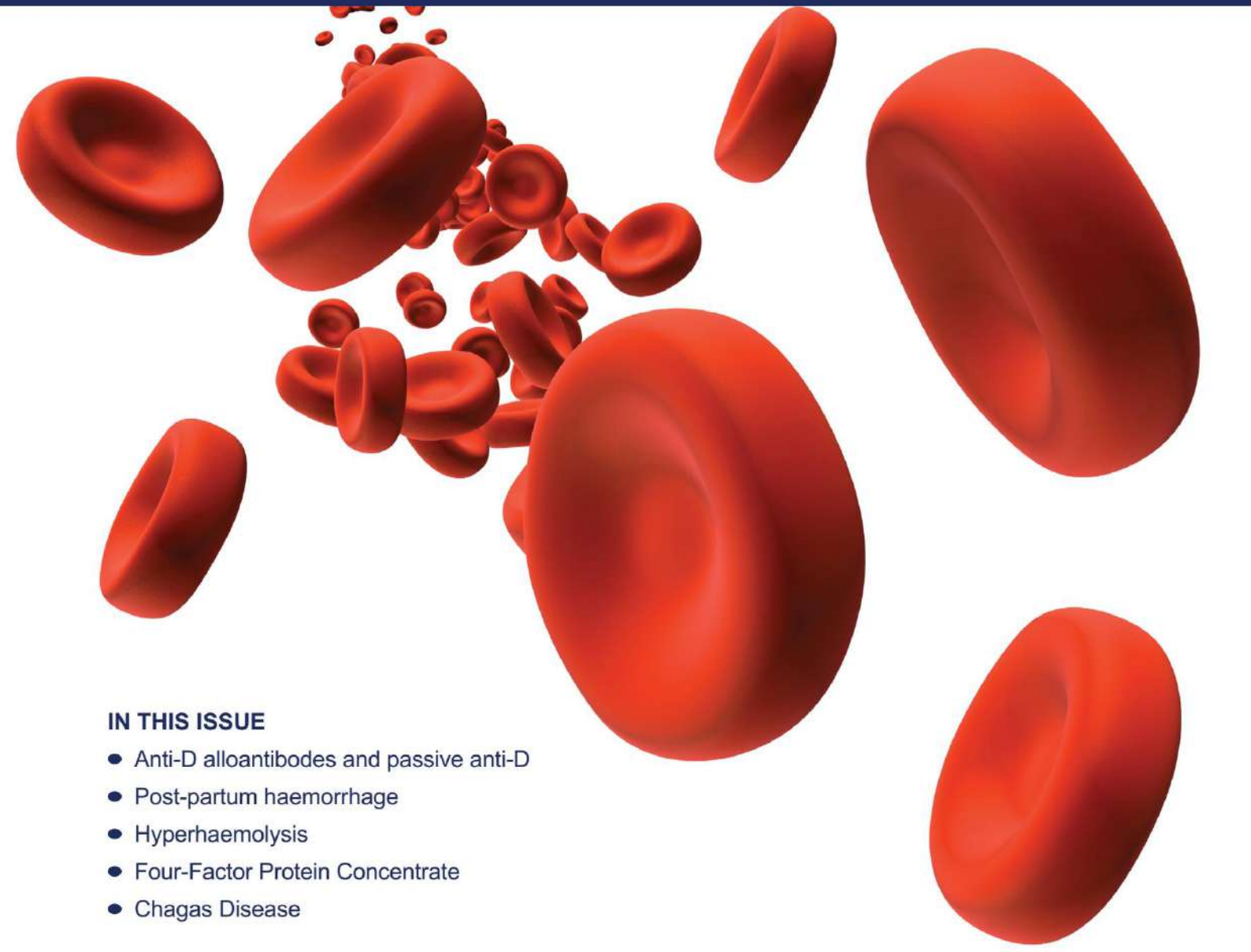
Volume 31 Supplement 1 • September 2021

TRANSFUSION MEDICINE

Official Journal of the British Blood Transfusion Society and the Network for the Advancement of Patient Blood Management, Haemostasis and Thrombosis



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WILEY Blackwell

British Blood Transfusion Society

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Transfusion Medicine

Volume 31, Supplement 1, September 2021

XXXVIII Annual Scientific Meeting of the British Blood Transfusion Society

13–15 September 2021
Virtual Event

WILEY

XXXVIII Annual Scientific Meeting of the British Blood Transfusion Society
13–15 September 2021
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DOI: 10.1111/tme.12814

TRANSFUSION MEDICINE WILEY

ABSTRACT

Speaker sessions

TUESDAY 14th SEPTEMBER 2021
PLENARY SESSION II
AWARD LECTURES

AW01 | A significant current challenge within transfusion; meeting the red blood cell (RBC) requirements of patients with sickle cell disorder (SCD)

S. Grimsley
[1]*IBGRL, NHSBT*

A significant current challenge within transfusion is meeting the red blood cell (RBC) requirements of patients with Sickle Cell Disorder (SCD). During my career in immunohaematology I have been fortunate enough to work in a tertiary reference laboratory where I would resolve some of these most complicated cases – unpicking antibody combinations and identifying rare antibodies to high frequency antigens. I have discovered several novel alleles through gene sequencing and contributed to the discovery of several novel blood groups.

My role has now moved from resolving individual cases within the laboratory to helping thousands of patients by developing and delivering organisational solutions including the NHSBT Haemoglobinopathy Genotyping Project (HGP). This helped build our understanding of the relative abundance of variant alleles and phenotypes within SCD patients and importantly improve our understanding of the clinical relevance of the related antibodies.

Current solutions to meet the RBC requirements of patients with multiple antibodies are often driven on an individual patient basis. Many different staff helps identify potential donors, confirm extended types, store and then deliver units from specific donors to specific patients. Despite working tirelessly to resolve the patient cases and maximise the effectiveness of available donors, delays in RBC provision do occur and in the most extreme cases blood is simply not available.

We must meet the demand of antigen negative RBC for patients with antibodies but we must also aspire to limit, or even prevent alloimmunisation in the first place. I believe these goals require a) the recruitment and retention of more donors of African ancestry b) detailed typing of these donors and patients c) appropriate logistical solutions to enable best-matching. The detail of how we bring these three components together must still be decided but I am proud to work alongside colleagues that share my drive and determination to make this aspiration a reality.

AW02 | Blood group genetics; stone age to space age

V. Karamatic Crew
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In 1900, when Karl Landsteiner described the first human blood group system, ABO, the basic principles of heredity were already known. Some 30 years earlier, Gregor Mendel explained through his experiments on pea plants how genetic traits were carried from one generation to the next. Another half of a century passed before the discovery of the DNA structure, which opened the door to the modern science of genetics. However, the early understanding of blood groups did not wait for the advancements in genetics and most of the well-known systems were already established by this time, albeit completely undefined at the molecular level. By the 1980s and 1990s, the advancements in DNA amplification, classical gene cloning and sequence determination started the age of rapid identification of blood groups at the level of the gene and the resulting genetic data substantially aided our understanding of the transfusion medicine, molecular biology of the red cell and physiological conditions and diseases associated with some of the blood group phenotypes. Recently, the development of novel and extremely powerful methods, such as next generation sequencing, has increased the pace of characterisation of the remaining and potentially new blood group systems, resulting in the 43 blood group systems and 345 fully described antigens. The International Blood Group Reference Laboratory has embraced the genetic methods from the start, utilising them in a powerful combination with serology and other sophisticated molecular tools and thus contributing to discovery of many human blood group antigens, systems and null phenotypes. Our most recent studies exploited next generation sequencing in many different ways, from defining the molecular basis of the MAM antigen and establishing MAM as the 41st blood group system, using this powerful genetic method to re-examine 'cold cases' and even looking back into our distant past and interpreting the blood group genotypes of Neanderthals and ancient humans, thus contributing information to the chronicle of human origins.

AW03 | Access to safe blood transfusion in low and middle income nations: *From 'big data' to mosquitos*

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While most of the high index nations of the world have an ample and relatively consistent supply of blood, the low and middle index countries (LMIC) do not. This results in preventable premature death and

morbidity. To improve access to safe blood in LMIC, the entire vein to vein blood system and barriers must be understood and multidisciplinary measures put in place. The global need for blood is important to define. Because different diseases require different levels of blood transfusion support during the course of treatment, the amount of blood stocks needed to care for the citizenry of a nation is not as simple as a per capita rate. Disease specific transfusion rates can provide a contextualised picture of the needs of patients and the blood stocks required to support patient care. Further, the delivery of blood to a patient at the hospital is critical to understand so that programs, policies and funding can be directed accordingly. Hospital based transfusion services are the final step before blood is administered to a patient. The way the hospitals are supplied with blood and how they keep blood transfusion safe with compatibility testing, policies and committees are critically important to transfusion safety. Lastly, the cultural fabric of a nation, its industries and economy impact healthcare and blood systems. These forces can lead to surprising connections to blood transfusion and public health as a whole.

DOI: 10.1111/tme.12815

TRANSFUSION MEDICINE WILEY

ABSTRACT

Oral sessions

SESSION

SHOT/QUALITY IMPROVEMENT

ORALS 01 | Tackling iron deficiency anaemia in pregnancy

Aine O'Kane[1], Roberta c[1], Brenda Kelly[1], Gary Benson[1]
[1]*Belfast HSC Trust, Belfast, UK*

Background: Having identified antenatal patients with anaemia risk in a previous project*, the aim of this QI project is to reduce the number of women presenting for delivery with anaemia (Hb <105 g/L).

Method: In October 2019, for a 200 patient trial in the anaemia-at-risk group:

A ferritin level was taken with routine blood count on first presentation. A month's supply of iron was offered along with the new patient information leaflet and letter for patient notes. GPs were sent a letter and a request to continue oral iron. Follow up ferritin was included in 16-20wks/28/term checks. IV iron was offered then if oral iron was a problem.

Results: Ferritin levels on first presentation:

67 women (34%) with normal Hb were already iron deficient with ferritin levels below 30 (Hb normal) 10 women (5.1%) anaemic Hb <110 at booking.

Following completion of the trial:

To directly compare results, haemoglobin results of patients throughout pregnancy in patients who delivered in a 6 week period before and after the project were compared.

Reduction in % anaemia:

- 8% during pregnancy
- 6.8% at 28 weeks
- 3.9% at delivery
- 4.3% postnatal

Conclusion: Anaemia reduced in all checked points with a 3.9% reduction of anaemia at delivery (post project only 1% anaemic at delivery).

We agreed there is enough evidence of improvement to roll out a modified form of risk assessment/issue of iron from booking (commenced 8/3/21).

Going forward:

Assess if any reduction in blood transfusions (previously unable to confirm a reduction in use)

Monitor issue of iron and follow up on any low ferritins at booking to further emphasise to women the need to take oral iron given

Continue to raise the profile of iron deficiency/anaemia for all professionals and to all pregnant women at reviews throughout pregnancy.

Review IV iron as a good alternative for women who cannot tolerate oral iron

Re-audit 6–12 months

Northern Ireland Regional approach being reviewed

*Previous project (Determining the risk of anaemia in the obstetric patient) also submitted to BBTS 2021.

SHOT/QUALITY IMPROVEMENT

ORALS 02 | Use of a day to day observation checklist to identify human factors related to the feto-maternal investigation and crossmatching process in the red cell immunohaematology department – NHSBT

Matthew Hazell[1], Benjamin Bowden[1], Mark Dwight[1], Katherine Jackson[1], Bekki Jeffs[2], Tess Winfield[1]
[1]*Red Cell Immunohaematology - NHS Blood and Transplant*, [2]*Specialist Services - NHS Blood and Transplant*

Introduction: Human Factors (HFs) relates to how a human interacts with processes, systems, equipment and the environment. By understanding HFs, it becomes easier to get things right, allowing benefits that include – less waste, fewer errors/injuries, reduced loss of time and greater engagement with an improved task.

Understanding is gained through the observation of how people work, the processes/systems/equipment they work with and the environment they work in. Here we describe a HFs day-to-day observation checklist and asses its use in identifying HFs related to Feto-Maternal Haemorrhage (FMH) investigation and red blood cell cross-matching (XM).

Methods: The HFs day-to-day observation checklist captured general information related to the working pattern observed e.g., early/late/out-of-hours and, if there was sufficient staff on the observation day. It also identified if equipment/consumables were available, adequately placed and serviceable/clean. Defined stages in the FMH and XM process were observed, and behaviours scored according to the frequency they occurred (Always (A), Sometimes (S), Never (N) and No opportunity to observe (N/A)) for the following themes:

- Remains task focused
- Work area set up checked
- Work area tidy/well organised
- Interruptions/distraction handled correctly
- Notices appropriately displayed
- Staff took their time/not under pressure
- Staff appear ergonomically comfortable
- Communications are appropriate
- Work environment is appropriate
- Visual management in place
- Visual management used appropriately
- Flow of the process maintained

Results:

HFs identified during the observations included:

- Distraction from phone calls (A)
- Uncomfortable work area (S)
- Reduced interaction with visual management (S)
- Consumables spread across laboratory at different locations (A)
- No specific location to undertake FMH investigation (A)
- Distraction from open laboratory conversation (S)
- Distraction from questions directed at BMS undertaking observed process (S)
- Consumables not stocked ready for use (S)

MARGARET KENWRIGHT AWARD ORALS

MK01 | Bacterial reduction of pre-bagged human plasma using 405 nm violet-blue Light

Caitlin Stewart[1], Scott MacGregor[1], Chintamani Atreya[2], Michelle MacLean[1,3]

[1]*The Robertson Trust Laboratory for Electronic Sterilisation Technologies, Department of Electronic and Electrical Engineering, University of Strathclyde, Glasgow, UK,* [2]*Office of Blood Research and Review, Center for Biologics Evaluation and Research, Food and Drug Administration. Views expressed in this article are an informal communication and represent the authors own best judgement. These comments do not bind or obligate the FDA. Silver Spring, USA,* [3]*Department of Biomedical Engineering, University of Strathclyde, Glasgow, UK*

Introduction: Major progress has been made to enhance blood safety with measures such as nucleic acid testing and sample diversion significantly reducing the risk of transfusion-transmitted infection (TTIs). Nonetheless, the risk of new or re-emerging pathogens and incidences of bacterial contamination continue to compromise patient safety. Pathogen reduction technologies (PRTs) have been developed as a proactive approach to inactivate infectious agents. Visible violet-blue light, with a peak wavelength of 405 nm, has recently demonstrated potential for in situ treatment of ex vivo stored plasma and platelet products, without the need for additional photosensitizers for pathogen inactivation. This study further examines the antibacterial efficacy and plasma protein compatibility of 405 nm light for the pathogen reduction of pre-bagged human plasma.

Methods: Pre-bagged human plasma (100 mL volumes) was spiked with low-level bacterial contamination (*Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli* and *Acinetobacter baumannii* at ~10^3 CFU/mL) and exposed under continuous agitation, to ~16 mW/cm^2 405 nm light. Inactivation efficacy was assessed using doses up to ≤403 J/cm^2. Preliminary analysis using SDS-PAGE was conducted to assess the compatibility of the antibacterial 405 nm light doses with plasma proteins.

Results: All bacterial species were significantly reduced ($P \leq 0.05$) after exposure to a dose of 58 J/cm^2. *S. epidermidis* was the most susceptible to inactivation with a 3.3-log$_{10}$ reduction (>99.96%) achieved after a dose of 173 J/cm^2. Near-complete inactivation (>3.0-log$_{10}$ reductions; >99.9%) of all species was observed with a dose of 403 J/cm^2. SDS-PAGE analysis indicated that antibacterial treatment levels (≤403 J/cm^2) had minimal effect on protein integrity. The protein electrophoretic patterns of plasma exposed to doses ≤230 J/cm^2 demonstrated no visually detectable differences between the exposed and non-exposed plasma samples.

Minor differences were detected in the protein banding pattern of plasma exposed to ≥288 J/cm^2, indicating slight changes in protein at the ~40 kDa region with these higher doses.

Conclusion: Results from this study support further development of 405 nm light for the pathogen reduction of human plasma. Future studies are required to determine the treatment regime that provides the optimal balance of antibacterial efficacy and product stability.

MK02 | An unusual case of 'massive' fetomaternal haemorrhage with positive patient outcomes

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[1]*Barking, Havering & Redbridge NHS Trust, Romford, UK*

Case History: This case describes a G1P0 38-year-old Female, within her first pregnancy by in vitro fertilisation. Numerous antenatal samples grouped her as O Rh D Negative with no allo-antibodies. The patient had a cervical suture inserted at 21/40 to minimise the risk of a late miscarriage. Following this, a Kleihauer test was performed and Prophylactic Anti-D administered.

The patient re-presented at 37 + 5/40 for cervical suture removal. This was a traumatic removal, so this was performed in Theatre. A Group & Save sample and Kleihauer test were requested as this is a sensitising event in an Rh D Negative Antenatal Woman.

Laboratory Results: This sample returned a mixed field reaction in the Rh D Group, with the analyser giving a 'No Type Determined' result. After review of clinical information, a Fetomaternal Haemorrhage (FMH) was the most likely cause. An urgent Kleihauer test was performed via Acid Elution and quantitated using Mollison's Formula. The results showed a 'Massive' FMH, estimated at 90-115 mL. An FMH of 102.4 mL was later confirmed via Flow Cytometry analysis at NHSBT.

The definition of a 'Massive' FMH is variable, with bleed volumes of 10-150 mL suggested (Ahmed and Abdullatif, 2011). 'Massive' FMH's are idiopathic in ~82% of cases, with bleed volumes >80 mL occurring at a prevalence of 1 in 1000 (Stroustrup et al., 2016), (Ahmed and Abdullatif, 2011).

Clinical Investigations: An urgent MCA-PSV Doppler Scan was performed, returning a result of 88.2 cm/s, indicating significant foetal anaemia.

Patient Outcomes: An Emergency Caesarean Section was performed, delivering the neonate with a Haemoglobin of 64 g/L. Following transfusion of one neonatal red cell unit, the neonate's haemoglobin incremented to 129 g/L. Following this, the neonate recovered well and was later discharged. Throughout, the mother

remained well and received 12 000 IU of PAD via IV route, which cleared foetal cells from her circulation.

Conclusions: This is a very unusual case of 'Massive' FMH, detected initially by discrepant Rh D Blood Grouping, similar to that previously described by (Reynolds, 2020). The difference of Rh D status between mother and neonate, alongside the rapid performance and response to the Kleihauer result contributed to a positive outcome.

MK03 | Transfusion requirements in operative care of appendicitis and related surgery (TROCARs): A retrospective service evaluation of routine group and save ordering using the susQI framework

Katie Gray[1], Stewart McLure[2], Julie Staves[1], Richard Owen[3], Søren Kudsk-Iversen[2,4]

[1]*Oxford University Hospitals NHS Foundation Trust, Oxford, England,* [2]*Nuffield Division of Anaesthesia, Oxford University Hospitals NHS Foundation Trust, Oxford, England,* [3]*Department of Surgery, Oxford University Hospitals NHS Foundation Trust, Oxford, England,* [4]*OxSTaR Centre, Nuffield Division of Anaesthetics, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford, England*

Introduction: The incidence of intraoperative blood transfusion in those undergoing laparoscopic appendicectomy (LA) or diagnostic laparoscopy (DL) is unknown. There is limited evidence that preoperative Group & Save (G&S) is beneficial [1], however it is routinely performed. Using the 'sustainability in quality improvement' (susQI) framework [2], the study aimed to evaluate the intraoperative usage and financial, environmental and social impacts (the 'triple bottom line') of a G&S prior to LA and DL.

Method: Project registered as service evaluation at the John Radcliffe Hospital, Oxford. Retrospective review of all patients identified through Procedure Coded Data and Theatre Information Management System to have undergone a LA or DL between December 2011 and February 2021. Using data-linkage with the blood transfusion laboratory, those who had a cross-match performed were identified and indications reviewed. Cost and weight of materials were used to calculate carbon dioxide equivalents (CO2e) [2]. A value process map was used to scan for social impact.

Results: Over ten years 10 196 patients underwent either a LA or DL, with 27 transfused same day. Financial cost of one G&S: £1.89 (excluding staff and utility costs). Environmental impact per G&S: 1066 grams of CO2e. Social impact included added workload to clinical teams, delay in processing other urgent blood samples and delays to surgery with added discomfort and risk to patient.

Discussion: To the authors knowledge this is the first study to estimate the environmental impact of routine G&S in patients undergoing LA and DL, and demonstrates the susQI framework for other trusts to evaluate similar practice. These data suggest same day transfusion for LA or DL is extremely rare with significant environmental impact, estimated at >1 tonne CO2e per year. Furthermore, there is a significant financial (>£2000/year) and social impact. Therefore, omitting pre-operative G&S should not impact on patient care but will improve the triple bottom line. Emergency O blood if required during surgery, offers a safe alternative without financial ramifications and minimal impact on wider services. Recognised limitations include retrospective review of routine data, broad inclusion criteria and carbon footprint not based on lifecycle assessment. Social impact may also differ in other trusts requiring re- evaluation.

MK04 | A case of D antigen blocking in a neonate born to a mum with multiple antibodies

Sara Wright[1], Maureen Ikwuema[2], Vinnay Eheekha[2], Cherelle Lawrence[2], Matthew Hazell[3]

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Introduction: At delivery a direct antiglobulin test (DAT) on a cord sample is performed in the presence of maternal red blood cell (RBC) antibodies. If positive, the haemoglobin and bilirubin is checked to assess the risk of haemolytic disease of the fetus and newborn (HDFN). As part of a HDFN investigation a group, screen/antibody ID and eluate is performed. This allows understanding of the maternal antibody's presence in the neonate and those opsonising RBCs. Here we describe a case where maternal antibodies caused HDFN, but had blocked the neonates D grouping result.

Method: Maternal anti-D, C and G were identified by BIORAD column agglutination technology (BCAT) (Coombs anti-IgG). Risk of HDFN from anti-C and G was determined via adsorptions on maternal plasma with R2R2 and r'r (Donor EDTA Samples), followed by 2-fold serial titration in BCAT. Risk of HDFN from anti-D was determined via continuous flow monitoring (AntiQuant Mk3) of maternal plasma. DAT was performed at delivery on a cord sample with BCAT (DC Screening I). Antibody eluate from neonatal RBCs was performed with an acid elution kit (Eluate Kit II). Antigen phenotyping for D and C was performed on neonatal RBCs using BCAT (Diaclone ABO/Rh). Neonate RBC genotype was performed via PCR sequence specific priming using the Amplification Refractory Mutation System (IBGRL).

Results: At delivery maternal allo anti-D was 4.1 IU/mL (moderate risk of HDFN) and anti-C + G titre was 64 (high risk of HDFN). The neonate's DAT was positive (IgG = 4+). Clinical assessment and laboratory investigation supported HDFN diagnosis. Anti-D + C + G was identified in an eluate from neonatal RBCs. Phenotype of the neonate's RBCs was D negative but confirmed D positive by genotype. A follow-up maternal sample identified a significant increase in anti-D.

Discussion and Conclusion: Maternal antibody/neonatal eluate results and clinical diagnosis of HDFN were not consistent with neonatal phenotype. Maternal antibodies had opsonised the neonatal RBCs, blocking the D antigen, appearing phenotypically antigen negative. The neonatal D group was resolved via RBC genotyping, demonstrating the usefulness of molecular techniques when discrepancies between maternal alloantibody specificity and neonatal phenotype occur during HDFN investigation.

MK05 | Optimisation of a flow cytometric method for fetomaternal haemorrhage estimation using anti-fetal haemoglobin (anti-HbF)

Laura Reyland[1], Frances Green[2], Kay Ridgwell[2], Roger Hunter[2], Nina Dempsey-Hibbert[3]

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[2]*Protein Development and Production Unit, International Blood Group Reference Laboratory, NHS Blood and Transplant, Bristol, UK,*
[3]*Manchester Metropolitan University, Manchester, UK*

Introduction: The anti-D flow cytometry (FC) method for fetomaternal haemorrhage (FMH) estimation is suboptimal when D variants are present, or if investigating placental abruption or intrauterine death in a D positive mother[1,2,3,4]. Targeting fetal haemoglobin (HbF), requiring the permeabilisation of glutaraldehyde-fixed red cells (RBCs), can provide estimations regardless of D antigen status[5]. Due to glutaraldehyde toxicity, this study aimed to determine if red cell (RBC) fixation can be achieved without using aldehydes[5,6,7].

Method: Dimethyl 3, 3′-dithiobispropionimidate (DTBP) and dimethyl suberimidate hydrochloride (DMS) were investigated for RBC fixation. 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES) or buffer (both pH 8.3) washed cord RBCs were incubated (37°C) with 10 mg/mL DTBP or 25 mg/mL DMS in a time trial, followed by permeabilisation with a range of Triton-X100 concentrations[8,9].

After incubating 20 μL 3% RBC in HEPES with 10 μL of 10 mg/mL DTBP (15 minutes, 37°C), 1 mL of 6 mg/mL Tris(hydroxymethyl) aminomethane (Tris) in HEPES quenched the reaction (10 minutes, 37°C). Washing in phosphate-buffered saline/0.1% bovine serum albumin (w/v) (PBSB) (pH 7.4), 0.5 mL of PBSB/1.5% Triton- X100 permeabilised RBCs for labelling with R-phycoerythrin-conjugated anti-HbF (15 minutes, room temperature). A Beckman Coulter Navios FC was used for immediate analysis.

Thirty adult RBC samples (thirteen spiked to 1% fRBC) were tested by the DTBP and glutaraldehyde methods, establishing FC gating[5]. Four patients were tested by this anti-HbF method and an anti-D method[1].

Results: Bland–Altman (BA) comparison of DTBP and glutaraldehyde method fRBC estimations favoured the glutaraldehyde method (bias = 0.23). Excluding two anomalous results, the bias decreased to 0.14. BA analysis of four patient samples tested by the DTBP anti-HbF and anti-D methods, bias = 0.1.

Conclusion: RBC fixation was successfully performed using DTBP in HEPES. DMS was not used due to consistent solubilisation problems. HEPES replaced borate to increase safety[9,10]. Tris quenched unreacted DTBP to reduce non-specific antibody binding. Visible static adhesion, not observed in the DTBP method, of glutaraldehyde-fixed cells to the analysis tube corresponded to two anomalous results. Divergence between methods requires investigation with a larger patient sample size. Addition of anti-carbonic anhydrase (CA) could refine the method, differentiating adult F cells from $fRBC_4$.

MK06 | The Right Time for Iron

Rita Agarwala[1], Olivia Dow, Thumuluru Madhuri, Ibrahim Jeries, Anil Tailor, Katie Blightman

[1]*Royal Surrey County Hospital, Guildford, UK*

Introduction: There has been a recent emphasis in the management of perioperative anaemia, with the publication of international consensus guidelines and as one of the top 5 Improvement priorities from the Perioperative Quality Improvement Programme. We reviewed the perioperative trend in haemoglobin, the management of preoperative anaemia and our transfusion practice in major open gynaecological surgery in a tertiary onco-surgical centre in order to improve our service.

Method: We reviewed electronic records and a local surgical database of 138 patients who had major open gynae- oncological surgery in 2019. We collected oncological diagnosis, chemotherapy, intraoperative blood loss, transfusion requirements, ferritin and transferrin saturation levels and haemoglobin levels preoperatively, at day 1, lowest inpatient, at discharge and at 4–6 week postoperatively.

Results: Preoperatively, 57% of patients had mild to moderate anaemia (defining anaemia as less than 130 g/dL). The majority were discharged anaemic (135/138) and 85% remained anaemic at 4–6 weeks. 14% (15/106) had iron deficiency anaemia using criteria set by the international consensus guidelines[1]. However this is likely to be underestimated as 71 patients of the 78 anaemic patients had a confirmed malignancy which can artificially raise ferritin levels. 34 patients were transfused 61 units of blood from 24 hours postoperatively to discharge. Average blood loss was 1068mls.

Conclusion: Perioperative anaemia may affect postoperative recovery, rehabilitation and success of adjuvant chemotherapy. We found the majority of patients remained anaemic 4–6 weeks after surgery. Previous local audits have shown the time from preoperative assessment to surgery is short making the provision of preoperative iron logistically challenging in our trust.

We will introduce a three pronged approach to change the management of perioperative anaemia. Firstly, we will perform iron studies earlier in the patient journey, during preoperative chemotherapy, when applicable. Secondly we will set up a novel postoperative iron infusion service as part of our enhanced recovery pathway, in those not captured preoperatively. Finally, we will educate our multidisciplinary team about patient blood management strategies, including oral and intravenous iron, single unit transfusion and appropriate transfusion targets.

With this, we aim to reduce transfusion rates and the incidence of perioperative anaemia.

DOI: 10.1111/tme.12816

TRANSFUSION MEDICINE WILEY

ABSTRACT

Poster session

BLOOD DONATION (INCLUDING DONOR SAFETY)

PO1 | COVID-19 impact on Nigeria's National Blood Transfusion Service - lessons for low- and middle-income countries (LMICs)

Adaeze Oreh[1], Christopher Irechukwu[1], Felix Biyama[1], Agatha Nnabuihe[1], Andrew Ihimekpen[1], Daniel Oshiame[1], Tariere Bozegha[1], Omosigho Izedonmwen[1], Elton Oga[1], Eneye Suberu[1], Kingsley Odiabara[1], Omale Amedu[1]

[1]*National Blood Transfusion Service, Abuja, Nigeria*

Introduction: On the 27th of February 2020, Nigeria's Federal Ministry of Health officially announced the country's first case of COVID-19. As case numbers started to rise, what ensued was government-led interventions similar to those instituted across the world in the form of non-pharmaceutical interventions such as lockdowns, curfews, restrictions on mass gatherings and other physical distancing measures. These measures negatively affected blood donor mobilisation activities. Nigeria, like many other countries in sub-Saharan Africa prior to COVID-19 had encountered challenges with recruiting sufficient voluntary blood donors to meet the huge blood needs in the country, and so dire consequences of these infection prevention measures on national blood supplies were anticipated. A noticeable decline in blood donations and available safely screened blood for transfusions thus followed.

We aimed to assess the blood service activities across seventeen (17) National Blood Transfusion Service centres in Nigeria, including numbers of blood donations, mobile blood drives, blood units screened, outcomes of screening, number of hospitals the NBTS provided services to and number of blood units discarded over the study period.

Method: A retrospective descriptive study was conducted to determine the impact of the COVID-19 pandemic on blood services in seventeen (17) NBTS centres in Nigeria, comparing the months of January to December 2019 (pre-COVID-19) to the months of January to December 2020 (peri-COVID-19).

Results: A 100% decline was observed in mobile blood donation drives in the first two months following government-imposed lockdowns, and numbers of all blood donations and voluntary blood donations declined by 9.8%. An 11.9% decline was also observed in the number of blood units screened; while the number of blood units that screened positive for transfusion-transmissible infections reduced by 28.6%. The number of discarded blood units declined by 3.1%; however, a 32.6% increase was observed in the number of hospitals that accessed blood for transfusion purposes from NBTS.

Conclusions: The COVID-19 pandemic affected NBTS operations in Nigeria. However, by strengthening hospital linkages and employing innovative strategies, NBTS ensured continuity of operations, thereby significantly managing the challenges of COVID-19 to voluntary blood donor recruitment and the availability of safe blood for transfusion.

PO2 | Respecting donors protecting recipients: Gathering evidence for the FAIR approach to blood donor selection policy for MSM

Katy L. Davison[1], Claire E. Reynolds[2], Eamonn Ferguson[3], Susan R. Brailsford[2]

[1]*NHSBT/Public Health England (PHE) Epidemiology Unit, PHE, London, UK,* [2]*NHSBT/Public Health England (PHE) Epidemiology Unit, NHSBT, London, UK,* [3]*University of Nottingham, Nottingham*

Introduction: From June 2021, a new donor selection policy will be implemented across UK blood services, which will allow some men who have sex with men (MSM) to donate without a deferral. This change from the 3-month deferral for MSM, and others with sexual partners, who are at increased risk of infections, was recommended from the work of FAIR (For the Assessment of Individualised Risk). With engagement of stakeholders, FAIR gathered evidence to assess whether the UK blood services could move to a more individualised donor selection policy while maintaining safety.

Methods: FAIR reviewed epidemiological and behavioural data from blood donor and general population surveillance and published literature. This was triangulated with psychosocial evidence from focus groups and surveys with donors, staff, MSM, patients, recipients and non-donors. Questions about sexual activities associated with increased epidemiological risk were assessed for accuracy, reliability and acceptability.

Results: In UK donors, syphilis is increasing, and HBV remains the greatest risk for non-detection on screening. In the general population, HIV is in decline, but MSM remain most at risk, and significant increases in syphilis and gonorrhoea have been seen. The literature confirmed new or multiple partners, using condoms inconsistently, chemsex and bacterial STIs are associated with an increased risk of infection; anal sex posed the greatest risk between partners. Consistent with this, behavioural modelling indicated that questions about these activities statistically clustered, were reliably reported, associated with self-reported higher risk of infection and had minimal reporting bias. A policy based on an individual's sexual activity was perceived as fair and unlikely to deter donors.

Conclusion: FAIR used an evidence-based approach to recommend a change to allow people without a new sexual partner in the last three months to donate irrespective of gender or type of sex. Under this FAIR policy, MSM in long-term partnerships are eligible. Implementation of FAIR has included an emphasis on recipient safety, and clearer messaging around the rationale for current deferrals in donor selection questions has encouraged donors to think about their recent sexual activities before donating. The impact of FAIR will be regularly monitored.

PO3 | Determination of the frequencies of ABO, Rh (D) and Kell system in patients belonging to the Andean Population of Teligote-Ecuador

Diana Villagómez[1], Eduardo Alvarado[1], Danny Asimbaya[1], María Nieto[1]

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Introduction: Blood typing is based on the identification of antigenic properties of blood cells, which could result in undesirable adverse reactions. The main objective of this study is to establish the frequency of antigens of the ABO, Rh and Kell systems; using a gel technique, in people belonging to an Andean indigenous population between the age of 18 to 55 years old, during February of 2020.

Methods: This study is a descriptive, cross-sectional study of 216 people in whom blood typing was performed using two DG gel cards (Diagnostic GRIFOLS S.A.) through the gel microagglutination technique. The first card contained anti A, anti B and anti AB antibodies for the ABO system, and anti D IgM monoclonal antibodies (DVI+, DVI-), C, c, E, e, Cw for the determination of Rh system. The second card contained anti-K human IgM monoclonal antibodies to type for the Kell system. All the statistical analysis was carried out using SPSS version 20.

Results: The distribution found according to the blood groups of the ABO system and the Rh factor was: O RhD Positive 71.8%, A RhD Positive 21.8%, B RhD Positive 4.2%, O RhD Negative 1.9% and A RhD Negative 0.5%. The frequency of the Cw antigen of the Rhesus system was 2.8%, and Kell antigen had a frequency of 8.3%. The most frequent phenotype was R1/R2 (DCe/DcE) 38.4%, followed by the phenotype R1/R1 (DCe/DCe) 35.6% and with lower frequency the phenotypes rr and RzRz.

Conclusion: This study provides relevant information about the frequency of the antigens of ABO and Rh system, which are similar to other local studies reported, but differs on the reports on phenotypes (21). The Kell antigen prevalence in this population is higher than the national and international prevalence previously reported (16). The Cw antigen prevalence was higher than that reported in Caucasian (2%) and Afro-descendant (1%) populations (12) and lower than other populations such as Finnish (9%) (10). The information of one of the country's indigenous populations provides specific data for the health system.

PO4 | Vasovagal reactions reported in COVID-19 convalescent plasma donors - NHSBT experience

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Safety and efficacy of COVID-19 Convalescent Plasma (CCP) was tested as part of two large randomised controlled trials in UK (REMAP-CAP and RECOVERY). CCP collections by apheresis were started across NHSBT from early in the pandemic to support the trials.

Data from CCP donors who had donated at least once in the period between April 2020 and March 2021 (inclusive) was reviewed.

Of the 57 213 attendances during this period, 6908 (12.1%) resulted in at least one adverse event, reported within seven days of attendance. Donors experiencing an adverse event were more likely to be first-time donors than donors with no adverse event were. The risk of having any adverse event reduced from 14% for first-time donors to 7% for repeat donors. Bruising was seen in 58% and vasovagal events were the second most common donor adverse events accounting for 37% (2570/6908). Most (2373/2570, 92%) were mild with no loss of consciousness. CCP donors experienced lower rates of mild vasovagal events to new/returning whole blood donors overall but appear to be at higher risk after stratifying by sex and age. They are significantly more likely to feel faint than new/returning apheresis donors.

Differences between new/returning whole blood and CCP donors are statistically significant ($p < 0.05$) in both men and women in all age groups from 35 years upwards. In all cases where there is a significant difference, the rate was higher for CCP donors. When compared with new/returning apheresis donors, the rate in CCP donors was higher overall.

One serious adverse event of donation was recorded in a new male CCP donor in his mid-40s who had severe immediate vasovagal reaction with hypotensive seizure requiring hospitalisation following his first CCP donation. He recovered subsequently and was withdrawn from donation.

Donating CCP was largely safe but complications were seen following donation in 12% with vasovagal events, bruising and arm pain being the most reported donor adverse events. Vasovagal events could be multifactorial with increased anxiety, new/first time donors, vascular dysregulation or subclinical cardiac dysfunction secondary to recent COVID-19 infection possibly contributory. It is encouraging to see that the risk of having any adverse event halved with repeat donations.

PO5 | Do deferred blood donors with low haemoglobin or low iron stores seek medical care?

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Introduction: The Welsh Blood Service notifies its deferred blood donors with low haemoglobin or low mean corpuscular haemoglobin

findings by a postal letter. The letter is to advise of the likelihood of iron deficiency or iron deficiency anaemia and seek their general practitioner's care. There is currently no agreed care pathway to outline the management of iron deficiency anaemia in these blood donors in primary care.

The study examined the subsequent behaviour of deferred blood donors after receiving this letter informing them of the likelihood of iron deficiency/iron deficiency anaemia. It also investigated the treatments offered by the general practitioner and the specifics of the care provided with the demographic factors that influenced differences.

Methods: 668 deferred donors were invited to complete a questionnaire to detail their response to the advice letter. 444 consented to take part in the study and completed the questionnaire. They reported their recall of the experience of care and on personal demographics descriptors.

Results: The majority (77.5%) of the responders reported that they sought primary care. There was an association that iron tablets are more likely to be provided to females (Male 55.7% vs Female 73.2%, $p = 0.02$.) Those who had a blood sample taken were less likely to report receiving dietary advice (15.1%) than those who did not have a blood sample (27.8%, p-value = 0.02). Those who reported that they did not act on the advice were more likely to attempt blood donation again (82.0%, vs 67.5% for those who sought care (p-value >0.001).

Discussion: We saw diversity in treating low haemoglobin and low iron stores offered at primary care, as recalled by donors. Some demographic factors influenced this; however, the treatment provided seems independent of these factors, except that females are more likely to have iron supplementation supplied to them. The act of seeking care makes a person less likely to donate blood again.

COMPONENTS, DONATION, TESTING AND SAFETY, TISSUES, CELLS AND CELLULAR THERAPIES

PO6 | Six years of experience with plasma fractionation industries at a private super speciality hospital in South India: Renaissance in usage of excess plasma in blood banks

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Background: According to World Health Organisation (WHO) each country must plan for its safe and consistent supply of blood and plasma products for regular clinical needs as well as in case of any disaster. Self-sufficiency ratio is the key parameter to assess the ability of a country to meet its need for plasma derived medicines, through utilisation of locally collected plasma. It also helps in proper usage of surplus plasma in blood banks.
Aim: This study aims to evaluate the impact of plasma fractionation industries as an add on in proper utilisation of plasma components in the current Indian scenario.
Materials and Method: A retrospective observational study was conducted to analyse 6 years of data in providing excess plasma for plasma fractionation (PF) industries from the Blood Bank, Yashoda Hospitals, Hyderabad, India.
Results: A total of 25 361 whole blood donations were collected from qualified blood donors between January 2013 and December 2018. Of which, 23 448 plasma units were prepared from the donations which were negative for Transfusion Transmittable Infections (TTIs). Only 54.7% (12832) of the available plasma units were transfused to patients and 0.79% (187 units) was discarded. The remaining 44.3% (10301) of the plasma units were sent to PF companies at regular intervals where they are used for preparing varied plasma derived medical products.
Conclusion: Six years of shipping plasma to PF reduced plasma wastage by 44.3% (10 301 TTI negative plasma units). Implementation of usage of plasma components for transfusion to patients along with shipping excess plasma for PF periodically improves the effective utilisation of blood components as well as preparation of medical products in large numbers by PF industries. However, the blood donation process and plasma supplied should meet the specifications as per Drugs and Cosmetics Act, 1940 and Rules made thereunder.

PO7 | HIV antibody false positive results among COVID-19 immune plasma donors

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Aim: During our routine work at the Turkish Red Crescent (TRC) laboratories, HIV 1/2 antibody false positive results were observed among immune plasma donors more frequently than healthy donors. We aimed to determine anti-HIV1/2 antibody false positivity rates among the convalescent plasma donors and healthy blood donors.
Methods: 2593 donors donated 3689 donations of immune plasma to the TRC between 11 April-06 July 2020, and were screened by eCLIA for the presence of antibody against HIV1/2. The confirmation tests were performed with LIA. All of the donors were non-remunerated immune plasma donors between the ages of 18 and 60. For the control group, 41 078 donations from 407 363 healthy blood donors received on the same days.
Results: Repeated reactivity rates (1.87%) was significantly higher in immune plasma donors than the control group (0.13%, $p < 0.05$). However, there was not a statistically significant difference between the confirmed reactivity rates of the study group (0.03%) and the control group (0.01%, p: 0.217).
Conclusion: Serologic and NAT screening tests are performed in the laboratories of the TRC to prevent transfusion transmitted infections. In our study, it was determined that the false positive results obtained from serologic HIV screening tests of convalescent plasma donors were significantly higher when compared to the healthy blood donors.

PO8 | HEV pool testing review at the Welsh Blood Service

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Welsh Blood Service (WBS) introduced HEV NAT testing in pools of 16 donations on the Grifols Panther System in July 2017 following SaBTO guidance. Pools with a Sample to Cut-off (S/CO) ratio value above 1.0 are positive and automatically individually tested. In 2019 whilst reviewing the HEV pool results, a negative pool with an S/CO ratio of 0.87 was found (pools with S/CO ratio < 1.00 are all classed as negative). Individual testing of the components of this 'negative' pool resulted in the detection of an individual donation that was reactive with a viral load of 58 IU/ml. This prompted a review. In this, trial HEV results for pools of 16 were individually retested if any reactivity was observed (i.e. sample/cut-off ratio 0.01–0.99). 1403 pools (23 311 donations) were tested resulting in 24 pools requiring re-test (384 tests) due to sample to cut-off ratio being 0.01–099. One confirmed positive donation was found with a viral load of 75 IU/ml from the negative pools. The clinical impact of this will vary depending on component type and recipient risk factors.

PO9 | Platelet concentrates for neonates suspended in 80:20 ratio of plasma to platelet additive solution

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Introduction: In response to the observation that end of storage pH levels in apheresis-derived platelet concentrates (PCs) for neonates had declined and were not meeting the UK specification, NHS Blood and Transplant colleagues suggested adding platelet additive solution (PAS) at a ratio of 80% plasma to 20% PAS to take advantage of the buffering capacity of solutions such as SSP+ (Macopharma; Mouvaux, France). The Welsh Blood Service (WBS) undertook a study to confirm the expected increase in pH and ensure the buffering of the pH was not masking an increase in the storage lesion.

Method: In each replicate one adult dose from a double or triple dose apheresis collection had 50 mL of SSP+ aseptically added on day 3 (day 0 being the day of collection). A second dose from the same collection was untreated and acted as a control. Both doses were split into four neonatal units on day 3. Splits from both the control and test arms of the study were tested on days 3, 6, 7 and 8.

Results: A total of twelve replicate experiments were performed. pH was better maintained in the units with added SSP+, with a mean difference between control and test arms on day 8 of 0.48 ± 0.17. Test units showed lower levels of platelet activation (surface CD62P expression of 57.1 ± 10.8% versus 69.4 ± 11.7%; $p < 0.001$) and performed equivalently or better in assays measuring aspects of platelet function. Three of the experiments used collections from donors whose previous donations had shown pH levels below 6.4 at end of storage. Controls from these units all had pH (22°C) <6.3 on day 8. Test units, in contrast, all showed pH (22°C) levels >6.8 and markedly improved performance with other markers. Further work demonstrated it was the addition of SSP+, and not simply the increased volume and lower platelet concentration that was responsible for the higher pH.

Discussion: The addition of 20% SSP+ not only served to buffer the storage medium, but also had a benefit on indicators of platelet function and viability. The component has since been introduced into routine manufacture at WBS.

PO10 | A year of collecting convalescent plasma donations in England: How do infections compare to blood donors?

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Background: NHSBT started convalescent plasma (CVP) collection in April 2020. By July, donations were prioritised from people more likely to have high antibody levels, generally males. Along with specific COVID-19 requirements, the usual donor selection criteria and screening applied.

During 2020, there was concern that the number of syphilis positive CVP donors suggested higher risk sexual behaviour. Here we describe confirmed hepatitis B virus (HBV), hepatitis C virus (HCV), HIV, HTLV and syphilis in CVP donations for April 2020 to March 2021 and compare January 2020 to December 2020 testing data in whole blood donations.

Methods: CVP donations were included in the routine surveillance for infections in blood and apheresis donors. Number of CVP donations with demographics were supplied by NHSBT Statistics and Clinical Studies. Rates were calculated per 100 000 donations and compared using Fisher test.

Results: Of 55 191 CVP donations 53% were from new donors and 90% by males compared with 13% and 44% respectively in 1.37 million donations from whole blood donors. Preliminary results showed 56 confirmed positive CVP donations from new donors (20 HBV, 4 HCV, 1 HIV, 0 HTLV, 30 syphilis, 1 HCV/syphilis) and 2 syphilis positive CVP donations from lapsed donors. Rate of all markers in new donations was significantly higher in CVP, 196 per 100 000 CVP donations vs 111 per 100 000 whole blood donations, but not for repeat donations. HBV and syphilis rates were higher in new CVP donations, syphillis significantly higher, while19/20 HBV and 26/31 syphilis were longstanding or past infections. Nine syphilis positive CVP donors donated despite a history of infection. Rates of syphilis acquired within12 months remained higher but not significantly different to whole blood donations.

Discussion: These data provide assurance that viral infection rates mainly reflected chronic infection identified in new male donors, similar to whole blood donors. Higher rates of syphilis in new CVP donors mainly reflected past infection, a third with a known history, while rates of recent syphilis were not significantly higher. Messaging on the rationale for selection criteria and the syphilis deferral remains important to maintain safety and avoid an unusable donation, especially when recruiting new donors.

PO11 | Impact of CMV requirement on the match grades of HLA-selected platelets

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Introduction: HLA-selected platelets (HSP) are a specialist blood product used to treat patients diagnosed with immunological platelet refractoriness. Selection of platelets based on the HLA type can be further complicated by additional requirements to match CMV, ABO and RhD blood groups. In 2012, the Advisory Committee of the Safety of Blood, Tissues and Organs (SABTO) recommended that leucocyte depleted components be used as an alternative to CMV seronegative components for all recipients except pregnant women, neonates and intra-uterine transfusions. Adherence to SABTO recommendation by hospitals has been variable, with some not following recommendations. The aim of this prospective study was to determine the impact of inappropriate requests for CMV negative HSP on HLA matching.

Methods: HSPs were ordered using the On-line Blood Ordering System (OBOS) for a named patient and, a search for compatible donors was performed using the patient's HLA type and HLA antibody profile, with and without CMV as an additional

requirement. The HLA matching was graded as follows: 'A' grade, = no HLA-A or B mismatches and 'B' grade (B1-B4) = 1, 2, 3, 4 mismatch antigens between the patient and donor. The number CMV positive and CMV negative HLA matched donors was also recorded for comparison.

Results: Data from the first 22 requests showed that the requirement for CMV negative reduced the available HLA matched pool of donors by an average 50%. In addition, 4 patients (18%) had a worse match grade due to the requirement of CMV negative units: 3 patients received a platelet with 1 HLA antigen mismatch ('B1' grade match) instead of an 'A' match grade and 1 patient received a platelet unit with 2 HLA antigen mismatches ('B2' match grade) instead of 'B1' match grade.

Conclusion: The preliminary results of our on-going study show that requesting CMV negative platelets outside of the SABTO guidelines can reduce the number of HLA compatible platelet units available for transfusion but also resulted in 18% of patients receiving poorer matched units. HLA mismatching in refractory patients can reduce the efficacy of platelet transfusion and result in increased HLA sensitisation and this data should help inform practice.

PO12 | HBsAg level and hepatitis B viral load correlation in asymptomatic healthy whole blood donors

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Introduction: Blood collection centres have the responsibility of counselling and management of donors found to be sero-reactive for transfusion transmitted infections. This includes measurement of hepatitis B viral load to estimate transmission risk. However, viral load estimation is expensive and not affordable by many, especially in resource constrained settings. Aim of the present study was to investigate the relationship between HBsAg and HBV DNA levels and to determine applications of HBsAg level monitoring for estimating viral load.

Methods: This was a prospective, observational study including whole blood donors who were found to be Hepatitis B surface antigen (HBsAg) reactive by chemiluminescence immunoassay (CLIA) (Vitros 3600 immunodiagnostic system, Ortho Clinical Diagnostics, New Jersey, USA) over a period of two years. All such donors were tested for HBV DNA quantification by real-time polymerase chain reaction (PCR) (Qiagen, Germatown, USA). Correlation between E-ratio obtained by CLIA and viral load obtained by real-time PCR was determined by Spearman correlation coefficient ρ.

Results: A total of 252 whole blood donors were found to be HBsAg reactive during the study period. These included 219 males and 33 females. The correlation between HBsAg and HBV DNA levels was found to be insignificant [$\rho = -0.11937$ ($P = 0.14167$; $n = 252$)]. Higher HBsAg E-ratios were observed in donors with high as well as low viral load. Similarly, lower HBsAg E-ratios were observed in donors with low as well as high viral load. HBV DNA <3 IU/mL was almost always associated with lower HBsAg E-ratios.

Conclusion: Correlation between HBsAg E-ratio obtained by CLIA and HBV DNA levels obtained by PCR was found to be insignificant in asymptomatic whole blood donors. Therefore, HBsAg E-ratios obtained by CLIA cannot be used to estimate the viral load for diagnostic or monitoring purposes and the measurement of HBV DNA is necessary for quantification of Hepatitis B viral load in sero-reactive blood donors.

DIAGNOSTIC SCIENCE AND TECHNOLOGY

PO13 | The development, validation and implementation of IgA deficiency and anti-IgA testing by flow cytometry in NHS blood and transplant

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IgA deficiency is relatively common with a frequency of approximately 1:700 individuals. IgA deficient patients may produce anti-IgA if transfused with blood components containing IgA, which can result in anaphylactic transfusion reactions and can require the use of non-standard washed or IgA deficient components. It is important to be able to test for both IgA deficiency and anti-IgA to assist in the clinical management of patients and maintain a supply of IgA deficient donor blood components. RCI previously employed Column Agglutination Technology (CAT) to perform both IgA deficiency and anti- IgA tests. However, due to commercial supplier kit withdrawal, NHSBT needed to develop, validate and implement two new assays to maintain a service to patients, donors and clinicians.

Since RCI has employed flow cytometry to determine Fetomaternal Haemorrhage using FITC labelled anti-D, new assays based on this technology, equipment and expertise were considered. IBGRL has expertise in developing new assays and reagents and so embarked on developing these assays in partnership with RCI. Two novel bead-based flow cytometry assays were developed to detect IgA deficiency and anti-IgA in patient and donor samples. The IgA deficiency assay utilises anti-IgA coated beads incubated with patient sample, followed by FITC labelled anti-IgA to detect bound IgA between 0.0005 g/L and 4 g/L (upper limit of normal range). The anti-IgA assay utilises IgA coated beads incubated with patient sample, followed by FITC labelled anti-human IgG and IgM to detect bound anti-IgA. The mean fluorescence is measured against 3 standards created by NHSBT - strong positive, weak positive, and negative. Weak reactivity can be resolved using an inhibition procedure. The presence of IgA does not cause false negative results.

IgA deficiency and anti-IgA assay validation was performed by comparing previously reported CAT results with the new bead-based assays to assess suitability and reproducibility in RCI labs. The newly developed assays perform at least as well as the commercial kits, have been put into clinical service by RCI and are currently being assessed for accreditation to ISO15189.

PO14 | High dose prophylactic anti-D interference of flow cytometry analysis in a D negative patient follow up samples

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Introduction: Prophylactic anti-D (PAD) is administered to D negative women in response to potential feto-maternal haemorrhage (FMH) during pregnancy. This mitigates sensitisation and prevents Haemolytic Disease of the Fetus and Newborn (HDFN) in future D positive pregnancies. FMH analysis by flow cytometry (FC) in RCI uses a fixed gating strategy and automatic dose calculation of PAD. Here we report two cases where large volume PAD interfered with FC FMH follow up testing.

Method: FC was performed using a two-colour reagent to exclude granulocytes from analysis – BRAD3- FITC/BIRMA17C-PE (anti-D/anti-CD66b) and negative control AEVZ-FITC/BIRMA17C-PE (anti-Varicella Zoster/anti-CD66b); fixed gating strategy and automatic PAD calculation. All follow up samples underwent repeat testing.

Results: Case 1 (Transfusion of D positive cells in trauma patient): D positive population = 179 mL, required 18 000 IU PAD IV. At 48-hour follow-up, insufficient right-shift of D positive peak = 31.4 mL, suggesting 4000 IU PAD IV. Gate manipulation = 39.7 mL, and 4500 IU PAD IV.

Case 2 (Intra-uterine death): D positive population = 96 mL, required 10 500 IU PAD (9000 IU IV, 1500 IU IM). At 48-hour follow-up, insufficient right shift of D positive peak = 4.0 mL, suggesting 500 IU PAD IM. Gate manipulation = 6.4 mL, and 1000 IU PAD IM.

Discussion/Conclusion: A fixed gating strategy in FC clinical testing removes the requirement to manipulate analysis, reducing the risk of erroneous result interpretation. Full positive shift seen in primary sample results was hindered in follow up samples. Results suggest incomplete opsonisation of D positive cells with PAD administered IV in the presence of a large FMH, reducing surface binding of BRAD3-FITC during 48 hour follow up testing.

When using a fixed gating strategy this interferes with accurate PAD calculation. Care should be taken to review fixed gating results where PAD has been administered to ensure full positive shift.

PO15 | Serological determination of drug-induced immune haemolytic anaemia caused by ceftriaxone

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Introduction: Drug-induced haemolytic anaemia (DIHA) is a rare, under–reported and often overlooked cause of red blood cell (RBC) destruction. There are 4 types of DIHA: non-specific adsorption, drug adsorption, immune complex mechanism or drug independent autoantibody production. Ceftriaxone is an antibiotic widely reported to cause DIHA, with a more significant presentation in paediatric patients. A recent case highlighted the importance of serological investigation of DIHA to link the cause in a 5-year-old male with endocarditis and secondary septic arthritis with unexplained haemolysis.

Method: Drug-induced immune complex mechanism testing was performed. Patient's serum was incubated with reagent RBCs (unpapainised and papainised), a 10 mg/mL drug suspension or PBS control, with and without a source of complement.

Results: The first dose of Ceftriaxone was administered in May 2020 with no negative impact. Following a second dose in June 2020 the patient experienced a peri-arrest, fever and haemoglobin drop from (WHAT?) to 30 g/L. This was accompanied with a positive DAT (C3d). DIHA immune complex mechanism investigation demonstrated binding of Ceftriaxone antibody in the patient's serum using papainised reagent RBCs.

Discussion/Conclusion: The patient described here had experienced significant unexplained haemolysis, resulting in an increased range of clinical, hospital and reference laboratory investigations. There was an initial sensitising event followed by a later response to further Ceftriaxone treatment. In cases of unexplained haemolysis, resolution is often achieved by ceasing drug treatment but without full understanding of the cause of a haemolytic episode. The lack of a proven link between the drug and haemolysis poses the risk that a patient could later receive the same drug treatment. Here we clearly demonstrate the link between specific drug treatment and haemolysis, allowing avoidance in the future.

PO16 | A case report: An antenatal patient with allo-antibodies to the high - frequency antigen, At(a)

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Introduction: This case study describes a 31-year-old G5P2 Antenatal patient, who first presented for Antenatal Booking Bloods in 2005. She was grouped as O, D Positive with no allo-antibodies. Her Booking Bloods for her third pregnancy in 2013, showed a pan-reactive antibody.

Laboratory Results: This antibody demonstrated reaction strengths of 2+ and 3+ upon BioRad LISS IAT and BioRad Enzyme LISS IAT panels, alongside a negative auto-control. Further investigations by NHSBT identified the presence of anti-At(a), an allo-antibody to a high frequency antigen (HFA). This persisted at a titre of 32 throughout this pregnancy. In her fifth pregnancy, anti-At(a) was initially detected at a titre of 128, rising to 256 prior to delivery. The neonate was delivered via Caesarean section, with just 450 mL maternal blood loss.

Clinical Outcome(s): The neonates born from the third and fifth pregnancies were at risk of haemolytic disease of the foetus and new-born (HDFN), due to anti-At(a). These had similar laboratory presentations, with Haemoglobin 156-157 g/L, a positive Direct Antiglobulin Test (DAT) and clinical observations of jaundice. No Bilirubin levels were available for either neonate. The last neonate demonstrated a positive DAT of IgG 3+, with anti-At(a) in the eluate.

Discussion: The clinical significance of anti-At(a) is not well described due to the rarity of this allo-antibody. As At(a) is a HFA, it's present in >99% of individuals in all ethnicities. Meaning At(a) - blood is scarce, and only ~15 cases of anti-At(a) antibodies have been reported (Raval et al., 2016).

In the antenatal setting, a number of cases have reported absence of any indicators of HDFN when anti- At(a) is present. Cases with solely a positive DAT as in this case have also been reported (Raval et al., 2016). A single case of severe HDFN due to anti-At(a) was reported (Culver et al., 1987).

Transfusion reactions due to anti-At(a) have also been reported. Raval et al. (2016) described an acute haemolytic transfusion reaction (HTR), and Cash et al. (1999) described a delayed HTR. Both were cases of severe HTRs, treated by immunosuppressants and provision of At(a) - units (Raval et al., 2016; Cash et al., 1999).

PO17 | Pregnancy with anti-HrS antibody in a patient typed with antigen D variant and e variant

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Introduction: Anti-HrS is a rare antibody associated with moderated haemolytic disease of the newborn, mainly when titre is greater than 32. Anti-HrS was first reported in 1960, 2 antibodies were distinguished in the serum of Mrs. Shabalala. The name 'hr' was from Wiener's terminology for 'e' and superscript 'S' was from Shabalala as referred above.

We aim to observe if HrS is likely to cause a HDFN.

Method: Here, we present the case of a 34-year-old woman with a history of two pregnancies, not known to have been problematic and with historical anti-C, anti-E, anti-Cw, anti-Hr and anti-HrS. Important to note that anti-Hr and anti-HrS were detected on the 2nd pregnancy only and an auto pan reactive antibody has been reported on the 1st pregnancy.

When we first received the sample on the current and 3rd pregnancy, the gestation time was already 18 weeks. As expected, we carried on performing allo absorptions as the standard panels were reacting all the way through.

Results: Allo adsorptions cells R1R1 and rr were able to confirm the presence of anti-E, rr cells confirmed the presence of anti-C and R2R2 the presence of anti-Hr and anti-HrS. To note that this patient was previously typed D and e variant and reactions on R2R2 allo adsorbed plasma were suggestive of anti-e.

The anti-Hr and anti-HrS antibody titre was 128 and anti-C/−E reacted only with neat plasma. Patient was monitored at a specialist Fetal Medicine Unit and samples were taken at 28 weeks and every 2 weeks until delivery.

The results remained the same until delivery, a newborn sample was sent to RCI due to symptoms of HDN and 3 paediatric RBCs units were requested.

Due to the small paediatric sample received and the positive DAT (IgG 4+), the only testing we could perform was our routine Rh phenotyping and an eluate from which we detected an anti-HrS.

Conclusion: As this is a rare entity, no case reports have been published. The present case suggested HDN due the presence of anti-HrS, however, this could not be confirmed due the lack of sample for further testing.

PO18 | Transfusion management of antenatal patient presenting with anti-U antibody

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Introduction: Anti-U is a rare red cell alloantibody, exclusively found in black Africans [1]. It can cause haemolytic transfusion reactions (HTR) and haemolytic disease of the fetus and newborn (HDFN). The U antigen is part of the MNS blood group system; M, N, S, s and U antigens normally being most important for transfusion. HDFN varies in severity from asymptomatic to intrauterine death [2]. U negative blood is rare [2]. We present an antenatal patient with anti-U, with a multidisciplinary plan based on clinical history and results.

Method: Records of this 35-year-old pregnant woman were obtained from our patient and laboratory information systems and from the hospital where her previous baby was born.

Results: Anti-U titres were high at ~~1:~~512 at 11 weeks and ~~1:~~256 at 15 weeks gestation. In her previous pregnancy, an emergency caesarean section was required at 38 weeks for oligohydraminios: neonatal Hb was normal at bith but dropped to 66 g/L on Day 20 requiring a top up transfusion. DAT +; mildly raised bilirubin but no phototherapy required. Other causes of fetal anaemia were excluded (CMV, rubella, parvovirus, haemorrhage, G6PD, haemoglobinopathies). Mother had post-partum bleeding of 650 mL: no transfusion required.

Plan: Obstetric assessment indicated no obvious risk for PPH: for such 'standard' as opposed to 'high' risk patients, we would not routinely thaw frozen blood, as stocks are finite. In major haemorrhage, we would give ABO, full Rh & K compatible blood with IVIg and/or IV methylprednisolone 1 g cover.

Fetal middle cerebral artery Dopplers showed no fetal anaemia by 24 weeks. Given the previous probable neonatal HDFN, we will call a donor for exchange blood just before delivery around 37 weeks. Should an IUT be required, frozen U-units can be used, if insufficient time to call donors.

Conclusion: High titre anti-U may cause HDFN [3, 5], however not in all pregnancies [4, 5]. We strongly recommend a multidisciplinary approach to manage such patients with rare alloantibodies, considering past obstetric and neonatal history. They should be referred to Fetal Specialists. Plans for rare blood should be discussed early with a Blood Service.

PO19 | The potential for anti-CD47 Fab fragments to inhibit the interference of therapeutic anti-CD47 in serological investigations

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Background: CD47 is a cell surface glycoprotein that acts as a 'do not eat me' signal for macrophages. High expression of CD47 has been identified in haemato-oncology conditions, protecting malignant cells from phagocytosis. Anti-CD47 Therapeutic Monoclonal Antibodies (TMAbs) are undergoing clinical trial. They block the 'do not eat me' signal, allowing antibody–mediated phagocytosis and macrophage destruction.

Anti-CD47 TMAbs complicate transfusion support, as they recognise CD47 expressed on red blood cells (RBCs). In the transfusion laboratory this causes interference in serological investigation across a range of platforms/techniques, including ABO grouping and antibody identification.

Here we describe the impact of Fab fragments prepared from seven anti-CD47 monoclonal antibodies (BRIC 32; 122; 124; 125; 126; 168; 211) on interference during serological investigation caused by the corresponding whole molecule IgG (WM IgG) and anti-CD47 TMAbs.

Methods: RBC phenotyping reagents (anti-D, C, c, E, e, M, N, S, s, K, k, Jk^a, Jk^b, Fy^a, Fy^b) and patient plasma samples with known antibodies (anti-D, c, E, M, S, K, Jk^a, Fy^a) were used to investigate steric hindrance of these antibodies due to anti-CD47 Fab binding to reagent RBCs.

Indirect antiglobulin technique (column agglutination and glass tube) with anti-CD47 WM IgG was used to assess the ability of anti-CD47 Fabs to block CD47 on the surface of reagent RBCs.

Antibody titration (indirect antiglobulin technique) of plasma from two patients undergoing anti-CD47 therapy was used to investigate whether anti-CD47 Fab could inhibit RBC agglutination by anti-CD47 TMAb.

Results: Anti-CD47 Fabs did not inhibit RBC phenotyping reagents or known RBC antibodies in patient plasma from binding to their antigenic targets.

All anti-CD47 Fabs showed inhibition of RBC agglutination by anti-CD47 WM IgG. BRIC125 Fab completely inhibited all anti-CD47 WM IgGs.

Anti-CD47 Fabs did not completely inhibit anti-CD47 TMab agglutination. Titration of plasma from two patients undergoing treatment demonstrated a dramatic reduction in score (65 000 vs 512).

Summary/Conclusions This work demonstrates:

- That anti-CD47 Fabs do not interfere with clinically significant RBC antibody binding.
- That anti-CD47 Fab binding to reagent RBCs reduces anti-CD47 WM IgG and TMAb binding.
- The concentration of anti-CD47 Fab requires further optimisation to completely inhibit anti-CD47 TMAbs

PO20 | Verification of patient triplicate tests in FMH estimation by flow cytometry

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Performing FMH estimation by flow cytometry in triplicate allows for clear identification of single outlying test results. If a potentially incorrect test result is identified, assay performance can then be evaluated to identify any errors in technique and the assay repeated.

Furthermore, performing the patient testing in triplicate permits statistical analysis of the results. The precision of FMH estimation measurement will increase with the number of independent patient tests. While statisticians would recommend >5 measurements for an accurate assessment of precision, three replicate tests gives confidence in the mean result and allows the standard deviation to be determined, which in turn allows for statistical discrimination of assay results.

Significant differences in independent test results often appear obvious. However, this is not always the case. Therefore, the triplicate results need to be examined to determine if they are acceptable and the FMH estimation result valid.

Verification of patient triplicate tests has been performed at the Welsh Blood Service since 2019 by calculating precision using relative SD (co-efficient of variance) expressed as %CV. Results show that precision increases with an increase in the volume of packed fetal cells present in the maternal sample (Table 1).

Volume of packed fetal cells (mL).

Table 1: Mean %CV by fetal cell volume 2019–2021.

	<1 mL	1–4 mL	4–12 mL	>12 mL
Mean %CV	49.9	4.3	2.7	1.6

Precision was lower (%CV >10%) for bleeds of <1 mL of packed fetal red cells. 99.5% of patients tested with an FMH of >1 mL had a triplicate CV of <10%. The acceptance criteria for patient triplicates are currently set at a %CV of ≤10%.

Triplicate tests may reduce the need for repeating assays and provide inexperienced operators confidence in their results. Assay precision may vary with the level of fetal cells present in the maternal sample. The precision of flow cytometry FMH estimation assays should be determined and appropriate acceptance criteria for independent test results established.

PO21 | Alloadsorptions as an aid to excluding additional antibodies in patients with confirmed antibodies to a high incidence antigen

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Introduction: The exclusion of other antibody specificities in patients with a known antibody to a high incidence antigen can be challenging. Finding sufficient antigen negative panel red blood cells (RBCs) for exclusions can be difficult, with commercial panels rarely including antigen negative RBCs for clinically significant antibodies to high incident antigens such as Fy3 or anti-U and only single examples of KK cell (k-). This can lead to delays in pretransfusion testing and routine antenatal antibody testing. Alloadsorptions can be used to overcome this obstacle.

Method: Alloadsorption of patient plasma with selected reagent RBCs can be used to adsorb out the antibody to the high incidence antigen. The adsorbed plasma can then be tested with routine panel RBCs using a standard IAT technique to allow the identification or exclusion of further alloantibodies.

Case study: A sample from a patient with known anti-k was referred for exclusion of additional alloantibodies prior to leg amputation surgery. Four K + k − RBCs were identified in the 4 commercially available panels in use within the laboratory. All 4 RBCs were found to be negative when tested by BioRad IAT. All k + panel cells tested reacted with a 3+ reaction strength. However, anti-Fya and anti-E could not be excluded in the panel or using the patient phenotype. A search for k − Fy(a−) E− red cell units was performed. Only two suitable units were identified, neither of which was located in the region. Importing the units prior to crossmatch could not be completed in time for the surgery to take place.

Alloadsorption studies were performed. The alloadsorption studies successfully removed the anti-k and the IAT panel performed on the modified plasma was negative allowing the exclusion of ant-Fy^a and anti-E.

Conclusion: Alloadsorption studies have been successfully been used to exclude additional antibody specificities in patient with confirmed antibodies to high incident antigens in both clinical situations and during routine antibody monitoring during pregnancies. The advantage of alloadsorptions in these cases is that it eliminates the need to source rare antigen negative panel cells to use for exclusion studies allowing better utilisation of rare antigen negative units.

PO22 | Rising antenatal anti-K titres despite a K-negative foetus

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A 41 year old lady, originally from Kuwait, gravida 2, para 0 presented to our centre in her third pregnancy. The booking antibody screen was positive, demonstrating an anti-K antibody. The patient had a history of late pregnancy losses at 29 weeks and stillbirth at 39 weeks gestation with no cause identified. A thrombophilia screen was normal. She had no significant past medical history, nor took regular medications. She was a non-smoker, abstinent from alcohol.

A rising titre was seen throughout pregnancy from 1:32 at 10 weeks, 1:64 by 27 week and 1:128 by 28 weeks. She was reviewed by the fetomaternal unit. At 26 weeks gestation, foetal *KEL* genotype was negative by DNA PCR amplification of exon 6. At 37 weeks gestation she had a successful delivery of a healthy baby by an elective Caesarean

section with estimated blood loss of 400 millilitres. The baby was well with no clinical features of anaemia or jaundice and resuscitation was not required. The baby's haemoglobin was 164 g/l, reticulocyte count 247 x109/l, the DAT was negative and the phenotype was confirmed as K−, AB R1r (CDe/cde). The baby was discharged the day after delivery.

One year later, the patient presented again with another singleton pregnancy, and blood samples taken at booking again showed an anti-K with a titre of 1:64. At 16 weeks this had risen to 1:128 and by 22 weeks was 1:256. The partner's phenotype was K- antigen negative. At 30 weeks, foetal *KEL* genotyping was negative by DNA PCR amplification of *KEL* exon 6.

Conclusion: This case highlights the presence of a rising anti-K antibody during pregnancy in the absence of a K-positive foetus documented in two pregnancies. Transient anti-K antibodies have been reported elsewhere in the literature in the context of sepsis; these are usually IgM and not pregnancy related.

PO23 | A novel molecular basis for the Gy(a-) phenotype in a pregnant individual with anti-Gya

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Background: The 10 antigens of the Dombrock blood group system are encoded by the *ART4* gene and reside on the Dombrock glycoprotein (ADP-Ribosyltransferase 4; ART4). The Gy(a-) phenotype, lacking all the Dombrock system antigens, is the DOnull phenotype. Gy(a-) is the result of different inactivating mutations in *ART4*. Currently, the ISBT lists six null alleles associated with this phenotype.

Methods: A pregnant Uzbekistani woman, with one previous child and no previous transfusions, presented with an antibody to an unknown high frequency antigen in her plasma. Samples from the patient were investigated with standard serological methods. Soluble recombinant Dombrock(b) protein (Inno-train) was used in inhibition tests. Genomic DNA was isolated from the patient, all exons of the ART4 gene were amplified by PCR and Sanger sequenced. Outcome of pregnancy data was provided.

Results: Anti-Gy^a was identified in the patient's plasma, reacting moderate strength with untreated and papain treated cells. Two examples of Gy(a-) cells were found to be compatible with her plasma. An example of each Hy- and Jo(a-) cells were found to react only weakly. The anti-Gy^a was inhibited by soluble recombinant Dombrock protein. The patient's red cells were found to be Gy(a-) with two examples of anti- Gy^a. ART4 sequencing confirmed the patient to be *DO*02* (*DO*B*) homozygous. In addition, a novel homozygous single nucleotide deletion c.139delT in exon 1 was detected. This change encoded p.Ser47LeufsTer31, causing a reading frame shift and in turn introducing a premature stop codon at Leu77. This deletion would most likely result in a truncated Dombrock glycoprotein and therefore no expression of Dombrock antigens. A healthy male infant was born in gestational week 40 by vaginal delivery and found to be DAT positive, Hb 155 g/l, with no treatment needed.

Conclusion: We report serological and genetic evidence for the Gy(a-) phenotype resulting from a novel molecular background, a homozygous single nucleotide deletion c.139delT, encoding p.Ser47LeufsTer31. Anti-Gy^a was found in the plasma of the pregnant individual. The outcome of pregnancy was a healthy male infant born with no clinical signs of HDFN observed.

PO24 | NHS blood and transplant – red cell immunohaematology flow cytometry based feto-maternal haemorrhage screening service pilot with the royal wolverhampton NHS trust

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Introduction: Red Cell Immunohaematology (RCI) provide D positive feto-maternal haemorrhage (FMH) confirmation testing and volume estimation by flow cytometry (FC) following a positive Hospital Transfusion Laboratory (HTL) acid elution (AE) screen. Problems related to the laborious nature and the accuracy of AE are well documented. FMH NEQAS demonstrates that the CV for results gained is higher than those for FC. Here we describe the RCI pilot study with the Royal Wolverhampton NHS Trust of a rapid FMH screening test by FC.

Method: The FC screening test was performed using a two-colour reagent – BRAD3-FITC/BIRMA17C-PE (anti-D/anti- CD66b) and a fixed gating strategy. A positive FC screen was ≥2.5 mL. The two-colour reagent/fixed gating strategy was also used for confirmation testing, but, with a two colour negative control reagent – AEVZ-FITC/BIRMA17C-PE (anti-Varicella Zoster/anti-CD66b). AE testing was performed at the HTL (Clintech AE test kit) and FMH was measured by Miller square technique (BSH Guidelines, 2009). A positive screen by AE was to be ≥2 mL.

Results: 134 samples were referred to RCI for the pilot (Delivery = 89; PV bleed = 20; Abdominal trauma = 15; IUD = 2; Other = 8). 38 samples were rejected from testing (32 = sample age; 4 = D negative baby). 3 samples were identified to have an FMH result ≥2 mL by AE screen vs 13 ≥ 2.5 mL by FC screen. Following FMH confirmation testing by FC, 11 of these samples were established to have an FMH ≥2.5 mL.

Conclusion: The screening pilot was conducted to assess and optimise processes for sample referral, testing, reporting and reflex to FC confirmation. The FC screening test was considered simple to set up by RCI scientists and result determination was gained in <60 minutes from start of process. Result generation was made easy by automated calculation by FC software. Results were reported to the HTL upon completion and appeared on Sp-ICE shortly after verbal contact. More samples were referred for confirmation test following FC compared to AE, even though a higher mL cut off for a positive result (≥2.5 mL vs ≥2 mL). This was thought to result from the greater sensitivity of FC testing.

PO25 | Follow-up of D negative antenatal patients with a positive antibody screen due to possible prophylactic or immune anti-D

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Introduction: Sheffield Teaching Hospitals NHSFT (STH) developed an algorithm to in 2010 to determine which patients need continuous flow analysis (CFA) quantitation of anti-D. Revised guidelines (White et al, 2016: BCSH Blood Grouping and Antibody testing in Pregnancy) advised some changes to monitoring of potential immune anti-D. Studies compared the STH algorithm against the 2016 guidelines.

Method:

- Comparison of antibody screen using patient plasma diluted 1:10 and 1:20 in PBS against the CFA quantitation result.
- Retrospective follow-up of 24 cases of confirmed immune anti-D to check that they would have been detected using the STH algorithm.
- Retrospective follow-up of pregnancy outcome in 121 D negative pregnancies with a positive antibody screen due to suspected prophylactic anti-D (RAADP).
- IAT antibody screen method tested against NIBSC anti-D to give a semi-quantitative measure of anti-D, ensuring that the reaction cut off in the algorithm is ≤0.2 IU/mL.

Results: The algorithm would have detected all samples determined to have immune anti-D in the study. The study of pregnancy outcome showed no cases of suspected haemolytic disease of the foetus and newborn where the algorithm was used. The cut off for the antibody screen in the algorithm equated to less than 0.2 IU/mL.

Discussion: The studies showed that the algorithm at STH would detect cases where the anti-D detected may be immune. Samples showing a strong positive antibody screen, positive antibody screen when diluted 1:10 or no evidence of RAADP in the last 8 weeks should be referred for CFA.

In order to comply with the 2016 guidelines we would recommend follow-up samples at 16, 20 and 24 weeks if the anti-D was detected prior to 28 weeks but did not require CFA. If immune anti-D cannot be excluded by 28 weeks follow-up should be by mid-cerebral artery doppler scan. If detected after 28 weeks samples should be taken at 34 and 36 weeks.

This would allow midwives to concentrate resources on the highest risk pregnancies, while monitoring all pregnancies at potential risk due to anti-D.

PO26 | Multi site comparative study of three heparin induced thrombocytopenia (HIT) test methods and preliminary consideration of their utility in suspected vaccine induced thrombocytopenia and thrombosis (VITT)

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Heparin induced thrombocytopenia (HIT) occurs when patients generate an antibody response against the heparin/platelet factor 4 (PF4) complex. In some cases, these antibodies cause platelet activation and clinical thrombosis. The 'Four-T's' score assesses clinical likelihood of HIT. Anti-PF4 antibodies have been detected in patients suffering from vaccine-induced immune thrombotic thrombocytopenia (VITT) following SARS-CoV-2 vaccination and testing by ELISA is recommended.

Various platelet activation and pF4/heparin complex antigen assays are employed to detect HIT antibodies. High test sensitivity increases likelihood of detecting of antibodies that do not cause clinical HIT. We compared the BioRad ID-PGIA test with the Werfen Acustar assay and the Werfen immunoassay in a comparative study of 12? HIT patients and two UKNEQAS supplementary exercises. The specificity of the BioRad ID-PGIA Heparin/PF4 gel filtration test is considered poor, although its negative predictive value is more reliable. The Werfen Acustar chemiluminescence assay and the Werfen HaemosIL HIT-ab latex immunoassay have comparable sensitivity and superior specificity to the BioRad test. Preliminary studies suggest all three assays have limited sensitivity to VITT.

BioRad HIT results were positive for 10/12 patient samples. The two negative samples were also negative by Acustar and immunoassay. One additional sample was negative by Acustar but positive by immunoassay. Four further samples were negative by immunoassay but positive by Acustar. Patients deemed HIT positive by Acustar were switched to fondaparinux or argatroban. Continued heparin infusion did not cause clinical deterioration in the patient who tested HIT positive by immunoassay but not Acustar. The BioRad method obtained expected results for UKNEQAS distributions S20 and S21. Both Werfen methods obtained expected results for S20 but demonstrated poor sensitivity to VITT and HIT in S21.

Agreement between results of the three HIT assays is limited but typical of expected patterns. Heparin is variable in terms of chain length and degree of sulphation, which affects degree of conformational change, and therefore antigenic presentation, of PF4 in complex with heparin. Variable antigenic profile in different assays leads to poor comparability of results. It is important to distinguish between HIT and VITT for the purposes of assay selection.

PO27 | LEAN startup a new approach to service development for the transfusion laboratory?

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NHS England has created 29 hospital networks to enhance clinical expertise, pathology staff careers, productivity and running costs. Networks do not include service provision by specialist reference laboratories, however, red cell immunohematology (RCI) have identified a potential requirement for the provision of new services. RCI service development is undertaken in house, with little customer input, risking the release of services that do not meet customer requirement. NHSBT has LEAN manufacturing principals embedded organisation wide, reducing process waste, not sacrificing productivity and adding value for the customer. Could LEAN principals be used to develop services that better target Hospital requirements?

Method: Hospital Transfusion Laboratory Managers were invited to an event. LEAN manufacturing and Startup tools were employed to explore service ideas:

- Value Proposition Canvas – Used to Identify service themes and pains they cause
- Kano modelling – Identified features of potential services related to themes
- Business Model Canvas – Identified how RCI create, deliver and capture the value of new services.

Results: Three themes were identified – Quality assurance, Training and LEAN Laboratory. Below is a summary of the pains they cause and important related features for a future service:

1. QUALITY ASSURANCE:

Pains – Inter-departmental conflict; Creation/identification of validation materials; Staff training; staff disheartenment.

Features – Self-sufficient; Validation templates; Contributes towards compliance; Centralised library of materials; Delivered by external partner.

2. TRAINING:

Pains – Mentors availability; Effort to prepare/assess materials; Wasted time if staff leave.

Features – Demonstrates training effectiveness; Across organisation platform for delivery/competency checks; Bitesize sessions; Accredited; Delivered by external partner.

3. LEAN LABORATORY:

Pains – No protected time; reduced understanding = no staff buy in; scarce published evidence of effectiveness in laboratories.

Features – Should be part of day2day practice; Delivered by external partner.

Conclusion/Next Steps: The Value Proposition Canvas and Kano model were viewed positively by attendees who considered them easy to use. The tools allowed for the identification of service themes and features for their resolution. The Business Model Canvas was considered cumbersome and not of value in the event. With these themes identified, future services will be developed with a hospital partner.

PO28 | Analysis on the impact of COVID-19 on the identification and laboratory investigation of haemolytic transfusion reactions

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Introduction: The COVID-19 pandemic put a huge pressure on all aspects of healthcare. Staff shortages were widely reported in the media; however, there were additional difficulties on staff including worries about putting their own health and that of their families at risk by continuing to support patient care. An additional challenge in provision of safe blood transfusions early in the pandemic was the lack of and published data regarding whether the virus could be transmitted via blood of infected patients. This introduced uncertainty around the safety of performing manual serological tests, commonly employed and recommended by the British Society for Haematology (Milkins et al, 2012), in antibody identification and investigation of haemolytic transfusion reactions (HTR).

Method: HTR reports submitted to SHOT in 2020 were compared to those reported in the preceding two years to identify whether the pandemic had affected the incidence and the profile of serological investigations performed (e.g. direct antiglobulin test (DAT)).

Results: The total number of HTR reported to SHOT in 2020 is comparable to the number reported in preceding two years, with 35, 49 and 46 reactions reported in 2018, 2019 and 2020 respectively. However, in 2020, a DAT was only reported in 27/46 (58.7%) of cases. This is a significant reduction when compared to 40/49 (81.6%) in 2019 and 34/35 (97.1%) in 2018.

Discussion: Although there has been no significant increase in the incidence of HTR reported in 2020, the investigation of HTR has been affected, which may be a result of the additional challenges laboratories faced while managing the COVID-19 pandemic, and the effect of decreased testing may be observed in future years. As the DAT is a relatively simple test that can be performed by almost all transfusion laboratories in the UK, this may be indicative of a wider problem. Clear, timely guidance should be released by national bodies such as the BSH or National Blood Transfusion Committee in times of uncertainly, to enable transfusion laboratories to confidently provide the best standard of care to patients, whilst protecting the safety of staff.

PO29 | Weak D Type 11 – The sudden identification in blood donors due to the change of routine anti-D reagent

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Introduction: Weak D Type 11 is an RhD variant common in Northern Europe and has been detected by molecular studies in RhD negative blood donors.

Depending on the haplotype, it can be characterised as Weak RhD like variant (cDe) or as partial DEL (CDe). In 2019, a new routine anti-D reagent, NOVACLONE Anti-D IgM (D175-2) + Anti-D IgG

(D415 1E4), detected a positive Weak D Test (WDT) in two previous RhD negative donors. In 2021, a first time donor presented the same discrepancy. In all samples, a RHD*11 allele was identified in the Lisbon immunohaemathology reference laboratory (LIRL).

We report the impact of a new anti-D routine typing serum in RhD negative blood donors for the detection of RhD variants.

Methods: Three blood donors were referred with serological discrepancies with anti-D sera. Studies used Diagast D-Screen panel, France. Genetic characterisation included RH-TYPE Kit, BAGene, Germany and Inno- Train RBC-Ready Gene D weak Kit, Germany.

Results: All donors were R1r, and had a negative Direct Antiglobulin Test.

The samples were negative with all anti-D reagents, except in the WDT by NEO IRIS equipment, IMMUCOR, USA (2+). Studies with the anti-D panel showed no reaction except for the IgG clone P3X249 (w/1+).

Genetic characterisation identified a RHD*11 allele (c.885G > T) in all samples, confirmed with both kits.

Conclusions: Between 2010 and 2012, the LIRL performed the genetic characterisation of RhD negative blood donors with Cde and cdE haplotypes, without detection of RHD*11 alleles.

The introduction of a new anti-D serum led to the identification of a DEL variant. These are the first examples of RHD*11 detected in LIRL, all associated with a CDe haplotype and a DEL phenotype.

In two blood donors, it was the second and third blood donation respectively and so a trace back was performed. The Red Blood Cell units were administrated to RhD positive patients, so no alloimmunization occurred. Care should be taken when analysing RhD negative phenotypes associated with Cde and cdE regarding weak RhD variants in blood donors.

PO30 | Comparison of Rh and K and non-Rh and K phenotyping errors in United Kingdom National External Quality Assessment Service (UK NEQAS) blood transfusion laboratory practice (BTLP) pre-transfusion testing (PTT) exercises

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Introduction: UK NEQAS BTLP monitors the performance of laboratories in red cell phenotyping as part of its PTT programme. Up to 2019, nine to twelve samples were sent each year for either Rh(CcEe) typing, or typing for other clinically significant blood group antigens; meaning that phenotypes for each blood group system were only assessed once every two years. In 2019, the PTT exercises were changed to assess phenotyping for Rh and K (RhK) only and a pilot scheme was introduced for extended red cell phenotyping (ERP) for other commonly tested antigens.

Method: Data for phenotyping results from PTT exercises was gathered for the five exercises before the change (all non-RhK) and the five exercises after the change (all RhK) and error rates compared. No attempt was made to analyse the cause of any errors.

Results:

42 599 results for Rh (C,c,E,e) and K contained 134 errors

- 46 (0.2%) false positive results in 18 801 tests
- 90 (0.4%) false negative results in 23 798 tests

13 187 results for non-RhK (M,N,S,s,Jka,Jkb,Fya,Fyb) contained 160 errors

- 46 (1.5%) false positive results in 3063 tests
- 114 (1.1%) false negative results in 10 124 tests

Discussion/Conclusions: The results show a higher error rate with non-RhK phenotyping than RhK.

There are many factors which affect phenotyping results; the nature of the antisera itself, the complexity of the testing being undertaken and the number of manual interventions required during testing. It is not known how many of the errors are related to transposition/typographical errors and how many are technical or interpretive errors.

For users of column agglutination technology RhK testing cards/cassettes are normally available with antisera already impregnated within the card/cassette; these lend themselves to automated testing or simple manual testing (addition of red cells and centrifugation). The majority of other phenotyping antisera are generally available as liquid reagents with varying methodologies (e.g. IAT, tube saline); other methodologies may involve technology not commonly used in the laboratory performing the testing.

The higher error rate in non-RhK phenotyping highlights the importance of the ERP scheme as a way for laboratories to externally monitor their performance with these tests.

EDUCATION AND TRAINING

PO31 | Use of online learning platforms to enable continuous professional development (CPD) in pathology, across multiple sites, during the COVID-19 Pandemic

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Introduction: The UK pathology service has been completely restructured over the past 10 years leading to many challenges for service users. One challenge is providing consistent training across pathology, as having multiple sites and staff shift patterns has made it increasingly difficult to ensure there are equal opportunities to learn. Additionally, COVID-19 restrictions have reduced the ability for both educators and learners to travel to events; making it harder to nurture staff's continuing professional development (CPD).

Method: North Kent Pathology Service (NKPS) has employed the use of E-learning through YouTube to combat this issue. Discipline specific presentations and generic educational materials were created, recorded and uploaded to YouTube. Staff could complete their learning at a time convenient for them. This also provided unlimited access to the information so they could reinforce their knowledge at any time.

Educational worksheets were provided and staff were encouraged to complete reflective learning after the presentations.

Results: Analytics on YouTube were employed to assess usage of the recordings. The channel was launched in June 2020 with one recording, it now has 15 recordings with a combined 775 views and climbing. There is an average of 52 views per recording, with some having over 100 views. NKPS currently employs 26 members of staff within the blood transfusion and haematology departments, showing that staff from other areas are also using these resources.

Discussion: Due to social distancing restrictions, teaching groups are limited in number therefore it would be difficult and time consuming to teach these topics to large numbers of staff. Comparing face to face teaching to the impact of this E-Learning, it has demonstrated that it is more accessible and readily available to staff members at a time suited to them. The educational worksheets and reflective learning has allowed monitoring of which staff are engaging with the recordings, and produced evidence for their CPD portfolios. This project has demonstrated the benefit of utilising online platforms, and also highlighted the requirement for staff to become competent in the use of IT so we are able to continue to support our employees.

PO32 | Blood assist - safe transfusion practice at your fingertips

Anne Davidson, Andrea Marshall, David Melia, Pnt Laloë, Richard Stickland

Background: Transfusion guidance is extensive and complex, and for staff who are not regularly involved in transfusion, it can be overwhelming and difficult to interpret in an acute clinical setting. Anecdotal evidence and error trends indicated a need for support tools accessible in the clinical area. The intention for Blood Assist was to summarise key messages and safety points, presenting them in a simple and clear format, reducing ambiguity and risk of misinterpretation.

Methods or Study Design: Content was designed in collaboration with clinical stakeholders including biomedical scientists, nurses and clinicians. This feedback also led to the development of a web-based version that can be accessed from any device to support training and education.

An extensive and robust quality and validation process, interrogating accuracy, functionality and reliability was completed.

Two stakeholder organisations piloted the app clinically to assess the functionality within the clinical setting and gather crucial service user evaluation.

Results: Blood Assist launched 1st February 2021. 2.7 K downloads in the first 28 days.

5 K+ downloads since launch Average use 2.5 minutes Accessed in over 35 countries.

5-star reviews on The App store Positive feedback from clinical users.

Conclusions: Data and feedback suggest the app is already proving useful and improving patient safety. Direct impact on patient safety from the app will be difficult to evidence, however, review of annual error trends and reports from clinical users may corroborate use of the app with improvements in transfusion safety.

Clinical user feedback.

'Lots of useful information, the compatibility section is really helpful'.

'Very well laid out and useful advice. Clear guidelines on rates, complications etc.*'*

'Brilliant resource, easy and clear to use. Promoting safe best evidence transfusion practice with a gorgeous user experience interface. Clinical support tools done right!'

Dr J Cort Deputy Medical Director Chesterfield Royal Hospital NHS Foundation Trust UK.

'Blood Assist app is extremely useful for anyone involved in transfusion medicine. Thoroughly recommend it. Ask IT to install it in every available device in your hospital'.

Dr J Uprichard Deputy Chief Medical Officer St George's University Hospitals NHS Foundation Trust UK.

PO33 | Major haemorrhage pack to support massive transfusion protocol

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Introduction: Massive blood loss can be defined as the loss of one blood volume within a 24-hour period, 50% blood volume loss within 3 hours or a rate of loss of 150 ml per minute. At Bradford Royal Infirmary, the massive haemorrhage protocol should be initiated when bleeding leads to a heart rate greater than 110 beats/minute and/or systolic blood pressure less than 90 mmHg. Major haemorrhage can result in hypovolaemic shock and is potentially fatal. Quick and

effective implementation of a massive haemorrhage protocol is essential for favourable patient outcomes and requires specific equipment and resources to ensure safe and effective delivery of blood products, and patient monitoring.

Method: A questionnaire was developed and circulated to doctors in the critical care and surgical departments, to ascertain how many people had been involved in implementing the massive haemorrhage protocol, in what setting, what equipment they thought was essential for implementation, and where they might find the equipment. Participants were asked whether they thought having a pack with the necessary equipment would be useful.

Results: 85% of doctors surveyed had been involved in a major haemorrhage event across a variety of hospital locations. 95% of respondents were confident they knew what equipment was required to facilitate delivery of the protocol, including: central and peripheral wide bore access; arterial line and transducer; pressure bag; blood giving set; blood bottles; ultrasound sheath and lubricant and massive haemorrhage guidelines. Knowledge of the location of where to find equipment was poor in all settings, particularly ward/radiology, and ICU. 85% of doctors surveyed thought that having a pack with the correct equipment would be useful and should be located in ICU.

Conclusion: A major haemorrhage pack was implemented with equipment to facilitate rapid delivery of blood products and invasive patient monitoring. Staff were educated about the location and contents of the pack, and to ensure equipment is checked and replaced. It also contains the massive haemorrhage guidelines, AAGBI Quick Reference Handbook 'Massive Blood Loss', and massive obstetric haemorrhage guide. It allows safe and effective monitoring and treatment for patients with major haemorrhage, to improve patient outcomes.

PO34 | Case study: Coagulopathy in a near drowning patient. The merit of thromboelastography (TEG) to aid product selection

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Introduction: This is an unusual case presentation of a near-drowning patient that highlights the merits of thromboelastography to aid decision-making regarding blood products.

Clinical Presentation: A young male was found submerged in seawater, unconscious, in cardiac arrest. On arrival, the patient was hypothermic with no obvious signs of bleeding. Cardiothoracics agreed to re-warm on cardio-pulmonary bypass. Despite persistent ventricular fibrillation unresponsive to defibrillation, and epistaxis during intubation, good end-tidal CO2 was recorded.

Laboratory Results: After initially normal results, there was a gradual fall in platelet count and haemoglobin (166 g/L to 133 g/L); a continuing decline suggested bleeding and disseminated intravascular coagulation (DIC). Admission clotting results were prolonged, and fibrinogen was low, also correlating with DIC. There were acute renal and hepatotoxic liver injuries. Haemolytic markers suggested intravascular haemolysis.

In addition to routine laboratory tests, samples were processed on the TEG5000 analyser to provide a real-time insight into the patient's haemostatic profile and aid rapid product selection. Initial TEG results indicated specific product requirements; prolonged initiation time suggested factor deficiencies, requiring fresh frozen plasma (FFP); weak clot formation and absent functional fibrinogen suggested cryoprecipitate (to replace fibrinogen) and platelets; clot lysis implied a need for tranexamic acid (TXA), an anti-fibrinolytic, to avert clot breakdown. Following administration of 4xFFP, 3xcryoprecipitate, 1xplatelets and TXA, a repeat TEG showed clot initiation and strength were improved, clot lysis corrected, and functional fibrinogen was low but measurable.

Discussion: Drowning leads to respiratory insufficiency, ensuing asphyxia and eventual cardiac arrest. Concurrent DIC observed in drowning patients with bleeding results primarily from hyperfibrinolysis (demonstrated in this patient), and the absence of clotting is a predictor of mortality. An ischemia-induced release of tissue plasminogen activator contributes to hyperfibrinolysis, hence both TXA and fibrinogen replacement may act as a therapeutic approach for bleeding in drowning victims. Results from this case fit with the literature: laboratory results were suggestive of bleeding, with an absence of clotting as demonstrated by the TEG®; this guided the administration of blood products including cryoprecipitate and TXA, which improved the patient's haemostatic profile. Unfortunately, as with 92% of all drowning patients with overt DIC, this patient died.

PO35 | Maintaining a continuous programme of support and education for hospital transfusion laboratory professionals during the SARS-CoV-2 pandemic

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Implementation of stringent infection prevention and control measures, including social distancing, created a significant challenge for laboratories to maintain an on-going programme of training, education and continuing professional development for professionals working in blood transfusion during the SARS-CoV-2 pandemic.

The NHS Blood and Transplant (NHSBT) Patient Blood Management (PBM) team developed a remote, free at the point of access education group, open to newly qualified biomedical scientists and those new to transfusion science. Meeting monthly, an industry expert speaker is invited to deliver a lecture on a specialist area of blood transfusion before opening the session for discussion between delegates and speakers. The curriculum is flexible and reactive to feedback from delegates and considers key industry recommendations, such as those published in the 2019 SHOT annual report.

We have received 650 registrations to join the Biomedical Scientist Empowerment and Discussion Group. The membership spans the whole United Kingdom, as well as Ireland and overseas. We invited the delegates that attended the sixth meeting of the group to respond to a short survey. 72 delegates responded.

62.5% (n = 45) respondents felt that blood transfusion training time been reduced or difficult to facilitate during the last 12 months, due to the SARS-CoV-2 pandemic. 98.61% (n = 71) respondents felt that the education provided during these sessions enabled them to provide a better service to patients and service- users.

By operating remotely, we were able to maintain a continuous programme of support and education for hospital transfusion laboratory professionals during the SARS-CoV-2 pandemic. As a result, delegates felt empowered to provide a better service to patients and service-users. This accessible, cost-effective, and successful model should be considered by other organisations working within other pathology specialisms to enhance individual and service performance.

PO36 | Case study: Anti-D detection in an Rh D positive antenatal patient

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Introduction: Maternal anti-D is a significant cause of haemolytic disease of the foetus and newborn (HDFN). To reduce the incidence of this, women who are Rh D Negative are offered routine antenatal anti-D prophylaxis (RDAAP). Rh D discrepancies are sometimes not identified until sensitisation has occurred, and an antibody developed which requires further investigation. In the antenatal setting, this can lead to the risk of women developing anti-D.

Case Study: An antenatal patient with a previous history of pregnancy (gravida 2, para 2) had a routine group/screen prior to induction of labour. She grouped as A Rh D Positive (reactions strengths 3+/4+) which was consistent with historical. The antibody screen was positive. BioRad Indirect Antiglobulin Test (IAT) and papain panels showed anti-M in IAT and anti-D detected in enzyme. Samples were sent to the National Blood Service (NBS) for group confirmation (insufficient for antibody identification). NBS confirmed patient typed as DV variant and the patient should be regarded as A Rh D Negative.

Discussion: This case highlights the gap of D variant women who are mistakenly typed as Rh D Positive only to be discovered as a variant after they have developed anti-D. This risks HDFN occurring as the variant would not have been detected early enough to enlist the patient for RDAAP. A literature review showed many of these cases are discovered during delivery, which means anti-D levels are not monitored throughout pregnancy.

Anti-D by enzyme only likely indicates a low antibody titre. Therefore, risk of HDFN was theoretically low for our patient. However, for future pregnancies, there is greater risk to an Rh D Positive foetus. Foetal genotyping is not indicated due to the D Variant, but future pregnancies would warrant referral to foetal medicine. Patient education is essential so that they are aware of their ABO/D status and how it may impact them in the future. Could these women be detected earlier if a wider array of D-typing reagents are used? Screening all pregnant women for Rh D variants is unfeasible however potentially in the future molecular typing may become the norm for ABO grouping and these women could be detected early on.

PO37 | Case study: Delayed haemolytic transfusion reaction with symptoms attributed to the patient's underlying clinical condition

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Introduction: A delayed haemolytic transfusion reaction (DHTR) occurs >24 hours post transfusion. Indications include a fall or failure to increment Haemoglobin (Hb) and the presence of an incompatible crossmatch not detectable pre-transfusion. The 2019 SHOT report contained 23 cases of DHTR, 12 with no clinical symptoms of a transfusion reaction. It is widely thought that DHTR are under reported due to no clinical symptoms or symptoms similar to the patient's underlying condition. This case study highlights the importance of considering test results for identification of DHTR when there are no clear clinical symptoms.

Method: Case study of a 73-year-old female admitted to hospital with melaena. The patient grouped as O D positive with an anti-c and the presence of additional alloantibodies was excluded. The patient had at least one previous pregnancy, but no history of transfusion. She continued to have an upper gastrointestinal (GI) bleed and was transfused two units of crossmatch compatible red cell units.

Results: Nine days post transfusion, the patient developed a positive direct antiglobulin test (DAT). In addition to the known anti-c, anti-Fya was detected in the eluate. Thirteen days post initial transfusion, the patient's Hb failed to increment (Hb pre-transfusion = 81 g/l, Hb at day 13 post initial transfusion = 76 g/l). An additional anti-Jkb was detected, and the plasma was a dark colour. However, the failure to increment Hb was attributed to the continuing upper GI bleed. A CT scan confirmed the patient had liver cirrhosis. The patient passed darkened urine, but this was attributed to her underlying liver condition. The patient reported no other symptoms associated with DHTR. The DAT and serology results confirmed a DHTR. The initial red cell units transfused phenotyped as Fy(a+) and Jk(b+).

Conclusion: It is not possible to determine if one or both additional antibodies detected were responsible for the DHTR. This case study demonstrates that clinical symptoms of DHTR may not be present or may be associated with the patient's underlying condition. Laboratory staff should be aware of signs of DHTR, such as changes in plasma colour and positive DAT post transfusion, and be empowered to alert clinicians.

PO38 | Implementation of a manual competency assessment task for emergency procedures in blood bank at Sheffield Teaching Hospital NHSFT

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Introduction: The procedure for assessing staff competency in blood transfusion at Sheffield Teaching Hospitals NHSFT was predominantly a verbal assessment or done without supervision (completion of a NEQAS exercise and a set number of TACT exercises per year). After

an incident involving misinterpretation of an emergency blood group in an urgent situation and a recommendation from UKAS; an observed, manual, practical assessment of emergency procedures was put in place. The aim was to ensure all staff could provide appropriate, fully cross matched blood using manual techniques when under pressure.

Method: 16 members of staff were provided with whole blood samples for rapid tile grouping, and a weak anti-D reagent (National Institute for Biological Standards and Control (NIBSC)) for manual antibody screen and cross match by indirect antiglobulin test (IAT). Staff were required to provide fully cross matched blood within 40 minutes. No standard operating procedures (SOPs) were allowed and each section was timed with the following expectations: rapid group complete within 5 minutes, antibody screen and cross match set up within 20 minutes, results read and blood issued within 40 minutes.

Results: 100% staff correctly carried out a provisional group and ascertained the correct group <5 minutes. 93% staff set up the manual antibody screen and cross match within 20 minutes. 67% staff read the cross match results within 40 minutes (times ranged from 33:44–43:50). 1 member of staff was unable to complete the exercise.

Discussion: With the continuing improvements in automated techniques in blood transfusion, laboratory staff are at risk of becoming deskilled as their manual techniques are infrequently used, especially in emergency situations. The majority of laboratory staff were able to successfully and correctly carry out a provisional group, manual antibody screen and crossmatch, read the results and issue blood within 40 minutes from the beginning of the exercise. Staff discussions showed that this exercise was a good way for staff to reflect on their manual techniques and how they would handle urgent situations going forward. This has now become part of our yearly competency assessment.

PO39 | Automated red cell exchange transfusions for the routine management of symptoms associated with congenital methaemoglobinaemia first diagnosed during pregnancy. A case study

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Introduction: This patient (a previously unpublished case) presented with cyanotic lips during her first pregnancy with no relevant family or medical history. Methaemoglobin (MetHb) by co-oximetry was approximately 10%. She was diagnosed with autosomal recessive Methaemoglobinaemia (type 1). DNA testing confirmed two CYBR3 gene mutations. During her second pregnancy MetHb levels rose to 19.5%. She experienced body cramps, palpitations and gross lethargy. A partial manual red cell exchange reduced MetHb to 10% substantially alleviating symptoms. Despite dietary advice, folic acid and vitamin C treatment; headaches, shortness of breath on exertion, generalised fatigue and intermittent joint pains continued. Monofer was administered for borderline ferritin (25.9 pg/L).

Pathophysiology: Nicotinamide adenine dinucleotide (NADH) and NADH phosphate (NADPH) reduce oxidised ferric iron in MetHb via the enzyme cytochrome-b5 (encoded by the CYBR3 gene) back to haemoglobin. Cytochrome-b5 reductase deficiency limits natural reduction of MetHb by the glycolytic pathway. The pentose phosphate pathway provides a secondary mechanism essential to prevent 100% conversion of Hb. The condition usually presents with cyanosis during the neonatal period. Symptoms develop as MetHb increases >20%. Previously asymptomatic patients occasionally present later in life. Disease prevalence is unknown.

Method: Routine automated red cell exchange transfusions (ARCET) were introduced to alleviate ongoing symptoms. 6/8 ABO, Rh, K matched units <10 days old were transfused via the Spectra Optia Apheresis system at intervals (28 to 79 days) agreed between the patient and Transfusion Practitioner, according to symptoms.

Results: Pretransfusion baseline MetHb ranged 9.1–1.7%, with beneficial reductions following each procedure. Hb was stable pre (129–145 g/L) and post (129-155 g/L) exchange. Monofer was administered twice when Hb fell to 129 g/L. 8 unit exchanges provided no benefit (symptom relief or prolonged intervals).

Conclusion: This patient experiences symptoms at lower MetHb% despite being asymptomatic throughout childhood. The pentose phosphate pathway may have adequately compensated pre-pregnancy but has not recovered. Intermittent Monofer requirements may suggest increased erythropoeitic response to ongoing hypoxia. No Methaemoglobinaemia guidelines exist for exchange transfusion beyond acute treatment. This regular regime has consistently lowered MetHb%. Long term automated RCET may benefit other patients unsuitable for Methylene blue treatment.

PO40 | A rare case of autoimmune haemolytic anaemia secondary to the use of the anti-PD1 monoclonal antibody pembrolizumab for treatment of lung cancer

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The use of immunotherapy has opened a new frontier in oncology, but some drugs present challenges for the transfusion service. Prembrolizumab is an immune checkpoint inhibitor, used in non-small cell lung cancer and relapsed Hodgkin lymphoma. It blocks the programmed cell death protein-1 (PD-1) on the surface of T-lymphocytes, resulting in immune-mediated killing of malignant cells. With increased use, we have greater experience of its immune toxicities such as colitis and pneumonitis. These immune-mediated effects are generally reversible with steroids and drug cessation. Immune-mediated haemolysis, however, appears to be an extremely rare complication, with only the occasional case report.

We describe a 77 year old male with no transfusion history who presented with cardiovascular compromise. His background included squamous cell lung cancer, for which he received his first cycle of prembrolizumab three weeks prior. On admission, bloods were

consistent with haemolysis (Hb 60 g/L, bilirubin 36 μmol/L, LDH 778u/L, reticulocytes 13.99%, haptoglobin <0.01 g/L). His red cell antibody panel was strongly panreactive, including auto-control, and local transfusion laboratory were unable to determine ABO group. There were no historical transfusion results at his admitting hospital, nor his oncology centre. Samples were sent to the regional Red Cell Immunohaematology laboratory for analysis.

His direct antibody test was positive for IgG (4+) and C3d (3+). Alloabsorption using R1R1 and rr cells identified antibodies against E and c. The patient's red cells were phenotyped as B rr and κ. Whilst the anti-c was determined as an autoantibody, the aetiology of the anti-E was unclear. Hypotheses include previous transfusion which the patient was unaware of, naturally acquired or expressed as an E variant.

With 3 units of red cell transfusion (negative for C, E and K) and prednisolone, his bilirubin normalised and haemoglobin stabilised within 48 hours. There was continued improvement in haemolysis markers until normalisation 5 weeks later. Given the timescale after receiving pemrolizumab, this was suspected to be the trigger for this patient.

Our case highlights the potential for the pembrolizumab to cause severe autoimmune haemolysis. As new immunotherapy agents emerge, both on and off-target immune effects are increasingly likely to impact on transfusion testing.

PO41 | 'Putting the IT into PITS' - creating a new digital practical introduction to transfusion science course for NHSBT

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Introduction: For over 15 years NHS Blood and Transplant (NHSBT) has delivered a face-to-face five-day Practical Introduction to Transfusion Science (PITS) course. It is designed to provide trainees and newly qualified biomedical and healthcare scientists with theoretical and practical transfusion knowledge to enhance their ability to work effectively and safely in the transfusion setting. The UK Transfusion Laboratory Collaborative (TLC) identified that a significant proportion of transfusion laboratory errors were related to staff education, staffing levels, training and competency issues, showing a need for the PITS course to support transfusion training. Health Education England provides NHSBT with educational funding allowing us to offer many fully funded NHS places. However, to allow for increased accessibility and the push for innovative strategies in biomedical science education, the PITS course has now undergone a major review to ensure it is still fit for purpose.

Methods: In October 2019 a project team was formed, including members of the NHSBT Scientific and Clinical team, to provide scientific input, and Digital and People Skills team to develop content into digital packages. The project plan deadlines included; digital packages by January 2020; interactive cases studies by February 2020; a 3-day face to face package by June 2020 and a Learning Hub by June 2020. A pilot cohort was enrolled to start mid-June 2020 with further rollout following review.

Results: All deadlines were met; digital packages supported by virtual classrooms have been created. The Learning Hub hosts the digital packages, case studies, quizzes and additional resources. The 3-day virtual classroom consist of digital packages with tutorials followed by a 2-day practical session.

Discussion: Following this review, we have reduced the face-to-face requirements but maintained key topics and content, to support transfusion training and foster skills required by competent transfusion scientists. Delegates no longer need to sit through lectures; the revised course is immersive, encouraging learners to take responsibility for their own development. Increased accessibility will provide additional places for delegates and address some of the UK TLC concerns. An additional benefit is NHSBT have been able to provide transfusion training even in these challenging times of social distancing.

PO42 | Challenges of platelet refractoriness in the highly sensitised patient

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Platelet transfusion refractoriness is defined as failure to achieve a platelet increment (PI) of 5 x 10^9/l, 10 minutes to 1-hour post-transfusion with random donor platelets (RDPs) on 2 consecutive occasions. The majority of immune cases (95%) are caused by HLA antibodies formed as a result of pregnancy, previous transfusion or transplantation. For such patients, HLA selected platelets may be indicated.

Here we discuss the case of a 52-year-old female with severe thrombocytopenia due to AML transformed from MDS awaiting allogeneic HSCT. Patient R presented in February 2020 after failing to increment to RDPs. HLA antibody testing by single antigen bead (SAB) Luminex® technology identified multiple high-level antibodies (peak 15 000 Median Fluorescent Intensity – MFI) with a calculated reaction frequency of 99%. Local supply was not possible due to the clinical urgency of the request. Suitable units were sourced from another Blood Service with a larger apheresis donor panel to which the patient had low level antibodies. An adequate PI was achieved, and the patient's platelet count recovered.

Patient R returned in October 2020 with relapse and planned further intensive chemotherapy prior to HSCT. SAB testing identified additional high-level HLA antibodies. Mismatched platelet units were identified using an increased positive cut-off of 5000 MFI (standard 1000 MFI). Adequate PIs were achieved with 6 donors over the course of 3 months. She subsequently failed to increment to a unit from a donor with which she had previously shown adequate PIs. HPA antibodies were investigated using the MAIPA assay and an HPA-1b antibody identified. HPA-1b positive individuals were removed from the pool of suitable donors. Due to the limited number of donors available to

her, the SAB positive cut-off was further raised to 8000 MFI. Adequate increments were achieved with platelet donations to which she had antibodies at a cumulative level of 10 500 MFI. Patient R received a successful allogeneic HSCT in March 2021.

This case highlights the challenges of supplying selected platelets for highly sensitised patients, particularly when developing HPA antibodies in addition to HLA antibodies, and gives an indication as to the level of donor specific antibody giving adequate platelet increments.

PO43 | Virtual SSA - interactive distance learning in Wales

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Introduction: All final year medical students in Wales undergo a half day transfusion training programme as part of 'senior student assistantship' (SSA) preparation for practice.

Due to the impact of COVID restrictions, self-directed learning packs were created for use in 2020, however in 2021 an interactive distance learning programme was delivered.

Method: The SSA programme was re-designed adhering as closely as possible to the existing face to face content, unfortunately one element exploring activity in the transfusion laboratory had to be omitted due to the logistical challenges.

The remaining scenarios required relatively little work to convert them to a virtual learning experience, however ensuring students had access to relevant information did require more intensive planning.

MS Teams was used as the platform to run the virtual SSA, as this was the most accessible among Health Boards and medical education departments. Significantly, the breakout rooms function within MS Teams was critical in being able to divide students into groups to run sessions as small group action learning sets within the time allocated.

Results: The virtual programme was delivered to 362 students over 7 dates in May 2021. The content was compressed into a 2 hour session, with an additional separate virtual interaction to undertake pre-transfusion competency assessments on a one to one basis.

Key lessons learned:

- Scenario based learning takes longer to work through
- Request cameras on to better engage with students
- Chat function detracts more than it adds to the learning
- A list of students' names ahead of time was invaluable for directed questioning
- Invariably there were technical challenges – dedicate at least one person just to support this

A modified evaluation form asked the students about their 'virtual' experience.

Conclusion: Students had no SSA transfusion education in 2019. This virtual adaptation was considered to be a viable alternative to a face to face programme for 2021.

One advantage was the reduction in travel for both facilitators and students to attend the training events in person.

Ultimately a transfusion training programme with mostly the same learning outcomes was successfully delivered using a virtual learning environment.

PO44 | Laboratory management of anti-Yta, an antibody against a high frequency antigen, in an antenatal patient

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Introduction: Antenatal samples are referred to the Red Cell Immunohaematology (RCI) laboratory when antibodies are detected by hospital transfusion laboratories. This case study involves an antibody against a high frequency antigen, anti-Yta. This is unlikely to cause Haemolytic Disease of the Fetus and Newborn (HDFN), but will interfere with routine antenatal testing and demonstrates the resources RCI has in supporting antenatal care.

Method: The patient's booking sample was received at 11 weeks gestation and was known to RCI from a previous pregnancy where a positive antibody screen was reported. However, no antibody specificity was determined. Initial testing involved Indirect Antiglobulin Test (IAT) and enzyme IAT panel by Bio-Rad technique.

Results: Panel results showed pan-reactivity with a negative patient auto control. The patient's plasma was tested against a panel consisting of high frequency antigen negative cells. A negative reaction was seen with the Yt(a-) cell and a second Yt(a-) frozen cell. The patient phenotyped as Yt(a-) confirming the antibody present as allo anti-Yta. Allo-adsorption was used to exclude the presence of additional antibodies. An extended phenotype was performed to determine what antigens the patient was negative for and therefore which antibodies the patient could potentially develop.

Repeat samples were taken at 28 and 34 weeks gestation to exclude the presence of additional antibodies, which may cause HDFN or impact blood provision. Although anti-Yta is unlikely to cause HDFN, the sample was titrated to monitor antibody strength. Antigen negative units are recommended for transfusion in strong examples of the antibody.

Conclusion: With regular antenatal monitoring RCI confirmed no additional antibodies were developed and titration results gave confidence that Yt(a-) units may not be required. If testing showed a strong reaction, Yt(a-) donors may be asked to donate or frozen units may be considered.

The patient gave birth to a healthy baby and did not require any blood products during labour or postpartum. This supports previous evidence suggesting that anti-Yta is unlikely to cause HDFN.

PO45 | Development of the consultant clinical scientist role in haematology and transfusion medicine

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Introduction: The Higher Specialist Scientific Training (HSST) program prepares healthcare scientists for the challenging role of Consultant Clinical Scientist within the NHS. This 5-year work based program, underpinned by a part time doctorate, is managed and delivered by

the National School of Healthcare Science (NSHCS) and funded by Health Education England (HEE).

Method: The HSST training programs for pathology specialities and life sciences are implemented in conjunction with the Royal College of Pathologists including Haematology and Transfusion Science, Clinical Immunology, Histocompatibility and Immunogenetics, Microbiology and Virology. These programs entail a blend of training for essential skills required in senior scientific roles within the NHS either in hospitals or blood services, including leadership, innovation, research and higher specialist scientific and clinical knowledge. The funded academic element entails a Professional Doctorate (DClinSci) and a Postgraduate Diploma (PgDIP) in Leadership and Management. Trainees are required to gain Fellowship of the Royal College of Pathologists through specialist FRCPath examinations.

Results: There are currently 58 candidates enrolled on the Scientist Training Programme (STP) for Haematology and Transfusion Science that provides eligibility for entry to HSST training either for the Haematology or for Transfusion Science program. This will hopefully increase further with an updated STP curriculum in 2022. There is also now increased eligibility for biomedical scientists to apply for these HSST training posts. There are currently 11 trainees on the HSST Haematology program and a further 11 on the Transfusion Science program with training for many of the latter strongly supported by the UK Blood Services and in particular NHS Blood and Transplant.

Conclusion: The initial HSST cohorts of trainees are now beginning to complete the program and taking on significant clinical and scientific responsibilities with scope for easing the burden where there are significant workforce gaps. During the COVID19 pandemic, HSST trainees took on further roles and responsibilities highlighting their adaptability and resilience.

The relatively low number of HSST posts in Haematology and Transfusion Medicine at present suggest this is a highly under-recognised and under-utilised resource with potential for a blended medical and scientific consultant workforce as a flexible solution to staffing and recruitment issues.

PO46 | Autoanti-D causes haemolytic disease of the fetus and newborn?

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Introduction: It is essential in pregnancy to identify maternal red blood cell (RBC) antibodies and assess their risk for haemolytic disease of the newborn (HDFN). IgG can cross the placenta, bind corresponding fetal RBC antigen and cause haemolysis. RBC autoantibodies have not been reported to cause clinically significant HDFN (White et al, 2016). Here we describe a case of a Weak D mother with autoanti-D who delivered a direct antiglobulin test (DAT) positive neonate with raised bilirubin.

Methods: A panel of monoclonal anti-D reagents (ALBAclone, Quotient) identified Weak D maternal phenotype during the first pregnancy. Grouping (DiaClon ABO/D + Reverse Grouping, Bio-Rad), serological panelling (NHSBT- RCI Reagents; ID-LISS/Coombs, Bio-Rad), differential DAT (ID-Screening1, Bio-Rad) and elution by acidification of RBCs (Eluate Kit II, Immucor) were performed during this pregnancy (gravida 2). Risk of HDFN was determined via continuous flow analysis (AntiQuant Mk3 Rapid Flow Analyser).

Results: The mother grouped as D negative and had formed anti-D since their first pregnancy. The mother was DAT positive (IgG = 4+) and anti-D was eluted from her cells. Anti-D level (IU/ml) was quantified throughout pregnancy (week 12 = 7.0; 18 = 6.9; 22 = 7.1; 26 = 6.5; 29 = 6.0; 31 = 5.9; 33 = 4.8; 36 = 4.4). At delivery the neonate grouped as D positive, DAT positive (3+ polyspecifc IgG/C3d) with increased serum bilirubin (85 μmol/L) and mild anaemia for a neonate (160 g/L).

Discussion/Conclusions: The mother likely typed as D negative due to their anti-D blocking D antigen sites. In the absence of molecular typing, determination of antibody allo/auto status was not confirmed. It was considered auto as the mother was un-transfused, DAT positive and anti-D was eluted from maternal RBCs. Due to the unexpected maternal D group, anti-D quantification was performed, identifying levels consistent with moderate HDFN risk (if allo). Although clear evidence of the antibody being auto, a negative impact on the neonate was noted, requiring increased monitoring post-delivery. Unfortunately, ABID/eluate was not performed to confirm the positive DAT related to the presence of anti-D opsonising the neonate's RBCs.

This highlights a potential risk of auto anti-D during pregnancy and poses the question – Are there cases when laboratories should actively monitor autoanti-D during pregnancy?

PO47 | The anti-G antibody and the risk of HDFN

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The anti-G antibody and the risk of HDFN.

Introduction: G antigen is different that the main group of Rh antigens (D, C, E, c, e). G is present on any red cell that carries either the D or C antigen or both. Therefore, G is only absent when a person's red cells lack both D and C antigens.

Anti-G antibody is found as a component in sera from rr (ce/ce) people with anti-D and/or anti-C, D+G- people with anti-C and some DIIIb people with anti-D. Anti-G antibody belongs to IgG immunoglobulin class with optimal technique the IAT-enzymes. Anti-G is a clinically significant antibody which can cause HTR and HDFN.

Case Study: An antenatal sample received on booking date of gestation with a positive antibody screen test. Primary antibody identification showed the present of anti-D antibody without being able to exclude anti-C. Based on the National BSH guidelines for antenatal antibodies monitoring through a pregnancy, the anti-D was quantified and further tests for the present or absence of anti-C were performed, and results confirmed the absent of anti-C antibody and the present of anti-G along with the anti-D.

Methods: The absorption technique was performed for the Differentiation and quantification of anti-G, anti-C and anti-D, using r′ and R2R2/Ro absorption cells by IAT techniques.

Results: Seven antenatal samples were tested so far between the 8 weeks and 31 weeks of gestation from the same patient. Anti-C wasn't detected on all occasions. Anti-D and anti-G were detected on each sample and quantified with both giving titres less than 32 and stable measures which categorises them into LOW risk of HDFN.

Discussion: Paternal phenotype and fetus Rh genotyping were recommended, and results predicted that fetus is RhC Positive and RhD Negative which means that the anti-G can be stimulated. After the 28 weeks/gestation, samples will be tested every 2 weeks until delivery. Administration of prophylactic Anti-D Ig is covered by the Antenatal clinic. Identification of anti-G in early stages of a pregnancy can provide very important information to clinicians for how they will monitor and treat patient until and after delivery.

PO48 | Transfusion based patient information – are we getting it right?

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Introduction: The Blood Health Team (BHT) based at the Welsh Blood Service (WBS) provides transfusion paper based patient information leaflets to patients and health care professionals in Health Boards (HBs) across Wales. In 2018, a review of these resources found that they were not well utilised in clinical practice. Furthermore, research has shown that the value of relying solely on paper based information in assisting patients to make informed decisions regarding their care and treatment is questionable as evidence suggests that approximately 61% of adults do not have the necessary literacy skills to read and comprehend current text based health literature1. To further explore the effectiveness of these resources the BHT undertook a BEVAN exemplar project.

Method: Two surveys were disseminated:

1. The first to patient and public engagement groups via engagements leads of the seven HBs and three NHS Trusts in Wales, to assess the readability and usefulness of the current leaflet for supporting patients through the decision of having a transfusion.
2. The second to clinical teams in Wales via medical schools to determine usage and accessibility of the leaflet in clinical practice.

Results: The results of the project:

- Establishment of a local patient/public participation group
- Production of an Easy Read leaflet in collaboration with service users
- Production of a QR code and associated info-pod, utilisation of which will allow access of information at 'point of delivery/need'
- Links to developing audio versions of the PIL to further increase accessibility for the Welsh population

Conclusion: The project fulfilled its aim of improving the design and delivery options for transfusion based health information and ensuring it becomes more accessible in clinical practice. This will enable a collaborative approach to individualised care planning and treatment options by ensuring shared decision making through encouraging dialogue between patient and clinician. An unexpected positive of this project was the demonstration of excellent collaborative working between different sectors during the COVID 19 pandemic. Future work includes a review of all transfusion related patient information produced by WBS and an ongoing collaborative approach to the future design and delivery of these resources.

PO49 | When 'guideline' compatibility is not an option

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Introduction: Pregnancies in England undergo routine antenatal testing for red cell (RC) serology and women with RC antibodies undergo additional monitoring; sometimes, requiring interventions with blood support during pregnancy or post-delivery. Here we present a case of a woman with complex antenatal history and previously affected children with Haemolytic disease of the fetus and newborn.

Method:

Methods used to manage this pregnancy include:

- MCA Doppler scanning
- Free fetal DNA typing
- Paternal phenotyping
- Quantification/titration of antibodies
- 8 IUT units and double exchange at birth and multiple top-up transfusions
- Multiple serological investigations including DAT and eluate on baby

Results: Patient presented in 4th pregnancy with anti-s (8), D (36.8 IU/mL), C (64) and G (64) managed under fetal medicine. At delivery an exchange unit was crossmatched and found to be incompatible and reactions of undetermined specificity present. 7 weeks post-partum baby presented with a Hb of 53 g/L requiring transfusion, irradiated units to match mum requirements were not compatible. Additional panels detected further specificities. Due to urgency, the units were crossmatched against the baby sample after performing an antibody screen released under medical concession. Baby presented again at 9 weeks and was referred to Red Cell Immunohaematology (RCI). Antibody identification on mum demonstrated anti Jkb and anti-Fyb; there were no suitable units available nationally. A decision to test baby's sample for antibodies and perform an eluate was made which showed the presence of anti-D, C and G. Due to the requirement for blood Paediatric units which were O, rr, K-were crossmatched against baby and issued under medical concession after discussions with the NHSBT consultant and the local Haematologist. The top up was successful and the baby had a good increment and has not required a further transfusion.

Discussion and Conclusion: Patients with multiple antibodies during pregnancy are incredibly complex to manage, requiring good communication between the hospital transfusion and the RCI to ensure sufficient blood provision. Where blood provision cannot be sought due to complex requirements alternatives should be considered including the use of baby sample to crossmatch after considering any maternal antibodies present.

PO50 | Two cases of mistaken identity in relation to anti-CD38

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Monoclonal anti-CD38 is used to treat multiple myeloma[1]. Whilst a useful resource, anti-CD38 interferes with serology and samples are commonly referred to reference laboratories to exclude the presence of underlying antibodies. Serology is easily resolved if all are aware of anti-CD38 treatment. Where the correct information is not provided, time is wasted and treatment potentially delayed.

Case one was referred from a private hospital transfusion laboratory (HTL) where the patient was awaiting spinal surgery. Initial investigation revealed a panreactive antibody by BioRad IAT and BioRad enzyme IAT, which failed to react with the patient's own cells. Since the HTL denied the presence of myeloma or anti- CD38 treatment, the possibility of an antibody against a high frequency antigen (HFA) was investigated, testing the plasma against a selection of HFA negative cells. The antibody present failed to react with an Lu(a-b-) AnWj- cell and two umbilical cord blood samples, and was weakened with a Js(b-) cell. Further work was planned for the following morning. The HTL later informed the laboratory that the surgery was related to myeloma and that the patient had been referred from another hospital who were contacted. It was revealed that the patient had received anti-CD38 recently. The plasma failed to react with a panel of Dithiothreitol (DTT) treated cells, resolving serology.

Case two was received for a patient with historical non-specific anti-HI, a cold-reacting panreactive antibody that is often found in group A individuals that can be resolved by performing investigations at strict 37°C[2,3]. The request form stated the patient was receiving anti-CD38. A panreactive antibody was present, which also reacted with DTT-treated cells by IAT and LISS tube IAT (2+ and 5+, respectively). To resolve possible anti-HI alongside anti-CD38 reactivity, DTT-treated cells were tested by strict 37°C LISS tube IAT with a slight reduction in reaction strength (3+). The laboratory asked the HTL if the patient was on anti-CD38 and were told they were not currently on the treatment. Further samples were needed to completely ensure the exclusion of clinically significant alloantibodies, which was performed by IAT at strict 37°C.

PATIENT BLOOD MANAGEMENT

PO51 | Are there any absolute contraindications to cell salvage?

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Introduction: Intraoperative cell salvage (ICS) is a commonly used blood conservation technique in patient blood management. Despite a long history of use, there remains some controversy over areas of use and relevant contraindications. We surveyed current practices to establish whether there is a UK/international consensus regarding the limitations of cell salvage and identify whether further research is needed to expand the use of cell salvage.

Methods: An interactive questionnaire [1] was devised using Survey Monkey® to establish which guidelines are used, what are considered to be contraindications and how risks are mitigated, as well as establishing in which situations ICS would be used where contamination was known to be present. The survey was sent to individuals with a known interest in ICS both in the UK and further afield, and the responses collated.

Results: Responses were received from 20 UK and 11 international respondents. The most commonly used guidance for informing local policy was from the UKCSAG [2] (21, 70%). Responses around local classification of contraindications are given in Table 1.

Table 1. Classification of contraindications.

Contraindications	Absolute	Relative	Warning
Sickle cell disease	9 (29%)	12 (39%)	10 (32%)
Thalassemia	2 (6%)	8 (26%)	9 (29%)
Infected fields	14 (45%)	12 (39%)	11 (35%)
Malignancy	1 (3%)	20 (65%)	18 (58%)
Phaeochromocytoma	2 (6%)	7 (23%)	3 (10%)
Pharmacological contaminants	18 (58%)	5 (16%)	10 (32%)
Biological contaminants	5 (17%)	16 (52%)	15 (48%)
None of the above	4 (13%)	4 (13%)	5 (16%)

In infected fields, respondents would use ICS in: infected joint replacement (8, 26%); vaginal delivery (16, 52%); trauma (22, 71%); lower GI surgery (11, 35%) and in patients refusing allogeneic blood transfusion (27, 87%). In tumour surgery, ICS was acceptable in: urological (22, 71%); pulmonary (9, 29%); spinal/orthopaedic (18, 58%); hepatic surgery (12, 39%); and patients refusing allogeneic blood (28, 90%). Leucocyte depletion filters are used to reduce risks in: malignancy (28, 90%), infection (18, 58%), amniotic fluid contamination (20, 65%). Further research priorities included ICS use in malignancy and vaginal delivery.

Conclusion: There is inconsistent opinion on where ICS can be used safely.

PO52 | Emergency uncrossmatched blood: Introducing O D Positive Red Blood Cells for female patients over the age of 60, with electronic prompts at the fridge

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Background: As a major trauma centre and tertiary referral hospital, University Hospital Southampton (UHS) maintains a number of satellite blood fridges each holding sufficient group O red blood cells (RBC) to ensure quick access during major haemorrhages. Given the continued challenges around the supply of O D negative RBC (Bend et al, 2020), it is therefore our responsibility to minimise use of this resource.

Proposed Change: UHS already uses group O D positive for emergency uncrossmatched RBC for male patients over 18. The next step was to extend this to post-menopausal female patients. Whereas British Society for Haematology guidelines suggest the age of 50 years to identify appropriate patients (Hunt et al, 2015), the age of 60 was chosen by the UHS Hospital Transfusion Committee based on consultant obstetric and emergency medicine advice.

Implementation: UHS blood fridges are controlled by an electronic system allowing clinicians to select from a list of age and gender options for emergency blood. This prompts which group to remove with audio-visual alerts if the wrong selection is made. Adding a 'females over 60' option was therefore a simple technical process. Using an established network of link staff, electronic communication channels and posters, introducing the change was also made without significant difficulty. Rather than expressing caution at the change of practice, most clinicians were already aware of the safety and rationale behind choosing O D positive RBC for post- menopausal women. Blood transfusion laboratory staff were also asked to suggest O D positive RBC for bleeding female patients over 60 who could not wait for crossmatched blood.

Analysis: Data from 8 weeks pre and post upgrade was analysed and showed that 11 units of O D positive RBC were removed and transfused to female patients aged 60 and over post-upgrade who would have otherwise received group O D negative. Overall, 66% of emergency uncrossmatched RBC removed from blood fridges was O D positive post-upgrade compared to 46% pre-upgrade, suggesting that this change has reduced our use of O D negative blood. These figures do not include potential reductions in O D negative RBC issued directly from transfusion.

PO53 | Use of cell salvage for major obstetric haemorrhage: A tale of two cities

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The NICE recommendation for Patient Blood Management is that cell salvage should be considered in patients where high volume blood loss is

expected. The SALVO trial did not find any statistically significant reduction in the number of donor blood transfusions when intraoperative cell salvage was used. However the average cell salvaged blood transfused in this study was only 260 mls. We set out to investigate the use of cell salvage in patients with major obstetric haemorrhage (MOH) at caesarean section (estimated blood loss 1500mls and higher) in 2 trusts in the West Midlands, UHCW and HGS.

A retrospective audit looking at data over a 4 month period in 2019 found that 41 patients at HGS and 24 pts at UHCW had an estimated blood loss >1500 ml. At HGS 9/41 pts received cell salvaged blood, the average transfusion being 860 ml. At UHCW 13/24 patients received cell salvaged blood, the average transfusion being 467 ml (1 patient was excluded due to incomplete data). Combining the 2 groups, only 4/22 patients who received cell salvage needed donor blood transfusion compared to 16/41 patients who did not have cell salvaged blood.

In conclusion, this audit demonstrated that less patients who received cell salvage needed donor blood compared to patients in which cell salvage was not used. We recommend that cell salvage should be set up for all obstetric patients undergoing caesarean section and that cell salvaged blood should be processed and transfused in all patients with major obstetric haemorrhage.

PO54 | A one year review following implementation of new guidelines and management process for the provision of HLA selected platelets at the Welsh Blood Service

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Introduction: In February 2019 the Welsh Blood Service (WBS) implemented revised 'All Wales Guideline for HLA and HPA Selected Platelets: Requesting and Feedback', holding the British Society of Haematology (BSH) Guidelines (2016) at its core and centralising the coordination and management of this service within the WBS.

Method: Clinical Scientists work closely within these guidelines to assess clinical need upon receipt of patient referrals. This ensures patients only receive selected platelets where clinically indicated, preventing inappropriate use and waste of a precious resource; following prudent healthcare principles.

Assessment of the request requires the requestor to provide key information, including clinical diagnosis and the presence of non-immune causes of platelet refractoriness. Pre- and post-transfusion platelet counts (taken 10 mins-1 hour post transfusion) are also required, with a minimum of two ABO matched random donor platelets (RDPs) prior to referral.

Provision of selected platelets for individual patients is monitored, with clinical teams required to report pre and post transfusion counts for these components. This enables the Clinical Scientists, working closely with WBS Consultants and apheresis collection nurses, to review the patient clinical condition, efficacy of platelets provided and ongoing availability of suitable donors.

Results: The introduction of this revised and rigorous management procedure that incorporates the BSH Guidelines for Platelet Transfusions (2016) and holds the patient clinical teams accountable has been highly successful. HLA selected platelets are a precious resource, provided by a limited pool of dedicated donors and prudent use is vital.

The service changes have resulted in a 61% reduction in the provision of HLA selected platelet concentrates. In the period February 2019–January 2020 the WBS provided a total of 57 HLA selected platelets, this is compared with 148 in the preceding 12 months (February 2018–January 2019).

Conclusion: As a result of this change, patient care has improved. The provision of timely and accurate increment feedback data has enabled the WBS to monitor the efficacy of the platelets provided to: a) inform further testing which may be required and b) update preferred HLA selected platelets to ensure the patient is provided with effective units.

PO55 | Blood component requirements in patients with COVID-19 infection

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National Health Service Blood and Transplant (NHSBT) undertook a survey of hospitals in England to determine blood component requirements for patients with COVID-19 infection. The survey ran from February 2020 to January 2021. 65/295 (22%) hospitals submitted complete transfusion details for 1464 confirmed COVID-19 infected patients. Blood component use was examined in three settings: wards, intensive therapy units (ITU) and patients receiving extra corporeal membrane oxygenation (ECMO). Not all hospitals submitted data from all three areas.

Methods: Online data submission of blood component use in individual patients.

Results: 874 ward-based patients (median age 72.5 years) received 1291 red blood cell (RBC) transfusions (median 1 unit), 130 platelet transfusions and 106 units of FFP, cryoprecipitate and plasma.

459 ITU patients (median age 59 years) received 1304 (median 1 unit) RBC transfusions at 51 sites. 17 sites accounted for 78% of the patients in ITUs for the data collected over this the period. A total of 433 units of platelets were transfused to ITU based patients along with a total of 203 units of FFP, cryoprecipitate and plasma.

131 ECMO patients (median age 44) received 845 RBC transfusions. 157 platelet transfusions were given to 35 patients and 923 units of plasma (predominantly FFP) was given to 118 (14%) patients. 3 sites accounted for 87% of data submissions.

Summary and Conclusions

- This study found that blood component requirements in patients with COVID-19 infection was low, confirming data from government sources indicating that between 0% and 4% of COVID-19 infected patients received a blood component transfusion depending on the organisation.
- Levels of transfusion were much higher in some patients on ITU, and ECMO patients commonly received multiple transfusions.

- Changes over time in transfusion frequency for COVID-19 infected patients mirrored the rise and fall of the pandemic generally.
- Low levels of demand in this patient group combined with postponement of high blood component elective clinical activity allowed continuation of a sufficient blood supply despite reductions in blood donations at the beginning of the COVID pandemic in England.

Acknowledgements

Thanks to all hospitals and transfusion staff who submitted data at a difficult and challenging time.

PO56 | Frozen red cells: The need for long term storage of phenotypically rare units

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Introduction: Clinically significant Red Blood Cell (RBC) antigens can elicit an immune response in patients lacking the antigen. High frequency antigens (HFA) are present on RBC surfaces in >90% of the population. Individuals lacking HFAs are considered rare. Difficulties arise when blood provision in routine and emergency situations occur. The National Frozen Blood Bank (NFBB) Liverpool provides extended storage of rare phenotyped RBC units. Normal storage life is 35 days in SAGM at 2–6°C, whereas, RBCs stored in NFBB are kept up to 30 years in a glycerolised state at −80°C. Rare RBC donors form <1% of UK donors, identified through voluntary donation or routine blood tests at clinical appointments. Current stock in NFBB is approximately 1000 and comes from a small cohort of ≃530 donors. All patients should be able to receive blood, including those with rare, clinically significant phenotypes, where fresh donations are not available.

Aim: To demonstrate the importance of long-term storage of frozen RBCs for the treatment of patients with a rare phenotype.

Method: Audit of thawed, washed and issued units for 2020 was performed. RBC unit data was categorised for: phenotype; clinical condition and duration of frozen storage.

Results: The phenotypes of the 91 units issued from NFBB in 2020 were – Fy(a-b-) (51); U- (9); r′r′ (7); k- (6); Lu (a-b-) (6); Kpb- (3); Inb- (3); Bombay (3); pp (2); Vel- (1). These were issued to cover conditions such as: Sickle Cell Disease (SCD) & Anaemia. Storage time ranged from <1 year to 12 years.

Discussion/Conclusion: All units thawed were phenotypically rare in the UK donor population (incidence <1%). The highest number of units were issued after 1–2 years of storage (N = 14, 15% of total units issued), these were mostly Fy(a-b-) units required for exchange procedures. Fy(a-b-) was the most frequently issued rarity and is often complicated by additional phenotype requirements. It is common in patients with SCD, who often require exchange transfusions. NFBB is a last resort for RBC provision after other avenues have been exhausted.

Long term storage at NFBB is important in facilitating blood provision for patients suffering life threatening conditions.

PO57 | Why does it take so long?

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Introduction: A remark from a parent asking why did it take so long for their child to have their transfusion when bloods were taken early in the morning led to an audit of the timings; from the morning full blood count (FBC) to the transfusion being started.

Methods: 45 in-patients on the 3 haematology-oncology wards were randomly selected. Due to the Coronavirus pandemic there were 2 data collection episodes (30 October 2019 and 15 October 2020).

Timings were established by retrospectively reviewing the patient's electronic record (Epic), the blood tracking system (Haemonetics) and the blood transfusion LIMS (Bank Manager). FBC taken and result, blood request times, group & save (G&S) sample times (if required), blood issued and blood collected times were recorded.

Results

- Time from FBC result to blood order- 2019 average 3 hours 44 minutes compared to 1 hour 41 minutes in 2020
- 35% (16/45) needed a repeat G&S
- 88% (14/16) taken after the blood was ordered (26 minutes to 4 hours 37 minutes)
- Average time FBC to transfusion in 2019 = 8.6 hours
- Average time FBC to transfusion in 2020 = 9.75 hours
- 35% of blood/platelets were administered overnight, despite many being 'top up' transfusions

Discussion: The transfusion process has many steps and involves a number of healthcare professionals and there is not a one fix to resolve the time taken. The results were presented to the nursing and medical teams so suggestions for improvements to manage within their own teams could be made. All agreed that transfusions are safer during the day ('before bedtime') and small changes could help facilitate this, which included:

- Group & save samples taken routinely 3 times a week on certain patients early in their treatment phase
- Doctors verbally informing nursing staff when blood ordered and not just an addition to the EPR worklist
- Late afternoon nursing huddles to review which patients have blood ordered and still need to be transfused before bedtime
- Reviewing the evening IV drugs/infusions and coordinating with the timings of the blood administration to manage late transfusions

PO58 | Implementation of group O D positive emergency units

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To prevent ABO incompatible transfusion reactions (Never Event), Emergency patients with unknown blood group receive O red blood cells (RBC) until their ABO group is known.

Approximately 7% of the UK population is O D Negative, while average Hospital stock level demand is around 12–13%, due to the reliance on O D Negative RBC in emergency issue. To safeguard national stock levels the NHSBT have asked all Transfusion laboratories to

limit stock levels of O D Negative RBC to less than 12.5% and to keep overall wastage to a minimum, with a target value of <4%.

Oxford Road Campus (ORC) issued a total of 2832 O D Negative RBC, or 12.56% of total issues and had a wastage as percentage issued (WAPI) of 18.27% in 2019.

During September 2020 to reduce reliance on O D Negative RBC at the ORC and support the NHSBT and regional efforts, our Transfusion team implemented a key recommendation from the National Blood Transfusion Committee (NBTC) appropriate use of O D Negative RBC (2019) by implementing O D Positive emergency units into our emergency issue procedures.

Initially O D Positive emergency units have been introduced into Manchester Royal Infirmary Accident and Emergency department for all Males over the age of 18, this has also been extended to females over the age of 50 within the control of the ORC Transfusion Laboratory.

Implementation of this change included update of local policy and procedures, validation of the Laboratory Information Management System (LIMS) and blood tracking system and training of both laboratory and ward staff.

O D Negative as percentage of total issues has averaged at around 11.97% since go live, with a WAPI of 8.51% (October 2020–April 2021). 180 O D Positive emergency units have been issued to Males over the age of 18, and 7 units to females over the age of 50 during this time period. 171 of these units were issued as part of major haemorrhage activations, which were predominantly male.

Our intentions are to extend the use of O D Positive emergency issues to Adult Theatre, Trafford General Hospital and Wythenshawe Hospital.

PO59 | Sprinting ahead - a new methodology of working for the Blood Health Team

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Introduction: 'Sprints' are an activity management system, whereby specific tasks are to be completed over a set time- period, commonly 4 weeks. Progress is monitored during the sprint allowing for identification of barriers, and a review after the end evaluates success and further action required.

In 2019 the Welsh Blood Service Blood Health Team (BHT) decided to adopt a Sprint methodology to support how they work.

Method: A timetable of sprints was created; each lasts 3 months due to the nature of work being undertaken, with a spreadsheet chart to document activity, and 2 weekly team meetings to facilitate regular updates and discussion.

Each team member was allotted a swim-lane on the chart where their workload could be broken down into actions; in addition, collaborative projects were also given their own swim lanes.

Close-out meetings were scheduled at the end of each sprint to review outcomes, reflect on successes and challenges, and allow managed 'roll-over' of activity into the next sprint.

Results: The BHT has successfully utilised sprint working methodology since January 2020, and are now in the middle of sprint 5. Team activities are being effectively monitored, and insight into blockers to progress are being clearly identified (in columns titled 'awaiting review' and 'waiting on others').

The 'done' column has created a valuable log of output/achievements, while the 'to do' columns in the spreadsheets for future sprints have been populated to good effect in managing medium term objectives that have a delayed start.

It is not essential for everyone to attend every team meeting, however provision of significant updates on activities has been beneficial.

At the final meeting of each sprint each team member has been asked what they thought went well and what went not so well, helping the others to better understand and support their way of working.

Conclusion: Sprints are an effective way of working for the BHT, being more dynamic than written report submission, and the management of team workload and output is well governed. The small number of team members make regular sprint meetings achievable in a reasonable time-frame.

PO60 | Bombay is in Ireland

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Patients with the Bombay blood group who need a blood transfusion can only receive blood of Bombay blood group, otherwise a fatal transfusion reaction may result. This presents a challenge as this blood group is so rare that the Irish Blood Transfusion Service (IBTS) has no registered Bombay blood group donors.

We report the case of a 37-years old patient, with Bombay blood group, who needed an elective multiple myomectomy for fibroids. Crossmatch compatible blood was required for surgery. At her medical assessment, she was found to have a moderate iron deficiency anaemia, a hemoglobinopathy screen was negative.

Her case was further complicated by comorbidities (thyrotoxicosis), poor compliance with medications and rescheduling of surgery due to the Covid-19 pandemic. Providing blood was however, the most significant challenge.

Our options included blood from autologous, targeted, imported or frozen recovered donations. When assessed for autologous donation, we deemed the patient unsuitable to donate due to very low weight and total blood volume.

The patient's family in Mauritius were excluded as donors due to the COVID-19 pandemic restrictions. Targeted donations were then considered from neighbouring countries with a known suitable donor pool. Our colleagues in United Kingdom (UK) kindly identified a suitable donor. Meanwhile our patient was monitored regularly to optimise both her hyperthyroidism and iron status. As her compliance and tolerance to oral

iron were poor, she received intravenous iron four weeks before surgery and her haemoglobin improved from 10.0 g/dl to 12.4 g/dl.

Three days prior to surgery, the identified donor was bled in UK. However unexpected delays occurred at customs because of increased regulation following the exit of the UK from the European Union. Fortunately, these issues were resolved in time and the blood was available for the surgery. Surgery was completed in 40 minutes with 40 ml blood loss and no transfusion administered.

Early and close liaison between the gynaecology, haematology and transfusion teams was key in overcoming the challenges associated with this case. The patient's care was optimised thus avoiding a potentially risky transfusion, as the best transfusion outcome is no transfusion.

PO61 | Saving packed red blood cells and plasma units in a pre-hospital trial

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Introduction: The RePHILL pre-hospital blood trial required that two units of each PRBC and freeze-dried plasma (LyoPlas) were stored in validated Credo ProMed transport boxes at different temperatures; 2–6°C (PRBC) and 2–25°C (LyoPlas). Initial packing methods included one data logger in each box which resulted in wastage of the second unit if not administered to a patient. We designed ways to mitigate this and save units.

Methods: We interrogated trial records and spoke with blood bank colleagues to determine how many units had been wasted and determined which sites could accommodate changes to one or both packing methods. We then developed different solutions specific to each unit type:

PRBC

We collaborated with a company who could provide single-unit temperature monitoring of each unit (QTA).

LyoPlas

Each trial kit contained LyoPlas, transfer set and diluent. In order to fulfil trial regulations, our initial method of packing meant all elements of both kits were mixed together in the box. On a site visit, one of the blood bank managers had re-designed this so each unit was contained within a tamper-proof bag. This meant each kit could be individually temperature monitored.

Results: Before we made changes, 24 units of PRBC and 86 units of LyoPlas were wasted because we could not confirm integrity of the second unit. Of the five trial blood banks, we were able to implement single-unit monitoring of PRBC in one, LyoPlas re-packing in two others, and both new systems in a fourth. This resulted in saving 15 units of PRBC and 10 units of LyoPlas.

Conclusions: We proved it was possible to reduce PRBC and LyoPlas wastage, whilst also adhering to trial regulations. Benefits include cost-savings plus fewer wasted donations. Now the trial is over, participating blood banks are providing a combination of PRBC and LyoPlas/FFP to air ambulances. Some continue to implement new methods but lessons learned here have also been transferred to other non-trial blood banks. Single-unit processing will take more time, so this may be a consideration for sites providing the PRBC/FFP combination. However, the overall benefits would out-weigh this, especially if changes are made nationwide.

QUALITY REGULATION AND GOVERNANCE (INCLUDING PATIENT SAFETY)

PO62 | Audit of genetic haemochromatosis blood donors to be able to donate frequently as per guidance

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Introduction: We reviewed whether or not potential donors with Genetic Haemochromatosis (GH) including homozygous C282Y or double heterozygote are being accepted in a timely manner and being given the opportunity to donate at least 6 weekly.

Methods: All donors accepted as GH on maintenance phase who contacted NHSBT between 1st April and 30th September 2018 were included. Donor management system (Pulse GUI) and documents stored on network drives were reviewed and data logged directly into Excel spreadsheet.

Results: A total of 309 potential GH donors contacted NHSBT during the study period. The clinical team called the donors to assess the eligibility and acceptance criteria. The donors were sent an agreement letter to be returned (reply paid envelope) to allow booking of first donation.

204 included in audit.

82 did not return agreement form or lost interest, 22 not in maintenance phase (eligibility criteria), 1 medically withdrawn.

Male: Female 2:1, age range 23–77, average 50 years Assigned HAE code: 65%; WHB code 35%.

Verbal acceptance following eligibility call: 97.5%.

Mode of communication: verbal and email: 15%; verbal and letter 85%.

Method of booking donation appointment: call helpline 60%, online (portal) 21%, At session/walk-in 5%, 14% not booked.

70% attended and donated, 13% medical deferral and 17% did not attend appointment Only 22% donated within 4 weeks of acceptance (average 105 days from acceptance).

Key Findings

- Improvements required ensuring that HAE donor code should be given to all GH donors.
- Improvements required in ensuring donors return agreement form.
- Considerable improvements are needed to enable GH donors to donate within four weeks of acceptance with available appointments

Conclusion: The audit highlighted the challenge facing GH donors to be able to donate according to need. HAE code allows GH donors to donate more frequently with a call to the national helpline to negotiate an appointment slot. However, 35% prefer the WHB code, which gives them online access to the portal and all available slots, but constrained by minimal donation intervals of 12 (male) and 16 (female) weeks.

Since the audit, we are now offering the online portal to all HAE donors.

PO63 | Reducing red cell wastage in trauma and major haemorrhage: The use of blood tracer devices to predict core temperature compliance in unused units

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The blood safety and quality regulations (BSQR) 2005 require red cell (RC) storage to be at a constant 4 ± 2°C core temperature and for a full, unbroken cold chain record to be maintained to ensure safety, consistency and clinical efficacy.

Southmead Hospital, Bristol (SMH) is a major trauma centre, where delivery of emergency RCs in cool boxes to the patient bedside is commonplace during major haemorrhage (MH). However, unused units must be discarded if cold chain records are incomplete. Continuous temperature monitoring can reduce this wastage through permitting blood re-issue where core temperature compliance is evidenced.

Usage of mobile temperature monitoring devices for RCs temporarily removed from controlled storage is not a novel idea. However, core temperature fluctuations occur at a reduced rate than the surrounding air temperature, thus, measurements taken at the surface risk premature wastage. The QTA Blood Tracer System utilises a 'tardiness' feature, applying a calculation based on Newton's law of cooling to offer accurate estimations of core blood temperature from values taken at the surface.

SMH received 30 QTA tracers (pre-calibrated by an ISO17025 accredited laboratory) in September 2019. The tardiness feature was validated through placing a tracer with 0 tardiness setting inside a RC unit whilst attaching a further tracer to the surface with tardiness time constant set at various levels. Temperatures were monitored as blood warmed and cooled between controlled storage and ambient temperature to establish which setting most accurately replicated the core. Simultaneously, tracers without tardiness were attached to emergency RCs issued during MH for practicality assessment. Temperature data on returned units was evaluated to determine unit fate.

Without tardiness, time taken for a RC unit surface to reach 6°C (once removed from a blood fridge) was on average 22 minutes faster than its core. With tardiness time constant set to 2500, the mean warming times were matched. Use of the tracers (without tardiness) led to an average of 3 units saved from wastage each week.

Usage of blood tracers during MH can significantly reduce RC wastage where units have remained temperature compliant and there is no alternative robust cold chain documentation available.

PO64 | When EPR fixed the protocol problem

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Introduction: A Bone Marrow Transplant (BMT) protocol is prepared for each patient and details the patient history, preparative regime plus patient and donor details. The protocol is circulated to the multidisciplinary team prior to the patient admission.

The protocol is received in the Blood Transfusion Laboratory (BTL) by the senior BMS staff as part of a wider email distribution list. Once

received, the protocol information is entered onto the LIMS (Laboratory Information Management System).

On this occasion, the protocol was not received in the BTL for a patient who had under gone an ABO mis-matched BMT. The patient subsequently received blood and blood components of their own ABO group for some time after their transplant, not the bi-compatible components required.

Methods: Following an incident investigation, it was agreed that the email system notifying the BTL was not robust and there was a high probability this could happen again. Discussions between the teams involved led to a solution utilising the existing electronic patient record (EPR). The system used is Beacon within Epic.

Results: A tool within the EPR was created so that the senior Transfusion Laboratory BMS can see the BMT protocol prior to distribution, and sign to say it has been checked, or amended if necessary.

The process is now as follows:

- The BMT team complete the BMT protocol and treatment plan
- Blood transfusion view the draft protocol PDF (once notified it's ready for review) in Epic and have their own 'mini-form' that they sign to confirm that all details are correct
- This signature/date will then display in the pdf, and in the BMT database
- The protocol is not circulated within the multi-disciplinary teams until the transfusion section has been signed

Discussion: BMT patients by their very nature are complex, and this includes their transfusion requirements. The risk of transfusion errors in these patients has been identified by SHOT. By utilising the existing EPR system, a process is now in place that has significantly reduced the risk of the Laboratory not being informed of the BMT taking place, and the patient receiving the incorrect components.

PO65 | Small changes make a difference

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Introduction: In March 2020 SARS-Covid 19 halted access to clinical areas thus direct access to staff and patients handwritten case records. NHS Scotland Transfusion Practitioners (TP) and Hospital Transfusion Teams (HTT) struggled to elicit information to complete incident reviews. Most HTT's were using SHOT questionnaires for each event/reaction and found multiple communications required to gather the smallest piece of information. Often senior staff in clinical areas (e.g. Charge Nurses, Consultants, Clinical Directors and Managers) were overwhelmed and struggling to translate clinical information to incident reviews. To ensure timely, appropriate information gathering and reporting the TPs recognised a need to modify interactions when investigating clinical reactions and events with clinical teams.

Method: The SNBTS Transfusion Team Haemovigilance Working Group applied a Plan-Do-Study-Act (PDSA) test of change cycle following analysis of NHSS Service-Now clinical incident trends available from all NHSS health boards. This identified seven common recurring incident trends Anti-D, ADU, HSE, ICBT – SRNM, RBRP, WBIT and TRALI/TACO.

The group then utilised the information from the relevant SHOT questionnaires in addition to applying an understanding of the clinical thought process to produce bespoke Incident investigation forms, which facilitate straightforward information gathering and review. These are in MS Word format that are easily pre populated prior to sending and are readily attached to incidents in local Risk Management Systems.

Results: The SNBTS TT Haemovigilance Group produced nine Incident Investigation Forms. These forms lay out information requests in an intuitive manner for clinical teams to record information and findings.

The group found the Incident Investigation forms facilitate straightforward information gathering during review of reactions and events, reducing the requirement for multiple requests from large, small, near or remote sites.

Conclusion: When the TP role was first created, the TP's were deemed the essential link between the laboratory and clinical areas often translating one discipline to the other. Nowadays, we find ourselves in a similar situation. As such small and helpful changes supporting efficient and effective data gathering supports clinical areas, risk management and haemovigilance.

PO66 | More haste, less speed? – A delicate balance but potential to reduce O D-negative blood use. improvements and lessons from a single centre major haemorrhage protocol audit

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Background:

Good major haemorrhage (MH) management through MH protocol (MHP) activation can be life-saving. MH practice continues to be updated with recommendations from clinical trials.

We present an audit of MHP use at the Royal Free Hospital (RFH), a teaching hospital and transplant centre with a busy obstetric unit.

Practice was compared against British Society for Haematology guidelines and previous RFH audits of MH (2014) and Major Obstetric Haemorrhage (MOH) (2012).

Initiatives introduced following the 2014 MHP audit:

- Instruction from switchboard at MHP-activation to call the blood transfusion laboratory (BTL).
- Introduction of remote issue blood fridges
- Formalised regular simulations with clinicians.

Methods:

A retrospective audit of MHP-activation from 01/05/2019–31/07/2019 and 01/04/2020–13/09/2020 was undertaken. Cases were identified through switchboard MHP-activation records and BTL records of massively-transfused patients. Data were collected from review of clinical notes, prescriptions and BTL records.

Results:

MH (n = 55):

Mean age 56.9 (range 17–87).

MHP-activation via switchboard: 75% Tranexamic acid (TxA) administered: 69%.

75% of patients with gastrointestinal bleeding received tranexamic acid TxA. Received transfusion: 75%.
Received Emergency O D-negative blood (O-): 47% Mean time to access O-: 2 minutes.
MOH (n = 20):
Mean age: 31.2 (range 23–42).
MHP-activation via switchboard: 80% TxA administered: 75% (vs 33% in 2012).
Received transfusion: 10% Received Emergency O-: 0%.
45% of red cells issued in MH were from emergency fridges.
81% of O- recipients could have received emergency O D-positive (O+) blood instead. 17% of O- blood recipients were issued with O- blood from the BTL.
Conclusions:
TxA use has increased following evidence from the CRASH-2 trial, the WOMAN trial and its incorporation into MH guidelines.
In MH, rates of MHP-activation have increased since 2014 (75% of cases vs 29%), as has the proportion of patients receiving O- blood (47% vs 14%), 81% of whom could have received O+ units.
Recommendations:
The HALT-IT trial found no effect of TxA on mortality in gastrointestinal haemorrhage. MHPs should be reviewed for this presentation.
For emergency blood collected from the BTL, laboratory staff could ensure O+ units are issued if appropriate, to reduce O- use (providing there is no delay in transfusion).

PO67 | Emergency blood provision in a box: A nightingale tale

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The Nightingale Hospital North West (NHNW) was a temporary field Hospital, built and run in collaboration between the NHS and the military. The Hospital was assembled in record time to combat the additional pressures placed on the NHS during the COVID-19 global pandemic.
Due to the distance of the NHNW from Oxford Road Campus (ORC), the Transfusion service was asked to supply on-site O D Negative red cells for emergency blood provision on the 8th of April 2020. We needed a quick, creative and safe way to bring the blood closer to the patients.
After seeing the already successful collaboration between the NHS and the military, it was decided what better way to support the war on COVID-19, but to respond as the military would. This solution came in the form of Golden HourTM Technology, Credo Cube; this technology was originally designed for the military to protect temperature sensitive components in the battlefield.
Validation was carried out in a staggered approach to ensure a Credo Cube was on site as soon as possible. Each Credo Cube was validated for up to 120 hours. Variations on user preparation, packaging and stability meant we decided to adopt a 72 hour change over with the NHNW to fit in with our current workload.
Continuous temperature monitoring was achieved by utilising small microchip temperature devices, to aid early detection of any problems and protect the quality of the emergency units issued.
Each Credo Cube was truly-'Emergency Blood Provision in a Box'. The Cube contained giving sets and all documentation and information for the NHNW staff, including guidance on transfusion, traceability, transfer and investigation of transfusion reactions.
The blood was on site by the 20th of April 2020, this was an extremely short time frame and a true collaboration between Wythenshawe Hospital and Oxford Road Campus.
Our success was measured by the availability of emergency units to the NHNW patients, safeguarding against a Major Haemorrhage and supporting transfer of the critical patients back to A&E. This gave our users re-assurance that all patients within our care had the safest blood available for their needs.

PO68 | Simulated assessment of the use of the Mollison calculation to treat D negative women with prophylactic anti-D following D positive solid organ transplant

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Introduction: Red Cell Immunohaematology provides D positive feto-maternal haemorrhage (FMH) investigation for D negative women. The Mollison calculation determines the FMH volume by considering a total maternal packed red blood cell (RBC) volume (1800 mL), and fetal RBC size (22% greater than adult RBC).
D positive solid organ transplant (SOT) also risks D sensitisation. There is a difference in the SOT calculation because RBCs are mature and procedures can take place with children who have a reduced RBC volume. A recent audit identified no SOT referrals between 2016–2020 (N = 20) resulted in a > 8 mL D positive volume.
Aim: To assess the use of the Mollison calculation to treat D negative women with prophylactic anti D (PAD) following a D positive SOT.
Method: Microsoft Excel was used to calculate D positive FMH and SOT D positive RBC volume from simulated percentage RBC populations; 0.1% (FMH = 2.2 mL; SOT = 1.8 mL) increasing in 0.1% increments to 3.1% (FMH.
= 68.1 mL; SOT = 55 mL). Patient treatment was compared using intramuscular PAD dose (4 mL = 500 IU).
FMH formula:
RBC volume (mL) = % fetal cells × (1800/100) × (122/100).
SOT formula:
RBC volume (mL) = % adult cells X (1800/100).
Results: PAD dose calculations considered a 15% uncertainty of measurement. Simulated D positive populations resulted in PAD dose ranges from 500 IU to 10 000 IU (FMH) or 500 IU to 8500 IU (SOT). Disparity in PAD dose between FMH and SOT ranged from no difference to 2000 IU, with the disparity increasing with D positive cell population percentage (Slope FMH = 3156.8 vs Slope SOT 2587).

Discussion/Conclusion: Disparity between PAD dose calculation for FMH and SOT cases was identified, resulting from the larger RBC size considered in the FMH calculation. Despite this, use of the FMH Mollison calculation to estimate D positive cell volume from SOTs and provide PAD is considered safe. This is because the first % D positive population in the exercise for dose disparity was 0.5%; FMH = 11 mL; 2000 IU vs SOT 9 mL; 1500 IU. Where historic samples referred for investigation have been identified to have a D positive RBC volume < 8 mL.

PO69 | Audit of the characteristics and compliance of genotyping undertaken by the red cell immunohaematology department (AUD3842)

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Introduction: Red Blood Cell Genotyping (RBC) allows the provision of RBCs that avoid antigens of clinical significance. It can provide suitable blood to patients with complex/sometimes unresolved serology. Genotyping is prescribed through internal decision making between the Biomedical Scientist and Consultant. This national audit investigated genotyping activity carried out within RCI to identify indications for the use of the technology and areas of improvement.

Methods: Data from fifty investigations was required from each laboratory. This was collected retrospectively and prospectively via audit proforma. Fifty investigations per laboratory was the target. RCI LIMS was used to identify patient genotype, the five recent RBC units they were issued and RBC unit phenotype. Other parameters were: hospital request for genotype; reason RCI performed genotype; fault occurrence; repeat extraction attempts; BMS performing extraction/genotype investigation; time taken from sample booking to genotype result; RCI referral to Molecular Diagnostics (MD) IBGRL and reason for the referral.

Results:

- 372 cases were identified between February 2018 to October 2019
- 99% met serological characteristics defined in MPD1057 for test application
- 29% undertaken as a result of the RCI decision also had a hospital request
- 89% had the genotyping performed by RCI. The remaining 11% were undertaken by MD IBGRL. 82% of RCI Liverpool cases were directly referred to MD IBGRL
- 100% of cases that had DNA extracted by RCI were successfully genotyped
- 84% of cases that had DNA extracted by RCI only required 1 extraction attempt. 16% required 2 attempts
- Numbers of BMSs undertaking DNA extraction at RCI sites ranged from 3–7; those performing genotype ranged from 3 to 6
- 72% of samples where the genotype was performed by RCI were completed with a written report within 5 days after sample booking
- 46% of patients were issued RBC units by RCI subsequent to the investigation of their genotype

Conclusion Recommendations:

- Consider providing a genotyping service to hospitals
- An improvement event to for DNA extraction
- Introduction of a system to maintain BMS competency for extraction/genotyping
- Reduction of referral barriers for genotyping investigation between RCI laboratories

PO70 | Confirmatory samples of pre-transfusion compatibility testing: Analysis of the time gap between confirmatory samples in a tertiary care hospital

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Introduction: A key recommendation of BSH guidelines for pre-transfusion compatibility procedures states, 'Unless secure electronic patient identification systems are in place, second sample should be requested for confirmation of the ABO group of first time patient prior to transfusion' However, practice of taking two pre-transfusion samples in same phlebotomy episode and labelling one with a different time is a common practice which negates the recommendation. Although many of these errors are detected before transfusion, some will result in an incorrect transfusion. Also, unnecessary and inappropriate duplicate sample testing contributes to increasing health care costs.

Methods: A two-week retrospective review (from 20th of April to 5th of May 2020) was conducted to identify all duplicate pre-transfusion compatibility tests performed within 24 hours. Duplicative testing was classified as appropriate or inappropriate by availability of historical blood group. Time gap was analysed along with persons involved in the process.

Analysis and Results: Total of 1542 samples (1328 patients) were received, of which 389 samples (175 patients) were duplicates (25.2%). Out of 175 patients 59 (33.7%) samples were clinically appropriate for duplicative testing whilst 116 (66.3%) samples were inappropriate. Out of all the duplicates 96 (54.9%) of patient's confirmatory samples were taken within very short period (30 min) whilst 148 (84.6%) were taken within two hours. Significantly, 41% of samples were taken by the same person within a short period (30 min).

Out of 59 patients who required confirmatory testing, 36 (61.0%) patients had both first and confirmatory samples taken by the same person where 29 (49.2%) samples were taken within very short period. However, out of 23 (39.0%) samples taken by a different person only 8 (13.6%) samples were taken within 30 min.

Out of all duplicates, number of confirmatory samples taken after two hours by a different person 23 (85%) is significantly higher than by the same person 4 (15%).

Conclusion: To prevent errors due to duplicate sampling, two sampling episodes must be separated in time and ideally each taken by a different person. As per the analysis, a time gap of more than 2 hours

for confirmatory sample encourages second sample to be taken by a different person and this does not impede the delivery of urgent blood or components.

PO71 | Failure to match for RHK in haemoglobinopathy patients

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Introduction: British Society for Haematology (BSH) guidelines recommend that haemoglobinopathy patients are transfused with red cells matched for extended Rh and K type in addition to ABO group (Milkins et al, 2012). Compliance with this guideline would prevent haemoglobinopathy patients from developing antibodies to C, c, E, e and K antigens by transfusion. Additionally, it would prevent any patient who became sensitised to these antigens during pregnancy from experiencing a haemolytic transfusion reaction (HTR) if transfused antigen positive red cells.

Method: Cases of HTR reports submitted to SHOT between 2017 and 2020 were reviewed to identify the number of cases in which antibodies to C, c, E, e and K antigens were reported in patients with haemoglobinopathies. Data on both Rh and K antibodies implicated in the HTR and preformed RHK antibodies in male patients was collected.

Results: A total 36 HTR were reported in haemoglobinopathy patients. Of these 24/36 (66.7%) had alloantibodies present in their plasma. Antibodies to C, c, E or e antigens were present in 12/24 (50.0%), of which all patients were female, and in 4/12 (33.3%) of these cases the antibody to the Rh system was directly implicated as the cause of the HTR due to the failure to transfuse the patient with RHK matched blood products. 2/12 of these cases were due to the use of emergency flying squad blood and two due to the failure to identify the need to provide the patient with RHK matched products.

Conclusion: Although this review was performed on a very small sample of patients, it demonstrates that patients are not always being administered RHK matched red cells, despite the BSH guidance being in place for several years. There was insufficient information available to ascertain the underlying reason for these failures but examples included the need for urgent emergency transfusion, failure by the teams managing the patient to correctly identify the need for RHK matched blood and a failure in sharing information about the patient when they move between different hospitals. Further work is needed to improve the management of this high risk patient group.

PO72 | Avoidable transfusion of O D negative red cells

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Introduction: Serious Hazards of Transfusion (SHOT) is the UK independent, professionally led haemovigilance scheme. Reporting includes instances of avoidable transfusion of O D-negative red blood cells (RBC). It is estimated that 8% of the UK population are O D-negative but this represents 13% of RBC requests from hospitals. To conserve O D-negative stocks, O D-positive RBC may be transfused to adult males over age 18 and women over age 50 in emergency situations who are not on regular transfusion regimens. O D-negative RBC should not be used when acceptable alternatives are available.

Method: A retrospective database search was performed of reports submitted between 2014 and 2020. We reviewed reporter-identified instances of inappropriate transfusion.

Results: 159 cases of avoidable emergency O D-negative RBC transfusion were reported. In 99/159 (63.2%) the recipient was an adult male or woman over age 50, of which 72/99 could have been avoided altogether as either fully crossmatched in 43/99 (43.4%) cases and type-specific in 29/99 (29.2%) were available.

Emergency O D-negative RBC could have been avoided in a further 60/159 (37.7%) owing to blood sampling errors, poor communication between clinical and laboratory staff, collection of incorrect units from satellite refrigerators, issuing errors and IT failures. Acute bleeding was the transfusion indication in 146/159 (91.8%). In 13/159 (8.2%) cases emergency O D-negative units were transfused in the absence of bleeding.

Discussion: There are opportunities to avoid O D-negative RBC in emergencies. Processes should be implemented to improve practice. Hospitals should review policies regarding emergency O D-negative RBC transfusion, focussing on communication in major haemorrhage, reducing sampling errors and ensuring clinical teams understand RBC availability. There is scope to use O D-positive RBC for more patients in emergency transfusion. Further work is needed to assess the impact of policy change on potential transfusion delays. Cross-matched or group specific red cells are preferable when available.

PO73 | SHOT 2019 key recommendations survey

Jennifer Davies[1], Emma Milser[1], Victoria Tuckley[1], Simon Carter-Graham[1], Debbi Poles[1], Fahim Ahmed[1], Shruthi Narayan[1]
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SHOT is the UK independent, professionally-led haemovigilance scheme producing recommendations for improving practice which are published in annual reports. This survey assessed progress with implementing recommendations from the 2019 Annual SHOT Report in reporting organisations across the United Kingdom (UK).

An electronic survey (Online surveys) was emailed to all registered reporters in April 2021. A total of 88/171 (51.5%) responses were received, representing all countries of the UK. Data were analysed for the 2019 key recommendations.

Key recommendations:

1. Organisations must establish causes of patient identification errors by recognising gaps in existing processes, using electronic systems, empowering patients/staff. Most organisations (72, 81.8%) had mechanisms to recognise gaps in existing processes. Electronic systems were in place for 17/88 (19.3%), 19/88 (21.6%) were experiencing difficulties with implementation and 14/88 (15.9%) had no plans to implement, mainly due to lack of funding and engagement. Empowerment of patient and staff were in place for 37/88 (42.0%) and 62/88 (70.5%), respectively.

2. Clinical and laboratory staff should be trained in fundamentals of transfusion, human factors, investigating incidents and patient safety principles. 71.6% of respondents had implemented holistic training. Training was mostly delivered by e-learning (52, 59.1%) and course attendance (45, 51.1%). The pandemic, staffing levels and competing training priorities were barriers to implementation.
3. Healthcare organisations should incorporate the principles of Safety-I and -II to improve patient care. Most organisations (63/88, 71.6%) had processes for improvement from unsafe care. Improvements from excellent care were available for 45/88 (51.1%).
4. Healthcare management must recognise that safety and outcomes are multifaceted, requiring leadership, adequate staffing and knowledge. Leadership roles existed in 44/88 (50.0%) organisations. Staff knowledge was addressed, or working towards, in 72/88 (81.8%). Adequate staffing was achieved in 21/88 (23.9%) with 30/88 (34.1%) facing barriers, recruitment and retention of staff being a common challenge.

Although the pandemic did not affect haemovigilance reporting for most organisations (87/88, 98.9%), some found it harder to submit SHOT reports (29/88, 33.0%), mainly due to inaccessible wards/clinical notes and staff shortages/redeployment.

Understanding progress with implementing SHOT recommendations is essential to inform future direction and strategy. Identifying challenges faced by frontline healthcare staff helps SHOT work collaboratively with all involved in transfusion, including government strategy groups, to improve patient safety.

PO74 | Back to the future - a decade of SHOT reports relating to information technology

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Information technology (IT) has long been heralded as the future of transfusion safety, providing effective barriers to human error. In 2017, SHOT recommended that all available IT systems supporting transfusion practice should be considered and implemented to their full functionality. IT solutions have been utilised as laboratory information management systems (LIMS) for decades. Electronic systems are now available for patient records (EPR), test and component ordering, blood management (EBMS) and temperature monitoring for blood storage.

A retrospective database search was performed for IT related cases reported to SHOT between 2010 and 2020. This review looks at trends in a decade of SHOT reporting focussing on incidents where IT was involved.

2146 reports involving IT (data was not specifically analysed for IT themes in 2015) were recorded. Specific requirements not met (SRNM) account for most errors (948/2146, 44.2%), consistently relating to failures to add, heed/update alerts in the LIMS. Since 2012, IT errors contributed across several SHOT categories; wrong component transfused (WCT) (n = 230/2146, 10.7%), handling and storage errors (HSE) (n = 292/2146, 13.6%), right blood right patient (RBRP) (n = 396/2146, 18.5%), avoidable, delayed or under-/over-transfusion (ADU) (n = 142/2146, 6.6%) and anti-D Ig (n = 136/2146, 6.3%). EPR systems contributed to 2 patient deaths; one delay in obtaining prothrombin complex concentrate and one due to complexity of prescription of blood and visibility of diagnostic results. IT contributed to near miss (NM) events from 2016–2020 (n = 822). In 2020, 72 NM-WCT reports involved IT, in 33 (45.8%) error was averted by EBMS used as part of pre-administration checks.

As organisations continue to harness IT solutions for patient care the number of IT related SHOT reports is expected to rise. Despite over 10 years of SHOT learning relating to alerts in LIMS little progress appears to have been made. EPR, blood ordering and EBMS can reduce errors in the transfusion chain and improve safety but SHOT data show that they can introduce errors if they are too complex or not available for use. For IT systems to be effective, they must be configured correctly, validated and used appropriately. When implementing IT systems consideration must be given to ergonomics, and contingency plans must be in place for planned and unplanned downtime.

PO75 | Recognising barriers to break them down: SHOT UK Collaborative reviewing and reforming it processes in transfusion (SCRIPT) laboratories survey 2020

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The SHOT UK Collaborative Reviewing and reforming IT Processes in Transfusion (SCRIPT) group was formed by the Serious Hazards of Transfusion (SHOT) laboratory and information technology (IT) Working Expert Groups, planning future stakeholder engagement. Aims include improving transfusion safety through enhanced IT systems, functionality, and practices. Hospital transfusion laboratories were surveyed regarding IT systems used throughout the transfusion chain and barriers to implementation, which will be the focus of this abstract.

The anonymous SurveyMonkey™ survey was emailed to registered SHOT reporters (open 30 November 2020–14 February 2021) with one response requested per transfusion laboratory and returns analysed.

Free-text responses to key questions 'What barriers have you experienced in regards to introducing improved IT systems?' (Q1) and 'What ideas do you have for overcoming these barriers/what solutions have been found within your Trust/Health board?' (Q2) were grouped according to main theme.

A total 102 responses were received, 99 SurveyMonkey™ and 3 pdf. Q1 was answered by 89/102 (87.3%); barriers were financial/resource 42/89 (47.2%), technical issues 11/89 (12.4%), lack of IT support 10/89 (11.2%), lack of engagement 9/89 (10.1%) and others 12/89 (13.5%). Only 5/89 (5.6%) responded 'none'. Q2 was answered by 87/102 (85.3%), solutions were communication and engagement at a Trust/Health Board level 19/87 (21.8%), increased resources 13/87 (14.9%), persistence 8/87 (9.2%), national intervention 7/87 (8.0%) and business cases 8/87 (5.7%).

The self-reporting survey format and subjective interpretation of free-text answers provides limitations to analysis. Most respondents faced barriers when introducing transfusion IT systems. Appointment of Chief Clinical/Nursing Information Officers or creation of Chief Pathology Information Officers will support decision-making. Appropriate resources must be allocated at UK government level to enable advancements and support excellent care. Hospital boards must recognise impact of safer transfusion systems (e.g. electronic patient ID) and risks of not introducing technologies. Safety improvements have been noted when such systems are implemented and used correctly[1]. SCRIPT has begun engaging with UK wide central bodies to raise transfusion in the digital agenda and improve patient safety.

PO76 | What's taking so long? – SHOT excessive time to transfuse errors 2019 and 2020

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British Society for Haematology guidance states red cells should be transfused within 4 hours of removal from temperature-controlled storage (or 4 hours 30 for neonates when necessary), due to risk of bacterial proliferation when stored >6°C1. The Serious Hazards of Transfusion (SHOT) haemovigilance scheme accepts reports of 'Excessive time to transfuse (>5 h from removal from cold storage to completion of transfusion)' under the category handling and storage errors (HSE)2.

HSE reports accepted by SHOT in 2019 and 2020 were retrospectively analysed to determine number of excessive time to transfuse errors (ETTE) and identify recurrent themes.

A total 584 HSE errors occurred, 162/584 (27.7%) were ETTE and 4/162 involved paediatric patients (<18 years). Death unrelated to transfusion occurred in 15/162 and the longest transfusion was 14.5 hours with no patient harm. Most were clinical errors 159/162 (98.1%), with 3 instances of incorrect laboratory advice (2 in 2019, 1 in 2020) and occurred 08:00–20:00 75/162 (46.3%). Requests were mostly routine 86/162 (53.1%) or urgent 47/162 (29.0%) and occurred in ward settings 108/162 (66.7%) or medical admission units 24/162 (14.8%). Electronic systems were highlighted in 15/162 (9.3%), involving incorrect infusion pump programming (4), electronic patient identification systems (5) and failure to act on alerts (3). Data regarding infusion pumps or gravity-fed systems was not explicitly requested.

Contributory features noted in the human factors investigation tool included:

- Staffing levels, acuity, and skill mix (19/162, 11.7%)
- Temporary/agency staff (10/162, 6.2%)
- Lack of training (9/162, 5.6%)
- Handover (9/162, 5.6%)
- Patient transfer (9/162, 5.6%)
- Transfusion overnight (5/162, 3.1%)

ETTE occur mostly in the ward setting. Training of staff should include appropriate patient monitoring, transfusion duration, and actions for when this is exceeded. This will not rectify fundamental issues; lack of substantive staff, transfusion overnight or poor safety culture. Patient transfer issues and poor handover can be mitigated with robust policies and documentation. Further research may determine whether use of electronic infusion pump reduces ETTE errors.

PO77 | The heat is on: SHOT cold chain errors 2016–2020

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The Blood Safety and Quality Regulations (2005) state red cells should be stored at 2–6°C[1]. The Joint United Kingdom (UK) Blood Transfusion and Tissue Transplantation Services Professional Advisory Committee state components can be stored outside temperature-controlled conditions (OTC) and safely returned after 30 minutes, or 60 minutes with specified control measures[2]. When exceeded, this is reportable to the Serious Hazards of Transfusion (SHOT) haemovigilance scheme as a handling and storage error (HSE). If adverse clinical reactions are caused, reporting occurs in other categories.

HSE accepted by SHOT 2016–2020 were retrospectively analysed to determine the number of OTC deviations and contributory factors.

A total 1283 HSE errors were reported, 429/1283 (33.4%) were OTC errors in which 16 deaths unrelated to the transfusion occurred.

Laboratory errors caused 322/429 (75.1%); most due to storage equipment failure 145/322 (45.0%), inappropriately returning to stock 42/322 (13.0%), or inappropriate storage 41/322 (12.7%). Equipment failure errors were caused by lack of action following temperature monitoring systems (TMS) prompts 59/145 (40.7%), failures in the TMS 46/145 (31.7%) and equipment being tampered with/malfunctioning 44/145 (30.3%). In one case, cool packs were stored at an inappropriate temperature.

Clinical errors caused 105/429 (24.5%); most due to inappropriate storage (outside specified blood fridges) 44/105 (41.9%), failure to record/comply with cold chain 34/105 (32.4%) or transport/delivery of components between sites 23/105 (21.9%).

Two cases in 2017 were classed as neither laboratory or clinical errors and involved a police officer and a taxi driver.

OTC errors mainly occur in the laboratory. Some TMS and procedures for actioning alarms (single phone call or alert which can be permanently muted) are insufficient/impractical. Laboratory and quality management should examine TMS and procedures to identify gaps and contingency plans for TMS failure. Clinical errors mostly involve inappropriate storage. Storage conditions should form part of routine transfusion training and policies should state that components are returned to the laboratory if there is any doubt of an OTC breach.

PO78 | Cognitive bias- an under-recognised cause of transfusion errors?

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Cognitive biases are flaws or distortions in judgement and decision-making. These are inconsistently reported and therefore challenging to quantify but cognitive biases are increasingly recognised as contributors to patient safety events. More than 80% of the reports submitted to Serious Hazards of Transfusion (the UK haemovigilance scheme) every year relate to transfusion errors. Whilst the contribution of cognitive biases to errors has not been systematically captured or analysed, cases reviewed have highlighted that these are under-recognised and need addressing to reduce errors. Two illustrative cases reported to SHOT in 2020 are included here to highlight the importance of cognitive bias.

Case 1: A young patient in mid-20's received 2 fresh frozen plasma (FFP) and 2 cryoprecipitate out of hours in error instead of 4 units of FFP prior to computerised tomography guided biopsy for a mediastinal mass. The cryoprecipitate was stored in the wrong location in the freezer and staff failed to check the components prior to thawing and issue, assuming all four to be FFP. Staff collecting the component and administering also failed to identify the error and this was only noticed by laboratory staff the next day.

Case 2: Two units of red cells were inappropriately issued electronically and transfused to a patient in her mid-30's. Antibody screen was negative, but patient was known to have historical anti-E antibodies. Staff failed to heed a laboratory information management system alert about requirement for phenotyped blood for this patient. Fortuitously the units were suitable, 'E' negative but were not cross-matched and there was no adverse patient impact.

Assumption bias and inattentional blindness seem to be contributory in these incidents. Decision fatigue especially when lone workers have been functioning in busy shifts could also be contributory.

While these cases are only illustrative, they highlight the need for all staff need to be aware of the potential for such biases, and be trained to recognise, and if possible, prevent them through simple interventions.

These include formally 'slowing down', using checklists, use of flowcharts and 'metacognition' (considering alternatives). Such strategies help mitigate the effect of cognitive bias in healthcare and improve patient safety.

PO79 | Pathological transfusion reactions in recipients of COVID-19 convalescent plasma – Insights from SHOT

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Convalescent plasma, donated by persons who have recently recovered from COVID-19, is the acellular component of blood that contains antibodies, including those that specifically recognise SARS-CoV-2 virus. Safety and efficacy of COVID-19 Convalescent Plasma (CCP) was tested as part of two large randomised controlled trials (RCT) in UK (REMAP-CAP and RECOVERY).

Serious Adverse Reactions (SAR) data relating to use of CCP reported to SHOT between April 2020 and Feb 2021 (inclusive) were reviewed.

A total of 13 407 units of CCP were transfused under the two trials in the UK, with 11 477 (86%) of these given under RECOVERY. There were 14 confirmed SAR (one from REMAP-CAP and 13 relating to RECOVERY) equating to a risk of SAR of 1 in 958 units of CCP. The most common reactions seen in CCP recipients were pulmonary reactions (9/14, 64.3%). Transfusion-associated circulatory overload (TACO) was confirmed in 4 cases and transfusion associated dyspnoea (TAD) in the other 5. Moderate to severe febrile, allergic, hypotensive reactions were reported in 5 patients, all of whom recovered fully. Four patients with pulmonary reactions (3 with TACO and one with TAD) died with death possibly related to the transfusion complication. All reactions were reported in adult patients, with the average age being 65.6 years. TACO checklist was used in only 4/9 (44.4%) pulmonary reactions. One case of TAD was possibly preventable, all other cases were not. Significant co-morbidities were present in 9/14 (64.8%) cases, including COPD and cardiac disease (among many others). Imputablity assessment was challenging given the multisystem nature of severe COVID-19 illness-no reactions reported to SHOT have been noted by experts to be definitely related to CCP.

The two large RCT from UK have helped establish the evidence that CCP does not improve survival or other clinical outcomes in patients hospitalised with COVID-19. A systematic review and meta-analysis published in February 2021 confirmed that treatment with CCP compared with placebo or standard of care was not significantly associated with a decrease in all-cause mortality or with any benefit for other clinical outcomes. Data from SHOT shows that the febrile, allergic hypotensive reactions and pulmonary complications were the most commonly reported reactions.

Conclusion: The HFs day-to-day observation checklist was considered a useful tool for identifying behaviours that could lead to errors, waste in the system, staff injuries and lost time. The next step is to use the findings for change that will improve the process and lead to a better level of BMS engagement.

PO80 | Major haemorrhage audit at a major London teaching hospital, 2020

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Introduction: This audit evaluated the management of major haemorrhage (MH) calls at University College London Hospitals NHS Foundation Trust (UCLH), a tertiary haematology centre with a large obstetric department. It is not a major trauma centre.

Method:

Eight months (May – December 2020) of MH calls were interrogated using electronic patient notes and blood bank documentation. Calls were divided into non-obstetric and major obstetric haemorrhages (MOH). Electronic patient notes and transfusion laboratory documentation were hand checked to assess the three main aims of the audit:

1. Identify whether initial and repeat sets of investigations were requested, as per hospital protocol and national guidance.
2. Identify the type and amount of blood products transfused.
3. Establish the level of blood product wastage.

Results:

156 MH calls were identified. 105 (67%) were MOH. 51 were non-MOH (33%). 38/156 had blood products issued (24%).

MH management was largely concordant with Trust guidelines and some cases of excellent management were noted.

Shortfalls were identified among Trust policy-stipulated initial investigations – FBC (32/38, 84%), biochemistry (18/38, 47%), coagulation (30/38, 79%) and fibrinogen (18/38, 47%). Reassessment of FBC (31/38, 82%, mean time 4.7 hours) and coagulation (27/38, 71%, mean time 4.8 hours) also fell short of Trust targets.

With regards to MOH, 12 patients were issued products: PRBC given to 8, FFP to 4, no platelets, no cryoprecipitate. Max 3 units PRBC received. RBC:FFP ratio 2.4:1. Mean time to first unit 20 mins. There were no deaths.

In non-MOH, 26 patients were issued products. RBC – total 110 units, mean 4.2 per patient. FFP – total 48 units, mean 2.0. Cryoprecipitate – total 6, mean 0.3. Platelets – total 19, mean 0.80. PRBC:FFP ratio 2.3:1. Mean time to first unit 19 mins. There were 5 deaths, which were not attributable to management of MH.

Conclusion:

To improve, we aim to make the following interventions:

- Include printed copies of the trust MH protocol within MH packs and on resuscitation trollies.
- Amend MH transfusion sheets to allow clear documentation of timings.
- Conduct simulation sessions for clinical staff in settings where MH management can be improved.

DOI: 10.1111/tme.12817

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