et al (1994). Since then many laboratories world-wide have introduced electronic issue and selection and many report advantages in its use. UK BCSH guidelines for blood bank computing give the criteria necessary for the electronic selection and issue of blood in the UK (BCSH 2000). They recommend that in laboratories where there is complete automation of the ABO/RhD typing and antibody screening procedure the introduction of electronic selection and issue is acceptable. The risks associated with manual interventions in these laboratories are minimised. Where there is not complete automation the guidelines recommend that a risk assessment is carried out before introducing electronic issue. A recent international forum in Vox Sanguinis (2001) indicated that the recommendations are generally in line with those in operation in a number of other countries in respect to a past and current history of the absence of clinically significant antibodies and the requirement for two ABO and RhD groups. The UK and the Netherlands were the only two countries out of 17 requiring the use of an automated system for ABO and Rh typing and antibody screening. In all but the UK, Netherlands and USA there was a requirement for serological ABO/Rh typing of the donor unit after the final label had been attached. The NBS accepts responsibility for the accuracy of the blood

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group information printed on the blood group label.

Electronic selection and issue is a safe procedure provided that:-

- BCSH guidelines for blood bank computing are followed
- Computer software has been validated for computer issue
- Each element of the compatibility test has been carefully evaluated and conforms to BCSH pre transfusion testing compatibility guidelines
- Written Standard Operating Procedures are in place
- Comprehensive training is given to all staff undertaking the procedure
- The systems in place for ABO and RhD typing are secure
- Quality systems are in place for phlebotomy and for the administration of blood

Conclusion

The use of electronic selection and issue can have positive benefits in the blood transfusion laboratory including the ability to contend with difficulties better in times of staff shortages, the potential to reduce stress on the crossmatching bench potentially increasing safety and the promotion of an efficient working environment. Compatibility testing is only one element of the blood transfusion procedure; the others are equally important and include the correct patient identification at the time of collection of the blood sample and at the administration of the blood transfusion.

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The Chief Medical Officers' 'Better Blood Transfusion' Seminar and the Establishment of the National Blood Transfusion Committee

The Chief Medical Officers' *Better Blood Transfusion Seminar* was held in London on 29th October 2001. It was attended by an invited audience which included clinicians, patients, medical and scientific staff involved in blood transfusion, and health service managers. The objective of the Seminar was to set the agenda for NHS transfusion services for the next 3 years by seeking the views of the invited audience focussing on:-

- Providing better information to patients
- Avoiding unnecessary transfusion
- Making transfusion safer
- Ensuring 'better blood transfusion' is an integral part of NHS care

After introductory remarks by the 4 UK Chief Medical Officers, Martin Pflieger outlined the National Audit Office (NAO) report on the NBS and how the NAO had organised the Seminar in collaboration with the Department of Health and the NBS. He challenged the NBS to describe how it is meeting hospitals' demands for blood, support and medical advice. Martin Gorham, NBS Chief Executive, responded by outlining how the NBS is implementing the NAO's recommendations, and emphasised the support of the NBS for the *Better Blood Transfusion* initiative.

An audit of the implementation of the HSC 1998/224 *Better Blood Transfusion* was presented showing that most hospitals have Hospital Transfusion Committees (HTCs), participate in the Serious Hazards of Transfusion scheme, and have protocols for the administration of blood. However, the audit provided evidence of poor provision of training and patient information, few protocols for the appropriate use of blood, few audits of transfusion practice and low use of autologous transfusion. Presentations were given by a patient on providing better transfusion services for patients and by a representative of the Jehovah's Witnesses on methods for avoidance of blood transfusion. How to make blood transfusion safer was discussed by representatives of the National Patient Safety Agency and Serious Hazards of Transfusion (SHOT). The final sessions of short presentations were on how to improve the quality of transfusion practice and how to make HTCs more effective.

In the afternoon, the audience participated in 5 workshops on:-

- The needs of people at risk of transfusion
- Making blood transfusion safer
- National blood transfusion protocols
- Monitoring the use and effectiveness of blood transfusion
- Strengthening the HTC and the role of the Transfusion Nurse Practitioner

The main action points from each workshop were presented to the whole audience in a final discussion led by the Chief Medical Officers.

Further details of the Seminar can be found on www.doh.gov.uk/bbt2. Recommendations from the work carried out at the Seminar on *Better Blood Transfusion* will be published in the form of a Health Services Circular by April/May 2002. These will include immediate actions to be taken and an ongoing programme for *Better Blood Transfusion*.

The newly established Chief Medical Officer's National Blood Transfusion Committee (NBTC) will play an important role in supporting the *Better Blood Transfusion*

initiative. The NBTC (see *Blood Matters* issue 8, September 2001) held its first meeting on 3rd December 2001. Its membership includes representatives from the Regional Transfusion Committees, Royal Colleges, SHOT, the NBS, patients, and the Department of Health. Professor E.Gordon-Smith, who was the Chairman of the National Blood User Group and the Interim National Transfusion Committee, has been appointed Chairman. *Blood Matters* will include reports of the work of the NBTC in future issues.

Dr.Mike Murphy

Lead Consultant of Hospital Liaison & Secretary of the National Blood Transfusion Committee

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NEW WEB SITE

www.transfusionsguidelines.org.uk

This new web site will be launched on **11th February 2002**. It is the web site which contains all the guidelines produced by the Joint United Kingdom Blood Transfusion Services/National Institute for Biological Standards and Control Professional Advisory Committee (JPAC).

Here you will find the **Red Book** "Guidelines for the Blood Transfusion Services in the UK - 5th Edition". Also the **Handbook of Transfusion Medicine** - 3rd Edition, now widely distributed to all hospitals in the UK and essential reading for everyone who prescribes blood, blood components and plasma derivatives.

The site also contains the Tissue Donor Selection Guidelines (T-DSG) and the Donor Selection Guidelines (DSG). These supplements of the Red Book contain very detailed guidance used by professionals throughout the Service. Currently these are restricted areas but we are working towards making them freely available. Professionals wishing to access the restricted areas can apply via the web site.

The site provides a full search facility for all guidelines and contact details for queries or requests. The site is a must for all professional information related to Blood Transfusion and Tissue Collection in the UK.

You will also find a brief history of JPAC and its family of Standing Advisory Committees (SACs), and an account of how the guidelines are developed.

The site has links to its 5 parent organisations:

➤ National Institute for Biological Standards and Control (NIBSC)

and the 4 Transfusion Services in the UK

➤ National Blood Service

➤ Scottish National Blood Transfusion Service

➤ Northern Ireland Blood Transfusion Service

➤ Welsh Blood Service.

It is our aim to keep this site constantly updated, please visit it.

Table 1

ACUTE MASSIVE BLOOD LOSS - A TEMPLATE GUIDELINE		
GOAL	PROCEDURE	COMMENTS
<ul style="list-style-type: none"> ● Restore circulating volume 	<ul style="list-style-type: none"> ● Insert wide bore peripheral cannulae ● Give adequate volumes of warmed crystalloid, colloid, blood ● Aim to maintain normal BP and urine output >30ml/hr 	<ul style="list-style-type: none"> ● 14G or larger ● Monitor CVP ● Blood loss is often underestimated ● Refer to Advanced Trauma Life Support guidelines ● Keep patient warm
<ul style="list-style-type: none"> ● Contact key personnel 	<ul style="list-style-type: none"> ● Clinician in charge ● Duty anaesthetist ● Blood bank ● Duty haematologist 	<ul style="list-style-type: none"> ● Nominated co-ordinator should take responsibility for communication and documentation.
<ul style="list-style-type: none"> ● Arrest bleeding 	<ul style="list-style-type: none"> ● Early surgical or obstetric intervention ● Interventional radiology 	
<ul style="list-style-type: none"> ● Request laboratory investigations 	<ul style="list-style-type: none"> ● FBC, PT, APTT, Fibrinogen; blood bank sample, biochemical profile, blood gases or pulse oxymetry ● Ensure correct sample identity ● Repeat FBC,PT,APTT,Fibrinogen every 4 hrs, or after 1/3 blood vol replacement ● Repeat after blood component infusion 	<ul style="list-style-type: none"> ● Take samples at earliest opportunity as results may be affected by colloid infusion ● Misidentification is commonest transfusion risk. ● May need to give components before results available
<ul style="list-style-type: none"> ● Request suitable red cells 	<ul style="list-style-type: none"> ● Un-crossmatched group O Rh neg <ul style="list-style-type: none"> ● In extreme emergency ● No more than 2 units ● Un-crossmatched ABO group specific <ul style="list-style-type: none"> ● when blood group known ● Fully crossmatched <ul style="list-style-type: none"> ● if irregular antibodies present ● When time permits ● Use blood warmer and/or rapid infusion device ● Employ blood salvage if available and appropriate 	<ul style="list-style-type: none"> ● Rh pos is acceptable if patient is male or postmenopausal female ● Lab will complete crossmatch after issue ● Further crossmatch not required after replacement of 1 blood volume (8 - 10 units) ● Blood warmer indicated if flow rates >50ml/kg/hr in adult ● Salvage contra-indicated if wound heavily contaminated
<ul style="list-style-type: none"> ● Request platelets 	<ul style="list-style-type: none"> ● Allow for delivery time from blood centre ● Anticipate platelet count <50 x 10⁹ /l after 2 x blood volume replacement 	<ul style="list-style-type: none"> ● Target platelet count <ul style="list-style-type: none"> ● >100 x 10⁹ /l for multiple/CNS trauma or if platelet function abnormal ● >50 x 10⁹ /l for other situations
<ul style="list-style-type: none"> ● Request FFP (12-15 ml/kg body wt(1 litre or 4 units for an adult) 	<ul style="list-style-type: none"> ● Aim for PT & APTT < 1.5 x mean control ● Allow for 30 mins thawing time 	<ul style="list-style-type: none"> ● PT/APTT >1.5 x mean control correlates with increased surgical bleeding
<ul style="list-style-type: none"> ● Request cryoprecipitate (1-1.5 packs/10kg body wt) 	<ul style="list-style-type: none"> ● To replace fibrinogen & FVIII ● Aim for fbg > 1.0g/L ● Allow for delivery time + 30 mins thawing time 	<ul style="list-style-type: none"> ● Fbg <0.5 strongly associated with microvascular bleeding ● Fbg deficiency develops early when plasma poor RBCs used for replacement
<ul style="list-style-type: none"> ● Suspect DIC 	<ul style="list-style-type: none"> ● Treat underlying cause if possible 	<ul style="list-style-type: none"> ● Shock, hypothermia, acidosis lead to risk of DIC ● Mortality of DIC is high

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