

Blood and Transplant

Information for hospitals served
by NHS Blood and Transplant

Matters

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Next Edition

Issue 53 will feature articles on:

- Teamwork Delivers: Support for a Special Series of ITUs.
 - Out of Hours Transfusion Audit.
 - IDP.
 - Case Study.

If you would like to comment on any of the articles in this edition of **Blood and Transplant Matters**
please email the Editor: robert.webster@nhsbt.nhs.uk

EDITORIAL

Welcome to Edition 52 of Blood and Transplant Matters and I hope you enjoyed the last edition and found areas of interest and use.

Firstly, may a big thank you be sent to John Forsythe, who is leaving the Editorial Board, for his great contribution to Blood and Transplant Matters. Secondly a warm welcome to Dale Gardiner, who joins the Editorial Board, but will, still, also, continue with his interesting and informative articles.

This edition commences with a solution to the problem of where and how to obtain services. In this case, where and how to obtain Therapeutic Apheresis Service in the South West. Following the success of a Web-Based Roadmap detailing the Apheresis Service provided for each Trust in the North West of England and North Wales. Hollie McKenna describes the process undertaken for the South West region of England. This is followed by another electronic mobile solution, in this case where to easily and quickly find evidence based guidance to aid appropriate transfusion of blood components. Denise Watson, Amanpreet Dhesi, Paul Watson, Helen New and Janet Birchall outline the development of a Blood Component App for smart phones, which will help front line staff make the correct transfusion decisions.

The next few articles take a varied look at organ donation, starting with Oluwayemisi Alabi, Zoe Butler, Laura Machin, Sarah Ralley and Mark Wilkinson taking a look at communication barriers and how to raise the profile of organ donation amongst a local student population by creating Student Representative Posts. These posts had an initial aim of encouraging the local community to inform their families of their wish to be potential organ donors. How this was achieved is fully described. Next, Michael Nicholson gives a brief overview of structure of the National Institute for Health Research (NIHR) Blood and Transplant research Unit in Organ Donation of transplantation, along with a brief outline of the various research themes and cross-cutting themes. Finally in this section Dale Gardiner provides the case for donation memorials and provides a few examples.

Changing tack slightly, Laura Unitt describes the progress NHS Blood and Transplant (NHSBT) has had with the Apprenticeship Scheme so far, with over 120 started or registered interest to start an apprenticeship programme. Chris Sims follows with the reasons for considering a new blood centre to replace Leeds and Sheffield Blood Centres and gives a taste of how the future will look.

As always, there are both CPD Questions based upon these articles, with answers. Some interesting clinical situations with suggested approaches and some references, which I hope are both interesting and informative.

Have a happy read. All good points are due to the authors, any mistakes are mine. Any comments should be sent to myself or my hard working Editorial Assistant Lynne Hodkin at blood&transplantmatters@nhsbt.nhs.uk.

The results of our reader survey are now available and show that Blood and Transplant Matters is equally read by NHSBT and non-NHSBT staff, providing a good spread of current information with the CPD Questions (and answers) and clinical cases provide particularly popular.

Looking to the future we may be producing forthcoming editions as an online version only – no distribution of print editions – which will enable further developments. I would be grateful for comments to be sent either directly to myself or to Lynne Hodkin via our email address given above.

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Development of a Web-Based Roadmap to Improve Access to Apheresis Services for Patients in the South West of England

Background

NHS Blood and Transplant (NHSBT) are major providers of Therapeutic Apheresis Services (TAS) to the NHS, treatments provided include: Automated Red Cell Exchange, Plasma Exchange (PEX), Extracorporeal Photopheresis, Stem Cell Collection, Low Density Lipoprotein Removal and Leucodepletion. The specialist TAS nursing and medical teams provide routine and 24/7 emergency services from eight units across England. NHSBT are not the only provider of TAS services, some Hospitals also deliver a comprehensive and seven day apheresis service through robust in-house arrangements utilising Trust resources. For other Hospitals, access to services is fractured or unclear, particularly as the apheresis service provider often varies between clinical specialties.

The British Committee for Standards in Haematology have emphasised that time-to-treatment is a critical factor in determining patient outcomes in guidelines for the diagnosis and management of Thrombotic Thrombocytopenic Purpura (TTP) and other thrombotic microangiopathies (Scully *et al*, 2012); it is therefore necessary that the referral process is clear, to enable efficient treatment delivery. Furthermore, there is a requirement to identify service gaps which could account for delays in apheresis treatment delivery.

A web-based roadmap, detailing the apheresis service providers for each Trust in the North West (NW) of England and North Wales (Alimam *et al*, 2015), was created in 2013. No service delivery failures have since been reported in the region. An annual NHSBT User Satisfaction Survey, sent to Consultants who have referred patients to TAS in the previous year, highlighted scope to improve the clarity of the referral process and accessibility to referral forms.

NHSBT and the South West Regional Transfusion Committee (SW RTC) have therefore collaborated to improve the efficiency of apheresis referrals. The South West Roadmap webpages, available on hospital.blood.co.uk, provide an overview of the apheresis service providers for each relevant specialty, in the 17 Trusts in the region. The [Roadmap*](#) also provides direct links to referral forms and clinician contact details for NHSBT-delivered apheresis services.

Method

A web-based survey was designed and circulated in November 2016 to all members of the NHS Hospital Transfusion Teams (HTT) in the South West Regional Transfusion Committee. One representative from each HTT

provided service provider information for the specialties within their Trust. Results were mostly obtained through completion of the web-based survey with the exception of four Trusts where results were obtained verbally or by email.

The results of the survey, highlighting gaps in apheresis services in the South West region, were presented at the South West Regional Transfusion Committee meeting in May 2017.

Results

The results of the survey showed that 41% of Trusts have a lack of contingency plans for circumstances when their primary apheresis provider is unable to deliver services. 35% of Trusts offer no weekday out of hours or weekend services and 41% of Trusts have experienced difficulties in gaining access to therapeutic apheresis procedures over the last few years.

The results of this sample demonstrated that NHSBT provides at least one type of apheresis service for 59% of NHS Trusts in the South West region, either directly or indirectly. 35% of Trusts have a formal Service Level Agreement (SLA) with NHSBT, while the remainder may rely on ad hoc or one-off treatment requests.

NHSBT was identified as the main service provider for Extracorporeal Photopheresis (59%), Leucodepletion (52%), Automated Red Cell Exchange (41%) and Low Density Lipoprotein Removal (35%), in the region. Low Density Lipoprotein Removal and Extracorporeal Photopheresis were not offered as in-house treatments in any Trusts. The treatments with the greatest proportion of in-house provision by Trusts were PEX for haematological conditions (41%) and Stem Cell Collection (35%).

While 82% of Trusts offered PEX for haematological conditions either in-house or via NHSBT, fewer Trusts offered PEX for other specialties, as shown in *Figure 1*.

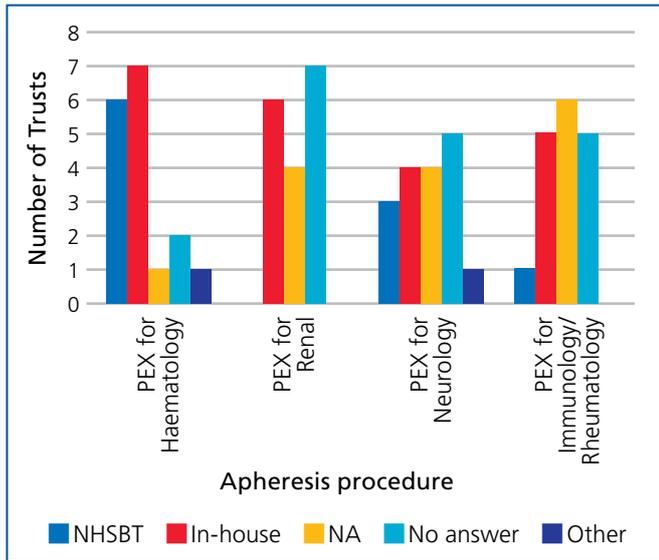


Figure 1: Proportion of Plasma Exchange Service Providers for Haematology, Renal, Neurology and Immunology/Rheumatology Specialties.

Figure 2 displays a screenshot of a Trust-personalised webpage on the hospital.blood.co.uk website, detailing the apheresis service providers for the Royal Cornwall Hospitals NHS Trust. It demonstrates the variability between apheresis service providers in a Trust; while the in-house Renal Department provides PEX for Haematological and Renal conditions, Stem Cell Collections are conducted by the Haematology Department and patients are referred to NHSBT for Extracorporeal Photopheresis.

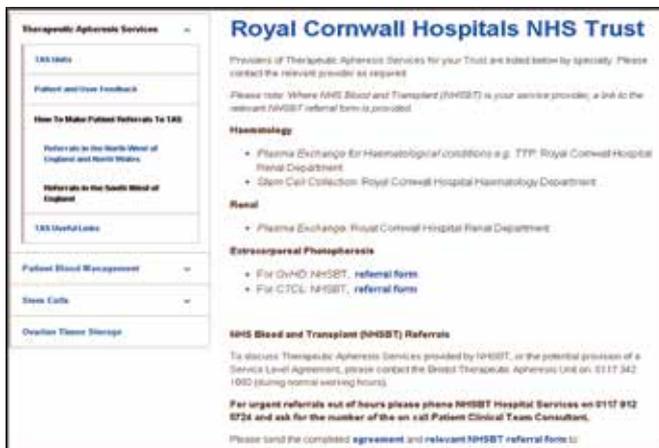


Figure 2: Screenshot of the Roadmap webpage for the Royal Cornwall Hospitals NHS Trust.

Discussion

The majority of Trusts surveyed (82%) reported that a Roadmap would be helpful. The results of the survey support the rationale for Roadmap development to clarify referral pathways and also highlighted gaps in apheresis service provision which needed to be reviewed.

Trust-personalised webpages were developed to outline the apheresis service providers, in the South West of England for all applicable specialties. The webpages

provide direct links to referral forms, and outline clinician contact details for NHSBT provided services. For Trusts without an SLA with NHSBT, the webpages also outline the in-house or tertiary service providers, with a link to the agreement form to be completed for one-off NHSBT requests.

The results from respondents, the majority of whom were Consultant Haematologists, demonstrate that Hospitals have variable service providers and access to apheresis services across the region; 41% of Trusts in the region reported difficulties in gaining access to therapeutic apheresis procedures.

The Roadmap report highlighted the specific gaps in apheresis service provision in order to facilitate discussions between Trusts and service providers. Trusts with SLAs with NHSBT Bristol TAS referred to difficulties in arranging in-patient clinical care with University Hospital Bristol (UH Bristol) NHS Foundation Trust; this information has facilitated discussions between the Bristol NHSBT apheresis Unit and other UH Bristol colleagues. Other Trusts referred to difficulties with budgets and transfers to tertiary providers.

The success of the Roadmap, at improving the clarity of the referral process and accessibility of referral forms, will be reviewed by analysing the NHSBT TAS User Satisfaction Survey Results for 2018 in the South West region. The results for 2018 will be compared to 2016, prior to the webpages development, to demonstrate the beneficial impacts of the Roadmap.

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* <http://hospital.blood.co.uk/patient-services/therapeutic-apheresis-services/how-to-make-patient-referrals-to-tas/referrals-in-the-south-west-of-england/>

Transfusion Guidelines at your Fingertips – “Blood Components” App

National, regional and local audits in England consistently show inappropriate use of all blood components; 15-20% of red cells and 20-30% of platelets/plasma¹. One reason may be that those authorising blood components do not have easy access to recommended national guidelines – not only do they need to find them online, but then have to search the sometimes-lengthy documents for the key information they require.

To support clinicians accessing these guidelines, the National Blood Transfusion Committee (NBTC) produced an indication codes for transfusion tool in April 2013 which amalgamated key national guidelines for adult patients, acting as a prompt for clinicians to facilitate appropriate use and to enable robust documentation of indications. To make the NBTC indication codes more accessible to clinical staff, the NHS Blood and Transplant (NHSBT) Patient Blood Management (PBM) Team developed bookmarks in September 2013. These are a popular resource with demand from hospitals at around 1,000 a month.

In 2015 Ofcom reported that two thirds of people in the UK now own a smartphone². Ownership of smartphones are higher among doctors (98.9%), of which 92.6% said a smartphone was ‘useful’ or ‘very useful’ to support their clinical duties. A report by Mobasher *et al* (2015) found 89.6% of doctors owned medical apps and used these as part of their clinical practice³.

There is anecdotal evidence from Transfusion Practitioners that medical staff ask for an App to download to act as a prompt to facilitate appropriate transfusion. Until now none existed in England which could be recommended.

In June 2016, the NBTC indications were updated. An Anaesthetic Registrar in the South West region with support from an NHSBT PBM Consultant and an NHSBT PBM Practitioner then transferred the bookmark into an App – and the first Blood Codes App was born. The App was developed via an interactive process and the content optimised for digital format. In addition to the architecture build work required, the layout, content, colour etc were prepared, extensive testing was carried out, and finally the App was sent to the NBTC for sign off. The App maintained the identifiable colour features that were used in the bookmark. This was launched in October 2016 and within the first 6 months 3,000 individuals had downloaded it. This clearly identified a demand for blood transfusion guidelines in a digital form. A limiting factor was that the Blood Codes App was only available on Apple (iOS) devices.

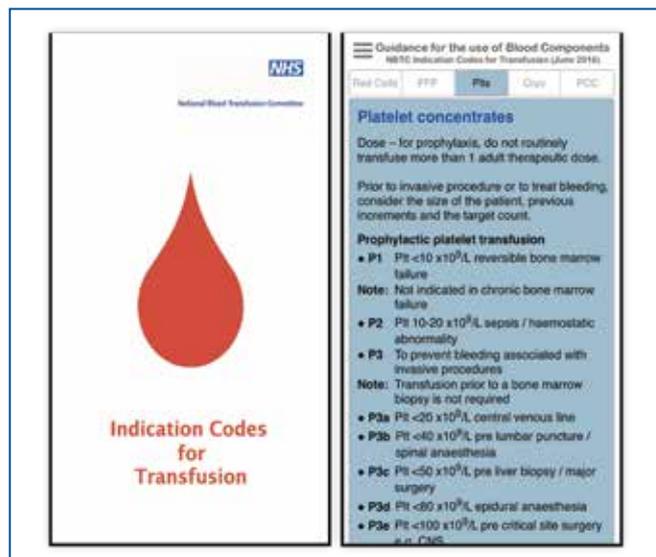


Figure 1: Screen shots of load screen and platelet NBTC indication codes from the original ‘Blood Codes’ App.

The original PBM bookmarks and Blood Codes App were not directly applicable to paediatric transfusion (including neonates and older children). However in February 2017, following publication of the new British Society of Haematology (BSH) *Guidelines on Transfusion for fetuses, neonates and older children (2016)*, the NHSBT PBM Team hosted a national conference on paediatric and neonatal PBM, which attracted over 200 delegates. For this event members of the BSH guideline writing group and NHSBT PBM Education Team developed neonatal and paediatric bookmarks with key indications for transfusion based on the new BSH guidelines, modelled on the format of the adult bookmarks. Following this event feedback from clinical colleagues included requests for this information to be made available on the current App.

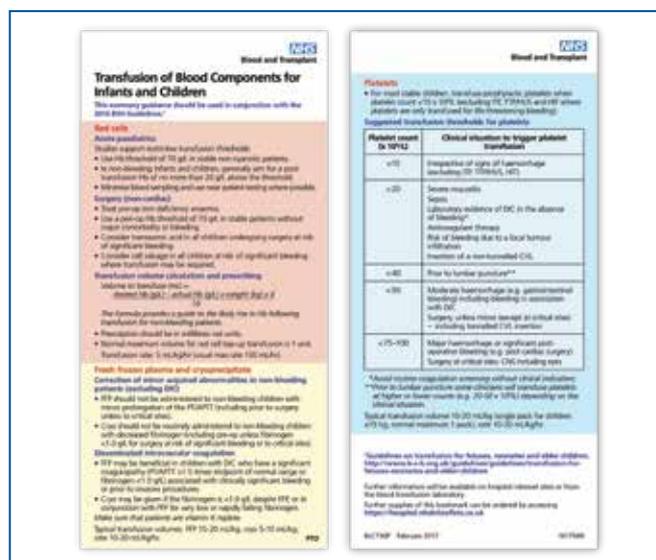


Figure 2: One of the two bookmarks developed from the 2016 BSH Guideline.

In March 2017, the NBTC and NHSBT secured funds to develop the App onto an Android platform and for the inclusion of new user journeys (the pathways of information for digital users) for both. This App was renamed “Blood Components” as it now included both the NBTC indication codes and paediatric transfusion indications from the BSH guidelines. Since late April 2017 this has been available to download for free from the Apple or Play store.

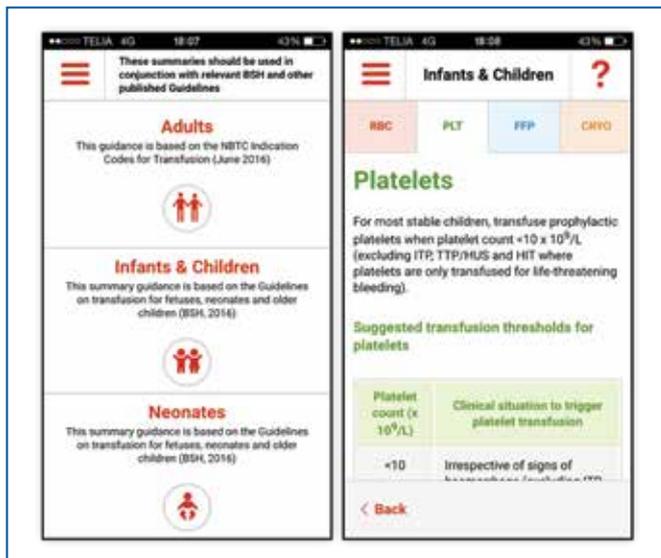


Figure 3: Screen shot of the home page and Infants and Children platelet page from the new ‘Blood Components’ App.

In addition to providing clinicians with easy access to best practice it is now possible to see how often this information is viewed, where and which are the most frequently used specialties and components. In May 2017, there were 1,134 unique visitors and the number of people who return to use the App has increased since release. *Figure 4*, shows the number of new and returning visitors. We expect this to change as time goes on and core users are established – something we will monitor over time. The plan is to further develop the App in the future, following user feedback. Additional areas that may be considered include transfusion for paediatric major haemorrhage and specific requirements.

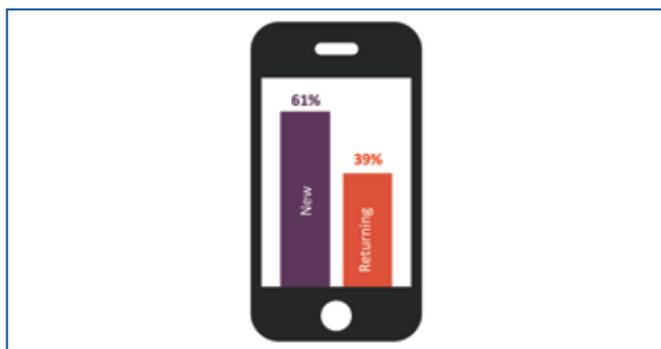


Figure 4: New users are unique visitors. Returning are when a user accesses the App more than once in May 2017.

Figure 5, shows the locations where the App is being downloaded – the majority are in the UK but like the guidelines and online bookmarks there is interest in other countries.



Figure 5: Downloads by country in May 2017.

Figure 6, shows the screens which people interact with – this may change once users settle into what they need to access. This will give the PBM team insights into where more activity around education may exist and areas to target.

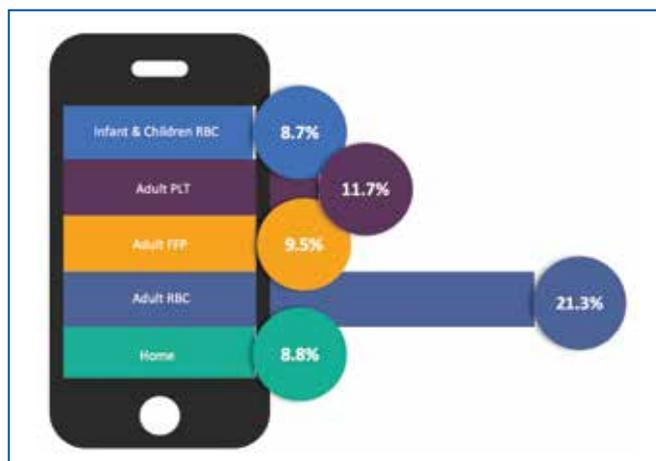


Figure 6: Top 5 screens viewed in May 2017, these may represent people looking at the App upon download. After time, this will give useful insights into what users need to check guidelines on.

We hope this is a useful new tool to support hospitals implement national guidelines to improve safety and care to patients. We welcome your feedback and ideas for further development.

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The Importance of Engaging Healthcare Students in Supporting the Work of Hospital Organ Donation Committees

Introduction

The current supply of organs for transplantation fails to meet demand, with people needlessly dying every day for want of a transplant. Although it is unlikely that there will ever be enough organs to meet the demand, the knowledge that the UK has one of the lowest rates of consent to organ donation in Europe is an impetus to increase donation rates. One of the many recommendations made in the 2008 Organ Donation Taskforce report, supported by all four UK health departments, was the establishment of Organ Donation Committees within hospitals; such as the University Hospital of Morecambe Bay Trust (UHMBT) Organ Donation Committee. The committee meets quarterly, and has the authority to make and implement decisions on donation policy and practice ensuring full consultation with clinical and management staff is integral to the implementation process.

Setting up the Committee

In line with the ambitions of the Task Force, the UHMBT Organ Donation Committee aims to: (1) influence policy and practice within the hospital trust in order to ensure that organ donation is considered in all appropriate situations, (2) ensure that a discussion about donation features in all end of life care, wherever located and wherever appropriate, recognising and respecting the wishes of individuals and (3) maximise the overall number of organs donated, through better support to potential donors and their families.

The Committee consists of representatives from a range of medical specialities such as Emergency Medicine and Intensive Care, in addition to representatives from tissue services and operating theatres. The Committee is chaired by a lay member and is supported by the hospital trust's clinical lead (MW), specialist nurse for organ donation (SR) and a medical ethicist (LM) from the local medical school.

Despite the Committee consisting of a variety of members, the Committee identified the possible benefit of widening its representation to include local nursing and medical students. Whilst 90% of individuals report a positive outlook on the process of organ donation, it is often within healthcare settings where practitioners find difficulty in broaching the conversations with families and individuals (Ozdogan 2001). This difficulty in communication may cause loss of an individual's ability to consent to donation due to lack of information and awareness of the donation process. Whilst this demonstrates practitioners are at the centre of initiating the donation process (Ertin *et al* 2010), it highlights the sheer importance for healthcare professionals to be educated about organ donation, its process and how to break down communication barriers when discussing donation with individuals and their close relatives (NHSBT 2012). These initial conversations are crucial to establishing contact with NHSBT, yet it has been noted that nurses express concerns due to their lack of knowledge and understanding in regard to the concept of donation (Lin *et al* 2010); whilst medical students

display lack of knowledge surrounding the subject also (Bardell *et al* 2003). Furthermore, transplantation is not a fundamental part of the curriculum for either of these professions, resulting in practitioners feeling out of depth and uncomfortable with the scenario of possible donation due to a lack of experience and understanding (Anker *et al* 2009).

In light of this, the UHMBT Organ Donation Committee alongside Lancaster Medical School joined forces to create two Student Representative posts (OA, ZB) that could feed into the work of the Committee to address these issues and raise the profile of organ donation amongst the local student population. The overarching role of the Student Representatives being to: (1) actively participate in organ donation committee meetings, (2) identify opportunities for nursing and medical students to contribute to discussions relating to organ donation at a local and national level and (3) feedback to nursing and medical students on organ donation policy and practice developments at a local and national level.

Students were required to submit an application and were interviewed to elucidate why they wanted to apply for the role, how it would relate to their future careers, and how they would contribute to the work of the Committee. Zoe Butler, a third year nursing student at The University of Cumbria and Oluwayemisi Alabi, a fifth year medical student at Lancaster University were appointed representatives for the Committee and led a newly formed sub-committee involving other students.

Once formed, the Student Representatives organised an initial meeting with the sub-committee with representation from the UHMBT Organ Donation Committee present to discuss the aims for the academic year. The sub-committee recognised that family decline is currently the biggest obstacle to donation and that families are more likely to agree to donate their deceased relative's organs if their wish to donate was known to them. With this in mind the student sub-committee decided that their primary goal for the year would be to encourage students and members of the local community to inform their families of their wishes towards donation. Against this backdrop, the first activity the student sub-committee decided to host was 'Tell Your Family day'. This was a virtual day that was meant to emulate other similar virtual events for health matters, such as World Mental Health Day. The main ethos behind the day was to encourage students to start a conversation with their peers and loved ones about their views and wishes towards donation. It was recognised that this would help raise awareness on the importance of informing family of individual's wishes towards organ donation. To help publicise the event, the Student Representatives set up a stall on Lancaster University campus, promoting the event

to the student community. They encouraged people who expressed an interest, to join the organ donation register as a way to actively show their family their wish to be an organ donor. Additionally, promotional pages were made on Facebook and Instagram and a live twitter feed was started by one of the Student Representatives (ZB) on the day of the event.

For the next event, the student sub-committee wanted to build on its aim of encouraging the local community to inform their families of their wish to donate and decided to host an Organ Donation Café. Inspiration for this event was taken from the very successful Death Café's where people eat cake, drink tea and discuss death in a safe and friendly environment. The event was planned to take place during the organ donation week in September 2017 utilising the raised promotion of organ donation that occurred during the week. Again, the spirit of the event was simply to encourage people to have a conversation about organ donation in whatever form they desire. Although leaflets explaining how to join the donation register was present for people to read if interested, like the Death Café's there was no wish to set an agenda for the event. The sub-committee just wishes to recognise the importance of conversations around organ donation being the norm and one of the ways to removing barriers that currently prevent engagement with organ donation and sees this as one way this can be achieved.

The final event the committee has organised is a community day whereby local school students were invited to discuss and exhibit what organ donation means to them through mediums such as poetry, photography, drawing, painting and pottery. Local medical and nursing students will be invited to participate in, and watch, debates relating to the ethical and legal aspects of organ donation.

Conclusion

The UHMBT Organ Donation Committee have been delighted with the work of the student sub-committee and have initiated the recruitment process for students to join the Committee for the next academic year. The student sub-committee have illustrated the importance of creating learning and development opportunities that tackle theory and concepts surrounding organ donation for healthcare students during their training, so that they are better equipped to engage in discussions and communicate the importance of organ donation in their practice. It is hoped that such improvement in communications surrounding the subject will create better outcomes in relation to the number of individuals becoming organ donors (López-Montesinos *et al* 2010).

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The National Institute for Health Research Blood and Transplant Research Unit in Organ Donation and Transplantation

Introduction

The National Institute for Health Research Blood and Transplant Research Unit (BTRU) in Organ Donation and Transplantation is an equal partnership between the University of Cambridge, Newcastle University and NHS Blood and Transplant (NHSBT). The BTRU was established in October 2015 after a competitive application process and is funded by a £3.8M National Institute for Health Research (NIHR) grant that will run until 2020. The overarching strategic aim of the BTRU is to develop and evaluate novel approaches and technologies that increase the availability in the UK of suitable donor organs for transplantation, while improving long-term graft survival.

The management and governance of the BTRU are now well established, with an annual programme of regular face-to-face and teleconference meetings. The face-to-face meetings (combined Management Group and progress update meetings) alternate between Cambridge and Newcastle and the two held during 2016–17 were

each attended by over 40 delegates. The work of the BTRU is overseen by an Independent Scientific Advisory Group (Professor Giovanna Lombardi, Ms Lorna Marson, Professor John Cleland, Professor Simon Johnson and Mr Luke Devey).

The BTRU is already producing innovative work that has changed clinical practice in organ donation and transplantation. In particular, advances in renal normothermic organ preservation using perfusion machines have led to the introduction of this technology in two non-BTRU UK transplant units (Guy's Hospital, London and Edinburgh Royal Infirmary). These advances have been applied to lung and liver transplantation in Cambridge and Newcastle.

Organisation of the BTRU

The BTRU has five main research themes and four cross-cutting themes. A great range of work is being undertaken and it is only possible to give a flavour of each theme here.

Theme 1: Improving organ donor management and evaluating novel interventions, is led by Professor John Dark in Newcastle and Professor Chris Watson in Cambridge. This theme is developing normothermic perfusion techniques for the heart and the liver. One of the main achievements has been the introduction of normothermic regional perfusion (NRP) for donation after circulatory death (DCD). NRP uses cardiopulmonary bypass technology to re-establish the circulation of oxygenated blood through the thoracic and abdominal organs immediately after donor death. Liver transplants from DCD donors have previously had a high incidence of biliary complications but the pilot series of livers transplanted after NRP has been notable because of a complete absence of ischaemic cholangiopathy.

Theme 2: Novel approaches for assessing donor organ quality, is led by Mr Colin Wilson in Newcastle. This theme is concentrating on the use of non-invasive methods for assessing the quality and transplantability of organs from marginal donors. The techniques being investigated include the liver maximal capacity test and an iPad-based test to quantify the level of hepatic and pancreatic steatosis.

The histological evaluation of pre-transplant donor kidney biopsies also forms a fundamental part of the theme. This work is being directed by Mr Gavin Pettigrew in Cambridge and his NIHR funded Pre-Implantation Trial of Histopathology In renal transplant Allografts (the PITHIA trial) is due to start in October 2017.

Theme 3: Resuscitating and reconditioning thoracic organs *ex vivo*, is led by Professor Andrew Fisher in Newcastle. Members of this theme are the national leaders in *ex vivo* lung perfusion (EVLP). The mechanisms of leucocyte–endothelial interactions during EVLP have been evaluated using a microfluidics platform. Following on from this, major progress has been made towards the identification of improved biomarkers of donor lung viability and future graft function. More than 40 biomarkers of tissue integrity, microvascular integrity, inflammation and damage-associated molecular patterns (DAMPs) have been evaluated in donor lungs undergoing EVLP. Interleukin-1 β has been identified as a key predictive marker of lung viability. Work is underway to develop a sufficiently fast cytokine assay to allow real-time decision-making during EVLP. This work has recently been published in the *Journal of Heart and Lung Transplantation*, which is the highest impact journal in the transplant field.

Theme 4: Resuscitating and reconditioning kidneys *ex vivo* is led by myself and Dr Sarah Hosgood in Cambridge. Normothermic machine perfusion (NMP) has been introduced into clinical practice in Cambridge and Newcastle. A Kidney Research UK funded randomised clinical trial of NMP in DCD kidney transplantation has

recruited 80 patients in the first year. A series of kidneys declined by all UK transplant centres have been successfully transplanted after assessment and resuscitation by NMP. This work was awarded the British Journal of Surgery Prize in May 2017.

In a collaboration with Professor Jordan Pober at Yale University, antibody-coated nanoparticles have been successfully targeted to the microvascular endothelium during NMP of discarded human kidneys. The long-term aim is to develop nanoparticles as a novel therapeutic targeting strategy for pre-transplant allograft treatment and immune modulation.

Theme 5: Improving organ allocation and protecting long-term graft function, is led by Professor John Trowsdale in Cambridge. A sophisticated human leucocyte antigen (HLA) histocompatibility algorithm has been created using advanced bioinformatics and computational modelling techniques. This has been shown to predict HLA immunogenicity, based on structural and 3-D electrostatic charge differences between donor and recipient HLA. This tool has now been validated by showing that it accurately predicts donor-specific alloantibody production in a unique cohort of patients undergoing lymphocyte immunotherapy. Novel killer immunoglobulin receptor (KIR) typing is also being developed based on high-throughput sequencing after capture.

Theme 6: Bioinformatics and biostatistics (cross-cutting), was led by Professor Dave Collett but following his recent retirement leadership of this theme has been taken over by Rachel Johnson. This theme provides essential statistical support to all the other BTRU themes. An example of this is the complex biostatistical analysis required to develop the new HLA histocompatibility algorithm by Theme 5. Clinical trial expertise has also been provided to help with the design, conduct and analysis of the PITHIA trial (Theme 2).

Theme 7: Biomarkers and genomics (cross-cutting), is led by Dr Menna Clatworthy at the Laboratory of Molecular Biology in Cambridge. The theme provides capacity in ribonucleic acid (RNA) extraction and sequencing and has expertise in bioinformatics. Considerable progress has been made using transcriptomic and proteomic analysis of tissue samples from Themes 1–4. For example, lung samples taken pre- and post EVLP (Theme 3) have been analysed to identify genes and pathways upregulated or downregulated by EVLP and those that significantly differ between lungs that pass or fail EVLP.

Theme 8: Mitochondrial biology (cross-cutting), is led by Dr Mike Murphy in the Medical Research Council (MRC) Mitochondrial Biology Unit in Cambridge. In collaboration with Mr Kouros Saeb-Parsy's group a

mitochondrial-targeted protective agent (MitoQ) has been investigated using discarded human kidneys undergoing NMP. This approach has the potential to reduce post-transplant ischaemia-reperfusion injury and this work was awarded the 2016 Royal Society of Medicine Future Projects Prize.

Theme 9: Novel interventions: pharmaceuticals and immunomodulators (cross-cutting), is led by Professor John Kirby in Newcastle. The main interests of this theme lie in the role of sphingosine one phosphate receptors and leucocyte–endothelial cell interactions during ex vivo organ perfusion. MicroRNAs are also under study as a target for modifying graft function. Initial results show a pro-fibrotic action of miRNA-21, whilst antisense to miR-24 increases the expression of protective genes during ex vivo perfusion.

Patient and Public Involvement and Engagement

The BTRU is committed to patient and public involvement and engagement in our open society. A Patient and Public Research Panel (PPRP) of 24 members has been established and has contributed to the success of the BTRU in many ways. Two PPRP members have joined the Management Group and attended BTRU meetings. Their feedback has been some of the most constructive in improving communication between the BTRU and patients and the public.

A range of BTRU events involving patients and the public have taken place over the last 12 months. At the 2017 Cambridge Science Festival members of the BTRU delivered a public lecture on the current goals for research in organ donation and transplantation. The quality of the questions from the audience was at a higher level than that experienced at many national scientific meetings. Open days that included ‘wet lab’ demonstrations of organ perfusion techniques have also been held in Cambridge. These were well received and further sessions have been requested.

One of the most successful and enjoyable interactions between the BTRU and patients/public was the ‘elevator pitch’ session at the trainees’ research day in March this year. Trainees delivered a brief presentation showcasing their research and this was followed by robust questioning from a panel of lay members. Their constructive feedback on the clarity and effectiveness of the trainees’ communication skills was very helpful.

Engagement with Industry

The establishment of partnerships with industry is critically important to the success of the BTRU. A number of successful relationships are already in place with the following companies: A1M Pharma in Sweden

(to investigate the role of a human endogenous free radical scavenger in renal ischaemia-reperfusion injury); Organ Assist, Netherlands (to further develop liver and kidney perfusion systems); Maquet, USA (to develop the Cardiohelp Machine for NRP research); Aedstem Ltd, UK (to develop a photographic point-of-care steatosis assay); MyCartis, Belgium (for the development of an ultra-rapid detection assay for cytokines); Biovitrum AB, Sweden (testing an IL-1 receptor antagonist); Faraday, USA (to investigate a novel sulphide-based compound in ischaemia-reperfusion injury); GlaxoSmithKline (to investigate the role of IL-18 blockade in renal transplantation).

Major Grant Awards Received as a Consequence of NIHR BTRU Funding

The BTRU has attracted additional external funding amounting to nearly £2M. Notable amongst these awards are the Natural Killer cells in disease grant awarded to Professor John Trowsdale, Professor of Immunology, University of Cambridge (£1.48M) and the NIHR research for patient benefit grant awarded to Mr Gavin Pettigrew, Reader in Clinical and Experimental Transplantation, University of Cambridge, for the PITHIA trial.

Website

The BTRU website (<http://odt.btru.nihr.ac.uk/>) was created by Rachel Brown, Project Manager, who has been widely praised for her meticulous attention to detail. One of the principal aims of the website is to showcase the BTRU to healthcare professionals and wider society as an open and collaborative venture. The website is a key achievement in the BTRU’s pursuit of positive branding.

Earlier this year four BTRU themes produced short videos to explain their work to a lay audience. The patient and public panel voted on the videos’ understandability, effectiveness in delivering learning, ability to hold their interest, and audiovisual quality and a prize was awarded. These videos have been posted on the website. We look forward to the continuing evolution of the website, with the aim of developing greater interactivity with patients and the public.

Summary

The strategic partnership between the University of Cambridge, Newcastle University and NHSBT has demonstrated that the whole can be greater than the sum of the parts. In parallel with delivering ground-breaking translational research, the BTRU has a passion to increase patient and public involvement in its work. Good progress has been made so far but in the future the aim will be to involve patients and the public in identifying the best research questions and in planning research projects.

The BTRU trainees' day in March 2017 brought together senior scientists and clinicians, patients and the public in a highly successful and interactive format. Presentations of the early work suggested that the BTRU has been successful in recruiting, placing and equipping scientific and clinical PhD students.

Alongside the strategic priority of ensuring effective bidirectional translation between basic biomedical and clinical research we have developed strong links with industry and feel that this will be important to the future success of the BTRU.

In conclusion, the NIHR BTRU in Organ Donation and Transplantation is now in its second year and is being successful in conducting pioneering research that is already changing clinical practice.

Michael Nicholson
Professor of Transplant Surgery
University of Cambridge
Director of the NIHR BTRU in Organ Donation and Transplantation

Donation Memorials

Many from the donation and transplant community consider donation as the greatest gift one person can give another in peacetime. Just as we remember those who gave so much to save others in times of war, so we should remember those who gave so much to save others in times of peace.

Recommendation 12 of the 2008 Organ Donation Taskforce report called for, "Appropriate ways should be identified of personally and publicly recognising individual organ donors, where desired. These approaches may include national memorials, local initiatives and personal follow-up to donor families."

In the UK, many hospital Organ Donation Committees have answered this challenge, and created local memorials of remembrance and thanks for deceased organ and tissue donors. One day we hope that every UK hospital will have a donation memorial. We'd like in this article to illustrate just a few of the many; highlighting both national and local initiatives. Our apologies that space does not allow us to feature all of them, but if you would like to see more visit Dale's personal website www.clodlog.com/donationmemorials where he displays as many as he has photos of.



The Gift of Life Memorial – designed by Julia Hennessey-Priest for the Donor Family Network. National Memorial Arboretum, Staffordshire



The Gift of Life Stone, Alexandra Gardens, Cardiff. Donated by the Kidney Wales Foundation.



Taigh House, Scottish National Donation Memorial in the Royal Botanical Gardens, Edinburgh.



Organ Donation Memorial Garden, Noble's Hospital, Isle of Man



'The Gift' – Worthing and St Richards Hospitals, West Sussex Hospitals NHS Foundation Trust.



Donor Celebration Sculpture, Russells Hall Hospital. The Dudley Group NHS Foundation Trust.

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Deputy National Clinical Lead for Organ Donation
Nottingham University Hospitals/NHSBT
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Our Ladder of Opportunity

In November 2016, NHS Blood and Transplant launched its Apprenticeship Scheme and so far, we are pleased to announce that 120 employees have started or registered their interest to start an apprenticeship programme. From the outset, our approach to Apprenticeships has been that they will form a fundamental part of our People Strategy at NHSBT; they will provide further opportunities for us to demonstrate that we will:

- **Attract the Best People** – by offering apprentice opportunities for vacancies, particularly for Band 2 posts initially.
- **Develop and Grow Our Talent** – by offering a wide range of apprenticeship programmes that can be studied, across all Directorates throughout England.
- **Retain Our People and Skills** – by offering apprenticeship opportunities to existing employees, particularly those who may not have had the chance previously to gain recognised qualifications.
- **Lead with Passion** – by engaging with Line Managers throughout the entire apprenticeship journey.
- **Create the Right Environment** – by working with Senior Leaders and Business Partners to ensure that our apprenticeship offering meets the needs of our organisation now and can be developed and sustained to meet future requirements.

Across all industries, including the wider NHS, there is a growing view that apprenticeships are a great step on the 'ladder of opportunity'. They are a chance for people to learn new key skills whilst gaining real experience in the workplace, improving long term career prospects, and obtain an accredited qualification upon completion, whilst not having to get into debt as the training/qualification aspect is funded.

Apprenticeships are not just for young people; they are open to colleagues of all ages. NHSBT are offering programmes at Level 2 and 3; these are the equivalent to completing a GCSE (Level 2) or A Level (Level 3) qualification. There are currently eight programmes available to complete including Business Administration, Customer Services, Healthcare Support Service, Logistics Operations and Team Leading. Each of our current apprenticeship programmes lasts for minimum duration of 12 months and 1 day. Our *People First* page has all the details at <http://peoplefirst.nhsbt.nhs.uk/nhsbt-apprenticeships.htm>.

Apprenticeship opportunities can be accessed by all our eligible employees, across all directorates and functions within NHSBT. Our scheme has two strands of access; for new starters recruited as an apprentice initially at entry level and for our existing employees who want to enhance

their skills and experience in their current job roles. We offer four intakes per year for existing employees. If a manager is interested in employing an apprentice as a new starter to fill a vacancy at Band 2, this can be done at any time. You do not need to wait for an intake because the normal recruitment process applies.

From 1 April 2017, a new apprenticeship levy has come into effect that requires all companies with a payroll totalling £3 million or more to invest 0.5% into the government's apprenticeship scheme. Our activity that ties in to this duty includes broadening our scheme to reflect the diverse range of job roles within NHSBT. We are also planning access to Intermediate (Level 2; equivalent to GCSE's), Advance (Level 3; equivalent to A Levels), Higher (Level 4; equivalent to a HNC) and Degree (Levels 5 to 7; equivalent to a Foundation Degree to Masters) Apprenticeships in the future. From 2018, we will be offering over 40 different apprenticeship programmes. This will include apprenticeship pathways in Science, Management and Healthcare Support to name a few. This will be a great opportunity to offer a broad range of apprenticeships, which will also be an alternative to university (Degree Levels).

Our apprentices have provided some feedback on their experiences and have provided an overview of some of the benefits of completing an apprenticeship, as follows:

"I have always been a hands-on learner. I find I am much more interested in working and getting experience than just attending education, so the opportunity to combine the two was perfect for me. I enjoy the working environment and find I gain better knowledge when experiencing the work." **Chloe Fitzpatrick-Creamer, Clinical Business Administration Apprentice (Clinical Directorate)**

"I was searching for jobs after taking a short break from completing my A Levels, and came across an apprenticeship advertised with NHSBT. It was advertised as a two-year apprenticeship (Customer Service followed by Business Administration) with a permanent job at the end of the two years. I decided to apply as I would be able to gain two further qualifications whilst gaining experience in the workplace." **Livvy Upton, Senior Organisational Development Administrator (Workforce Directorate)**

"I believe the apprenticeship can only be positive for my future. New skills are always a plus and by putting them into action during this programme I can gain the experience necessary to advance in my career." **Tim Keenan, Donor Carer (Blood Donation Directorate)**

“It doesn’t matter what age you are, if you lack experience or what qualifications you have, an apprenticeship is the perfect option if you feel college isn’t the route for you or you fancy a change of career.” **Tyisha Beighton, Recruitment Business Administration Apprentice (Workforce Directorate)**

We have received a high level of interest in our programmes, to the point where we have reached capacity for existing employee starts this year. We are however still able to support any requests for new starters; submit a recruitment request in your normal way. Our new programme offering, including our approach for the next 3 years, will be launched towards the end of 2017. Please do keep a look out on what’s on offer and submit an expression of interest through People First if you are

interested to start a programme. Our cohorts for our existing employees will be on a first come, first served basis, therefore get your application submitted as soon as possible. New starters can be recruited at any point; therefore, there is no need to wait.

For further information on our scheme or future plans, please visit our Apprenticeship page on People First (link above), or alternatively, you can contact Laura Unitt, NHSBT Apprenticeship Manager (contact details below).

Laura Unitt
NHSBT Apprenticeship Manager
NHSBT, Birmingham

Email: laura.unitt@nhsbt.nhs.uk

A New Leeds/Sheffield Centre

The existing blood centres in Leeds and Sheffield have been in existence for over 40 years and pre-date the creation of NHS Blood and Transplant (NHSBT). They are only 35 miles apart and occupy a footprint of around 15,500m².

Due to successive consolidations in manufacturing, testing and warehousing over recent years this is now approximately double the space that NHSBT currently requires. The impending move of manufacturing from Sheffield to Manchester in 2017 further exacerbates the situation.

Following a detailed review of the options, a single new centre located between Leeds and Sheffield has been identified as the best way forward for NHSBT and offers the optimal combination of financial and non-financial benefits. The new centre would accommodate all services from the existing centres, with the exception of blood collection team bases. These would remain at new sites close to the current locations, and warehousing, which is being relocated as part of a separate project.

A preferred site for the new centre, close to Junction 37 on the M1 has been identified and it is proposed that NHSBT enters a minimum 25 year lease and construct a purpose-built, flexible, efficient and modern facility, with some scope for future expansion, by June 2020. In addition to the new centre we will also retain a team base in both Leeds and Sheffield. The existing centres would be transferred to the government’s Homes and Communities Agency for disposal.

The capital cost to fit out the new centre will be £14.5m, plus £0.6m for the two team bases, and with £2.3m assumed as the proceeds from the sale of the Leeds and Sheffield sites. The project will generate recurring net revenue savings of £1.1m pa (i.e. to blood prices). The financial case is, however, driven by the avoided cost of maintenance and refurbishment of the existing sites (£16.1m over 10 years). Taking this into account the project generates a payback of 3.6 years (from the point of operational commissioning).

There has been extensive communication with employees and customers with their responses taken into account with regard to location, design and internal fit out. As with any project that involves relocation of stock holding units and laboratories we have been especially sensitive to the concerns of customers, especially those to the north and east of Leeds who will see potentially longer delivery times, albeit well within our Service Level Agreement. In recognition of this development, the proposal was delayed by three months to enable a programme of engagement by the Customer Services team with hospitals to outline the existing “problem” and engage them in identifying the solution.

A benefit of the location for the new centre is that it will establish a new ‘hub’ for services to hospitals in Red Cell Immunohaematology (RCI) as well as opening up greater collaboration in Histocompatibility and Immunogenetics (H&I) and potential expansion of Cellular and Molecular Therapies (CMT). In this regard the project includes the construction of new clean rooms to meet increasing demand for new cellular therapies in a cost-effective manner that meets modern manufacturing standards.

A new centre between the two existing centres has a lower impact on employees overall but there are, of course, significant impacts at an individual level, often positive but in some cases less so. We have therefore engaged extensively with employees from the start including, centre wide presentations, workshops, visits to the shortlisted sites, monthly newsletters and involvement in the design of the working spaces. We will continue to work closely with all stakeholders as the project progresses.

The business case for the proposals was approved by the NHSBT Board in May 2017 and we gained Department of Health approval in September 2017. Following that, we would plan to acquire the site by the Autumn and complete the build of the main structure by Autumn 2018. We would then expect to complete the fit out of the new centre in December 2019 allowing phased occupation to follow, with completion planned for June 2020.

Chris Sims

Assistant Director of Finance

NHSBT, Leeds

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Donating Aoife's Organs was an Easy Decision to Make

Aoife Marie O'Sullivan, born on 19 May 2011, from Leigh-on-Sea, Essex was waiting for a heart transplant when she died aged 4½ and became an organ donor herself.

She passed away on 2 March 2016 after suffering from overwhelming brain damage as a result of her heart failing and both of her kidneys were donated to a young man.

Aoife had been diagnosed with restrictive cardiomyopathy in December 2015 – a condition that meant her heart muscle was rigid and could not pump properly – and a heart transplant was her only chance of her life being extended.

She died in Great Ormond Street Hospital, shortly after emergency surgery to fit a Berlin Heart following a rapid deterioration in her condition.

Aoife's parents, Michelle and Neil, said "All Aoife's mechanical support was removed allowing her to pass on peacefully. We decided to allow her organs to be donated in the hope that in her passing she can also give the gift of life to others. We both take comfort in knowing that in death our little Angel might have helped to save another life. We can't stress how important it is to register yourself and your families to be an organ donor. Life is special and the greatest gift you can give is to register for organ donation."

Michelle and Neil also have a 19 month old daughter called Emilie.

Aoife had just started school when her illness became more apparent.

Michelle said: "Aoife was a typical lovely four year old. She had just started in reception class at school, and was making friends and enjoying herself."

Aoife had a persistent cough in the 12 months before diagnosis and the GP put it down to asthma. Her family later found it was a sign of restrictive cardiomyopathy, which is a rare condition.

By late November, she had been sent home from school a couple of times for coughing and was initially diagnosed with pneumonia after an emergency attendance at Southend Hospital's Accident and Emergency (A&E) department. Tests at Southend Hospital and later the Royal Brompton Hospital found she had an enlarged heart and the condition was diagnosed. She was taken straight to intensive care at the Royal Brompton. In December she was admitted to Great Ormond Street, but was too ill to return home for Christmas. In January Aoife was responding well to medication and was allowed home. After approximately two weeks, she became gravely ill and was readmitted to Great Ormond Street. She died on 29 February and became a donor on 2 March. It was not possible to donate

any organs other than her kidneys because of the cocktail of medications she had been on while on life support.

Michelle said: "Donating Aoife's organs was an easy decision to make. It was the right thing to do. Neil and I feel proud and take comfort from that fact that Aoife has given somebody an extension of their life and more time

with their loved ones. I would say to people 'put yourself in the shoes of someone waiting for a transplant. If you are willing to accept an organ donation, it is only right that you should be willing to donate the special gift of life to another family. Please sign the organ donation register for yourselves and your family'.



"Bringing Key Guidelines to your Fingertips"

Hospital doctors, the National Blood Transfusion Committee and the NHS Blood and Transplant Patient Blood Management Team have developed an App to allow you to access key guidelines when you need them.

The App is free to download and provides indications for appropriate use of blood components at your fingertips.



The app is based on the National Blood Transfusion Committee (NBTC) Indication Codes for Transfusion in Adults (2016) and the British Society of Haematology (BSH) Guideline on transfusion for fetuses, neonates and older children (2016).

You can download the app for [Android](#) and [iOS \(Apple\)](#). Search "**Blood Components**" in your App or Play Store.

Please share this App with your colleagues and encourage them to download and use it.

1. A Web Based Road Map:

- a) As NHSBT provides all Therapeutic Apheresis Service (TAS) to the NHS in the South West of England no Road Map is required.
- b) As each NHS Trust provides a full and comprehensive TAS in the South West of England, no Road Map is required.
- c) Access to TAS is unclear for some NHS Trusts, in the South West of England so a Road Map may be useful.
- d) There are no TAS to the NHS in the South West of England.

2. A Web Based Road Map:

- a) There are no time-to-treatment critical factors for any condition treated by Therapeutic Apheresis.
- b) Only TTP has a recommended minimum time-to-treatment, to ensure a good outcome.
- c) All conditions treated by Therapeutic Apheresis have a minimum time-to-treatment to ensure a good outcome.
- d) TTP and other Therapeutic microangiopathies have recommended minimum time-to-treatment, to ensure a good outcome.

3. A Web Based Road Map, detailing the Apheresis provided for each Trust:

- a) Was available in the North West of England and North Wales from 2013.
- b) Is available for the whole of the UK.
- c) Is available for the whole of England and Wales.
- d) Is available for the whole of England.

4. The South West Regional Transfusion Committee Found:

- a) All trusts have a contingency plan for circumstances when their primary apheresis provider is unable to deliver services.
- b) 35% of Trusts offer no weekday out-of-hours or weekend services.
- c) 25% of Trusts had experienced difficulties in gaining access to TAS procedures.
- d) Over half of Trusts have a formal Service Level Agreement with NHSBT for TAS.

5. NHSBT provided:

- a) Over half of all Extracorporeal Photopheresis.
- b) Less than half of all TAS for Leucodepletion.
- c) Over half of all Automated Red Cell Exchange.
- d) Less than a third of all TAS for Low-density Lipoprotein removal for Trusts in the South West.

6. Blood Components App: All audits in England consistently show.

- a) Appropriate use of all blood components.
- b) Inappropriate use of less than 5% of Red Cells.
- c) Inappropriate use of less than 15-20% of Red Cells.
- d) Inappropriate use of between 20-30% of Red Cells.

7. In 2015 Ofcom reported that:

- a) Over 90% of people in the UK now own a smart phone.
- b) Less than 50% of people in the UK now own a smart phone.
- c) One third of people in the UK now own a smart phone
- d) Two thirds of people in the UK now own a smart phone.

8. The Blood Component App:

- a) Is only applicable to adults.
- b) Is only applicable to haematology patients.
- c) Includes paediatric transfusion indication.
- d) Does not include paediatric transfusion indication.

9. The Blood Component App:

- a) Is only available in beta mode.
- b) Is available to download for free.
- c) Is available to download from Apple Store Only.
- d) Is available to download from Play Store Only.

10. The National Institute for Health Research Blood and Transplant Research Unit in Organ Donation of Transplantation is an equal partnership between:

- a) University of Cambridge and Newcastle University.
- b) University of Cambridge and NHSBT.
- c) University of Cambridge and Newcastle University and NHSBT.
- d) Newcastle University and NHSBT.

11. The BTRU has:

- a) Two.
- b) Three
- c) Four.
- d) Five.

Main research themes and four cross-cutting themes.

12. The cross-cutting themes include

- a) A bioinformatics and biostatistics theme.
- b) Resuscitation and reconditioning kidney ex vivo theme.
- c) A resuscitation and reconditioning thoracic organs ex vivo theme.
- d) A theme developing Homothermic perfusion techniques for the heart and liver.

13. The Biomarkers and Genomic Theme uses Samples from:

- a) Theme one only.
- b) Themes one and two.
- c) Themes one, two and three.
- d) Themes one, two, three and four.

14. The BTRU:

- a) Does not engage with industry.
- b) Has a Patient and Public Research Panel.
- c) Has no lay public involvement.
- d) Has no patient involvement.

15. A New Leeds/Sheffield Centre:

- a) The present Leeds and Sheffield Centres occupy a foot print of around 15,500m².
- b) The present Leeds and Sheffield Centres are less than 20 years old.
- c) The present Leeds and Sheffield Centres would need less than £10 million over the next 10 years on maintenance and refurbishment.
- d) The proposed new site is North of Leeds.

Clinical Case Studies

Question 1

Leukaemia relapse is still one of the main causes for mortality and significant morbidity following allogeneic stem cell transplantation. Donor lymphocytes can be infused to control early Leukaemia relapse and maintain remission. Sometimes repeated carefully titrated doses of lymphocytes need to be infused over many weeks or months. Donor Lymphocytes Infusion (DLI) can trigger GVHD. Moreover not all Leukaemia responds well to DLI.

Which of the following is most likely to respond to DLI?

1. Acute Myeloid Leukaemia.
2. Acute Lymphoblastic Leukaemia.
3. Chronic Myeloid Leukaemia
4. Chronic Lymphoid Leukaemia.
5. Multiple Myeloma.

Question 2

Which of the following are true regarding peripheral blood and marrow donation from unrelated donors?

1. 60% of donors are males.
2. Epidural or spinal anaesthesia can be used for marrow harvest.
3. Most donors (more than 75%) achieve required yield with a single apheresis procedure.
4. The risk of blood transfusion following a marrow harvest is 0.5%.
5. More than 25% of Peripheral Blood Stem Cell (PBSC) donors drop their platelet count following apheresis to less than $100 \times 10^9/L$.
6. All blood counts return to normal within one month.
7. 80% of donors experience bone pains regardless of method of donation, but this is usually mild or moderate.
8. Fatigue, insomnia, constitutional symptoms are reported with equal frequency in both types of donation.
9. Women and older donors are most likely to become symptomatic during or following donation.
10. Women are five times more likely to require a central line for PBSC collection.

Answers to Clinical Case Studies

Question 1

Answer 1 = C

Chronic Myelogenous Leukaemia (CML) is most likely to respond to Donor Lymphocytes Infusion (DLI). Acute Lymphoblastic Leukaemia (ALL) is least likely to respond to DLI. Multiple Myeloma (MM) and Acute Myeloid Leukaemia (AML) may respond to DLI.

The response to DLI (otherwise known as graft versus Leukaemia effect) is very prominent in CML, probably because of Leukaemia cells immunogenicity and relatively slow growth of the tumour.

ALL is not very immunogenic and it grows very quickly rendering DLI ineffective.

Reference: Kolb *et al* (2004) *Blood*, 103:767-776 and ASH SAP 2016.

Question 2

Answer 2 = All are true

All these statements are true and they are the findings of an americal prospective survey for donors from NMDP (National Marrow Donor Programme).

References:

Pulsipher *et al* (2014) *Blood* 123(23), 3655-63

Pulsipher *et al* (2013)

**CPD Blood and
Transplant Matters
Answers Issue 52**

1. C	2. D	3. A	4. B	5. A
6. C	7. D	8. C	9. B	10. C
11. D	12. A	13. D	14. B	15. A

Diary Dates

2018

17 January

Post ASH significant Highlights - London

Location: Cavendish Conference Centre, London

For more information, contact:

www.b-s-h.org.uk

18 January

Post ASH significant Highlights - Manchester

Location: Manchester Conference Centre, Manchester

For more information, contact:

www.b-s-h.org.uk

24 January

Post ASH significant Highlights - Bristol

Location: Doubletree by Hilton Bristol City Centre

For more information contact:

www.b-s-h.org.uk

28 February

Transfusion in Practice

Location: Post Graduate Centre, Birmingham

For more information contact:

www.b-s-h.org.uk

7 – 9 March

London Haematopathology Course

Location: Bart's and the London School of Medicine and Dentistry Pathology and Pharmacy Building - The Royal London Hospital, Whitechapel

For more information contact:

www.b-s-h.org.uk

9 – 11 March

4TH International Conference on Hematologic Malignancy at older age: Biological and Therapy

Location: Centre Mandeliew, France

For more information, contact:

www.esh.org

3-4 April

Venesection and Haemochromatosis – Sharing Best Practice

Location: Paddington, London

For more information contact:

www.b-s-h.org.uk

16 -18 April

58th Annual Scientific Meeting of the British Society for Haematology

Location: ACC Liverpool

For more information contact:

www.b-s-h.org.uk

18 – 20 April

ESH – GR – EX 2ND INTERNATIONAL SYMPOSIUM ON RED BLOOD CELLS – GENESIS AND PATHOPHYSIOLOGY

Location: Marriott Rive Gauche Hotel, Paris

For more information contact:

www.esh.org

14 June

World Blood Donor Day

www.awarenessdays.com

13 – 17 September

37th World Congress ISH

Location: Vancouver Convention Centre, Canada

For more information contact:

www.ishworld.org

29 September – 4 October

19th Meeting of European Association for Haematopathology

Location: Edinburgh International Conference Centre

For more information contact:

www.b-s-h.org.uk

3 – 5 October

BBTS Annual Conference

Location: Brighton

For more information, contact:

www.b-s-h.org.uk

13 – 16 October

AABB Annual Meeting

Location: Boston, MA-

For more information contact:

www.aabb.org

*Blood and Transplant Matters is prepared
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