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P22
Post transfusion hyperhaemolysis syndrome in Sickle Cell Disease

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Regular blood transfusion forms a major component in the management of Sickle Cell Disease. Red cell alloimmunization has been reported to be as high as 36% in this group of patients and hyperhaemolysis syndrome has been reported as a rare complication following blood transfusion. This syndrome is characterised by haemoglobin falling below pretransfusion levels, reticulocytopenia and haemoglobinuria, with no red cell alloantibody identified as the cause of the haemolysis. Further blood transfusions may exacerbate the anaemia to life threatening levels. Possible mechanisms include bystander haemolysis and activated complement components to autologous red cells. Symptoms such as fever, malaise and pain may be misinterpreted as a sickle pain crisis, delaying appropriate treatment of Intravenous Immunoglobulin and Corticosteroids.

A 40 year old woman with Sickle Cell Disease was admitted for suspected sickle pain crisis. The haemoglobin was 84 g/l (RR 120-160), she was transfused with 2 units leucocyte depleted red cells She had no history of red cell alloantibody. Over the next 6 days the patient was transfused with a further 8 units of red cells and experienced massive red cell haemolysis with the Haemoglobin reaching a nadir of 27 g/l and Reticulocyte count of 7.2%. A repeat crossmatch sample demonstrated weak, non specific reactions by the Indirect Antiglobulin Test and was referred to the Red Cell Reference Laboratory at the Red Cross Blood Bank, this antibody was not identified.

On day 7 the patient was transfused with 102g Intravenous Immunoglobulin and treated with Corticosteroids. The Haemoglobin rose to 80 g/l and Reticulocyte Count to 53.5% within the following 7 days. Further transfusion with red cells was not attempted.

Timely identification of Hyperhaemolysis Syndrome in Sickle Cell Disease patients is vital. Treatment with Intravenous Immunoglobulin and Corticosteroids and withholding transfusion as far as possible is the management of choice.

P23
Red cell allo- and auto-immunisation in myelodysplastic syndrome (MDS) patients transfused in the post-universal leucodepletion era

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Introduction & aim

MDS patients often require red cell transfusions and have an innate immune dysfunction increasing their risk of RBC allo-antibody formation compared to other multi-transfused subjects. We aimed to determine if universal leucodepletion had reduced the risk of allo- and auto-immunisation in these subjects.

Methods

Immuno-haematologic and transfusion data were reviewed for 29 MDS patients diagnosed after the introduction of universal leucodepletion in New Zealand. Those with uncertain diagnoses, prior transfusions, known immunological abnormalities or medications or lacking adequate follow-up were excluded. Prophylactic antigen-matched transfusions had not been used.

Results

All figures: n (%) except where stated

age	**67 – 94 years**
MDS subtypes – RA, RARS, RAEB, CMML, NOS, 'film only'	7 (24.1), 3 (10.3), 4 (13.8), 1 (3.4), 7 (24.1), 7 (24.1)
new RBC antibody - detected; not detected	8 / 29 (27.6); 21 / 29 (72.4)
allo-antibody – total; isolated	5 / 29 (17.2); 3 / 5 (60)
auto-antibody – total; isolated	5 / 29 (17.2); 3 / 5 (60)
allo- + auto-antibody	2 / 29 (6.8)
allo-antibody – single; multiple	3 / 5 (60) ; 2 / 5 (40)
allo-antibodies detected - total (specificity)	7 (anti-E 3, anti-Jka 2, unknown 2)
median PRBC u txed (/ month) – overall, non-antibody-formers, antibody-formers	17 (0.93), 13 (0.62), 22 (1.1)
median PRBC u txed pre-first antibody detection	6

Conclusions

17.2% of subjects formed allo-antibodies - a higher rate than in multi-transfused pre- or post-leucodepletion non-MDS but lower than in pre-leucodepletion MDS patients. This supports the known predisposition of MDS patients to RBC allo-immunization and also suggests that leucodepletion may reduce this in these subjects. Auto-antibody formation too was less than previously reported in MDS. In this limited study no clear conclusion could be drawn on the relationship between MDS subtype, age and gender and allo- or auto-immunization risk.

P24
Allo-adsorptions in AIHA - for how long are they necessary?

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Introduction & aim

Allo- rather than auto-adsorption is required to remove pan-reactive auto-antibody masking allo-antibody in recently transfused AIHA patients because persisting transfused red cells can potentially adsorb out allo-antibody. We aimed to determine for how long following a two unit transfusion, 'allogeneic' red cells were capable of doing this.

Methods

An in-vitro model was created mimicking in-vivo post-transfusion ratios of transfused RBC, autologous RBC & plasma at 10-day intervals from d 0 to 90 in a hypothetical 70 kg man with Hct 0.25 receiving 2 units of PRBC assuming minimal haemolysis (2.5mL / day) of 'transfused' RBC with reduced but steady 'autologous' RBC production or mild haemolysis of both 'autologous' and 'transfused' RBC (life span, 60 days), initial recipient blood and RBC volumes of 5 and 1.25 L respectively and an effective transfused RBC volume of 0.29 L (PRBC volume 0.3 L x Hct 0.6 x post-transfusion recovery 0.80 x 2). Proportionate mixtures were set up of 'transfused' K-pos, 'autologous' K-neg RBC and a 1/ 40 saline dilution of anti-K substituting plasma to reflect a steady blood volume of 5 L. Following incubation at 37°C for 1 hour, we looked for free anti-K in the supernatant using an IAT technique and K-pos RBC.

Results

In our experiments 'transfused' K-pos RBC were capable of adsorbing out significant amounts of (but not all) anti-K up to day 70 and 50 'post-transfusion' under conditions of 'minimal' and 'mild' 'haemolysis' respectively. Thereafter anti-K was easily detectable in the supernatant plasma.

Conclusions

This experiment, employing a physiological model, suggests that the auto-adsorption technique may be acceptable for detecting underlying masked allo-antibody earlier than currently thought in recently-transfused patients with AIHA though in-vivo conditions are not easily reproduced in-vitro and though other antigen-antibody combinations, transfusion volumes or antibody titres may have altered results.

P25
Quality of hyper-concentrated platelets (HCP) for intra-uterine transfusions (IUT) by a non-apheresis method

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Introduction & aim

Platelet IUT are used to treat neonatal allo-immune thrombocytopenia. In addition to other specifications, platelet concentration > 2 x 10^{12} / L and volume < 60 ml are required and are ideally achieved using apheresis systems e.g., Spectra (Cobe) (Dumont, et al. Transfusion 2000, 40: 91). In its absence we attempted to prepare & test the quality of HCP for IUT using processing rather than apheresis methods.

Methods

Nine day-6 pre-storage-filtered apheresis platelet units were used. After transfer to suitable bags and centrifugation at 3616 g x 11' at 20C, supernatant plasma (equivalent to the difference between the final desired and initial volumes) was removed. HCP were rested at RT x 1 h, re-suspended and then sampled. Volumes, platelet & white cell counts, pH, swirling, ∆ MPV & ∆ plat (citrate-sample MPV / platelet count – EDTA-sample MPV / platelet count respectively and indicators of platelet quality) were measured pre- and post-processing.

Results

parameter	**n**	**pre-processing**	**post-processing**
volume [ml]	9	208.3 (193 – 222)	55.6 (39 - 68)

platelet count [x 10^{12}/L]		1.348 (1.214 – 1.496)	4.01 (3.36 – 6.16)
platelet yield [x 10^{11}]		2.80 (2.61 – 3.17)	2.16 (1.80 – 2.45)
white cell count [x 10^{6}/L]		0.20 (0.05 – 0.50)	NT
pH		6.97 (6.82 – 7.16)	6.63 (6.43 – 6.80)
swirling		Y	Y
MPV [fl]	5	0.62 (0.5 – 0.8)	0.26 (-0.3 – 0.7)
plat [x 10^{12}/L]		0.04 (0.038 – 0.065)	0.01 (-0.4 – 0.56)

Results recorded as mean (range)

Conclusions

Despite using expired platelets, HCP characteristics may have been acceptable for IUT. MPV and plat values were reduced but there is a degree of overlap with pre-processing values and those quoted by Dumont et al. The relationship between these parameters and in-vivo efficacy is uncertain. Results with fresher platelets may well be better. These results suggest that non-apheresis methods may be sufficient for preparing HCP for IUT if apheresis systems are unavailable.

P26
RBC phenotyping post-transfusion in an experimental model

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New Zealand Blood Service, Christchurch

Introduction & aim

RBC phenotyping may indicate what antibodies may or may not be formed but may be difficult to do post-transfusion because of allogeneic RBC. But it is the regularly-transfused patient in whom phenotyping is often required. We aimed to determine how soon after hypothetical transfusions an unequivocal recipient RBC phenotype could be established.

Methods

An in-vitro model was created mimicking in-vivo post-transfusion ratios of K-pos ('txed') and K-neg ('auto') RBC at 10-day intervals from d 0 to 90 in a hypothetical 70 kg man with haematocrit 0.25 receiving 2 or 4 units of packed RBC (PRBC). PRBC haematocrit of 0.6, post-transfusion recovery 80% and minimal destruction of transfused RBC (c. 5.0 ml / day) were assumed. 0.8% suspensions of the mixtures were tested on Kell phenotyping cards.

Results

'two unit transfusion'

Day post-tx	0	10	20	30	40	50	60	70	80	90
predicted txed	290	265	240	215	190	165	140	115	90	65
In-vivo post-tx vol. (ml)		auto			1250					
vol. used txed	0.145	0.132	0.120	0.107	0.095	0.082	0.070	0.057	0.045	0.032
in expts. (ml)		auto			0.625					

reaction grade	0				not tested (NT)					

'four unit transfusion'

predicted txed	580	530	480	430	380	330	280	230	180	130
In-vivo post-tx vol. (ml)		auto			1250					
vol. used txed	0.290	0.265	0.240	0.215	0.190	0.165	0.140	0.115	0.090	0.065
in expts. (ml)		auto			0.625					
reaction grade	2 (mf)	2 (mf)	2 (mf)	1 (mf)	1 (mf)	1 (mf)	0		NT	

Conclusions
In this experiment a hypothetical 'two unit K-pos transfusion' did not interfere with detection of the 'recipient's' K-neg status at any stage 'post-transfusion'. A similar 'four unit transfusion' caused equivocal results to 'day 50 post-transfusion' preventing establishment of the 'recipient's' Kell-neg status.

P27
Understanding saves blood

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Aim
To maximise the efficient use of a rare resource by reducing the amount of donor blood product discarded in Tasmanian hospitals.

Method
Key representatives from the 6 transfusion laboratories in Tasmania met to discuss and develop a strategy to minimise the waste of blood products within the state. A documented memorandum of understanding (MOU) based on an ARCBS model was produced outlining the technical requirements for the participants. In the MOU all parties agreed to transfer blood products between sites on a regular and ongoing basis, particularly from the low use sites to the high use sites, where there is a greater likelihood of the product being used. Red blood cells were initially selected as the target product.

Result
This initiative resulted in an overall reduction in discarded donor red blood cells (due to expiry) for Tasmania from 10.3% (1206 units) of all red blood cells issued by ARCBS in the 2003-2004 year, to 4.2% (688 units) in 2005-2006.

Conclusions
The Tasmanian Blood memorandum of understanding has dramatically reduced the amount of donor blood discarded in Tasmania due to expiry. The group is currently targeting platelets.

P28
'An Australian First': A dedicated nurse consultant for intravenous immunoglobulin (IVIg) use in South Australia

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Background
Nationally the use of IVIg increased by sixteen percent over two years and in response to this the SA Australian Red Cross Blood Service (ARCBS) IVIg User group developed dosage guidelines and approached the Department of Health to fund an IVIg Project Nurse within the 'BloodSafe' Program. 'BloodSafe' is focused on improved safety and appropriateness of transfusion practice.

Some of the major objectives of the role are:
- Ensure efficient and effective use of intravenous immunoglobulin in consultation with key stakeholders
- Develop comprehensive state-wide management plan
- Promote safety and quality of IVIg administration by
  - participating in dedicated review clinics
  - facilitating patient reviews
  - supporting any changes following reviews
  - assisting with dosage issues
  - educating patients and staff and
  - improving inventory management

Achievements to date:
In collaboration with consultant Immunologists:
•
Dedicated Immunodeficiency clinics have been established and reviewed 80% of patients across SA receiving IVIg; resulting in dosage adjustments in 36% of patients (10% increase and 26% decrease dose).
•
Potential savings related to dosage adjustments of 1,400gms IVIg for 12 months if adjustments remain constant. Equating to potential savings of
  - $140,000 for IVIg if an estimated price of $100 / gram is used
  - $44,000 for infusion related costs and
  - at least 350 hours of donor time.
- Immunodeficiency clinical management database has been established and now functioning at 3 sites across SA.
- Adverse event investigation and follow-up.
- Development of state-wide home subcutaneous (S/C) immunoglobulin therapy program.
- IVIg product education including safe administration practice.
- Development of education material.

Conclusion
A coordinated approach across SA has resulted in:
- Improved patient care.
- Improved safety and quality related to use and administration of IVIg
- Dosage adjustments and subsequent product and infusion cost savings resulting in the role being cost effective.
- Enhanced knowledge of IVIg use and administration.

Thankyou to the Blood, Organ & Tissues Program SA Department of Health (Ms S Ireland) for support and funding.

P29
The introduction of subcutaneous immunoglobulin replacement therapy in South Australia (SA)

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Introduction
Chronic long-term IVIg therapy requires regular visits to hospital, whereas subcutaneous (S/C) immunoglobulin home therapy offers many benefits for suitable patients including:

- reduced hospital admissions
- treatment given at a time convenient to the patient and family at home
- eliminating the need for the patient to take time off work or school to attend for treatment
- potential reduction of side effects experienced with IVIg
- equivalent therapeutic efficacy to IVIg.

Process
Guidelines, policies and procedures including informed consent, education packages and a product order form were developed in consultation with immunologists, transfusion service managers and hospital transfusion committees. This program was approved by the State IVIg User Group under the auspices of the Australian Red Cross (ARCBS) and Department of Health (DoH).

Patients attend a minimum of 3 hospital-based education and training sessions covering administration, management of potential side effects and correct home storage conditions for S/C immunoglobulin. Patients do not commence self-administered home therapy until they are confident and competent.

The equivalent dose of normal immunoglobulin (160 mg/ml; CSL) to the patient's current intravenous dose is administered subcutaneously. The S/C immunoglobulin is infused over two hours; one to three times weekly depending on total dose.

Conclusion
Currently 5 adult patients and 1 child are receiving S/C immunoglobulin at home while a further 2 are undergoing training. This form of treatment has been well accepted by patients, parents and hospital staff. Patients have reported high levels of satisfaction as it allows them control over their therapy and it is convenient with reduced side effects when compared to intravenous immunoglobulin therapy.

P30
O Rh(D) negative red cells: Time for a review of practice?

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Aim
To determine the frequency of Rh(D) mis-matched red cell units issued for urgent (uncrossmatched) and non-urgent requests for transfusion.

O Rh(D) negative red cells are often referred to as the "universal blood group" due to compatibility with all other ABO blood types and are often requested for immediate transfusion support in the event of acute bleeding in patients whose blood group is yet to be determined. O Rh(D) negative red cell units are often held in blood refrigerators in emergency departments and operating theatres and in country hospitals where there may be a need for urgent uncrossmatched blood. Some centres will hold these red cell units until the expiry date at which time the blood will be discarded and replaced with fresh units.

Because of entrenched practices, there are often times when the supply of Rh(D) negative red cell units are at critically low levels. During these times, many centres are forced to issue Rh(D) positive red cell units to patients with chronic anaemia yet they continue to hold O Rh(D) negative red cells for possible acute bleeding episodes.

Methods
Retrospective data relating to the issue of uncrossmatched group O red cells and Rh(D) mis-matched groups in our institution over the past three years will include:

- Number of transfusion episodes where uncrossmatched red cells have been issued
- Number of transfusion episodes where Rh(D) mismatched red cell units have been issued
- Demographics (age, sex) and blood groups of patient receiving O Rh(D) negative and Rh(D) mismatched red cells
- Proportion of patients who had detectable alloantibody in initial antibody screen
-

Follow up (where possible) of anti-D production in Rh(D) negative individuals that have received Rh(D) positive red cell or platelet transfusions

Conclusions
In acute blood loss any request for issue of uncrossmatched O Rh(D) negative red cells should take into account the anticipated use of blood products, long term consequences for an individual patient (considering age, sex and future need) as well as blood inventory

availability. An appropriate decision should be made based on these considerations rather than blanket policies that may threaten more appropriate access by other patients to this scarce resource.

P31
Red cell antibody identification using 0.8% Resolve A panel – the NZBS experience

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Background

The BioVue system was implemented in NZBS Blood Banks from July 2004 to May 2005. The system functioned satisfactorily until 2006 when Blood Banks began to report increased numbers of unexpected reactions when testing with the 0.8% Resolve A panel.

Aims

To determine the frequency of unexpected reactions obtained, when testing with 0.8% and 3% Resolve panel cells.

To determine the detection rate for identifiable antibodies when testing with 0.8% and 3% Resolve panel cells.

Method

Parallel testing of antibody screen positive samples was undertaken by all NZBS Blood Banks using 0.8% Resolve A and 3% Resolve panels (A or C, depending on availability). The data was examined to determine the detection rate for identifiable antibodies and the frequency of unexpected reactions using both 0.8% and 3% Resolve panel cells.

Results

Over 250 patient samples were tested in parallel. The number of panels showing unexpected reactions with 0.8% Resolve A panel was much higher than that observed with 3% Resolve panel (79% and 16% respectively). The number of identifiable antibodies detected with the 0.8% Resolve A panel was also higher than that detected with the 3% Resolve panel (n=166 and 135 respectively).

(Note: this data is preliminary)

Conclusions

The frequency of unexpected reactions obtained with 0.8% Resolve A panel confirmed preliminary reports by NZBS Blood Banks.

The rate of detection of identifiable antibodies was higher with the 0.8% Resolve A panel than the 3% Resolve panels.

[1] 0.8% Resolve A panel manufactured and supplied by Ortho Clinical Diagnostics, Raritan, N.J.

P32
Why test purported Kell negative red cell units for Kell antigen?

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The aim of this poster is to draw attention to the low level of risk associated with issuing purported Kell Negative Red Cell Concentrate to women of childbearing age and who do not have Kell antibodies, without testing for the presence of the Kell antigen on the donor red cells.

An analysis of the frequency of units labelled as Kell negative since the introduction of the Progesa system by the Australian Red Cross Blood Bank in Melbourne was found to be approximately 1 in 4,000 or 0.00025, at a Melbourne Maternity Hospital

The incidence of Kell negative women is reported as 91%.

The reported antigenic rate for the Kell antigen is 0.1 per unit transfused.

Using the observed labelling error rate, this represents a risk rate of 2.3 immunisations per 100,000 units transfused.

If the possibility of a Kell negative woman producing a Kell positive baby is 0.045, the calculated risk of HDNB is therefore approximately 1 per 1,000,000 units transfused.

The reported background rate of HDNB due to Kell in the second pregnancy is about 1 in 3,500 (Mollison).

The question therefore is "Why test for Kell on purported Kell negative units?"

P33
Platelet usage in 7 New Zealand hospitals

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New Zealand Blood Service

Aim

To investigate the usage and appropriateness, using ANZSBT guidelines, of use of platelets in New Zealand by auditing platelet issues within the 7 main urban or tertiary hospitals that account for 78% of platelet issues nationally.

Method

Transfusion Nurses Specialists prospectively collected data on a minimum of 50 platelet transfusion episodes each. Two medical assessors reviewed each episode for clinical appropriateness.

Results

392 episodes were collected. The commonest indication was marrow failure, with or without risk factors, accounting for 46% of issues. Surgery, cardio-pulmonary bypass and bleeding accounted for a further 12 – 14 % each. The mean platelet increment was 18 $x10^9$/L per unit where pre and post platelet counts were available within 24 hours before and after transfusion. ABO incompatible platelet transfusions were given in 2.5% of episodes. Cardiopulmonary bypass and surgery accounted for 51% of these episodes. Overall 86% of episodes were considered to have an appropriate or probably appropriate indication for platelets. Transfusions for marrow failure without risk factors and for cardiopulmonary bypass were appropriate in 72% and 73% of episodes respectively. A double or greater therapeutic dose was issued in 12% of episodes. 78% of these were considered an appropriate use of platelets.

Conclusions

Appropriateness of use of platelets is comparable to other published studies but could be improved in the settings of marrow failure without risk factors and cardiopulmonary bypass.

P34
The Rh(D) project – Victorian perspective

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Aim

The Rh(D) Project involves deliberate immune stimulation of Rh(D) negative donors to induce and enhance Anti-D formation via primary immunisation and boosting programmes, to achieve and maintain self-sufficiency in the supply of Anti-D for Rh(D) prophylaxis. The purpose of this Victorian study was to determine the seroconversion rate of primary immunisation donors and the time interval to conversion, examine factors affecting both primary and secondary donor response to boosting, and to compare the levels of Anti-D achieved by our donors.

Methods

Data was collated and reviewed from 42 Victorian Rh(D) Project donors (31 from the primary immunisation programme and 11 from the boosting programme).

Results

Seroconversion was found to occur in 64.5% of primary immunisation donors, with the majority forming Anti-D following a single injection of cells from an accredited cell donor. The time intervals from exposure to seroconversion ranged from 1 month post 1st immunisation to 2 months post 3rd immunisation. No correlation was found between age, blood group, or Rh phenotype of immunising cells on the donor response to a cell injection, however it is difficult to draw firm conclusions given the small sample size available for analysis. Maximal Anti-D levels achieved following either primary or secondary boosting varied significantly from 0.2 to 2574 IU/mL.

Conclusions

The aim of the Rh(D) Project is to increase the availability of Anti-D for Rh(D) Immunoglobulin manufacture. It is therefore important to identify predictive factors of Anti-D stimulation, thus improving seroconversion rates, and to identify factors that may promote maximal donor response to boosting. So far this study has not revealed significant donor factors to achieve these goals. Further criteria such as HLA typing of donors may need to be considered in future, to aid in the recruitment of suitable candidates for the Rh(D) Project.

P35
A positive saving: Avoiding blood wastage in Tasmania

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Aim

To investigate the success of the transfer of blood components to the Royal Hobart Hospital (RHH) from other laboratories in Tasmania. In March 2004, due to the high percentage of outdated units in Tasmania (8.97% in 2002-2003 financial year), a procedure was implemented to allow laboratories around the state to transfer red cells that were close to expiry to the RHH, the largest user of blood products in the state, with the aim of decreasing state-wide wastage statistics.

Methods

Units received from other laboratories in the first six months of 2006 were reviewed. Information such as the origin of the unit, blood group of the donor unit and recipient, as well as the unit expiry date and date of transfusion were collected and analysed.

Results

In the first six months of 2006, 292 packed cells and 32 pooled platelets were received at the RHH originating from the Launceston General Hospital, Gribbles Pathology, North West Pathology and Hobart Pathology. 240 of the packed cells (82%) and 21 platelets (66%) were transfused. At time of receipt of the transferred blood products at the RHH, there was an average of 9.1 days left before expiration of the red cells and 1.8 days left before expiration of the platelets.

Conclusion

The majority of the units transferred to the RHH were transfused with the 240 saved units so far this year representing a potential saving of >$100,000. In the 2005-2006 financial year the percentage of outdated units state-wide was 4.34%, in comparison to 8.97% in 2002-2003. To be considered, however, is that past and current research has shown that increasing storage time of red cells may have negative effects on oxygen delivery as well as inducing cytokine release. Therefore, ultimately it is important that while a large degree of wastage is being avoided, the blood products should be used as early in their life as possible for the best patient outcome.

P36

Blood transfusion requirements for patients undergoing induction chemotherapy for acute myeloid leukaemia. How much is enough?

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Background

In Australia approximately 1400 people are diagnosed with acute myeloid leukaemia (AML) annually. Transfusion support is integral to their care and represents substantial blood usage, much of which is modified. However, there is little information available to quantify their needs, and no local data.

Aims

To assess transfusion requirements of adults receiving induction chemotherapy for AML.

Methods

Retrospective review of transfusion requirements of 122 consecutive patients with newly diagnosed AML who received induction chemotherapy at our institution from November 2000 to June 2006. Patients receiving palliative care only were excluded. Requirements for blood products, including plasma derivatives, up to day 35 of induction were assessed.

Results

Median age was 53 years (range 17-73). 92 patients received induction with standard dose cytarabine over 7d by continuous infusion, with 3d of anthracycline (7+3); 11 received high dose cytarabine regimens; and 6 received low intensity induction regimens. 13 patients with acute promyelocytic leukaemia received induction with ATRA and idarubucin. All patients received filtered and irradiated blood products.

Median transfusion requirements during induction were 14 units red cells (range 4–42) and 9 platelet doses (range 1–37). Most patients did not require plasma products or albumin (maximum usage for one patient 17 units fresh frozen plasma; for albumin 24 units). 16 patients (13%) required special products such as washed red cells or HLA-matched platelets. The major usage was of HLA-matched apheresis platelets (12 patients receiving a median 2 doses each, range 1–6).

Conclusions

Accurate assessment of the transfusion requirements of this group will assist in planning therapy and directing resources. Whilst the median number of transfused blood products appears relatively low, there is wide variability in actual need for individual patients. This information should provide guidance to blood collection centres and hospital blood banks in maintaining an adequate inventory based upon anticipated transfusion needs of these complex patients.

P37

The efficacy of fresh, unrefrigerated whole blood versus component blood products – a burns case study

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A 35 year old male working on a farm suffered extensive burns when a diesel fuel tank exploded. The patient had escharotomies performed to his legs and feet on the day of arrival (day 1). Debridement of both legs was scheduled for day 3, by which time the necrotic areas had become septic. Whole blood, along with one component blood product, was transfused during the debridement operation, with no post operative blood product usage.Debridement to the chest and abdomen occurred on day 35, with whole blood used intra-operatively, and packed red cells transfused post-operatively.On day 46, debridement was repeated on both legs due to ongoing sepsis. Whole blood was unavailable at this time, and multiple units of packed red cells were transfused both intra and post-operatively.

A comparison of product usage, haematological indices and intra-operative photographs demonstrates more effective haemostasis when fresh, unrefrigerated whole blood is used compared to component blood products.

P38
Transfusion-related acute lung injury (TRALI) the Queensland experience

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Introduction

Transfusion-Related Acute Lung Injury (TRALI) remains a serious and important transfusion complication, as it has been the top cause of transfusion related deaths in the US for the past 3 years. In spite of its adverse consequences, our data of 29 TRALI cases from March 1999 to July 2006 confirms that TRALI is still very under reported in Queensland.

Results

Average number of cases per year: 3 to 4 (except 2004 with 8 cases)

Highest Patient groups: oncology patients (45% cases)

Blood products: packed red blood cells and FFP

Leukocyte antibodies detected in associated donations:

- human neutrophil antigens (HNA) (34%),
- HLA class I (43%) and
- HLA class II (32%).

Benefits of investigation

These investigations have allowed ARCBS-QLD to confirm donations implicated in TRALI and ensure that products from these donors are permanently excluded from therapeutic use, thus preventing TRALI in other blood recipients.

It is also vital to preserving our limited blood stocks as it ensures that other donors who have been cleared of involvement can still be used for therapeutic purposes.

Key findings

Crossmatching of patient's neutrophils with donation serum provides an effective way of confirming if a donation is implicated in TRALI.

The consistent small number of cases reported to ARCBS-QLD suggests that TRALI is still very under reported in QLD. The reported incidence of TRALI of 1 in 5000 units transfused (Popovsky 1985), suggests that QLD should have about 31cases/year.

The under reporting and under investigations of TRALI cases prevents the ARCBS from identifying and excluding donations that are implicated in TRALI.

Therefore it is important that there is increased awareness of TRALI and that all suspected cases be reported to the ARCBS for investigation as soon as possible.

P39
Parallel testing of automated and manual pre-transfusion testing methodologies: High concordance observed for both typing and screening

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Aim

To investigate and assess the concordance of reaction strengths and interpretation of blood groups and antibody screens in routine pre-transfusion testing carried out using manual and automated methodologies.

Methods

Specimens submitted for routine pre-transfusion testing were investigated in parallel using manual techniques and an automated system and results were compared. The manual laboratory methods were, ABO and Rh (D) typing by tube techniques and antibody screening using a two cell screen using a manual gel card technique. Parallel testing was carried out on ~3000 routine pre-transfusion samples and

the results were evaluated. A difference in the grading of a result was defined as a change of two grades or more. Results for specimens for which the automated system gave an indeterminate result when the manual technique had given a clear score, were also defined as different.

Results

The parallel testing of ~3000 specimens for ABO and Rh (D) generated 15000 results. Of these, 98.3% showed concordance between the two methodologies. The 1.7% of specimens for which there was a different ABO and/or Rh (D) score, were frequently due to increased reaction strength in the reverse grouping with the CAT system. The automated system also detected an undefined D-variant, which was not found by routine testing techniques. Parallel antibody screening of ~3000 specimens generated 6000 results. Results for these were analysed in two groups. For specimens with a negative antibody screen using legacy methodology the concordance was 98.9%. For specimens with a positive screen using legacy methodology the concordance was considerably lower, 88.2%. This illustrated that there was variation in interpretation of reaction strength between the two methodologies.

Conclusion

It is of interest that there was a significant difference in the interpretation of the antibody screen, when the reaction strengths and indeterminate results were also considered. There was minimal difference in results for the ABO and Rh (D) typing. Analysis of samples on the automated system provided consistent interpretation of reaction patterns, a more efficient workflow giving a capacity to redeploy laboratory staff and an improvement in safety associated with processing of specimens in a closed environment.

P40

IVIG and Rituximab allows successful solid organ transplantation in patients with a positive crossmatch and donor specific anti-HLA antibodies

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Background

Intravenous immunoglobulin (IVIG) is used increasingly for immunomodulation. In end-stage renal failure (ESRF), transplantation of patients with positive cytotoxic crossmatch (XM) with donor specific anti-HLA antibodies (DSAb) was not previously possible due to rejection and organ loss. Up to 20% of ESRF patients have DSAb. However, using IVIG +/- plasmapheresis (PP), successful transplantation of such patients has been reported (Jordan et al, 2003). Rituximab is postulated as appropriate treatment of antibody-mediated transplant rejection (AMR) in this context.

Aims

To demonstrate that HLA-mismatched kidneys can be successfully transplanted using IVIG and PP, and to evaluate rituximab in AMR of such cases.

Methods

Crossmatches were performed by complement-dependent cytotoxicity (CDC) on potential donor and recipient pairs. If positive with T &/or B cells with demonstrable DSAb on CDC and/or solid phase assay (ELISA, Luminex®), recipients commenced mycophenolate mofetil a week before transplantation, PP five days before surgery and subsequently tacrolimus. IVIG 2g/kg was given 48 hours pre-transplant and one month after transplantation. Any transplant demonstrating AMR was treated with PP, IVIG and rituximab.

Results

We describe 6 successful renal transplants in which a positive XM with DSAb was overcome by PP and IVIG. 4 patients had HLA Class I DSAb, 2 had both both HLA Class I and II DSAb.

Graft and patient survival is 100% (mean follow-up 16 months, range 6 - 25). Two patients developed AMR, treated successfully with PP/IVIG (0.1g/kg) and rituximab. The renal function of the transplanted organs is excellent; creatinine and eGFR equivalent or better than donor (~60mL/min/1.73m). There are no episodes of cellular rejection, opportunistic infections, or post-transplant diabetes mellitus.

Summary/Conclusions

XM positive transplantation can be performed with a regimen of PP, IVIG and lower doses of conventional immunosuppression. Rituximab, with IVIG and PP, is successful treatment in AMR in these patients.

P41

Alloimmune neonatal neutropenia due to antibodies against HNA-1a and HLA Class I

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Introduction

Alloimmune Neonatal Neutropenia (ANN) can be caused by passive transfer of maternal antibodies to human neutrophil antigens (HNA) or human leucocyte antigen (HLA). ANN due to HLA antibodies are rare as maternal HLA antibodies are usually absorbed by HLA antigens expressed on the foetal tissues and therefore do not enter the foetal circulation in sufficient concentration to cause accelerated neutrophil destruction.

Case report

A male neonate was born at 32 weeks gestation to a woman, with a history of two miscarriages, after a fifth, uncomplicated pregnancy. The neonate did not require oxygen and had normal APGAR scores. As per preterm delivery protocol a FBC was performed (Hb 179g/L, WCC 7.7 $x10^9$/L, neutrophil count (NC) 2.19 x 10^9/L and Platelets (Plt) 233$x10^9$/L). Intravenous antibiotics commenced, which were stopped after 48hrs when blood culture results were negative. At day 12 a routine FBC was taken Hb 156g/L, WCC 9.2 $x10^9$/L, NC 0.09 $x10^9$/L and Plt 347 $x10^9$/L. The finding of neonatal neutropenia precipitated an ANN investigation

Results

Day 33 samples from the mother, father and infant were tested by the granulocyte immunofluorescence test (GIFT) and granulocyte agglutination test (GAT). The maternal serum reacted against paternal neutrophils (incompatible) and against a panel of phenotyped neutrophils. Further investigation revealed that the maternal antibody had specificity against HNA-1a and Class I HLA. HNA genotyping (father HNA-1a1b, mother HNA-1b1b, infant HNA-1a1b) supported the antibody specificity of anti-HNA-1a.

Follow up FBC at day 87 showed that the neutropenia had resolved and that the infant remained well.

Conclusion

This is was an unusual case of ANN associated with both HNA and HLA antibodies. Neonatal neutropenia should be investigated as future pregnancies may be affected.

P42
Prophylactic anti-Rh(D) – A matter of compliance

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Background

We previously reported the significant laboratory and operational impact of the introduction of prophylactic anti-Rh(D) therapy at 28 and 34 weeks gestation. We now report our data regarding compliance with this protocol.

Method

Laboratory records of 249 eligible Rh(D) negative mothers delivering between July 2005 and June 2006 were reviewed. Data was collected regarding administration of prophylactic anti-Rh(D) at 28 and 34 weeks. The Rh(D) status of the cord blood of the babies was also collected.

Results

Rh(D) negative women that received anti-Rh(D): 28 weeks 179/249 (69%), 34 weeks 189/249 (76%), 28 & 34 weeks 169/249 (68%), 28 weeks only 10/249 (4%), 34 weeks only 20/249 (8%).

Rh(D) negative mothers that received nil anti-Rh(D): 50/249 (20%).

Rh(D) positive cords from babies delivered to these Rh(D) negative mothers: 172/249 (69%). Of this subgroup the number that received prophylactic anti Rh(D) at 28 weeks 123/172 (71.5%), 34 weeks 130/172 (76%), 28 & 34 weeks 115/172 (67%), 28 weeks only 8/172 (5%), 34 weeks only 15/172 (9%), nil 34/172 (20%).

Rh(D) negative cords from babies delivered to these Rh(D) negative mothers: 77/249 (31%). Of this subgroup the number that received prophylactic anti Rh(D) at 28 weeks 56/77 (73%), 34 weeks 59/77 (77%), 28 & 34 weeks 54/77 (70%), 28 weeks only 2/77 (3%), 34 weeks only: 5/77 (6%), nil 16/77 (21%).

Conclusion

Over the last 12 months, and now that this protocol is well established at our hospital, overall complete compliance of eligible Rh(D) negative mothers is 68%. There is room for further education, and improvement of our systems.

In the study period, as a result of this protocol, 61 Rh(D) negative women, who delivered a Rh(D) negative baby, received ultimately unnecessary exposure overall to 115 doses of anti-Rh(D) immunoglobulin. We hope to trial antenatal maternal blood derived foetal Rh(D) genotyping to circumvent this.

P43

Operations Services – "The quiet achievers"

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This presentation outlines the role of Operations Services within ARCBS Tasmania and nationally.

Within the ARCBS organisational structure Operations Services is one of the Operations Portfolio streams which also includes Donor Services, Production and Testing Laboratories.

It is the role of Operations Services to ensure support services that comply with the Code of GMP, Council of Europe guidelines, organisational policies and procedures and other regulations and standards are provided, to ensure smooth day to day operations for the provision of blood products and services to end users occurs, so that the ARCBS can fulfil its Mission to "Provide Life's Best Gift", by the provision of quality blood products services. Additionally Operations Services must consider best outcome for the ARCBS including best practice, workplace: donor & product safety, compliance: risk and human resource management, cost benefit.

Operations Services has a "Whole of Organisation" relationship and covers areas including

- Facilities Management
- Coordinating Capital Equipment planning, procurement and installation
- Critical Equipment maintenance and repairs
- Insurance and Risk.

Each Operations Units has an Operations Services Team responsible for the management of the above areas.

Nationally uniformity is aimed for by each OU following standardised protocols and methodologies.

e.g. The ARCBS plans to upgrade a number of collection centres across the nation, The Operations Services Management Team is involved with the formulation and introduction of "Design Guidelines for Building Donor Centres" ensuring new Donor Centres meet a uniform set of specifications and are built using the ARCBS Project Management Methodology.

P44
Microbial detection in platelets

Clare Lamont

New Zealand Blood Service

Aims

Techniques to reduce the risk of contamination of blood donations have been implemented at the New Zealand Blood Service (NZBS) in line with international guidelines. The BacT/Alert (BioMerieux) microbial detection system was used to determine the bacterial contamination rate in platelets.

Methods

45% of total platelet doses prepared were sampled on day 2 (day 0 = day of collection). Platelet units that were sampled on day 2, which reached expiry on day 5 were held until day 7 and re-tested.

Results

Over 8,600 platelet samples were sampled on day 2 and tested using the BacT/Alert. Over 1,500 have been sampled on day 7. To date, 11 positive results have been recorded from day 2 samples, one of which was classified as a true positive. 5 false positives have been recorded for day 7 samples.

Conclusions

The New Zealand Blood Service experience has demonstrated a contamination rate that is lower than other published data.

P45
Manufacture of clinical fresh frozen plasma from male donor plasma

Clare Lamont

New Zealand Blood Service

Aim

Studies have shown that components with a high plasma content are more likely to result in TRALI than those components with a lower plasma content. Several preventative strategies have been suggested. This study focussed on the manufacture of clinical fresh frozen plasma from male donor plasma. The main aim was to determine the impact that the introduction of a male donor plasma only production model would have on the availability of product.

Methods

The number of fresh frozen plasma units that were issued for a 1 year period was examined in order to establish a baseline requirement to meet clinical demand. From this data, a target of 187 units per week was set. The criteria for manufacturing clinical fresh frozen plasma derived from male donors who had donated in the last 6 months was then applied.

Results

The amount of plasma produced was monitored and compared to the demand. Throughout the trial, the target of 187 units per week was never reached using plasma derived from male donors alone. Competing production demands and logistics were the primary factors contributing to this result.

Conclusions

From the data obtained from this trial, it is evident that the introduction of the manufacture of clinical fresh frozen plasma, derived solely from male donors would have a significant effect on the availability of product. Stock levels would need to be supplemented by female derived plasma

P46
Emergency donor panels: Artefact from the past, or asset for the future?

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Economies of scale and regulatory issues have encouraged the consolidation of blood centre activities, but patients in need of transfusion can be anywhere. Australia's majority live in and around coastal capitals, but even geographic proximity to blood stocks will not ensure timely access to transfusion if critical infrastructure is compromised.

Emergency donor panels (EDPs) exist in rural Queensland to make transfusion available to patients more than two hours removed from 4 units of fully tested O-negative RBCs. The donor panels should consist of at least 10 group O volunteers, of whom 6 or more are O-negative. A local population of at least 1000 is needed in order to establish and maintain a panel. Panel members must be screened for transfusion-transmissible diseases every three months. Locally high prevalence of transmissible disease makes stored blood preferable to EDPs. Conversely, where stored blood is delivered through a long and tenuous supply chain, EDPs might usefully coexist as a supplemental resource.

Presently, only about 25 EDPs are active in rural Queensland, down from 51 in 1998 and a maximum of 122 prior. The reduction follows improvements in infrastructure, but also reflects the challenges of keeping donors, nurses, and local medical directors motivated and practiced.

Cost per quality-adjusted life year (QALY) could be invoked for or against the maintenance of EDPs, if accurate data were available. On the other hand, many safety initiatives in transfusion medicine assume a disproportionately high cost per QALY compared with other medical interventions. Driven as we are by hypothetical risks, it might be argued that hypothetical risks associated with terrorism, natural disaster, or pandemic would justify an expansion, rather than contraction, of our EDP capacity.

P47
Investigation of Blood in Motion as a solution for storage of red cells at the bedside for massive transfusion

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Background

Transportation of red cells (RBC) to operating theatres from the hospital blood bank (HBB) is required to be safe and ideally reduce RBC wastage in instances when these cells are not transfused. Liverpool Hospital is considering the implementation of a system whereby, on an as needs basis, transportation of up to 6 units of RBC occurs. In situations when storage in a designated blood refrigerator is not desirable (eg. urgent/massive transfusion), the RBC must be maintained in the Orthopaedic and Accident and Emergency theatres at 2-6°C until transfusion is required. Wastage is potentially reduced, since RBC which are not required are able to be returned to the HBB for transfusion to another patient. This system also provides an increased timeframe to safely transfuse RBC, which allows greater flexibility in transfusion decisions.

Blood in Motion (BIM) is a passive transportation system, whereby the product for transport is locked between two pre-cooled elements filled with a phase change material (PCM). Inserts can be added which can alter the number of units able to be transported. Co-ordinated melting points of PCM hold the product at a designated temperature between the thermally charged elements during transport. The product (RBC) temperature is kept constant for a period of time regardless of external climate temperatures.

Liverpool Hospital seeks to achieve an effective, controlled, cost effective and time efficient transport method for RBC between the blood

bank and the Orthopaedic and Accident and Emergency theatres. The goal is to ensure that fresh blood products requiring refrigeration are available at the bedside in situations of urgency and massive transfusion, where storage in a dedicated blood fridge is not possible.

Methods

The BIM elements and inserts were preconditioned in the cold room (4-6°C for 12-24 hours) prior to inserting into the Silver Bag 11 and subsequent loading of expired RBC or coolant bricks. A digital thermometer with a wired probe was placed with the packs. The thermometer probe was placed between the packs with the lid in place. The Silver Bag 11 was closed and the digital thermometer placed on the outside. The BIM system remained on the floor of a temperature controlled laboratory (22-24°C) with readings taken every hour.

Results

The results show that the coolant bricks were kept under 6°C for approximately 6 hours, and expired RBC were kept below 6°C for between 7-8 hours. The curves on both the coolant bricks and RBC are similar which indicates that these results would be indicative of use within the hospital under the described conditions.

Conclusion

Three issues were identified with future use in mind:

1. People placing RBC into the BIM would need to ensure the correct placement of the Silver Bag 11 coolant lid, as any deviation from the SOP might result in less stable temperatures.
2. If the pre-conditioning standard operating procedure of the BIM elements is not followed correctly, less stable temperatures may result.
3. BIM components might go missing which may require replacement.

BIM was found to be an effective method for transporting and storing small quantities of RBC for a limited period (up to 6 hours). The BIM system has been described as “easy to use” following extensive theatre and hospital blood bank in-servicing. Future application of BIM could be thawed plasma transport.

P48

Case report on a patient with thrombotic thrombocytopaenia purpura (TTP) and transfusion related acute lung injury (TRALI)

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We report a case of a previously well 19 year old female who presented with a one week history of flu-like symptoms and mucosal bleeding. Examination demonstrated limb petechiae and bruising, peritonsillar bleeding and microscopic haematuria.

Her haemoglobin 10^9 g/L, platelet count $10x10^9$/L, coagulation profile was normal, creatinine 110ummol/L, bilirubin 30ummol/L, LDH was 2920 U/L and haptoglobins 0.21g/L. Blood film examination demonstrated schistocytes and confirmed the thrombocytopaenia.

A diagnosis of thrombotic thrombocytopaenia purpura (TTP) was made and she was commenced on plasmapheresis. During her second day of plasmapheresis, she developed dyspnoea and rigors. Examination demonstrated a fever, tachycardia, hypoxia, generalized wheeze and crackles at both bases. Her CXR showed pulmonary oedema. A clinical diagnosis of transfusion related lung injury (TRALI) was made and she was admitted to ICU overnight for high flow oxygen. She was able to resume treatment for TTP and made a full recovery.

Granulocyte Immunofluorescent Test (GIFT – flow cytometry) was performed and cross reactivity was demonstrated between the patient’s granulocyte and plasma from one of the nine donor FFP packs.

Discussion

Transfusion related acute lung injury accounts for 7% of all adverse events reported in the SHOT database and has a mortality rate between 5-25%. Vulnerable populations identified include patients with TTP and patients with haematological malignancies undergoing induction chemotherapy.

TRALI is predominantly a clinical diagnosis. Identification of donor or recipient granulocyte antibodies by laboratory testing is helpful in supporting the diagnosis.

Easy access to granulocyte antibody testing allowed us to quickly identify the implicated donor, minimize the risk of further patient exposure to donor granulocyte antibodies and inform ARCBS so look back and donor deferral could be initiated. The provision of plasma from male donors may additionally reduce exposure to HLA and granulocyte antibodies in this particularly vulnerable group of patients receiving plasma exchange.

P49

Management of blood and blood products in South Australian hospitals

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Aim

Anecdotal evidence from pathology staff show that management of blood and blood products by end-users is often less than optimal. In an effort to improve practice new criteria have been added into hospital accreditation programs that require them to demonstrate appropriate clinical transfusion practice. BloodSafe, a collaborative transfusion safety and quality improvement program between the SA Department of Health and ARCBS, has commenced an audit process to determine the level of compliance with the relevant standard in hospitals and health organisations.

Methods

A physical audit of blood fridges that are located outside of pathology laboratories in metropolitan and rural areas, was undertaken against a range of criteria based on ANZSBT, RCNA and AS3864 standards and guidelines. These criteria included alarm function and quality assurance schedules, security of fridge contents and documentation associated with product receipt and fate.

Results

In the period from January to June 2006 blood fridges located in 21 hospitals around South Australia were audited. Results demonstrated high levels of non-compliance including significant deficiencies in the frequency of alarm testing (<50% compliance), thermograph calibration (<70% compliance) and documentation associated with product fate (<40% compliance).

Conclusion

Audit results demonstrate significant gaps in management of blood products by end-users. This contributes to product wastage and has implications for blood supply, patient safety and accreditation of hospitals and laboratories. Systems that may assist in improved stewardship of blood and blood products include better engagement of transfusion providers in custodianship outside of the laboratory, standardisation of transport containers and procedures, and formal agreements between suppliers, laboratories and end-users that define each party's responsibilities.

P50

Designing an on-line education tool to improve clinical transfusion practice and assist hospitals to meet ACHS EQuIP accreditation criteria

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Introduction

Audits of clinical transfusion practice[1] have consistently demonstrated significant deficiencies in both knowledge and practice that impact on patient safety. Improvements need to be driven by a multifaceted approach that provides for systems, appropriate staff knowledge and a mechanism to enforce compliance. One mechanism for improvement has been to use hospital accreditation processes, with the ANZSBT contributing new criteria to the ACHS EQuIP (4th Edition) process that specifically address transfusion practice. This includes a specific requirement for knowledge credentialing of staff involved in the transfusion process. However large numbers of hospital staff, shiftwork, varying levels of background knowledge and limited resources create significant challenges in staff education. Needs analysis defined an on-line learning tool as being a suitable mechanism to assist hospitals to meet these requirements.

Design and Analysis

An effective e-learning tool must be engaging and replicate an authentic learning environment. This requires knowledge of on-line learning best-practice, learner profiles, learning styles and the learning environment, as well as consideration of interface design, motivational tools and knowledge retention strategies.

Result

A multimedia rich learning tool utilising video, audio, animations, and case studies (combined with didactic instruction) is being used to create an authentic learning environment. A flexible learning pathway gives learners control over sequence, content viewed and assessment. Learner demographics, progress and assessment tools are stored in an SQL database. Following implementation and evaluation at a single hospital site this tool will be available to all South Australian hospitals, and potentially to other areas of Australia. Further development is envisaged to provide additional modules offering advanced content and/or a broader audience base.

Conclusion

On-line learning has a significant role in improving transfusion practice that is only just beginning to be realised. In order to fully realise its potential and justify the costs it is important that these are designed and constructed utilising best-practice educational processes to

engage the learner in an authentic environment.

1 Published and unpublished data from BloodSafe (2003 – 2006) and a number of other groups

P51
Haemovigilance quality improvement project in a teaching hospital: The first 15 minutes of red cell transfusion - effect of audit feedback and education on patient monitoring

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Introduction

Close observation of patients during the first 15 minutes of blood transfusion is vital for early recognition of major transfusion reaction. A pilot audit (n=7) indicated that observations were not recorded within 15 minutes at least once in 100% of episodes, even by staff experienced in transfusion.

Aim

To determine if staff feedback and education can improve compliance of transfusion monitoring.

Method

Utilising a team of one part time scientist under the supervision of the Transfusion Officer

- Establish a baseline for future audit.
- Identify problem areas.
-

Provide feedback, discussion time and focused education, including information on acute haemolytic transfusion reaction.

- Update transfusion protocol in identified areas.
- Present project overview to medical officers and educators from lead areas.
- Re-audit lead areas to determine if improvement is demonstrated 6 months after completed cycle.

Results

Baseline audit: Four wards, including lead wards A&B were surveyed. Observations recorded within 15 minutes for all units/episode: 18.3% (n=252)

A mitigating factor offered by nurses was the time taken to prime the line with saline, up to 10 minutes (unproven). This led to change in data analysis to indicate time taken per unit, and refocusing education to first 5 minutes post-transfusion, when the blood enters the vein.

Wards A&B

% observations/unit	@ ≤15min	@ ≤30min	not recorded
Ward A 2004 (n190)	20%	67%	16%
Ward A 2005 (n41)	21%	81%	5%
Ward B 2004 (n158)	38%	68%	17%
Ward B 2006 (n38)	74%	90%	0%

Marked improvement in observations recorded ≤15 minutes was demonstrated in Ward B, and significant changes in observations documented ≤30 minutes, and in observations not documented, were demonstrated in wards A&B. Ward B staff had recently attended in-house transfusion education.

Conclusion

The results show that a combination of audit feedback & education can make a measurable difference. It is hoped that increased awareness due to haemovigilance activities is partly responsible for the initiative taken by Ward B. Whether or not improvement is sustained will be the subject of future audits.

P52
Haemolytic Disease of the Newborn: A case report of DAT-negative ABO incompatibility

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Background

ABO incompatibility is the most common cause of Haemolytic Disease of the Newborn (HDN), usually producing neonatal jaundice in the absence of significant anaemia. Typically the diagnosis is suspected when a jaundiced group A or B newborn has a positive Direct Antiglobulin Test (DAT), and is confirmed by elution of anti-A or anti-B from the cord red cells. A negative DAT can be misleading, and

result in a delay in diagnosis and appropriate therapy.

Case Report

A 3 day old female term infant was referred for investigation of severe jaundice (unconjugated bilirubin 610 umol/L). The maternal blood group was O Rh (D) Positive and the antenatal antibody screen was negative. The infant was B Rh (D) Positive, and the DAT performed on cord blood was negative. Apart from the jaundice the infant was clinically well. The full blood count on admission was normal, and the haemolytic screen was negative, including DAT, Heinz bodies and G6PD assay. Review of the blood film revealed moderate spherocytosis suggestive of HDN or hereditary spherocytosis. An eluate was prepared from the infant's red blood cells using an acid-glycine elution method (DiaCidal kit), and the presence of anti-B in the eluate confirmed by DiaMed Indirect Antiglobulin Test (IAT). The demonstration of high titre anti-B IgG in maternal plasma provided further evidence to confirm the diagnosis of ABO incompatibility. The infant underwent urgent exchange transfusion, and was discharged on day 7 having made a full recovery. Follow-up investigations at 6 months of age were entirely normal, including repeat G6PD assay and the eosin-5-maleimide test for hereditary spherocytosis.

Conclusion

A negative DAT does not exclude the diagnosis of ABO incompatibility. Antibody elution and maternal anti-A or anti-B titres should be performed when the index of suspicion is high.

P53

Development and preliminary evaluation of an in-line portable non-electrically powered blood and intravenous fluid warmer

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Introduction

Hypothermia and shock occurs commonly in trauma patients leading to potentially lethal complications of myocardial depression, cardiac dysrhythmia, coagulopathy and lactic acidosis. Critically injured trauma patients frequently require fluid resuscitation at the accident scene with rapid transfusion of cold blood (<10°C) or other ambient temperature intravenous fluids further exacerbating the effects of hypothermia. At present warming of intravenous (IV) fluids at accident sites is difficult due to lack of suitable portable fluid warmers that are not dependent on mains electrical or battery power.

Method

A prototype portable blood and IV fluid warmer was developed and evaluated in vitro. IV tubing within the prototype was surrounded by a non-flammable, non-toxic, environmentally friendly latent heat storage material as the energy source. The latent heat source chemical was kept in the liquid state until the IV fluid warmer was required, at which time solidification was induced, releasing the latent heat of fusion. Cold units of expired red cells or IV fluid (4°C) were passed through the blood warmer to determine the efficacy of warming of these fluids. Input and output temperatures (°C) were monitored and recorded using a multiple thermocouple data logger; flow rates (mls/min) were calculated using an electronic balance and stopwatch. Stored red cells were passed through the prototype then tested for indicators of red cell damage (K+ and plasma haemoglobin).

Results

Preliminary experiments using cold water confirmed the design and warming concept. Further testing using cold blood and IV fluids validated that the latent heat IV fluid warmer successfully and consistently warmed IV fluids to output temperatures of 33 to 38°C (Table 1) at clinical flow rates. Additional biochemical testing of stored red cells that had passed through the prototype showed no signs of increased cellular damage compared to age matched red cell controls.

Conclusion

Our portable non-electrically powered fluid warmer using latent heat storage may be used to significantly warm cold blood or intravenous fluids to near body temperature with minimal risk of cellular damage. The advantage of warming IV fluids using the latent heat of fusion of a solidifying liquid is that heat is released at a constant temperature dependent upon the physical characteristics of the material. Therefore the risk of overheating fluids with this type of IV fluid warmer is negligible as warming temperature is limited to the phase change temperature of the latent heat storage material.

Table 1 Summary of Fluid Warming Temperatures

Fluid	**No. Units**	**Mean Volume/Unit (mls)**	**Mean Input Temp (°C)**	**Mean Output Temp (°C)**
Water		1200	6.1	34.2

Saline	1	1000	0.9	33.2
Packed Red Cells	2	194	9.1	36.0
Red Cells	2	256	4.9	37.7
Red Cells	3	285	6.6	38.1
Red Cells	4	255	4.0	36.1

P54
An audit of autologous blood donations: January 2004 – June 2006

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Aim
To assess appropriateness of autologous donation practice including review of surgical indication, patient demographics and induction of pre-surgical, post-donation anemia.

To assess the incidence of positive serological screening tests and subsequent seroconversion during the donation period.

Methods
Retrospective audit of autologous blood donations through Melbourne Pathology and Cabrini Hospital, January 2004 to June 2006.

Results
1129 patients (542 males, 587 females) presented for donation on 2391 occasions during the review period. Mean age of donors was 64 years (17 – 88 years). 55 (5%) were aged 80 years or older. Surgical procedures were predominantly orthopaedic (75%), urological (15%), gynaecological (6%) or plastic surgery (2%). A mean of 2 units (1-4 units) was donated per procedure. The mean haemoglobin at presentation was 141g/L (107g/L-183g/L). 3% of patients had a haemoglobin <120g/L prior to first donation. We observed an average reduction of 9g/L from first to last donation, and of 835 patients who donated >1 unit, 4% had a haemoglobin <120g/L prior to donating their final unit.

A total of 2343 (98%) donated units had data available from serological testing; 19 patients had a positive initial screen for a single agent. No patient seroconverted during the period of donation.

Conclusion
This audit demonstrated that a small percentage of autologous units are still ordered inappropriately based on the type of surgery (as per the ARCBS MSBOS), pre-donation anaemia or positive serology for transfusion-transmitted disease. A predictable fall in haemoglobin with serial donations contributed to pre-surgical anaemia in a number of patients. The value of subsequent serological testing for patients with initial negative serology is questioned. These results will be used to educate and modify future ordering practice.

P55
Emergency blood protocol review

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At the Royal Hobart Hospital we encourage the use of group compatible units for emergencies which we can have available within 10 minutes. In situations where 10 minutes is too long we issue uncrossmatched Rh (D) Negative units. Due to the increase use of this blood over the years, the projected increase due to our ageing population and the decrease in the availability of O Rh (D) Negative blood a strategy was looked at to conserve this blood. Reviewing the Emergency blood procedure has been part of that strategy.

Aim
To evaluate the potential affect of changing the Emergency blood procedure so that men and post menopausal women receive Rh (D)

Positive blood instead of Rh (D) Negative

Methods
Retrospective analysis on all patients who were transfused Uncrossmatched O Rh (D) Negative blood between July 2001 – June 2006 was performed.

Patient characteristics looked at were age, blood group and antibody screen, transfusion reactions, ongoing transfusion requirements and amount of blood products transfused and overall mortality.

Results
Of the 47 patients who were transfused 21 were women (19 – post menopausal) and 27 were men. A total of 104 negative units were transfused. 18 units were transfused to 8 Rh (D) Negative patients, of which, 5 were men and 3 were women (only 1 of child bearing age).

Conclusion
This study suggests that altering the emergency blood protocol to Rh (D) Positive blood for men and post menopausal women will save only a small amount of negative blood. But used in conjunction with other policies can assist in the conservation of O Rh (D) Negative blood in isolated areas where blood supply is limited and resupply will take many hours.

P56
A fluorometric quantitative erythrophagocytosis assay using THP-1 monocytic cells and PKH26 labelled red blood cells (RBCs)

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It is well known that during storage of RBC products, RBCs undergo significant physical and biochemical changes, known as the storage lesion. In vivo, senescent or damaged RBCs are removed from the circulation by phagocytic cells. The exact mechanisms for recognition and removal of RBCs from circulation by phagocytic cells are still unclear. Several in vitro erythrophagocytosis methods are available, however they are limited by poor sensitivity or are semi-quantitative at best.

Aim
The aim of this study was to develop a sensitive quantitative fluorescence plate assay using PKH26-labelled human RBCs to investigate the effect of RBC product storage on the interaction of stored RBCs and phagocytic cells.

Method
RBCs were labelled with PKH26, which integrates into the lipids of the cell membrane. The human monocytic cell line THP-1 was used as the source of phagocytic cells. THP-1 cells were incubated with PKH26-RBCs at 37oC in media containing human AB-negative plasma. Quantitation of ingested PKH26-RBCs was determined by a fluorescence spectrophotometer in conjunction with a standard curve of known numbers of PKH26-RBCs. THP-1 cells were also assessed by flow cytometry (FCM) to determine the proportion of actively phagocytic cells. PKH26-labelled sheep RBCs were used as a positive control.

Results
The optimum incubation time and volume of human RBCs for phagocytosis were established.

Good correlation was shown between the plate and FCM methods for erythrophagocytosis ($p=0.74$). Significantly increased erythrophagocytosis was observed in both methods for RBCs stored for 43 days compared with day 1 ($p>0.009$).

Conclusions
A sensitive quantitative fluorometric erythrophagocytosis assay using the THP-1 monocytic cells has been developed. Increased erythrophagocytosis with product storage provides new data that may improve our understanding of the interactions of stored RBCs with the transfusion recipient's own cells and help identify means for improving transfusion efficacy and safety.

P57
Blood usage project

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Aim
To investigate the causes, and provide remedies, for the apparent over use of red cell transfusions.

Method
The Canterbury District Hospital Board (CDHB) sponsored a review of current transfusion practice by the audit of 100 medical and 100 surgical haemodynamically stable patients. A programme of re education on transfusion guidelines and safe practice occurred together with a review of resources. Re organisation of the ordering of blood was necessary to coincide with the relocation of Blood Bank to the hospital site.

Results

The audit of current practice found that 25% of patients had a post transfusion haemoglobin concentration over 110g/L suggesting over transfusion. Effective ordering and issuing of blood on demand was achieved through the relocation and automation of Blood Bank, in addition to an upgrade of blood delivery systems. Communication was enhanced by developing a link between the CDHB and NZBS computers. Medical and nursing staff were provided with educational material to promote best transfusion practice by the use of posters, a resource folder and improved intranet access in clinical areas. As a result, less blood has been issued despite an increase in patient activity.

Conclusion

Through process improvement there has been a substantial cost saving for the CDHB without compromise to clinical or patient safety.