CSTM 2021 Annual Conference Abstract Booklet

Surfing the waves of change

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Surfer sur les vagues de changements

patients, produits, professionnels

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Abstract ID :

195

A case of recipient neutrophil and human leukocyte antigen antibody mediated fatal reverse transfusion related acute lung injury

Type of abstract : Clinical

Abstract Topics : Adverse Reactions

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Abstract Summary :

Introduction

Transfusion related acute lung injury (TRALI) is a transfusion complication associated with significant morbidity and mortality. Mitigation strategies have decreased the incidence, particularly reducing recipient exposure to plasma from donors at higher risk of human leukocyte antigen (HLA) and human neutrophil antigen (HNA) antibodies. Recipient anti-donor HLA or HNA have rarely been implicated in cases of TRALI.

Design and Methods

Herein, we describe a case of fatal TRALI mediated by recipient, rather than donor, anti-HLA and anti-HNA antibodies. Cognate antibodies and antigens were confirmed with serologic and molecular assays.

Results

A 69-year-old G5P5 female with no prior transfusion history and progressive metastatic cholangiocarcinoma with thromboembolic complications presented with heart failure and dyspnea. She was transfused less than 15 mL from a unit of Fy^a-negative red blood cells and subsequently developed acute onset dyspnea, hypoxemia, hypotension, and fever. Clinical investigations revealed bilateral infiltrates on chest X-ray. The patient died of acute respiratory failure within 24 hours of transfusion.

Recipient testing revealed HLA antibodies cognate to donor HLA antigens, including anti-HLA-A2, anti-HLA-B35, B44, and Bw4. Recipient HNA antibody testing demonstrated HNA antibodies cognate to donor HNA antigens, including anti-HNA-1a, anti-HNA-3a, and anti-HNA-5a and HPA antibodies, anti-HPA-5b and HPA-2b, without cognate donor antigens. The donor was a 63-year-old female whose HLA antibody testing was negative for HLA class I antibodies and positive for HLA class II antibodies, including anti-HLA-DQ-DQA1, DQ7, DQ8, and DQ9 (recipient class II testing unavailable). Donor HNA genotyping revealed cognate antigens to recipient HNA antibodies, including HNA-1a/1b, HNA-3a/3a, and HNA-5a/5a.

Conclusions

The pathophysiology of TRALI has traditionally been ascribed to underlying recipient risk factors in combination with donor biological response modifiers. This case illustrates alternative pathogenic mediators including recipient alloantibodies to donor HLA and HNA antigens, or "reverse" TRALI. Transfusion recipients, like donors, may be at risk for developing alloantibodies through pregnancy, transplant, and previous transfusion. Additional studies to determine the contribution and frequency of recipient alloantibodies in TRALI may inform future mitigation strategies to further reduce the incidence of reverse TRALI, particularly in female transfusion recipients.

Acknowledgements

Funding for laboratory testing provided by Canadian Blood Services

Abstract ID :

205

Transfusion of a Platelet Pool Contaminated with Exotoxin-Producing Staphylococcus aureus: A Case Report

Type of abstract : Clinical

Abstract Topics : Adverse Reactions

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Abstract Summary :

Introduction: Contamination of platelet concentrates (PC) with *Staphylococcus aureus* has become a leading cause of transfusion-transmitted infections. This organism often escapes detection during routine PC screening with culture methods and causes false-negative screening septic transfusion reactions. Exotoxins produced by *S. aureu*s contribute to septic shock symptoms in transfusion patients.

Case report: In September 2020, an elderly male patient, suffering from leukemia, was transfused with a 5-day-old buffy coat PC. The transfusion was interrupted approximately 5 min after starting since the patient had an increased heart rate and low blood pressure. Approximately 40 min post-transfusion, the patient developed severe chest pain, shortness of breath, chills/rigors, nausea/vomiting, transient hypoxemia and fever. Following the reaction, analgesics and nitroglycerine spray were administered. Caspofungin and Cefazolin were added as supplementary treatment, and the patient recovered well. Microbiology and antibiotic sensitivity testing revealed that a patient blood sample and the implicated PC were contaminated with *S. aureus*. Bacterial quantification in the residual PC showed that the unit contained approximately10^9 CFU/mL. Further analyses revealed that this strain forms strong surface-attached aggregates (biofilms) in PCs, and carries genes encoding for five enterotoxins, including enterotoxin SEG, which was detected in the implicated PC unit by Western blotting.

Discussion: At Canadian Blood Services, PC are screened for bacterial contamination with the BacT/ALERT culture system at ≥36 hours post-collection. The PC involved in this case was routinely tested and yielded false-negative culture results. The severity of septic transfusion events depends on the virulence of the *S. aureus* strain, the type and concentration of toxins present in the PC, as well as the patience's immune status. In the case reported herein, we showed that *S. aureus* was present at clinical-relevant concentrations and the superantigen toxin SEG was found in the PC, likely triggering the septic shock symptoms developed by the patient.

Conclusion: The false-negative BacT/ALERT result substantiates the increasing incidence of missed *S. aureus* during PC screening with severe clinical consequences. As *S. aureus* can secrete enterotoxins into PC, testing for toxins should become essential during investigations of transfusion reactions involving this bacterium.

Acknowledgements: Adriana Sferrazza, Akash Gupta, and Marissa Laureano for their contributions to collecting information about the case. Blood donors, netCAD Blood4Research Facility for PC production for biofilm assays. Canadian Blood Services Intramural Research Grant Program for providing funding for microbiology investigation. SIC holds a Canadian Blood Services post-doctoral fellowship.

Abstract ID :

224

Practice Patterns of ABO-Matching for Cryoprecipitate and Patient Outcomes after ABO-Identical vs. Non-Identical Cryoprecipitate

Type of abstract : Clinical

Abstract Topics : Adverse Reactions

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Abstract Summary :

INTRODUCTION AND OBJECTIVE: There is currently limited evidence to suggest ABO-incompatible cryoprecipitate causes adverse reactions. The fibrinogen replacement in surgery (FIBRES) trial was conducted at 11 Canadian hospitals and randomized 735 adult patients who underwent cardiac surgery and developed clinically significant bleeding with hypofibrinogenemia post-cardiopulmonary bypass to cryoprecipitate versus fibrinogen concentrate. This sub-study of the FIBRES trial seeks to examine the patterns of ABO-matching for cryoprecipitate and to determine if there are any adverse consequences of ABO-non-identical cryoprecipitate.

DESIGN AND METHODS: This was a post-hoc analysis of data prospectively collected from the FIBRES randomized clinical trial. The primary outcome was the percentage of administered cryoprecipitate that was ABO-identical. Secondary outcomes were adverse events at 28-days including death, myocardial infarction (MI), stroke, liver injury, kidney injury, thromboembolic events, coagulopathy/disseminated intravascular coagulation (DIC), anemia/severe hemolysis, and hyperbilirubinemia.

RESULTS: 363 patients were included: 62 (17%) received ABO-non-identical cryoprecipitate and 301 (83%) ABO-identical cryoprecipitate. Unadjusted analysis demonstrated an increased incidence of postoperative anemia in the ABO-non-identical group (17; 27.4%) vs. the ABO-identical (42; 14.0%) group ($p = 0.01$). Among these cases, there was one case of hemolytic anemia classified as not due to cryoprecipitate but to mechanical circulatory devices. In the final multivariable logistic regression models accounting for clustering by site, there was no observed statistically significant association between the administration of non-ABO-identical cryoprecipitate and any adverse outcomes. The post-FIBRES survey was completed by 11 (100%) participating FIBRES sites, nine (81.8%) of which did not have a policy that required ABO-identical cryoprecipitate.

CONCLUSIONS: This sub-study demonstrated that most cryoprecipitate administered in practice is ABO-identical, despite the absence of guidelines or widespread blood bank policies to support this practice. A signal towards increased risk of post-operative anemia may have been explained by higher rates of urgent surgery (vs. elective) in the ABO non-identical group. Future studies in countries that continue to rely on cryoprecipitate should prospectively examine the impact of ABO-identical vs. non-identical cryoprecipitate, and may consider similar analyses with a focus on adverse patient outcomes to conclusively establish if there is a meaningful clinical impact associated with the administration of ABO-non-identical cryoprecipitate.

Abstract ID :

228

Enhanced biofilm formation and capsule biosynthesis of Staphylococcus aureus grown in platelet concentrates revealed by transcriptome analysis

Type of abstract : Scientific

Abstract Topics : Adverse Reactions

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Abstract Summary :

Introduction/Objective: Mucosa habituated *Staphylococcus aureus* is a major contaminant of platelet concentrates (PCs). PC storage conditions (20-24^{o}C under agitation) provide an ideal environment for *S. aureus* proliferation. This bacterium is often missed during PC screening for bacterial contamination with culture systems, and can cause severe septic transfusion reactions. To understand the mechanisms responsible for missed detection, we used RNA-seq technology to compare the transcriptomes of two *S. aureus* strains: a false-negative PC screening strain (CBS2016-05) and a strain detected during PC testing (PS/BAC/317/16/W).

Design/Methods: *S. aureus* CBS2016-05 and PS/BAC/317/16/W strains were grown in Trypticase Soy Broth (TSB) and PCs up to stationary phase at 20-24^{o}C under agitation. RNA was extracted and paired-end libraries were prepared using the Illumina Stranded Total RNA Prep kit and sequenced on the NextSeq 500 platform. Differential gene expression between the PC and TSB conditions for each bacterial strain was calculated using the 'lfcShrink()' function in DESeq2.

Results: RNAseq revealed that CBS2016-05 has highly upregulated expression of capsule *capAB* genes (5.8-fold) in PCs compared to TSB, and also in comparison to PS/BAC/317/16/W. Notably, the central regulator of *S. aureus* virulence, accessory gene regulator (*agr*), and its numerous regulated genes (e.g., RNAIII, phenol soluble modulin, cysteine/serine proteases), were highly repressed, which is quintessential for biofilm formation. Pyruvate formate lyase gene (*pfl*) was also highly upregulated (6.7-fold) in CBS2016-05 grown in PCs; Plf has a critical role in cell survival in the anaerobic region of biofilms. Genes encoding for platelet aggregation inducing proteins such as clumping factor A (*clfA*) and protein A (*spa*) were upregulated in CBS2016-05 (1.7-fold, 5.7-fold) and downregulated in PS/BAC/317/16/W (-1.2-fold, -1.5-fold). Crystal violet assay showed that CBS2016-05 is a strong biofilm former whereas PS/BAC/317/16/W is a weak biofilm producer. **Conclusions:** Our results indicate that significant upregulation of capsule and biofilm formation genes in *S. aureus* could contribute to aggregate formation in PCs and consequential missed detection during PC screening. *S. aureus* virulence factors that are differentially regulated in PCs could be used as targets to develop/improve platelet additive solutions and PC storage bags with the ultimate goal of enhancing PC transfusion safety.

Acknowledgements Blood donors, netCAD Blood4Research Facility for PC production. The study was funded by a Canadian Blood Services Intramural Grant. BY holds a Canadian Blood Services post-doctoral fellowship.

Abstract ID :

254

Evaluation of the quality of granulocyte concentrates collected for transfusion of neutropenic patients

Type of abstract : Scientific

Abstract Topics : Apheresis

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Abstract Summary :

Background/objectives: Granulocyte transfusions (GTX) represent a therapeutic alternative for life-threatening infections in neutropenic patients when anti-microbial treatments are ineffective. Granulocyte concentrates (GC) used for GTX are prepared by apheresis from corticosteroid and/or G-CSF-stimulated healthy donors. Although functional neutrophils are needed to fight infection, quality control of GCs relies solely on the number of neutrophils collected. To improve GC quality in Canada, the function of GC neutrophils collected from prednisone-stimulated donors was assessed. We aimed to identify which aspect(s) of GC manufacturing (leukapheresis and storage) affect neutrophil function. For comparative purposes, the same analysis was performed on GC neutrophils from G-CSF-stimulated donors.

Methods: GC neutrophils obtained from prednisone and G-CSF-stimulated healthy donors were analysed by flow cytometry to assess viability and cell-surface marker expression. Chemotaxis towards fMLP was determined with the ChemoTX 101 system. Phagocytosis of *S. aureus* and zymosan along with fMLP and PMA-induced ROS production were monitored by flow cytometry and the fMLP-induced increase in cytoplasmic calcium by spectrofluorometry. IL-8 was quantitated by ELISA. All assays were performed pre- and post-leukapheresis up to 48 hours of storage. All tests were performed on control neutrophils isolated from sex and age-matched, non-stimulated healthy donors.

Results: Prednisone mobilized fully mature neutrophils, the majority of which remain viable up to 24 hours post-leukapheresis. While prednisone-derived neutrophils respond to stimuli, their functional capacity varies between donors. Storage decreased viability and chemotaxis but increased IL-8 release of prednisone-derived neutrophils. In contrast, G-CSF mobilized a higher number of neutrophils, 40% of which were immature. Storage did not affect viability of G-CSF-derived neutrophils, however, these leukocytes produced higher levels of ROS and IL-8 and were less efficient at phagocytosing zymosan. Most neutrophil functions were altered after 48 hours regardless of stimulating agent. Albeit GC neutrophils are mostly viable and functional up to 24 hour post-apheresis, significant inter-donor variability in GC neutrophil function was observed.

Conclusions: Our findings indicate that GC quality control could be improved by using a functional test to ensure the transfusion of anti-microbial competent neutrophils. The significant differences between prednisone and G-CSF-derived GCs underscore the need to further characterize these two types of blood products to choose the optimal stimulant for GC preparation.

Acknowledgements: This project was funded by Héma-Québec, the Canadian Blood Services, and MITACS.

Abstract ID :

206

Non-Destructive Quality Control Sterility Testing For Red Blood Cell Concentrates (RCCs)

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

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Abstract Summary :

Introduction/Objective: Canadian standards require monthly quality control (QC) testing of 1% (minimum 10 units) of RCCs for product quality and sterility at expiry. QC testing of expired units is destructive and Canadian Blood Services has been investigating the use of small aliquots, collected from in-date RCCs and stored to expiry, for QC testing. This approach enables QC RCC units to be sampled and subsequently released for transfusion. Bacteria able to replicate in RCCs can be detected earlier than product expiry; hence, early sampling for non-destructive QC sterility testing was investigated in this study.

Design/Methods: Phase I (N=2): Four ABO-Rh matched leukoreduced CPD/SAGM-RCCs were pooled and split. Units were tested for sterility and inoculated with ~25 CFU of *Serratiatiliquefaciens* (units SL-A, SL-B) or *Listeriatimonocytogenes* (units LM-A, LM-B). Spiked RCCs were stored at 1-6^{o}C for 43 days. BacT/ALERT testing was performed on days 7-14 in units "-A" and on days 16-43 in units "-B". Phase II (N=3): Four ABO-Rh matched leukoreduced CPD/SAGM-RCCs were prepared: three RCCs were spiked with ~25 CFU of*tiS.tiliquefaciens*, *L.timonocytogenes* and *Cutibacteriumtiacnes.ti As thetilatiertibacteriumtiwastinottiexpectedtitotiproliferate,* the fourth RCC was spiked with 25 x 10^4 CFU of *C.tiacnes*. Units were periodically sampled for BacT/ALERT testing and for agar plating to determine bacterial concentration. In both Phases, after two sequential positive BacT/ALERT results, sampling was stopped until final testing on Day 43.

Results: Phase I, *S.tiliquefaciensti*was detected on day 7 while *L.timonocytogenesti*was detected on day 23 of RCC storage. Phase II, *S.tiliquefaciens* was detected in culture bottles on day 7 with concentrations of 10^2-10^3 CFU/ml. Consistent BacT/ALERT detection of *L.timonocytogenesti*was attained by day 23 with concentrations of 10^1-10^2 CFU/ml observed on day 30. *C.tiacnesti*remained viable but did not grow in RCCs.

Conclusions:A non-destructive QC sterility testing approach for RCCs could be implemented after 23 days of storage without negatively impacting QC results. This approach would decrease loss of RCCs and enable robust QC sampling plans.

Acknowledgements:ti Blood donors and netCAD Blood4Research Facility for blood collection & RCC production, and Canadian Blood Services for study funding.

Abstract ID :

214

In Vitro Characterization and Metabolomic Analysis of Cold-Stored Platelets

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

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Abstract Summary :

Introduction: Platelet transfusions are essential to restore the hemostatic function of bleeding patients. To maintain an inventory for these transfusions, platelets are collected from donors and stored at 22°C for five to seven days. This short shelf life leads to significant wastage. Cold storage is being reconsidered to extend platelet shelf life. Additionally, small clinical trials demonstrate that cold-stored platelets have better hemostatic function. In this study, we investigated the *in vitro* characteristics of cold-stored platelets under shaking and non-shaking conditions. Furthermore, we analyze the metabolomic profiles of platelets. We hypothesize that cold-stored platelets have distinct biological characteristics that can benefit bleeding patients.

Design and Methods: Platelet concentrates were produced using the buffy coat method. Platelets were pooled and split into three identical units. Platelets were stored at 22°C with agitation (RP), 4°C with agitation (CPA) or 4°C without agitation (CP) for up to 14 days. Platelets were analyzed for count, pH, surface marker expression and aggregation response. The platelet metabolome was analyzed by liquid chromatography and tandem mass spectroscopy.

Results: CPAs and CPs had significantly lower count than RPs on day 9. The pH of RPs was more acidic than CPAs and CPs on day 14. There was an immediate increase in CD62P expression of CPAs and CPs after 24 hours compared to RPs. Furthermore, CPs had elevated phosphatidylserine (PS) expression compared to RPs after 9 days of storage. Using adenosine di-phosphate, CPAs and CPs had higher maximal aggregation compared to RPs. Metabolomic analysis showed reduced antioxidant levels in response to reactive oxygen species (ROS) in CPAs and CPs compared to RPs. This was expected as cold storage slowed down metabolic rate. Correlation of metabolites with platelet *in vitro* function was performed. Specifically, L-carnitine and ascorbate positively correlated with platelet aggregation. Whereas, L-proline and L-arginine negatively correlated.

Conclusion: Cold storage has significant impact on platelet *in vitro* biology. *In vitro* changes, such as elevated P-selectin, PS exposure and superior response to agonists, may be beneficial to actively bleeding patients. From a blood banking perspective, lower metabolism and stable pH can be beneficial for extending storage time.

Acknowledgements: The authors would like to acknowledge the blood donors and Canadian Blood Services Blood for Research Facility for the platelets used in this study.

Abstract ID :

218

CPP: A DMSO-free cryosolution for cord blood grafts

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

Authors:

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Abstract Summary :

Introduction: Cryopreservation is necessary to store HSC grafts but freezing and thawing induce cell lesions leading to loss of function. Dimethyl sulfoxide (DMSO) is the most used cryoprotectant (CPA) for HSC grafts despite its negative effect on cell viability and patients. Herein, we tested whether cord blood units (CBU) could be cryoprotected with CryoProtectPure-STEM (CPP), a new protein-based DMSO and serum free CPA.

Study design: Processed CBU cells were split and frozen with 10% DMSO 1% dextran-40 (control) or CPP. The impact of the CPAs on cell viability and potency was measured using annexinV and potency assays. The engraftment activity of CB was tested by transplantation of thawed CB cells into immunodeficient mice.

Results: CPP provided very good post-thaw viabilities of $CD45^{+}$ cells and $CD34^{+}$ cell. Moreover, the net number of viable $CD45^{+}$ and $CD34^{+}$ cells tended to be superior with CPP (+50%, p=0.07, n=8). The colony forming unit assay revealed no significant differences in progenitor numbers between graft frozen with CPP or DMSO. Also, a stem cell expansion assay confirmed that both grafts induced similar expansion of various HSC and progenitor enriched subsets including $CD34^{+}CD45RA^{-}$ and $CD34^{+}CD45RA^{-}Epcr^{High}$ cells (n=3). Finally, we compared the engraftment activity of the grafts using immunodeficient mice. The pilot assay (n=2) revealed that platelet and leucocyte engraftment between week 3 and 16 were equivalent between both groups. Moreover, no significant differences were seen in long-term bone marrow engraftment at week 22.

Conclusion: These results demonstrate that CBU cryopreserved with CPP retained high viability, potency and engraftment activity.

Abstract ID :

225

New Stem Cell Agonist Cocktail Raises the Expansion of Hematopoietic Stem Cells

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

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Abstract Summary :

Introduction: Expansion of hematopoietic stem cell (HSC) with small stem cell agonist molecules can overcome the size limitation of cord blood (CB) leading to the use of the better matched unit. We developed 5 stem cell agonist cocktails (SCAC) to maximize expansion of HSC (X2A, X2B, SM2, SM6 and SMA). Each cocktail is composed of the same 4 stem cell agonists at distinct concentration providing both unique and redundant growth promoting activities. Herein, we set to define the engraftment activity of SCAC-expanded grafts and explore the underlying molecular programs that drive HSC expansion.

Study design: CB CD34+ cells were expanded for 14-days with SCACs. The engraftment capacity of HSC grafts was tested using serial and limit dilution (LDA) transplant assays. RNA-seq analysis was performed on SCAC expanded and freshly isolated CB CD34+CD45RA- cells.

Results: Engraftment analyses revealed that X2A-expanded HSCs (X2A-HSC) provided the highest level of platelet and leukocyte engraftment at week-3 ($p < 0.05$, n=3). Long-term engraftment was equally high with X2A-HSC and SM6-HSC in the periphery, bone marrow ($p < 0.05$ vs SM2, week-18, n=3) and in secondary transplants. SM6-HSC provided the lowest engraftment followed by X2B. Importantly, LDA assays revealed that X2A increased HSC content from an input of ~3 HSC to 41 ± 1, which was significantly superior to that measured in control C6 cultures composed of SR1 and UM171 (10 ± 2, p=0.02, n=2). Bioinformatic analysis revealed that the transcriptome profiles of fresh and SCACs expanded CD34+CD45RA- cells were quite distinct. Enrichment map analysis of X2A and X2B revealed, immune response, inflammatory response, and signal transduction as the top pathways affected. In comparison, the transcriptome data of C6 and SM6 revealed, SRP-dependent co-translational, translation initiation, and inflammatory response as the top pathways that were affected

Conclusion: X2A and SM6 were two cocktails of small molecules found to improve the engraftment activity of CB grafts with X2A boosting HSC numbers by ~15-fold. Furthermore, we highlight novel molecular programs that may drive the hematopoietic stem and progenitor cell expansion.

Abstract ID :

240

Evaluating Red Cell Concentrate Product Quality from Day 42 to Day 49 of Hypothermic Storage

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

Authors:

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Tracey Turner [2] *, MLT, MBA, Canadian Blood Services

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Abstract Summary :

Introduction / Objective: The COVID-19 pandemic demanded blood services worldwide to take action to ensure the availability of blood products. Strategies were adopted to maintain blood supplies while investigating viable options to mitigate national shortages. Canadian Blood Services evaluated the quality of red cell concentrates (RCCs) after 42 days of storage as part of a risk assessment for potential transfusion of these products after regulated expiry.

Design and Methods: Eighty leukoreduced CPD/SAGM RCCs, manufactured by either the red cell filtration (RCF) or the whole blood filtration (WBF) methods, were evaluated from day 42 to day 49. Hemoglobin, hematocrit, hemolysis, MCV and extracellular potassium were tested daily. Deformability was evaluated on day 42, 45, 47 and 49 and ATP at day 49; both on a subset of units.

Results: RCF produced RCCs met regulatory requirements for hematocrit, hemoglobin, and hemolysis at all time points, while WBF RCCs failed to meet hemolysis standards at day 42. Statistical differences were demonstrated between production methods for hemolysis at all time points and membrane rigidity at day 49. An increase in rigidity was detected for RCF RCCs when compared to WBF units. ATP concentrations showed no statistical differences between methods but predicts RCF RCCs may meet 24-hour *in vivo* recovery requirements.

Conclusions: Manufacturing method is implicated in RCC product quality after expiry demonstrated by the superior quality of RCF RCCs in this study. Further evaluation of RCF RCCs for transfusion could be an option for blood services facing shortages in order to meet patient needs.

Acknowledgements: This research received funding support from Canadian Blood Services, funded by the federal government (Health Canada)and the provincial and territorial ministries of health. The views herein do notnecessarily reflect the views of Canadian Blood Services or the federal, provincial, or territorial governments of Canada. We are grateful to Canadian Blood Services' blood donors who made this research possible.

Abstract ID :

243

Red Blood Cell Heterogeneity Defines Storage Lesion Outcomes

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

Authors:

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Abstract Summary :

Introduction / Objective: The importance of treating red cell concentrates (RCCs) as a heterogeneous population of red blood cells (RBCs) is increasingly being described. RCCs contain a wide range of RBCs of different ages (from recently matured/"young" (Y-RBCs) to senescent/"old" (O-RBCs) RBCs) at the time of donation, and lysis products from old RBCs during subsequent component processing and storage that may contribute to the overall quality of these products. Since the RCCs storage lesion is known to be donor-dependent, in this study we evaluated the contribution of RBC subpopulations of varied biological ages from male and female donors to the storage lesion.

Design and Methods: RCCs from male (n=6; mRCC) and female (n=4; fRCC) donors underwent Percoll-separation into less dense (Y-RBCs) and dense (O-RBCs) subpopulations, and were assessed weekly for 28 days for changes in hemolysis, mean cell volume (MCV) and hemoglobin concentration (MCHC), hemoglobin autofluorescence (HGBF), morphological index (MI), and deformability.

Results: Y-RBCs had higher MCV and MI, and lower MCHC, HGBF and rigidity than O-RBCs. By day 14, Y-RBCs retained lower hemolysis and rigidity compared to O-RBCs. Assessment of differences between fRCCs and mRCCs units demonstrated that the O-RBCs from fRCCs had higher MCV (day 14, 28) and lower MCHC (day 7) compared to mRCCs. The rate of change of hemolysis during storage for fRCCs demonstrated a 2.81-fold increase for Y-RBCs and a 2.60-fold increase for O-RBCs, while mRCCs reached a 3.56-fold increase for Y-RBCs and an 8.91-fold increase for O-RBCs. Differences in deformability showed that rigidity of O-RBCs (day 7, 14) and Y-RBCs (day 7) in mRCCs was significantly higher than that for fRCCs. By day 28 of storage, only Y-RBCs retained significantly higher rigidity for RBCs from male donors.

Conclusions: Dissimilarity of young and old RBCs from female and male donors reflects the heterogeneity of RCCs after donation and suggests that there is a larger contribution from old RBCs to the overall assessment of the RCC storage lesion.

Acknowledgements: We are grateful to Canadian Blood Services' blood donors who made this research possible. This research received funding support from Canadian Blood Services (IG2018-JA), funded by the federal government (Health Canada) and the provincial and territorial ministries of health. The views herein do not necessarily reflect the views of the federal, provincial, or territorial governments of Canada.

Abstract ID :

252

Performance Evaluation of a Non-Destructive Quality Control Technology for Red Blood Cell Concentrates

Type of abstract : Scientific

Abstract Topics : Blood Components Collection and Processing

Authors:

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Audrey Laforce-Lavoie [2], , Héma-Québec

Marie-Joëlle De Grandmont [3], , Héma-Québec

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Abstract Summary :

Introduction: To ensure the quality and safety of blood products delivered to hospitals, blood banks rely on validation and quality control (QC) systems. According to Canadian regulatory standards (CSA), a minimum 1% of the labile blood product inventory must be subjected to periodic QC testing. In Canada, the development of a non-destructive QC testing (NDQCT) method based on the use of small volume test containers (TCs) manufactured from the same components used for red cell concentrate (RCC) storage bags, referred as mother unit (MU), was recently conducted. The principal objective of this project is to conduct a performance evaluation study aiming to compare the behavior of RCC quality markers obtained from two different whole blood derived manufacturing processes during storage in MUs and TCs.

Methods: A total n = 30 CP2D/AS-3 (whole blood leukoreduced; Haemonetics) and n = 30 CPD/SAGM (RCC leukoreduced; TerumoBCT) were prepared on day 1 post-collection. RCCs were sampled non-destructively in V = 9 mL RCC TCs. AS-3 RCC units were sampled via the cannula line while SAGM RCCs were all sampled via the segment line. The tubing content of each RCC was stripped back and mixed to the MU to ensure homogeneity and content representativity prior TC filling. All MUs and TCs were stored upright as per standard procedure for RCC storage (1-6°C) until QC testing was performed on day 42. Red blood cell (RBC) concentration, RBC volume ratio, metabolic and Na/K-pump activities, hemoglobin release, RBC lysis and ATP consumption figure amongst the RCC in vitro quality markers assessed. Correlation and Bland-Altman analysis were performed considering all MU/TC pairs.

Results: A strong correlation ($p<0.0001$) between TCs and their associated MU was observed for hematocrit, pH, hemolysis, hemoglobin (g/L), glucose, sodium, lactate and ATP concentration. Measured potassium concentration demonstrated a strong correlation for AS-3 RCCs but a different behavior was observed for SAGM RCCs ($p=0.035$). As expected, there were no correlation for pO_2 and pCO_2 independently of the RCC manufacturing process and was probably caused by the TC sampling process. Despite the fact AS-3 TCs were filled with via the cannula line, their average hemolysis rate was lower than that of SAGM TCs (cannula-free tubing).

Conclusions: The data presented herein does provide evidence that TCs are an acceptable surrogate for RCC MU QC testing when either of the two manufacturing processes is used to produce RCCs.

Abstract ID :

204

Evaluation of immunoglobulin utilization: an interim data analysis from the Ontario Immunoglobulin Treatment (ONIT) Case Registry

Type of abstract : Clinical

Abstract Topics : Blood Product Management

Authors:

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D. William Cameron [5], , University of Ottawa at The Ottawa Hospital

Abstract Summary :

Introduction

Healthcare for immunodeficiency has been fragmented, resulting in lack of a uniform standard for case management. Individuals with immunodeficiency and immunoglobulin (IG) utilization are increasing. A pilot multicentre program (Ottawa, Hamilton and Toronto) funded by the Ministry of Health and Long-Term Care in Ontario dedicated to immunodeficiencies was created to examine healthcare delivery and support home-based subcutaneous IG (SCIG) treatment. A key component of the ONIT program is specialized nursing to educate, support and monitor IG treatment. A consented ONIT case registry was established to capture relevant demographic and clinical data prospectively from the point of care.

Objectives

To report on the ONIT program performance using case registry.

Methods

ONIT patients were enrolled in the case registry as of June 2020. We collected the following: diagnosis, comorbidities, IG indication, treatment, health outcomes, infections, adverse events and quality of life.

Results

These results report on the Ottawa experience which was the first to obtain ethics approval. There were 158 patients enrolled between June 1 to December 31, 2020. Average age was 59.6 years. A hundred were female. Of 158, 134 were already on IG (120 SCIG and 14 IVIG), ten had discontinued IG, twelve were new referrals for IG treatment, and two were new referrals for a switch to SCIG. Of twelve new referrals, nine started on SCIG, three opted for monitoring. Primary immunodeficiency was the main indication for IG treatment. SCIG dosage was less than IVIG (40.5±17.9 g/week vs. 45.6±17.1 g/4 weeks). There were two switches from IV to SC, two switches in SCIG brand due to adverse events, one SCIG dose reduction, one SCIG dose up titration due to inadequate control of myasthenia gravis, and two IG discontinuations for an adverse event and a resolution of immunodeficiency.

Conclusions

Prospective case registry data revealed that the ONIT program led to the initiation of SCIG, fewer hospital visits, and better monitoring of IG use. Next steps are to compare practices among centers within ONIT to better characterize and standardize this area of practice.

Abstract ID :

229

Trans People and Blood Donation: Community Engagement and Cultural Competence are Important

Type of abstract : Administrative

Abstract Topics : Donors

Authors:

Terrie Butler-Foster [1] *, RN , Canadian Blood Services

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Abstract Summary :

Background: Trans individuals (those whose gender identity differs from the sex assigned at birth) are important contributors to the blood system. Ensuring positive donation experiences for all people attracts and retains donors.

Methods: Canadian Blood Services engaged with trans communities to enhance inclusive and positive donor experiences. We implemented recommendations for cultural competence trainingfor staff created by trans people.

Results/Findings: Two trans persons co-designed electronic, interactive training modulesdelivered to all donor-facing staff. Video, term matching, and scenario exercises assisted in learning key cultural competence principles presented as follows:

• Ask and use pronouns: Sharing pronouns creates a safe and welcoming space.

• Sexual orientation (who a person is attracted to) and gender (who a person is) are independent of each other.

• Explain deferrals in gender neutral terms, based on the anatomy of the donor and their partner.

• If the past/pre-transition must be discussed, explain privately why this is required. Avoid using phrases like "born a man/woman" or "when you were a man/woman." Instead say "sex assigned at birth" or "previously."

• Chosen names are an important part of identity. If legal name and chosen name differ,avoid referring to legal name as "real name" and don't put chosen names in quotationmarks. If legal name must be confirmed, explain privately why this is required, and use chosen name in all discussion and when introducing donor to others.

• Ask about gender affirming/confirming surgery only if necessary. Not all trans people have surgery and unnecessary discussion overemphasizes the importance of surgery.

• If you say the wrong thing, simply apologize and make a sincere effort moving forward to use the correct terminology/pronoun/name.

• Organizational cultural competence includes striving for gender neutralpolicies/language/facilities, trained staff, including diverse identities in focus groups and advertising, and continued community engagement.

Conclusion: Anecdotal feedback from staff and donors about this training has been positive. Further evaluation, engagement, and learning opportunities are being planned. Future areas of study with both donors and trans communities include investigating acceptance of potential modifications of processes to be more inclusive for trans people. Canadian Blood Services is committed to improving donation experiences for trans donors.

Citation for this work: Goldman M, Butler-Foster T, Lapierre D, O'Brien SF, Devor A. Trans people and blood donation. Transfusion. 2020 May;60(5):1084-92.

Abstract ID :

223

Impact of the COVID-19 pandemic on blood donations in Canada

Type of abstract : Clinical

Abstract Topics : Donors

Authors:

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Abstract Summary :

Background/Objectives: The impact of the COVID-19 pandemic on blood services is complex. While SARS-CoV-2 is not thought to be transfusion-transmissible, swift operational changes ensured the safety of donors, staff and volunteers at Canadian Blood Services (CBS). The implementation of (1) the wellness checkpoint (before entering a clinic) and (2) expanded travel deferral and the addition of two COVID-19 deferral questions to the Donor Health Questionnaire (DHQ), could have a direct bearing on blood collections. We assessed the impact of these measures on the frequency of donors turned away and deferred.

Methods: Deferrals based on exposure to COVID-19 (14-day deferral from last contact) or a diagnosis of COVID-19 (14-day deferral after full recovery, or as of November 2020, if hospitalized, 21-day deferral after full recovery) from March to December 2020 were extracted from the donor database. We evaluated the proportion of people turned away and deferred based on the total number of allogeneic donations at specified time periods. We did not assess travel deferrals.

Results: Between June to December 2020, 0.2% (1074/495,961) of people were turned away at the wellness checkpoint based on self-assessment of COVID-19 risk (n=850) and refusal to wear a mask (n=224). Over time, the proportion of people turned away did not change. From March to December 2020, a total of 189 potential donors were deferred due to COVID-19; 62% were female, average age was 39 (min 17, max 86). Most of the deferrals were due to exposure to COVID-19 (67%; 124/189) rather than a COVID-19 diagnosis (33%; 64/189). The number of people being deferred for COVID-19 was higher earlier in the pandemic compared to later.

Discussion: Overall very few (0.2%) of donors were turned away at the wellness checkpoint or deferred due to COVID-19. This may be a result of potential donors self-deferring before attending a donation site, as safety measures were widely publicized by CBS and Public Health authorities. As the pandemic continues, monitoring the impact of COVID-19 related deferrals will be important to ensure the safety of donors and staff while maintaining Canada's blood supply.

Abstract ID :

196

An association between recent donor influenza vaccination and unconfirmed repeat-reactive syphilis serology test results: 2017-2020.

Type of abstract : Scientific

Abstract Topics : Donors

Authors:

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Abstract Summary :

Background: Canadian Blood Services (CBS) screens all donations for syphilis. Syphilis repeat reactive (RR) results, with or without confirmation, lead to the indefinite deferral of CBS donors. Anecdotal evidence suggests that increased rates of unconfirmed syphilis RR results are temporally associated with public health vaccination campaigns. The purpose of this study was to determine if there was an association between unconfirmed syphilis RR results and a history of recent influenza virus vaccination in CBS blood donors (September 2017-December 2020).

Methods: Syphilis RR results were obtained from CBS donations (September 2017-December 2020), after testing on the PK TP system (Beckman Coulter; Brea, CA, USA). Syphilis confirmatory serology was carried out at two reference laboratories. Donor influenza vaccination histories, within three months of donation, were extracted. Statistics were carried out using GraphPad Prism 5.01 (GraphPad Software, Inc., San Diego, CA, USA). Confirmed syphilis cases were used as a proxy control group against RR cases that did not confirm.

Results:

Association of unconfirmed vs confirmed syphilis RR serology to a recent donor history of influenza vaccination (September 2017-December 2020).

Syphilis test result	Total, n (%)	Recent donor history of influenza vaccination, n	Donor history of influenza vaccination, %
Unconfirmed RR	588 (80.8)	86	14.63
Confirmed positive	140 (19.2)	11	7.86
Total results	728	97	13.32

A further contingency table analysis identified an association between syphilis test results and a recent donor history of influenza vaccination (Fisher's exact test P=0.0374; two sided).

Discussion: Although highly sensitive donor testing allows for the rapid and effective identification of donor with active or historic syphilis infections, most are false-positive. Using syphilis-confirmed cases as a control group, this study identifies a temporal correlation between unconfirmed syphilis RR results and recent history of influenza vaccine. The possible determinants of this association leading to indefinite donor deferral have not been elucidated but may include; close temporal proximity between vaccination and donation, other seasonal factors or viruses, yearly changes in influenza vaccine formulation, variabilities in donor immune response to influenza vaccination and screening assay design.

Abstract ID :

198

Loss of repeat convalescent plasma donors due to waning anti-SARS-CoV2-2 plaque reduction neutralization test titers (April-December 2020).

Type of abstract : Scientific

Abstract Topics : Donors

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Abstract Summary :

Background: Canadian Blood Services (CBS) uses plaque reduction neutralization test 50 ($PRNT_{50}$) results to enroll convalescent plasma donors and qualify each donation with respect to neutralizing antibody titer. The generated $PRNT_{50}$ values are used to qualify convalescent plasma donations supporting clinical trials in Canada. We describe waning $PRNT_{50}$ titers of repeat plasma donors.

Methods: All donations met standard criteria for plasma donations. SARS-CoV-2 specific neutralizing antibody titers were determined using $PRNT_{50}$ in Vero E6 cell cultures. Plasma units demonstrating initial and repeat titers of ≥1:160 (and ≥1:80 in December 2020) were issued to trial sites. Donors with titers of ≥1:160 on initial donation and ≥1:160 (or ≥1:80 as of December 2020) were encouraged to return for repeat donation as frequently as weekly. Donors with titers of 1:40 or 1:80 were asked to donate one additional time in hopes their titers reached an acceptable level. Data were stored in an Excel file and statistical analysis was undertaken using GraphPad Prism.

Results: From April 29, 2020-December 27, 2020, there were 415 donations from 128 repeat donors making 2 or more donations. Of the repeat donors, 36.7% (47/128) showed a ≥ 8-fold decrease in $PRNT_{50}$ titers from peak to trough. The median time from onset of symptoms to a ≥ 8-fold decrease in $PRNT_{50}$ titers was 129 days (range 63-233 days). Regression analysis of titer versus time past resolution of symptoms indicated a significant relationship (P=0.0003; Spearman r = -0.1788 with Gaussian approximation; confidence interval (-0.2720 to -0.08109).

Conclusions: It is evident that blood operators cannot infer that SARS-CoV-2 $PRNT_{50}$ titers will remain high in repeat plasma donors at each donation. In many donors, $PRNT_{50}$ values will be substantially degraded four months after onset of COVID-19 symptoms. Operationally, this means that there will be a continual loss of convalescent plasma donors over time as their $PRNT_{50}$ values decrease. Blood operators will need to consider approaches for identifying convalescent plasma donors with high titers and focussing on donor groups that may have sustained $PRNT_{50}$ values over time from onset of symptoms.

Abstract ID :

220

A sensitive flow cytometric method of determining the percentage of CD71+ erythroid cells in whole blood

Type of abstract : Scientific

Abstract Topics : Donors

Authors:

Wenhui Li [1] *, , Ms.

Jason Acker [2], MBA PhD, University of Alberta/ Canadian Blood Services

Nishaka Willam [3], ,

Abstract Summary :

Introduction/ Objectives The percentage of CD71+ erythroid cells (CECs) is correlated with Hb level in whole blood (WB) and a promising parameter to assess= anemia. We are developing a flow cytometric method of determining CECs in WB to investigate differences between male and female donors. The method is= validated for its limit of detection, linearity, repeatability, and tech-to-tech variability.

Methods For a limit of detection and linearity, peripheral blood mononuclear=cells (PBMCs) were isolated from cord blood and stained with anti-human CD235a, anti-human CD71, anti-human CD45. Nine WB samples (EDTA; day 3) spiked with a=serial percentage of stained CECs (0.018 % - 2.18 %) were prepared from a labeled PBMC suspension. Triplicates measurements were made on a flow cytometer. To=obtain low, medium, high levels of CECs for repeatability and inter-variability, 3 WB (day 4) were spiked with PBMCs based on volume ratios of WB to PBMCs (4:170,=4:35, 4:17.5) and 10 replicates were measured. For CEC stability, WB (n=3, triplicates) were stored at 1-6 ℃ and analyzed every 24 hours for 7 days. Changing rates=in CEC number per day was determined.

Results The linear range is 0.018 % to 2.18 % with an R-squared 0.99 and the limit of detection is 4/100,1000. The coefficient=of variances of 10 replicates are 7.9%, 6.3%, 3.7% for WB spiked with 0.2%, 0.4%,1.6% of CECs, respectively. The inter-variability between two technicians is 11.9%,=12.5%, 1.9% for the three CEC levels. CEC numbers increase during 7 days while no significant differences are demonstrated on the changing rate of CECs among the=specimens at the same time-point. The changing rate of CECs did not differ significantly at the 24, 48, or 96-hour time-point.

Conclusions A sensitive method is=developed to detect CECs in EDTA WB for up to 96 h after collection and applicable to the investigation of donor WB variability.

Acknowledgments This research=received funding from Canadian Blood Services (CBS), funded by the federal government (Health Canada) and the provincial and territorial ministries of health. The=views herein do not necessarily reflect these institutions' views. We are grateful to CBS' blood donors who made this research possible. Wenhui Li is funded by China=Scholarship Committee.

Abstract ID :

247

Men who have Sex with Men (MSM): Are alternative donor screening questions feasible?

Type of abstract : Scientific

Abstract Topics : Donors

Authors:

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Marc Germain [2], MD, PhD, Héma-Québec

Antoine Lewin [3], , Héma-Québec

Mindy Goldman [4], MD, Canadian Blood Services

Abstract Summary :

Introduction: In December 2020 the For the Assessment of Individualized Risk (FAIR) Steering group of UK Advisory Committee on the Safety of Blood Tissues and Organs (SaBTO) recommended new behaviour based screening criteria that will permit removal of their current question and deferral for men who have had sex with another man (MSM). They would defer for chem-sex, and sex with a new partner or more than one partner if also had anal sex (all in last 3 months). We analyzed results from a Canadian national donor survey to assess the proportion of donors who would be deferred if these criteria were implemented in Canada and comfort with the questions.

Design and Methods: Two tick box style paper questionnaires (Q1 and Q2) were administered to all donors attending a clinic on selected days in late January/mid-February 2018. Donors were asked about frequency of alternative question behaviours (Q1) and their comfort with being asked these questions (Q2).

Results: Of 36,241 donors attending, 31,904 (88%) completed questionnaire 1. Of 34,947 donors attending, 30, 278 (87%) completed questionnaire 2. Few donors had chem-sex in the last 3 months (0.2%) and would be deferred. About 6.4% donors said they had a new sexual partner and 3.4% more than one partner in the last 3 months; 7% said yes to one or both. If they were also asked if they had anal sex in the last 3 months only about 1% of all donors would be deferred. This would be higher in younger donors (about 2% of 17 to 25 year olds). About 8% of donors were uncomfortable being asked about chem-sex, a new or multiple sex partners, and 17% anal sex.

Conclusions: We have not assessed the safety benefit. The proposed alternate screening questions for the UK would result in 3 extra questions for most donors and another for about 7%. Deferral of 1% of donors is substantial but may be partially counterbalanced by more MSM donors. It is unclear how well received these question changes would be given that currently eligible donors would be deferred and many are uncomfortable with the questions.

Abstract ID :

249

A Study on Phenotype Frequencies and The Geographical Distribution of Canadian Blood Services Donors of Indigenous Ethnicity.

Type of abstract : Scientific

Abstract Topics : Donors

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Balkar Gill [4], MLT, Canadian Blood Services

Abstract Summary :

Background

To study and report predicted antigen phenotype frequencies of blood group systems interrogated by Grifols ID Core XTTM genotype technology and the geographical distribution of Canadian blood donors who have self-identified as Indigenous ethnicity to identify rare phenotypes.

Design and Methods

A total of 865 Indigenous donors were genotyped for the predicted phenotypes of Rh, Kell, Kidd, Duffy, MNS, Diego, Dombrock, Colton, Cartwright and Lutheran blood group systems for the period of May 1, 2018 to January 15, 2021. Calculations of the predicted phenotypes were expressed in percentages for allele frequencies and compared to the published information on antigen prevalence obtained from The Blood Group Antigen Facts Book1. The geographical distribution of the donors was determined based on the location of blood donation by blood collection facility.

Results

Out of 2673 blood donors genotyped, 865 (32.4%) were Indigenous donors. The geographical distribution of the donors is represented as Dartmouth 131 (15%), Ottawa 104 (12%), Winnipeg 84 (10%), Brampton 203 (23%), BC and Yukon 69 (8%), Edmonton 110 (13%), Newfoundland 20 (2%), Saskatchewan 75 (9%) and Calgary 69 (8%). All ABO groups were included, 53% group O, 40% group A, 6% group B and 1% group AB. Of these, 83.4% were RhD positive and 93.5% were K negative. The positive Rh antigen frequencies were C 65.4%, E 36.2%, c 81.5%, and e 94.6%. In the Kidd and Duffy systems Jk(a+b+) and Fy(a+b+) were the most common phenotype frequencies, 46.2% and 46.6% respectively. The MNS system, 48.7% were M+N+ and 50.4% were S-s+. Blood group systems Diego, Dombrock, Colton, Cartwright and Lutheran had the following common frequencies, Di(a-b+) 98.4%, Do(a+b+) 47.1%, Co(a+b-) 92.3%, Yt(a+b-) 92.9% and Lu(a-b+) 92.9%.

Conclusions

Canadian data representing the diversity and geography of blood donors who have self-identified as Indigenous ethnicity is not statistically different from the antigen prevalence frequencies described in other populations. The study of antigen frequencies provides useful data on our indigenous donor population and the regions of Canada were our indigenous population are not well represented.

Acknowledgements

1Reid, M.E., et al., 2012. The Blood Group Antigen Facts Book, third edition. Elsevier, Waltham, MA.

Abstract ID :

255

Optimizing donor screening and eligibility for gbMSM and trans donors: Assessing current donors' perceptions of alternative screening questions

Type of abstract : Scientific

Abstract Topics : Donors

Authors:

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Taylor Kohut [3], ,

William Fisher [4], ,

Abstract Summary :

Introduction/objective: Canadian Blood Services aims to optimize donor screening and eligibility for gay, bisexual, and other men who have sex with men (gbMSM) and trans donors. Implementing a gender-neutral, individual risk behaviour-based approach to screening all donors may be an equitable screening approach and enable more gbMSM and trans people to donate. This approach would require the addition of alternative sexual behaviour questions in the donor questionnaire (DQ). Research suggests, however, that donors may feel discomfort answering some sexual behaviour questions (e.g., "in the last 3 months, have you had a new sexual partner?", "in the last 3 months, have you had anal sex?") which may lead to donor loss. This project seeks to assess donor views on and understandings of alternative screening questions with an aim of identifying strategies to mitigate discomfort and minimize donor loss.

Design and Methods: The current presentation reports Phase 1 (qualitative) results of a 2-year mixed methods study. Semi-structured interviews (n=40) were conducted from Jan. 2021-March 2021. Participants were recruited using a purposive sampling strategy to maximize diversity according to sociodemographic characteristics including: gender, sexual orientation, ethnicity, age, region, and number of donations. All interviews were audio-recorded, transcribed verbatim, and inductive thematic analysis was conducted.

Results: Preliminary (note – interviews will be completed early-March 2021)

1) Most participants would feel comfortable answering the alternative questions in the context of the DQ (thematic analysis of reasons why will be included in the presentation).

2) Few participants would feel uncomfortable answering alternative questions in the DQ; however, none would be deterred from donating (thematic analysis will be included).

3) All participants consider the alternative questions to be acceptable (thematic analysis will be included).

4) All participants expressed that understanding the rationale for asking thequestions would mitigate potential donor discomfort. Results suggest that "safety reasons" may be more effective than "inclusivity reasons."

Conclusions: Preliminary - Results suggest that a minority of donors may feel discomfort answering alternative screening questions but they may not be deterred from donating if an effective explanation is provided. Explaining that the questions contribute to the safety of the blood supply may be an effective mitigating intervention. Phase 2 (quantitative survey; n=1000) will test the effectiveness of an explanation to minimize donor discomfort and loss.

Acknowledgements: This project is funded by Health Canada through the Canadian Blood Services' Men who have Sex with Men (MSM) Plasma Program.

Abstract ID :

235

Development of an Online Reporting System for the Provincial Redistribution Program for Plasma Protein Products

Type of abstract : Administrative

Abstract Topics : Inventory Management

Authors:

Alison Wendt [1] *, MLT, ORBCoN
Rebecca Barty [2], ,
Tracy Cameron [3], , ORBCoN
Sarah Crymble [4], , Factor Concentrate Redistribution Program
Laurie MacLeod [5], ,
Wendy Owens [6], MLT, Ontario Regional Blood Coordinating Network (ORBCoN)
Troy Thompson [7], MLT, Ontario Regional Blood Coordinating Network (ORBCoN)

Abstract Summary :

Introduction / Objective: The Plasma Protein Product (PPP) portion of the provincial redistribution program is a partnership between Ontario Regional Blood Coordinating Network (ORBCoN) and the Factor Concentrate Redistribution Program (FCRP). The program requests hospitals to identify near to expiring products or products they know they will not use and facilitates their redistribution with an average savings of $2.1 million annually. The current process is time intensive relying heavily on manual processes.

Design and Methods:

Based on recommendations from an evaluation of the current process, an online reporting system was developed using Research Electronic Data Capture (REDCap) to streamline the process for both hospital users and ORBCoN staff. A complimentary interface platform was added to allow data upload and analysis. An internal ORBCoN working group tested the online system to validate its use for the PPP redistribution program.

Results:

The PPP tool is comprised of the following: Interface, bi-monthly survey, and PPP redistribution module.

The PPP interface is linked to REDCap and prepopulates select fields into the survey and includes a repository for: 1) A comprehensive list of all provincial hospitals' contacts, 2) Canadian Blood Services (CBS) product list refreshed bi-monthly providing all PPPs in CBS inventory; and 3) PPP price list uploaded yearly for calculation of the value of product redistributed.

Using REDCap, a unique bi-monthly invitation email will be distributed to hospitals with a survey link comprised of three sections: Hospital Information; PPP to Report for Redistribution; and Summary.

ORBCoN/FCRP will identify PPP eligible for redistribution in the interface and/or REDCap. Once a product is redistributed, ORBCoN/FCRP can track and document information in the PPP redistribution module. Each PPP redistributed record will include calculations for product and courier cost.

Conclusions:

The new online system is being piloted with select hospitals to test the functionality of this online system, ease of use for stakeholders and tracking of products to be redistributed by ORBCoN and FCRP.

A User Evaluation will be built to collect critical feedback from pilot participants to improve the process prior to provincial training and rollout.

Moving to online reporting will increase the efficiency of the process, while continuing to minimize waste and provide valuable workload, cost and product savings.

Acknowledgements: Ontario Ministry of Health for funding support

Abstract ID :

202

Implementing PRT Platelets: Impact on Production and Inventory

Type of abstract : Scientific

Abstract Topics : Inventory Management

Authors:

John Blake [1] *, PhD, Canadian Blood Services

Abstract Summary :

Introduction/Objective:

Pathogen reduction (PRT) is a technology for improving the safety of blood products. CBS has committed to implement PRT, when licensed in Canada. The implementation presents novel inventory challenges. In this study, we focus on running a dual product inventory for platelet products (pooled PRT platelets and non-PRT treated apheresis platelets) each having different shelf lives (5 days for PRT units and 7 days for apheresis units).

Design and Methods:

A simulation model was built to evaluate the impact of applying PRT to pooled platelets in the Ottawa region. The model was constructed in VB.Net. The model was populated with data from the Ottawa centre. Once populated with production data, the model was verified and validated against historical data. A series of experiments was executed to determine the impact on collection, production, and distribution of both pooled platelets and apheresis platelets following the implementing of PRT.

Results:

Model results indicate that pooled platelet waste and shortages increase as pooled shelf-life decreases. Apheresis platelets show a different response: While shortages of apheresis platelets increase as the shelf life of pooled units decreases, apheresis waste *declines* as pooled shelf-life decreases, since apheresis units can be substituted for pooled demand.

The simulation also showed, absent of increased collections, customer service level declines after the introduction of PRT platelets. To sustain patient service levels, an experiment was conducted using increased levels pooled and apheresis platelet collections and the effect on product availability was measured. These results suggest it is necessary to collect 15% more platelet units (either pooled or apheresis or both) to maintain customer service after the implementation of PRT technologies.

Conclusions:

Pathogen inactivation technologies offer increased patient safety. However, the implementation of PRT technology will also result in a decrease in nominal shelf-life for pooled platelets. Decreasing shelf life implies greater wastage and shortages. Simulated experiments reflecting the implementation of PRT in the Ottawa region show that collections must increase by 15% above nominal demand to preserve product availability. System wide wastage of platelets following PRT implementation is estimated at 18%.

Abstract ID :

244

Cryopreserved RCCs Exposed to Transient Warming Events Experience Rapid Warming Rates

Type of abstract : Scientific

Abstract Topics : Inventory Management

Authors:

Carly Olafson [1] *, , Canadian Blood Services

Tracey Turner [2], MLT, MBA, Canadian Blood Services

Olga Mykhailova [3], PhD, Canadian Blood Services

Gwen Clarke [4], MD, University of Alberta, Canadian Blood Services

Jason Acker [5], ,

Abstract Summary :

Introduction / Objective: At Canadian Blood Services, the ACP 215 Automated Cell Processor is used to cryopreserve red cell concentrates (RCCs) which can be stored for up to 30 years at temperatures below -65 °C. However, during this period, RCCs may inadvertently be exposed to transient warming events (TWEs) where temperatures deviate from the target of <-65 °C. TWEs, resulting from freezer failures, human error, or during routine inventory management, may cause cell damage due to ice recrystallization. Thus, RCCs that have experienced TWEs are often discarded to protect patients from potential adverse effects, thereby removing valuable rare units from inventory.

Design and Methods: Three RCC units, representing low (232 g), average (271 g), and high (325 g) collections (buffy coat derived red cell filtered), were glycerolized using the ACP 215. RCC core temperatures were monitored using K-type thermocouples to determine warming rates during: "fast" TWEs (warming at RT to -20 °C, cooling back to -75 °C) representative of inventory management practices; "slow" TWEs (warming at -20 °C for 3 hours, cooling back to -75 °C) representative of freezer failure/improper storage; room temperature and water bath (37 °C) thawing.

Results: RCCs undergoing fast TWEs (n=3) reached a temperature of -25 °C after 17.4 ± 0.4, 19.4 ± 0.4, and 24.9 ± 0.1 minutes with warming rates of 2.9, 2.5, and 1.9 °C/minute for the low, average, and high, respectively. For slow TWEs (n=3), units reached -25 °C after 72.6 ± 2.8, 82.0 ± 4.6, and 77.7 ± 6.6 minutes with warming rates of 0.6 °C/minute for low, average, and high. Current practice in the blood centre allows RCCs to be removed from frozen storage for up to 30 minutes at RT; these rates indicate the potential for ice formation to occur. Additionally, rates for slow TWEs demonstrate the urgency required to address improper storage or freezer failures.

Conclusions: Future quality monitoring of transiently warmed cryopreserved RCCs will help us understand the impact of TWEs on red blood cell quality and can inform decisions surrounding the management of frozen inventories.

Acknowledgments: This research received funding support from Canadian Blood Services, funded by the federal government (Health Canada) and provincial and territorial ministries of health. Views herein do not necessarily reflect the views of Canadian Blood Services or federal, provincial, or territorial governments of Canada. We are grateful to Canadian Blood Services' blood donors who made this research possible.

Abstract ID :

203

Ontario's Massive Hemorrhage Toolkit

Type of abstract : Administrative

Abstract Topics : Massive Hemorrhage and Emergency Transfusion

Authors:

Stephanie Cope [1] *, , Ontario Regional Blood Coordinating Network (ORBCoN)
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Kimmo Murto [9], ,
Andrew McDonald [10], ,
Menaka Pai [11], ,
Jacob Pendergrast [12], MD, University Health Network
Lani Lieberman [13], ,
Avery Nathens [14], ,

Abstract Summary :

Introduction/Objective: On September 20, 2019 ORBCoN released Ontario's first recommendations for the management of massive hemorrhage, key evidence-based principles required to develop a standardized provincial Massive Hemorrhage Protocol (MHP). Following the release of the MHP a multidisciplinary committee, representing consensus panel members, community stakeholders and other medical content experts were tasked with the creation of a provincial toolkit.

Design and Methods: The 7Ts, which illustrates that 'transfusion' is just one element in a massive hemorrhage, formed the basis of the toolkit which is comprised of 12 sections; patient transport, damage control resuscitation, team, communication, laboratory tests, temperature, transfusion medicine & coagulation, education, pediatrics, patient & family support, quality and research. Working groups were formed for each section and a content expert physician lead assigned. The MHP Steering Committee provided clinical oversight and final review of toolkit. In addition, a quality dashboard is being developed to track both local and provincial data on 8 quality metrics.

Results: The toolkit includes checklists/ patient handover tools, algorithms for different hospital sizes, a communications plan, guidance on training and maintenance of competency, simulation drills and review of activations to ensure reinforcement and process improvement. In addition, advice and guidance on pediatric and obstetric MHPs is included. The toolkit is electronically accessible through a dedicated massive hemorrhage tab at www.transfusionontario.org.

Conclusions: We expect that, with the use of the toolkit, hospitals will achieve a more consistent adoption of evidence-based care of patients with massive hemorrhage, improved speed of delivery of blood components and hemostatic adjuncts, and more diligent monitoring of clinical and laboratory parameters. A virtual educational forum on April 30, 2021 served as the platform to launch the toolkit. A follow-up audit will be conducted in 2022 to compare with the results of a 2018 baseline audit to measure improvement in practice from then to current state.

Acknowledgments: MHP Working Group, Ontario Ministry of Health for funding support

Abstract ID :

242

Plasma transfusion or plasma protein product administration restores hemostasis in a mouse model of hemorrhagic shock

Type of abstract : Scientific

Abstract Topics : Massive Hemorrhage and Emergency Transfusion

Authors:

William Sheffield [1] *, PhD, Canadian Blood Services

Abstract Summary :

Introduction: Traumatic bleeding can lead to hemorrhagic shock (HS). Some severe trauma patients also suffer coagulopathy, further complicating optimal care. Clinical evidence shows that early plasma transfusion or early tranexamic acid (TxA) administration can save lives, but the mechanisms involved, and the potential utility of other interventions remain unknown. We developed a mouse model of hemorrhagic shock followed by hemostatic challenge to address these issues.

Objective: To compare restoration of hemostasis by saline, 5% Human Albumin Solution (HAS), plasma, prothrombin complex concentrate (PCC), fibrinogen, plasminogen activator inhibitor-1 (PAI-1) or tranexamic acid (TxA) in HS mice.

Design and Methods: Blood was removed from anesthetized mice via the cannulated carotid artery to a mean arterial pressure of 35 ± 5 mM Hg (determined using a Transonic Pressure Catheter applied to the femoral artery). Shock was maintained for 60 minutes, and resuscitation fluid equal in volume to withdrawn blood was then infused intravenously. A surgically exposed liver lobe was then lacerated by a through-and-through injury with a standard scalpel blade. Shed blood was collected for 15 minutes and then weighed. Each treatment group comprised 6 CD1 mice (3 male and 3 female). All reported blood losses are means ± SD (mg).

Results: Sham-treated mice subjected to all procedures except HS lost 90 ± 40 mg of blood. Blood losses were 2.5- to 3.3-fold greater than sham in HS mice resuscitated with saline (240 ± 40), 5% HAS (300 ± 40), 0.04 mg/kg PAI-1 (270 ± 60), or 70 mg/kg human fibrinogen (250 ± 60) (all $p < 0.001$ versus sham by ANOVA with post-tests). In contrast, resuscitation with fresh-frozen murine plasma, murine plasma refrigerated for 120 hours, 10 mg/kg TxA, 140 mg/kg human fibrinogen, or 7.15 IU/kg PCC reduced blood losses to a level not statistically different from sham. Increasing the PCC dose did not further reduce bleeding.

Conclusions: Both plasma transfusion and TxA administration reduced bleeding in HS mice, mirroring mortality improvements shown in human trauma. Fibrinogen and PCC were also effective in restoring hemostasis. Our murine model replicates aspects of clinical experience in human trauma, supports the efficacy of infusing plasma or plasma protein products in HS, and could prove useful for mechanistic investigations.

Abstract ID :

199

Hemolytic Disease of the Fetus and Newborn Screening: Neonatal Bilirubin Trends in the Context of ABO Incompatibility

Type of abstract : Clinical

Abstract Topics : Neonatal and Pediatric Transfusion

Authors:

Sophia HT Peng [1] *, MD,

Derek Miller [2], ,

Sharon Sutherland [3], ,

Brian Berry [4], ,

Gwendolyn Clarke [5], MD,

Abstract Summary :

Background. ABO incompatibility (ABOi) is a common cause of hemolytic disease of the fetus and newborn (HDFN). However, clinically significant ABOi HDFN is unusual. Routine blood group and DAT without clinical suspicion or jaundice is not recommended. In a regional maternity service, we observed relatively increased rates of HDFN screening for infants of group O mothers. This study reviewed the bilirubin trends for HDFN screened infants to determine whether ABOi was the impetus for screening vs. clinical evidence of jaundice.

Design and Methods. HDFN screening includes neonatal ABO Rh, direct antiglobulin test (DAT), maternal ABO Rh, antibody screen, and peripheral smear review. Serum bilirubin levels were requested at the clinician's discretion. We performed a retrospective chart review of HDFN screening for 3 sets of 3 consecutive months spanning 2017-2020 in the Vancouver Island Health Authority.

Results. HDFN screening of 548 infants was evaluated in 9 months, with ABOi rates at 27%. Forty HDFN positive infants were identified (27% of ABOi); 38/40 (95%) were secondary to anti-A/B. There was no significant difference between initial or maximum serum bilirubin levels in ABOi vs ABO compatible infants (umol/L: 170 ±59 vs. 176±63, p=0.371; 218±65 vs. 218±65, p=0.962). Infants of O mothers were more likely to be screened and were screened earlier, with lower initial and maximum bilirubin compared to infants of non-O mothers (X2 (1, N = 511)=387, p=5.27E-03; days-old: 1.6±1.0 vs. 2.2±1.6, p=9.1E-6; umol/L: 165±58 vs. 195±65, p=7.81E-7; umol/L: 210±66 vs. 234±61, p=8.3E-5, respectively). Screened infants had significantly higher serum bilirubin levels than non-screened age-matched infants (max bilirubin, umol/L: 177±61 vs 218±66 p=6.03E-29). There was no difference in bilirubin of infants from Rh positive vs. negative mothers or with HDFN positive vs. negative results.

Conclusions. More infants of group O mothers and higher rates of ABOi were in the HDFN screened population than expected. Bilirubin levels in screened infants were higher than those not screened. Bilirubin levels were lower in infants of group O mothers vs. non-O mothers, but were increased at an earlier age. These findings suggest screened infants were at risk for hyperbilirubinemia and that clinical evidence of jaundice was appropriately considered in HDFN investigations.

Abstract ID :

215

A Case of Ceftriaxone-induced Immune Hemolytic Anemia in a Paediatric Sickle Cell Disease Patient

Type of abstract : Clinical

Abstract Topics : Neonatal and Pediatric Transfusion

Authors:

Wendy Lau [1] *, MD, The Hospital for Sick Children

Alison O'Leary [2], MLT, The Hospital for Sick Children

Abstract Summary :

Case: A 4 year old boy with known sickle cell disease presented with osteomyelitis and was treated with intravenous ceftriaxone. His presenting hemoglobin (Hb) was 67g/L (baseline in the 80's). 4 days later, his Hb dropped to 28g/L, was transfused 8 units of red cells. Initially, the Hb drop was ascribed to splenic sequestration. 10 days later, ceftriaxone-induced hemolytic anemia was considered and a request for drug studies was made to the Blood Bank. Fortunately the sample was still in storage and was retrieved for testing.
Methods: Ceftriaxone was obtained from the hospital pharmacy and reconstituted with sterile water per package instructions to the same concentration as the IV infusion. DAT, MTS and SIAT screen were performed as per hospital SOP. MTS and SIAT screen were re-run with the addition of ceftriaxone, as well as an eluate from the patient's cells. The volume of antibiotic used was equal to the volume of patient plasma required for testing.
Results: On the initial sample, the antibody screen was negative on MTS, but 4+ positive after adding ceftriaxone. By SIAT, plasma with drug was 2+ on immediate spin and after 37C incubation, but non-reactive at the IAT phase. DAT was positive with anti-complement, negative with anti-IgG. Eluate was weak with and without ceftriaxone.
On a subsequent sample taken 2 weeks later, DAT, eluate, MTS results were unchanged. SIAT screen was weak at immediate spin and 2+ at the IAT phase, suggesting a switch of the antibody from IgM to IgG.

First sample				2 weeks later			
MTS SCI	0			0			
MTS SCII	0			0			
MTS SCI + Ceftriaxone	4+			4+			
MTS SCII + Ceftriaxone	4+			4+			
SIAT	IS	37°	IAT	SIAT	IS	37°	IAT
SCI	0	0	0	SCI	0	0	0
SCII	0	0	0	SCII	0	0	0
AUTO	0	0	0	AUTO	0	0	0
SIAT SCI + Ceftriaxone	2+	2+	0	SIAT SCI + Ceftriaxone	wk	3+	Wk
SCII + Ceftriaxone	2+	2+	0	SCII + Ceftriaxone	wk	3+	2+

Conclusions: Ceftriaxone is a commonly prescribed antibiotic for children with sickle cell disease. Ceftriaxone-induced hemolytic anemia should be considered whenever there is a sudden and severe drop in hemoglobin, as hemolysis can progress rapidly in patients who have been previously exposed to the drug.

Abstract ID :

216

Transfusion of Paediatric Sickle Cell Anemia patients: sickle screening of units discontinued

Type of abstract : Clinical

Abstract Topics : Neonatal and Pediatric Transfusion

Authors:

Wendy Lau [1] *, MD, The Hospital for Sick Children

Letka Dumevska [2], MLT, The Hospital for Sick Children

Abstract Summary :

Introduction: We are a paediatric tertiary care hospital with a large hemoglobinopathy program. For many years, the policy of our transfusion service was to sickle screen red cell units destined for sickle cell anemia patients. Sickle screen positive units were transfused to patients getting a simple transfusion, but not for red cell exchange transfusion. There was no clinical problem transfusing sickle screen positive units (which came from sickle trait blood donors) to sickle cell anemia patients; the difference in policy between simple and exchange transfusions was for monitoring purposes. The volume of red cells needed for the exchange were calculated to decrease the sickle hemoglobin (HbS) percentage to less than 30%. This decrease might not have been achieved if sickle screen positive units were given in the exchange, as laboratory instruments cannot distinguish HbS from sickle cells versus HbS from sickle trait cells.

In recent years, fewer red cell exchanges are done on an emergency basis and more are done on a planned basis (patients in a chronic transfusion program with a high hemoglobin would get an exchange instead of simple transfusion). HbS percentage post elective exchange would be less of a consideration.

After an adult hospital in our area abandoned donor unit sickle screening, with no adverse clinical effects, we decided to relook at our own policy.

Method and Results: Firstly, we reviewed national and international standards for any requirement to sickle screen units transfused to paediatric sickle cell disease patients; there was none.

Secondly, we reviewed the sickle screen results in our transfusion laboratory; there was one screen positive out of 2268 units in one year (0.04%). This was less than what our neighbouring adult hospital found (50/26,003 or 0.2% over 7 years).

Thirdly, we looked at the cost of sickle screening in our laboratory and estimated about CAD $1,000 a month in supply and labour costs.

Last but not least, we consulted the clinical hematologists in our sickle cell program and presented the above data. It was a unanimous decision that sickle screening of units can be abandoned.

Conclusion: Sickle screening of donor units for paediatric sickle cell anemia patients has now been discontinued for two years; no complaint or adverse effect has been reported to our transfusion service.

Abstract ID :

241

A Survey of Intrauterine Transfusion Practice in Canadian Blood Banks

Type of abstract : Clinical

Abstract Topics : Neonatal and Pediatric Transfusion

Authors:

Melanie Bodnar [1] *, MD FRCPC, Canadian Blood Services
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Nadine Shehata [10], ,
Ann Wilson [11], MLT, McGill University Health Centre
Gwen Clarke [12], MD, University of Alberta, Canadian Blood Services
Nancy Robitaille [13], MD, Héma-Québec

Abstract Summary :

Background:
Red blood cells (RBC) for intrauterine transfusion (IUT) are used to treat fetal anemia with maternal alloimmunization being one of the most common causes. The transfusion of the fetus may allow a pregnancy to continue long enough to deliver a healthy baby near term. The selection and preparation of RBC for IUT tend to reflect historical practice and expert opinion with limited grounding in evidence-based recommendations. The aim of this survey was to assess Canadian blood bank practices with respect to IUT.

Methods:

A questionnaire was sent to nine Canadian hospitals known to administer RBC for IUT. Survey questions covered five categories: 1) number of IUT performed and indications 2) blood component selection and processing 3) fetal pre-transfusion testing 4) blood administration and 5) transfusion documentation and traceability. Results were analyzed to determine commonalities and differences.

Results:

Responses were received from all 9 institutions with 129 reported IUT events in 2019 and 123 in 2018. Maternal alloimmunization was the most common indication for RBC IUT. The selected RBC were consistently allogeneic, CMV negative, irradiated, and fresh (≤ 5 or 7 days) with most sites preferentially providing sickle cell negative, group O Rh D negative blood. Antigen matching strategies ranged from cognate antigen matching only, to the additional provision of Kell negative, maternal Rh/Kell matched, or full maternal phenotype-matched red cells. While the target hematocrit varied (range 0.55-0.9), most respondents used manual processing with only one site reporting an automated method. RBC processing was highly variable with respect to the use of a solution for reconstitution (saline, AB plasma or none). 5 of the respondents had an irradiator on site. Fetal pretransfusion testing uniformly included hemoglobin measurement, but additional serologic and confirmatory fetal-origin testing were highly variable. No transfusion reactions were reported to the hospital transfusion services. A variety of strategies were used to link the IUT event to the neonate post-delivery, including the creation of a fetal blood bank file at 3 sites.

Conclusion:
While several commonalities exist, the variation in IUT red cell selection, processing and fetal pretransfusion testing across Canadian hospitals highlights uncertainties with regards to best practices. The results of this survey suggest that national guidelines may be useful in this unique transfusion setting.

Submitted on behalf of the Canadian Obstetrical and Pediatric Transfusion Network.

Abstract ID :

193

Review of the most cited accreditation non-conformances in transfusion medicine in British Columbia

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

Authors:

SUSANNA M. DARNEL [1] *, MLT, College of Physicians and Surgeons of British Columbia

Elsie Chan [2], MLT, BC College of Physicians and Surgeons

Abstract Summary :

Introduction

The College of Physicians and Surgeons of British Columbia has a mandated duty to serve and protect the public. The Diagnostic Accreditation Program (DAP) has the mandate to asses the quality of diagnostic services in the province of British Columbia (BC), including Transfusion Medicine (TM), through accreditation activities. The DAP Laboratory Medicine Standards are used to assess TM. The Standards are developed using national, international and provincial guidelines and regulations, in collaboration with advisory committees. Standards not met during the assessment process are cited as non-conformances and this data is captured for studies.

Method

Accreditation is the process in which certification of competency, authority, or credibility is presented. For the DAP, this process occurs on a 4-year cycle. Assessments by the DAP are performed by DAP assessors using the DAP developed standards. Mandatory standards that are not met, are known as non-conformances.

A DAP assessor conducts the assessment using a customized auditing software populated with the appropriate standards for the facility being assessed. The software compiles the assessment data into a comprehensive report that summarizes the number and type of standards that are met and those that are not met (i.e. non-conformances).

Results

Data for this study was extracted within the dates of January 2016 to December 2020. This time period reflects the version of TM standards used to assess facilities in one 4-year cycle. In addition to TM specific standards, relevant general laboratory standards are also used to assess transfusion medicine facilities and results were also reviewed and summarized for this presentation.

Conclusion

The regular review of non-conformance data allows DAP to evaluate the standards and the support provided to the diagnostic facilities to better identify opportunities for improvement. Facilities preparing for assessment may use this data to perform a self-audit and evaluate their requirements to meet the standards.

Abstract ID :

217

Prevention of Alloimmunization in Mothers of Saskatchewan: Development of a Hospital-based Provincial Prenatal Testing Program Structure

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

Authors:

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Donna Ledingham [3], MD, FRCPC, Saskatchewan Health Authority - Regina Area; University of Saskatchewan

Sarah Tehseen [4], MBBS, Msc. FRCPC, Department of Pathology and Lab Medicine, University of Saskatchewan; Saskatchewan Health Authority, Saskatoon, SK

Sheila Rutledge Harding [5], MD, Department of Pathology and Lab Medicine, University of Saskatchewan; Saskatchewan Health Authority, Saskatoon, SK

Abstract Summary :

Introduction – Routine prenatal testing includes ABO/Rh blood group determination and an antibody screen performed by the transfusion medicine laboratory (TML). With the closure of Canadian Blood Services - Diagnostic Services in Regina, SK, TML-based prenatal testing samples from Saskatchewan patients were diverted to Vancouver, BC for analysis. This out-of-province service led to challenges, including the lack of results reporting into electronic medical records and a prolonged turn-around time. Here, we describe the process by which we developed our current in-province hospital-based prenatal testing structure within the Prevention of Alloimmunization in Mothers of Saskatchewan (PRAMS) Program.

Design and Methods – Mapping of health system resources was completed to screen potential hospital laboratory sites with TML services for readiness to participate in provincial testing. Four sites were identified as ready, based on existing assets and capacity. A team of transfusion medicine physicians collaborated to create and evaluate eight potential models of service delivery incorporating these sites. Agreement was established to utilize a fair and transparent decision-making process supported by an Accountability for Reasonableness Framework to evaluate potential models. Four domain-based priorities (System Alignment, System Performance, System Values and Population Health) encompassing 14 weighted criteria were established as priorities within the decision-making framework (DMF). The eight models were evaluated independently and anonymously by the transfusion medicine physicians, with scores balanced to remove geographic bias and achieve a final score for each model.

Results – Implementation of the DMF led to a unanimous, objective decision to allocate routine prenatal ABO/Rh and antibody screen testing to three geographically distributed community hospitals, and complex antibody investigations to one academic tertiary care center. Transparent sharing of the DMF and the summary of anonymously scored results supported successful communication of the rationale for the model presented to the PRAMS Steering Team. Upon formal review, the PRAMS Steering Team approved the proposal as presented.

Conclusions – The use of an ethical, criterion-based DMF supported by stakeholder engagement enabled an unbiased, transparent decision process to define a successful hospital-based provincial prenatal testing structure within the PRAMS program. This process ensured adherence to the principles of equity and is replicable in other environments.

Acknowledgements – Thank you to the innovative Saskatchewan Health Authority Transfusion Medicine and PRAMS Steering Committee teams who valued transparent decision making.

Abstract ID :

221

Transfusion Medicine Education for Physicians

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

Authors:

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Yulia Lin [2], MD, Sunnybrook Health Sciences Centre

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Wendy Owens [4], MLT, Ontario Regional Blood Coordinating Network (ORBCoN)

Abstract Summary :

Introduction/Objective

The Ontario Regional Blood Coordinating Network (ORBCoN) launched the revised Bloody Easy (BE) Lite eLearning program for physicians in November 2020. A previous study showed that completion of the BE Lite modules was associated with an absolute improvement of 6.8% in appropriate transfusions based on a hemoglobin threshold of 80 g/L.[2] As per Accreditation Canada standards, each hospital must have a formal program to maintain team members' competence which includes evaluating their theoretical and practical knowledge of transfusion medicine. This competency assessment program applies to all team members, including prescribing physicians.[1] The objective of this study was to report on the uptake of the e-modules in Ontario.

Design/Methods

The program was developed as a two module e-learning program providing basic information for physicians and other healthcare professionals who prescribe blood components/products. Module 1 focuses on the indications for blood transfusion and contains sections related to pre-transfusion testing and transfusion of red blood cells, platelets, plasma and fibrinogen replacement. Module 2 focuses on the recognition and management of adverse transfusion reactions. Both modules have a pre-assessment and post-assessment quiz in order to assess knowledge retention.

The program offers an optional participant tracking mechanism to assist health care facilities in meeting competency requirements by providing hospitals with participant completion reports. The program is also available in SCORM compliant files for hospitals that use Learning Management Systems (LMS).

Results

As of January 31, 2021, there have been 582 participants from 204 Ontario hospitals/colleges/universities that have completed the web-based BE Lite program, 9 hospitals have downloaded the SCORM compliant files and 40 hospitals are using on the Surge Learning LMS platform. 582 pre-assessments were completed with an average test score of 51%. 780 post-assessments for Module 1 and 1209 post-assessments for Module 2 have been completed with average test scores of 80% and 79% for Module 1 and 2 respectively.

Conclusions

eLearning programs such as BE Lite provide users with convenient, flexible access to learning content which can be self-driven or self-paced based upon the users own level of knowledge, skill or experience, and time, and also helps participating hospitals with meeting accreditation requirements.

Acknowledgement

ORBCoN gratefully acknowledges funding support provided by the Ontario Ministry of Health.

Abstract ID :

231

Multimedia resources to engage gay, bisexual, and queer men in Canada as stem cell donors

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

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Abstract Summary :

Introduction: Gay, bisexual, and other men who have sex with men (MSM) are eligible to register as stem cell donors in Canada. However, many MSM are unaware of their eligibility. Recruitment of MSM could augment efforts to recruit the most-needed stem cell donors (young and ethnically-diverse males) and support a more inclusive donor registry. We aimed to develop multimedia resources to engage queer men in Canada as potential stem cell donors.

Methods: Multimedia were developed by queer men in Canada, in collaboration with recruiters from the Canadian donor recruitment organization Stem Cell Club (stemcellclub.ca). The multimedia were designed to highlight this demographic's eligibility and educate about donation and the need for diverse donors. Resources were reviewed for accuracy by transplantation experts and appeal by focus groups of queer Canadian men. The resources were disseminated to participants of the community of practice (CoP) in stem cell donor recruitment in Canada (facebook.com/groups/stemcellclub) during an e-meeting**.** CoP participants were invited to provide feedback via an online survey.

Results: Multimedia developed included: infographics emphasizing MSM eligibility regardless of recent sexual contact and highlighting a gay man who donated stem cells to an unrelated Canadian patient; a @WhyWeSwab (twitter.com/whyweswab) story arc featuring a gay stem cell recipient; and short videos featuring queer performers advocating for their communities to sign up (published to YouTube, http://bit.ly/2NlGwID). 33 CoP members from 6 provinces across Canada, and with a median of 2-years experience in donor recruitment, participated in the online survey. The majority strongly agreed/agreed that the resources would engage MSM as donors (84%), and clarify MSM eligibility (87%). The majority noted experiencing a lack of awareness from potential registrants on whether MSM were eligible to donate stem cells (69%), and felt that a national campaign to recruit MSM is needed (97%) and would support a more inclusive registry (97%) and augment recruitment of diverse donors (94%).

Conclusions: We developed an array of multimedia which will be used to support a national campaign in 6/2021 to engage queer men in Canada as stem cell donors. We are currently conducting focus groups with this demographic to secure feedback and learn their perspectives ahead of this campaign.

Acknowledgements: This work was supported by a Canadian Blood Services BloodTechNet Grant and by Canadian Federation of Medical Students.

Abstract ID :

234

Multimedia resources to engage Black People in Canada as potential stem cell donors

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

Authors:

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Abstract Summary :

Introduction: The majority of patients in need of allogeneic stem cell transplantation do not have a fully matched sibling donor. 8/8 HLA matched unrelated donors (URD) remain the preferred alternative donor source; however, there is marked racial disparity in access to URDs. White patients of Northwest European ancestry have a 75% chance of finding an 8/8 HLA matched URD, compared to a 15-19% chance for Black patients of any ancestry (Gragert et al., 2014). Black Peoples make up < 2% of the Canadian Blood Services Stem Cell Registry but reflect 3.4% of the Canadian population. We aimed to develop multimedia resources to engage Black Canadians as potential stem cell donors.

Methods: Multimedia were developed by Black Canadians in collaboration with recruiters from the Canadian donor recruitment organization Stem Cell Club, designed to: emphasize the particular need for Black donors, educate about donation, and motivate Black Canadians to register. Resources were reviewed for accuracy by transplantation experts and for appeal by Black Canadians. In 2/2021, the resources were disseminated to participants of the community of practice (CoP) in stem cell donation in Canada (facebook.com/groups/stemcellclub) during an e-meeting. Members of the CoP were then invited to provide feedback via an online survey.

Results: Multimedia developed included infographics highlighting racial disparity in access to URDs and educating about donation; stories of Black stem cell recipients (@WhyWeSwab, Facebook/Instagram/Twitter); and TikTok videos/multimedia featuring Black performers advocating for their communities to sign up (e.g. bit.ly/3roCL3A, https://youtu.be/3eQcMxEYkis and https://youtu.be/Gok2USWMJxA). The materials were published in 2/2021 to stemcellclub.ca/blackdonorssavelives. 33 CoP members from 6 provinces across Canada, and with a median of 2 years experience in donor recruitment, participated in the online survey. The majority felt that the resources will support them to engage Black people in Canada as donors (82%), and that a national campaign to recruit Black people in Canada as donors is needed (97%) and would help diversify the registry (100%).

Conclusions: We developed an array of multimedia to engage Black Canadians as stem cell donors. These resources will be used to support a national campaign from 2.15.2021-2.26.2021 to recruit Black Canadians as stem cell donors. We are currently conducting focus groups with Black Canadians who are eligible to register as stem cell donors, to secure feedback about and learn their perspectives on this campaign.

Acknowledgements: Stem Cell Club is supported by the Canadian Blood Services BloodTechNet Award.

Abstract ID :

236

Development of a Library of TikToks to Support Stem Cell Donor Recruitment in Canada

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

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Abstract Summary :

Introduction

Recruiting committed hematopoietic stem cell donors from needed demographics groups (i.e. ethnically/racially-diverse and male young-adults) remains a challenge worldwide. Further, due to COVID-19, in-person recruitment drives have been suspended, with recruitment organizations working to adapt to virtual recruitment.

Purpose: TikTok is a social network for developing and sharing user-generated videos. We hypothesized that TikTok videos (TikToks) could be used to support virtual donor recruitment.

Methods

Participants of the community of practice (CoP) in stem cell donor recruitment in Canada (facebook.com/groups/stemcellclub) were invited to two TikTok training sessions (8/2020, 1/2021), outlining how to: overlay background music, adjust clip lengths, apply visual/transitional effects, edit text, and share across social media. In February 2021, CoP members were invited to complete an online survey to learn their perspectives on TikToks for donor recruitment.

Results

Between 9/2020-2/2021, a network of TikTok channels were launched by CoP members, including a national TikTok library to support stem cell donor recruitment (tiktok.com/@stemcellclub). A total of 87 TikToks were produced across these channels (median length 15s, range 8-47s), accumulating 146109 Views, 32864 Likes, 2276 Comments, and 11645 Shares.

TikToks developed and shared included those that raise awareness (e.g. Toothbrush Switch bit.ly/3pMIGzh), highlight ongoing patient campaigns (e.g. Swab for Jakob bit.ly/2MpO4Ko), and address the need for diverse donors (e.g. That Girl bit.ly/3roCL3A). Specific features employed include lip syncing (e.g. My Loneliness bit.ly/3cGkf2S), Text-to-Speech (e.g. Three Colored Pens bit.ly/36F6T35), and Green Screen (e.g. G-CSF Dance bit.ly/3au3jtK). Additionally, virtual recruitment campaigns of the CoP featured TikToks, including one campaign covered by media (CTV News Edmonton) [fb.watch/3qvtqXyaps/].

33 CoP members with a median of 2 years of experience from 6 provinces across Canada responded to the survey. The majority agreed/strongly agreed that TikToks help promote stem cell donation in an entertaining/attention-grabbing way (94%), engage younger donors (100%), and are effective at teaching key points within a short time period (94%). The majority were confident in their ability to make TikToks about stem cell donation (63%), but felt they would benefit from additional training (63%).

Conclusions

In summary, we describe the development of a TikToks to support donor recruitment. Our work is relevant to donor recruitment organizations worldwide.

Acknowledgements

This work is supported by a Canadian Blood Services BloodTechNet Grant.

Abstract ID :

248

How to Move a Lab and Never Stop Testing

Type of abstract : Administrative

Abstract Topics : Other - Not Listed

Authors:

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Abstract Summary :

Background

The Canadian Blood Services (CBS) facility located at 737-13 Avenue in Calgary (737) could no longer optimally support operations, including donor testing. In May 2017 CBS broke ground for a new facility, Calgary Operations (CAO).

The transfer date for testing Western Canada collections at CAO was scheduled for October 19, 2020 with the move beginning August 17, 2020.

Strategy

The move strategy planned to maintain testing of donations from Western Canada at 737 during the move.

The instruments and equipment (total 142) moved included major automated testing platforms (Prism nEXTs and Cobas 8800/P680 systems for Transmissible Disease/NAT testing; PK7300s and NEOs for Blood Group Serology testing), sample management, antibody identification equipment, testing records and minor equipment (waterbaths and serofuges).

To maintain testing at 737 during the move, temporary staff (9 MLTs; 2 Lab Attendants) were hired and trained in the year preceding the move. A Validation Team consisting of ten testing staff were responsible for packing equipment, setting up CAO lab, qualifying relocated equipment, and supporting staff after the move.

The move occurred in two phases. The first began August 17 with the move and qualification of half the equipment, reagents and consumables. The switch to testing at CAO occurred on October 19.

The second phase began October 20. The move and qualification of remaining equipment, reagents, consumables and records lasted until November 20.

Following each phase equipment was installed and qualified by vendors. The Validation Team and Equipment Services executed installation and performance qualification protocols to ensure the equipment met requirements. Each protocol was reviewed by Managers, Medical and Quality Assurance staff.

A contingency plan was created to ship BC and Winnipeg samples to Brampton Donor Testing from October 13 to October 18, if necessary, but this was not required, and all testing remained in Calgary.

Results and Discussion

The Covid 19 Pandemic was a risk in 2020 since so much of the support and execution depended on people and the ability to transport samples to Brampton.

Despite the pandemic, the move and cutover of testing occurred on schedule and with only minor issues. The dedication of CBS staff from many departments was required to undertake this major shift in testing with no adverse impact on the timing or completion of mandatory testing of the blood supply.

Abstract ID :

197

Transfusion Medicine Resources for Nurses

Type of abstract : Clinical

Abstract Topics : Other - Not Listed

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Abstract Summary :

Introduction/Objective

The Ontario Regional Blood Coordinating Network (ORBCoN) mission is "inspiring and facilitating best transfusion practices in Ontario"[1]. Nurses administer most transfusions. The College of Nurses of Ontario (CNO) defines professional nursing as advocating to "obtain the best possible outcome, with no unnecessary exposure to risk of harm".[2] Review of ORBCoN's nursing resources to ensure best practice transfusion care was undertaken.

Design and Methods

ORBCoN's nursing transfusion resources include Bloody Easy Blood Administration (BEBA) (electronic and hard-copy handbook, eLearning module, PowerPoint presentations, competency assessment tool), and an annual videoconference. A qualitative Lime survey was circulated to resource end users. Videoconference participant feedback was evaluated. The Canadian Standards Association[3] and Canadian Society for Transfusion Medicine[4] standards for transfusion practice were reviewed to validate ORBCoN resources address these requirements. Ontario blood utilization data was examined. Nursing resources provided by national and international Transfusion Medicine websites were assessed. Timelines and fiscal impacts were considered.

Results

The Lime survey and videoconference participant feedback response rates were 39 and 30 percent, respectively.
Prevalent themes identified:

1. Best practice information linked to TM standards is vital
2. Red Blood Cell (RBC) units comprise more than 75 % of Ontario transfusions
3. Resource time requirements align with nursing workflows
4. Electronic, paper, interactive and patient case formats are beneficial
5. Minimal pediatric and neonatal information is available
6. Competency assessment is mandatory, including blood product reconstitution
7. Ontario blood transfusion nursing competencies are not available

To address these themes, the BEBA handbook was refurbished with referenced full-text and summary sections and the BEBA eLearning module was shortened with emphasis on RBC transfusion fundamentals. As well, the annual videoconference was modified to highlight key practices; the 2021 edition will center on patient cases. Development of blood administration videos and blood product reconstitution eLearning are in progress.

Conclusions

To deliver safe transfusion patient care, nurses must constantly augment their knowledge "through education, experience and self-assessment"[2]. ORBCoN affords

resources to support this need. Future priorities are completing current projects, collaboration with the CNO to define blood transfusion nursing competencies and follow-up with pediatric and neonatal experts to develop materials.

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3. National Standard of Canada Canadian Standards Association (CA) Blood and blood components. Available from: https://community.csagroup.org/docs/DOC-126295

4. Canadian Society for Transfusion Medicine (CA) Standards for hospital transfusion services.
Available from:http://www.transfusion.ca/Resources/Standards

Abstract ID :

212

High prevalence of weak D type 42 in a large-scale RHD genotyping program in the province of Quebec (Canada)

Type of abstract : Scientific

Abstract Topics : Other - Not Listed

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Abstract Summary :

Background:

The determination of the RhD phenotype is crucial to avoid alloimmunization, especially in childbearing women. Following the 2015 recommendation from the Work Group on *RHD* Genotyping, a large-scale *RHD* genotyping program was implemented in the province of Quebec (Canada) and offered to women ≤ 45 years old with a serological weak D or discordant results. Our aim was to report the prevalence of the weak D alleles in the province of Quebec.

Study design and methods:

A retrospective study of 2105 women with serological weak D referred to Hema-Quebec's immunohematology reference laboratory between 2016 and 2020 was conducted. Results from the serological tests performed by the referring hospital were compiled and *RHD* genotyped.

Results:

Most patients presented at least one serological result ≤2+ before being referred to Hema-Quebec. Weak D type 42 was found to be the most prevalent variant, representing 17.5% of all genotypes found. Weak D type 1, 2 and 3 were observed in only 27.2% of patients. The *RHD*01.W42* allele is highly expressed in regions with low immigration rate and known for their founder effect.

Conclusion:

Our *RHD* genotyping program allowed for a better management of weak D. The province of Quebec presents a unique *RHD* genotype distribution. We confirmed that weak D type 42 is associated to a founder effect found in Caucasian French Canadians.

Abstract ID :

230

Feasibility of implementing alternative criteria for source plasma donation in Canada by gay, bisexual, and other men who have sex with men (gbMSM) from the perspective of donor centre staff.

Type of abstract : Scientific

Abstract Topics : Other - Not Listed

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Justin Presseau [17], PhD,

Abstract Summary :

Background: Sexually active gay, bisexual and other men who have sex with men (gbMSM) cannot currently donate plasma or blood products in Canada. As an incremental step towards more inclusive donation criteria overall, Canadian Blood Services is reviewing the feasibility of moving to behaviour-based screening questions for source plasma donation by gbMSM. This could allow some sexually active gbMSM to donate source plasma, such as those in a monogamous relationship for the last three months.

Staff who would be tasked with applying alternative source plasma eligibility criteria for gbMSM play an important role in the success of implementing such a change. Staff may have views and perspectives that would help to inform a feasible, inclusive, and acceptable roll-out of a gbMSM source plasma donation program.

We aimed to: 1) Determine the acceptability of behavioural screening questions for gbMSM from the perspective of donor centre staff and 2) Identify potential barriers and enablers to administering alternative donor eligibility criteria for gbMSM to inform implementation.

Methods: We invited all nurses and donor care associates (DCAs) from a Canadian Blood Services large volume source plasma donor centre located in London, Ontario to participate in semi-structured interviews. The Theoretical Domains Framework was used to guide analysis and identify and categorize barriers and enablers, that may influence the administration of alternative criteria. The analytic approach combines thematic, deductive, and inductive analyses.

Results: 13 interviews were conducted from June 2020 to February 2021. Four DCAs, five front line nurses, and four nurses in supportive roles participated. Interviewees all self-identified as female, ages 37-64, with 3-29 years' experience in their current roles. Interviews ranged from 45-99 mins in length. Data analysis is underway and will be completed prior to presentation. Specific barriers and enablers to implementing alternative source plasma eligibility criteria for gbMSM, organised by theoretical domain will be reported.

Conclusions: Should the screening policies change for gbMSM source plasma donors, the barriers and enablers identified in this study may inform evidence-based, fit-for-purpose implementation strategies to enhance the training and support needed for staff and the potential adjustments needed to donor centre processes prior to implementation.

Abstract ID :

233

The IgG Fc Region Is Essential For Monoclonal Antibodies To Induce Antibody-Mediated Immune Suppression.

Type of abstract : Scientific

Abstract Topics : Other - Not Listed

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Lidice Bernardo [2], Scientist, Sanofi Pasteur

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Abstract Summary :

Introduction

Hemolytic disease of the fetus and newborn (HDFN) is a disease provoked by erythrocyte antigenic incompatibility between mother and fetus. Polyclonal anti-D has been used to prevent HDFN and this mechanism has been referred as antibody-mediated immune suppression (AMIS). The major theory behind AMIS is based upon erythrocyte clearance. Recently, antigen loss has been proposed as a potential mechanism of AMIS; where Fcγ receptors and/or complement were required and we recently also demonstrated in a model system that immunoglobulin G Fc glycans are not essential for AMIS. However, the actual presence of the IgG Fc region on the ability of monoclonal antibodies (mAb) to induce AMIS has not been assessed. The aim of the present work was to determine the requirement for an IgG Fc region to mediate AMIS induction.

Design and Methods

Erythrocytes from transgenic HOD mice, which express an antigen composed of hen egg lysozyme (HEL), ovalbumin (OVA) and the human Duffy transmembrane protein [HOD], were used as a source of foreign erythrocytes. HOD-RBCs were opsonized with antibodies against different regions of the molecule as well as their $F(ab')_2$ and F(ab) fragments of these antibodies and transfused in C57BL/6 mice. Fc-add-back Experiments included HOD-RBC opsonized with $F(ab')_2$ and F(ab) fragments of HOD-specific mAb plus intact IgG vs F(ab')2 fragments specific against the primary antibody. IgM and IgG antibody responses were measured by ELISA after HOD-RBC transfusion.

Results

Erythrocyte antigen-specific intact mAb avoided alloimmunization. However, F(ab) as well as $F(ab')_2$ fragments of these mAb did not decrease alloimmunization. The inability of F(ab) or $F(ab')_2$ fragments of mAb to induce AMIS was restored when additional IgG but not $F(ab')_2$ fragments specific against the primary antibody were also administered .

Conclusions

The Fc region of IgG is essential for the successful induction of antibody-mediated suppression to foreign erythrocytes.

Acknowledgements

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Abstract ID :

245

Assessment of the impact of cannabis use on the quality of blood components

Type of abstract : Scientific

Abstract Topics : Other - Not Listed

Authors:

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Abstract Summary :

Background: Cannabis, better known under the name of marijuana, contains many chemical compounds called cannabinoids, the two main ones being tetrahydrocannabinol (THC) and cannabidiol (CBD). Cannabis has long been used for medical purposes (painkiller, anti-inflammatory, anti-convulsant, etc.) and its recreational use has recently been legalized in Canada (Bill C-45). A recent study conducted by Dr. Élise Roy (Université de Sherbrooke), in collaboration with Héma-Québec, found that around 12.69% of blood donors were cannabis consumers. This high prevalence of cannabis users in the donor population, coupled with the absence of a prescribed latency period between consumption and blood donation, led us to question the impact that cannabis consumption could have on the quality of certain types of blood components.

Aim: The main objective of this project was to determine the effect of THC and CBD on the activation and functionality of platelets, as well as on the fate of immune cells.

Methods: To mimic the consumption of cannabis during the pre-donation period, whole blood was collected and various concentrations of THC, ranging from 24 ug/mL to 500 ng/mL, were added. Whole blood was then incubated at 37 °C, 5% CO_2, for at least 12h. Following this incubation period, blood was collected and centrifuged. Plasma and platelets were collected in order to respectively measure serum free hemoglobin (used as an indicator of hemolysis) and CD62P expression (platelet activation index).

Results: Our preliminary results revealed that addition of THC to whole blood resulted in a dose- and donor-dependent effect on the level of free hemoglobin in plasma. Indeed, our results showed that free hemoglobin was significantly increased in the presence of high concentrations of THC. However, this hemolysis was very variable (from 0.5- to 3-fold increase) as a function of the donor. Regarding platelets, our preliminary results did not show any significant modulation of CD62P expression.

Conclusion: Although preliminary, our result suggests the consumption of cannabis, which is highly concentrated in THC, prior to blood donation, could have an impact on red blood cells that will be recovered from these donors. However, we have yet to confirm these observations.

Abstract ID :

210

A case-based approach to rare blood acquisition in a patient with multiple antibodies

Type of abstract : Clinical

Abstract Topics : Patient Blood Management

Authors:

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Joanna McCarthy [2], MLT, Alberta Precision Laboratories

Gwen Clarke [3], MD, University of Alberta, Canadian Blood Services

Abstract Summary :

Background: When blood transfusion is required for a patient in need of rare blood, finding matched donor units can be difficult. However, the provision of antigen-negative units may prevent hemolytic transfusion reactions and future alloimmunization.

Clinical Case: We report a 66-year-old female presenting with multifactorial anemia between October 2020 and January 2021. Her latest admission was for antibiotic related diarrhea, hypovolemia, and exacerbation of chronic anemia. Red cell concentrates (RCC) were required during management of the underlying colitis; a crossmatch was ordered. The antibody screen was positive, with a positive direct antiglobulin test (anti-C3d only), and cold agglutinin screen was positive but not significant.

The patient's known transfusion history began in 2019 when she presented with anti-S and a cold autoantibody. Following multiple transfusions for cardiac surgery, she also developed anti-K, anti-f, and anti-Dob. This alloantibody combination creates a unique and difficult situation. Only 2.4% of the donor population is estimated to be compatible; this correlates with a requirement for screening of 42 RBC units to identify 1 matched unit.

A single liquid RCC was available in national inventory and was site transferred for her use. An algorithm was created to identify additional units already in inventory. S-, K-, and f- units were selected for red cell genotyping to determine the predicted Dombrock b (Dob) phenotype. Based on this assessment of phenotype, 20 units were identified and associated donor samples urgently genotyped to evaluate for the Dob antigen. The expected frequency of Dob- units is 18%.

Testing yielded 4 units that were Dob-. The selected units were crossmatch compatible, and a unit was transfused. The patient's pre-transfusion hemoglobin was 53g/L; post-transfusion, it rose to 72g/L and remained stable for the remainder of her hospitalization.

Strategies to meet any ongoing need for RCC were also explored; unused RCC were cryopreserved and identification of potential new donors included the testing of family members, and the use of known antigen frequencies in various ethnic groups to target donor populations. A restrictive transfusion protocol and non-transfusion alternatives were implemented.

Conclusion: In cases where antigen-negative blood is required, multiple strategies are explored to provide both timely access and long-term solutions. In this case, an algorithm was created to find antigen-negative units suitable for our rare blood patient.

Abstract ID :

250

Case Study Sickle Cell Disease Patient's True Rh Phenotype and Antibody Identification

Type of abstract : Clinical

Abstract Topics : Patient Blood Management

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Jacqueline Cote [2], , Canadian Blood Services, Ottawa ON Canada Tammy Ison [3], MLT, Canadian Blood Services

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Gwen Clarke [5], MD, University of Alberta, Canadian Blood Services

Abstract Summary :

Background

Sickle cell disease (SCD) an inherited hemoglobin disorder is predominately found in the Black population. Red blood cell (rbc) transfusion remains a cornerstone of treatment of SCD. Current practice recommends SCD patients be transfused with rbc that are Rh and Kell matched. Persons of African origin are noted to have an increased rate of rbc alloimmunization due to numerous RH variants.

Study Design and Methods

Sample from female patient of African origin with SCD were received for rbc antibody identification. Standard process includes testing using different serological methodologies like MTS gel, PEG and saline IAT. Direct antiglobulin test (DAT), and elution. African origins patients with chronic transfusion requirements are routinely rbc genotyped including RHD for RhD positive individuals. Testing may indicate need for more detailed interrogation of patient's RhD and Rh CE gene.

Results

Immucor RHD Molecular BeadChip test reported a wild type RhD positive individual. RHCE results for Immucor Molecular BeadChip test identified patient with RHCE*ce.01 and RHCE*ceTI variant allele. RHCE*ceTI has partial c and e, wild type compensates for partial expressions. RHCE*ceTI known to have association with RHD variants. Test kit is known for failure to detect 2.9% of RHD variants in ISBT database. Patient's sample was referred out for RHD and RHCE sequencing to Grifols Immunohematology Centre, San Marcos, Texas. Results identified patient as DAU0. Patients with DAU0 can form alloanti-D and must be treated as Rh D negative.

Serological testing of plasma identified antibodies to low prevalence antigen, anti-Cw, anti-Cob and anti-Bg, by MTS gel and PEG IAT. Eluate showed presence of a warm autoantibody.

Conclusion

Risk of partial antigens in African origin patients indicates need to assessm results for possible extended rbc genotyping. Assessment performed based on known limitation of high put through test kits, known association of Rh variant and serological testing. Matching full extended phenotype Rh, Kell, Kidd, Duffy and Ss may not prevent alloantibodies. Once immune system is stimulated and forms alloantibodies exposure to antigens lacking on patient's rbc may result in additional antibodies associated with low prevalence antigens and increased risk of hyperhaemolysis in patients with SCD.

Abstract ID :

209

The Shelter of Complete Serologic Crossmatching in Sickle Cell Disease: Maintain or Desist?

Type of abstract : Clinical

Abstract Topics : Serology

Authors:

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Abstract Summary :

Introduction/Objective: Best practices in red cell transfusion (RBC) for people with sickle cell disease (pwSCD) incorporate deeper matches (beyond ABO/RHD) due to paramount seroconversion propensities and associated harms. At a minimum, pwSCD receive RBCs prophylactically antigen-negative for each negative (or partial) cardinal RHD/RHCE and KEL type, and more extensive profile emulation with any past/present antibodies of clinical significance (PPACS). Concern that screening cells insufficiently represent the diverse range of antigens inherent to selected (African-ancestry-enriched) donors has justified the precaution of complete anti-human globulin crossmatching (AHGXM) in all pwSCD. We sought to determine whether this adds value in identifying missed PPACS.

Design/Methods: In the laboratory information system (WellSky®) at an urban-academic hospital, incompatible crossmatches (iXM) from pwSCD (1/1/09-31/12/18) were analyzed for frequency, specificity, and outcomes.

Results: In 35,893 AHGXM (for 1076 pwSCD), 612 (1.7%) were iXM in 61 (5.7%) pwSCD (5.7%), of whom 14 (23%) had a history of ≥1 transfusion reaction (vs 50 [4.6%] for all pwSCD, P < 0.0). In 48 (79%), the iXM was the standalone/unexplained reactivity. In the remainder, 5 had false-positives, 4 had DAT+ donors, and 5 had classifiable results (unidentified antibody [UA, 2], Bg [1], Sda [1], passive IVIG isoagglutinin [1]). With the exception of the isoagglutinin, not one iXM identified a PPACS for match enhancements (uppermost 95% confidence interval for a meaningful finding: 6%). Among pwSCD and unexplained iXM, most (42 [88%]) had prior-positive screens (26 [62%] including UA), and 8 were authorized to receive 68 iXM RBC (11.1% of total) [range 1-31u] (vs 1766 compatible [cXM] RBCs [range 4-1207u]; for an involved recipient iXM:cXM ratio of 1:26). Two reacted after iXM RBC (nonlethal hyperhemolysis [autoantibody-attributed iXM], minor allergic reaction [anti-Kna-attributed iXM]), whereas another two received cXM on other occasions (post-albumin angina and post-exchange citrate toxicity in one; fatal hyperhemolysis in the other); at an odds of reacting after iXM:cXM (among historic receivers of both on ≥1 occasion) of 9.2 (P < 0.0001).

Conclusions: In an AHGXM-for-all-pwSCD policy, iXM occurred infrequently, often aligned with UA, and failed to reveal actionable results, although this may be a limitation of contemporary tools in testing. These data do not exclude the possibility of revelatory yields, while the enrichment of adverse events with iXM (results or transfusions), despite duly performed investigations ruling out clinically significant antibodies, calls for caution until covariates are better understood.

Abstract ID :

232

Blindspots in Immucor BioArray RHD Molecular BeadChip Test: A Review of Cases at Canadian Blood Services Referred Out for RHD Gene Sequencing

Type of abstract : Clinical

Abstract Topics : Serology

Authors:

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Abstract Summary :

Introduction:

The reference laboratory at Canadian Blood Services (CBS) receives samples for RHD genotyping from across the country for testing on the Immucor BioArray RHD Molecular BeadChip Test (BioArray). The package insert stipulates that 2.9% of variants may not be detected with this assay, and that number is growing as new RHD alleles are reported in the literature. In cases of discrepant or indeterminate genotyping results on the BioArray platform, samples are referred out for RHD gene sequencing. A case series review was undertaken to understand the limitations of the BioArray assay in the Canadian context.

Methods:

19 cases referred for RHD gene sequencing between January 1, 2018 and December 31, 2020 were reviewed. Sample type, the BioArray reported result, the trigger for further investigations and the outcome of gene sequencing, including impact on D status, were assessed.

Results:

2843 samples were tested on the BioArray. 19 samples (0.66%) were referred to Grifols Immunohematology Reference Laboratory for gene sequencing (3 donors, 11 prenatal, 5 others including 2 sickle cell disease). Triggers for referring cases for gene sequencing included warning flags on the report sheet or abnormal and unexpected probe calls (15). Low signal calls in exon 7 and 9 were the most common flag on the genotype report. 4 cases had discrepant serology only with no abnormalities flagged by BioArray (2 were suspected RhD mosaicism unable to be confirmed by gene sequencing). In 10 cases, sequencing revealed an allele to which BioArray is blind, including 2 novel alleles not previously reported in the literature. There were 9 instances where BioArray called "possible D" and subsequent sequencing determined the patient to to have a variant considered to be RHD negative, of which 8 were flagged by the genotype report.

Conclusion:

RHD genotyping assays have limitations and the results must be carefully reviewed and interpreted in the context of the clinical and serologic findings. Discrepant results on the RHD BioArray assay should be followed up with additional investigations. Communication between clinicians and laboratorians is essential for accurate interpretation of genotyping results.

Abstract ID :

200

Anti-Ina Implicated in Hemolytic Disease of the Fetus and Newborn in an Indigenous Woman

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

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Abstract Summary :

Background:

A 23-year-old Indigenous female, G2P1, was admitted at 33 weeks gestation with pre-eclampsia. Maternal bloodwork demonstrated a negative antibody screen. Baby boy was delivered by emergency cesarean section and subsequently presented with signs and symptoms of hemolytic disease of the fetus and newborn (HDFN): jaundice, elevated bilirubin (370 umol/L) and a positive direct antiglobulin test (DAT). Maternal-fetal crossmatch was incompatible and an antibody to low incidence antigen was suspected. Maternal, paternal, and newborn blood samples were sent to Canadian Blood Services Diagnostic Services (CBS) laboratory for investigation.

Method:

Routine hospital maternal work up consisted of ABORH group and antibody screen using gel-based technology. Routine DAT performed on newborn sample. Positive DAT result reflexed maternal antibody identification and maternal-fetal crossmatch.

Reference lab testing used PEG IAT for antibody identification. Samples referred to CBS National Immunohematology Reference Laboratory for genotyping and antibody confirmation.

Genotyping performed using Progenika IDCore XT platform. DNA sequencing performed for *IN* gene on paternal and newborn samples.

Results:

Mother typed as blood group O Rh positive. Sample tested negative against cells positive for the following low incidence antigens: Cw, Cx, Goa, Ew, Bea, V, VS, FPTT, Kpa, Ula, Dantu, He, Hil, Mg, Mit, Mta, Mur, Vw, Lua, Lu:14, Bga, Cob, Dia, Lwb, Rd, Sc:2, Tra, Wra, Wu and Ytb. Sample tested positive against Ina+ cells confirming presence of anti-Ina. Father typed as group O negative. Neonate typed as group O, DAT 3+ with anti-IgG and maternal-fetal crossmatch 4+. Father and newborn had a predicted phenotype of Ina+ by genotyping.

Conclusions:

Neonatal hemoglobin remained stable at 195 g/L and transfusion was not required. He was treated with triple phototherapy and one dose of IVIG and discharged after hyperbilirubinemia resolved.

The Ina+ phenotype is found in 11 % of Middle Eastern and 4% of South Asian populations compared to 0.1% in Caucasian, Asian and Black populations. Both parents are Indigenous, in which the prevalence of Ina+ is unknown. This is a rare case report given the ethnic population and the fact that anti-Ina is not known to cause clinical HDFN.

Abstract ID :

201

A Case of ABO Chimerism in a Perinatal Patient

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

Lhevinne Ciurcovich [1] *, MLT, Canadian Blood Services/BC & Yukon Diagnostic Services

Gwendolyn Clarke [2], MD,

Matthew Yan [3], MD,

Abstract Summary :

Background:

An ABO discrepancy was detected in the forward grouping of a maternal sample during routine perinatal testing. The patient was of South Asian descent with no prior medical history, pregnancy, transfusion or known twin. Serologic ABO investigation initially suggested a rare AB subgroup, cisAB, where both A and B are inherited on the same allele. Sample was referred out for ABO sequencing.

Method:

Initial ABO/Rh testing was performed on Immucor NEO Blood Group Analyzer. Further ABO investigation was performed by manual tube method.

ABO intron 1 enhancer and exons 1 to 7 were sequenced by Grifols (Texas, USA).

Results:

NEO testing showed 4+ agglutination with anti-A and query/? results with anti-B. Manual tube ABO was 4+ with anti-A, 4+ mixed field (MF) with anti-B and 4+ with anti-H. Solid phase 2-cell antibody screen was negative. There was no evidence of a cold agglutinin present.

Paternal sample tested as group A Positive.

Patient genotyped as ABO*B.01, ABO*A2.01 with a predicted phenotype of A2B. Sequencing demonstrated an unbalance of two alleles: ABO*B.01 (22%) and ABO*A2.01 (78%) suggestive of molecular chimerism.

Conclusions:

Based on initial serological findings (mixed field and strong H typing in an AB patient), literature suggested that the patient could be cisAB subgroup, where A and B are inherited on the same allele. If this were the case, ABO of the newborn may not follow expected inheritance patterns.

However, sequencing proved that the patient did not have the cisAB genotype but instead was suggestive of a molecular chimera. A chimera is defined as having two or more distinct cell populations within an individual; in this case group A and group B cells. Artificial blood group chimerism (e.g. recent transfusion, bone marrow transplantation, etc.) is commonly seen in transfusion, whereas true chimerism (e.g. twins) is considered very rare.

There is no known history of medical conditions or treatments in the patient that would contribute to artificial chimerism. The presence of chimerism may result in serologic discrepancies (e.g. mixed fields); however, the patient can be managed as AB positive.

Abstract ID :

211

Comparison of Manual SIAT vs Automated Solid Phase Methodology for Perinatal Antibody Titration

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

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Abstract Summary :

Background:
Pregnant women with antibodies associated with hemolytic disease of the fetus and newborn (HDFN) are monitored throughout pregnancy with antibody titres. This testing predicts the risk of HDFN and signals the need for clinical monitoring with fetal doppler ultrasound. The current titration method performed by the perinatal laboratories at Canadian Blood Services (CBS) is a manual tube method using a saline indirect antiglobulin test (SIAT). A new titration assay on the latest model of automated solid phase analyzer (ASP) is being investigated for use in the CBS perinatal labs. A study comparing SIAT vs ASP method was conducted to determine the critical threshold using ASP that corresponds to the long-established critical threshold of 16 by SIAT.

Methods:
79 previously tested, frozen samples (46 Rh and 33 non-Rh antibodies with titres from < 1 to 1024) were thawed and repeat SIAT titration performed. Samples were then shipped same day to the ASP instrument validation site for next day testing. The NEO Iris analyser (Immucor Canada) was used for ASP titrations. Whenever possible, the same cell type was used for both methods.

Results:

The mean increase in antibody titre using ASP was 1.06 which translates to a threshold of 32 (1 dilution increase from manual) for critical value. Based on this new threshold comparing manual titration vs. ASP, 49 samples (62%) matched non-critical values, 13 samples (16%) met critical value (overall concordance rate 78%). 10 (13%) were critical false positive (manual < 16, ASP ≥ 32) and 7 (9%) were critical false negative (manual ≥ 16, ASP < 32). The antibodies showing a falsely low ASP titer included 3 anti-M, 3 anti-Ec and 1 anti-D.

Conclusion:

ASP for perinatal antibody titrations offers better reproducibility and efficiency compared to manual titrations. Given the enhanced sensitivity of ASP, a titre cut-off of 32 appears appropriate for most clinically significant antibodies (equivalent to the critical titre cut-off of 16 by manual SIAT). Further work is required to determine how the IgG versus IgM component of an antibody influences reactivity in ASP (known to be less sensitive to certain IgM antibodies) and how samples with multiple antibodies behave in this platform. Manual titre testing will continue to be used for certain cases. The existence of dual testing methods with different cut-off values will necessitate a well-organized and clear reporting strategy.

Abstract ID :

222

Tracking SARS-CoV-2 seroprevalence among Canadian blood donors

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

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Abstract Summary :

Introduction/Objective: Tracking the proportion of the population exposed to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is important to assess population-level immunity and to inform public health policies. Using residual blood from healthy blood donors we evaluated SARS-CoV-2 seroprevalence over time and by sociodemographic factors across Canada.

Design and Methods: This serial cross-sectional study was conducted between May 9 and November 25, 2020, from people donating at all Canadian Blood Services locations. We used the Abbott Architect assay to detect SARS-CoV-2 IgG (targeting nucleocapsid) antibodies from retention plasma. Seroprevalence was standardized to population-level demographics and the assay characteristics were adjusted using the Rogan-Gladen equation. Results were stratified by region, age, ABO groups, ethnicity and quantiles of material and social deprivation indices. Comparisons were made at three time periods in 2020: Wave 1 (May-July 21), October and November.

Results: Overall 108,015 retention samples were tested and adjusted seroprevalence increased from 0.70% (95% CI 0.63, 0.77) in Wave 1 to 0.88% (95% CI 0.73, 1.04) in October and 1.51% (95% CI 1.31, 1.71) in November. There were significant variations by region. From Wave 1 to November seroprevalence in Manitoba and Saskatchewan increased from 0.59% to 8.56% and 0.53% to 4.17%, respectively. Seroprevalence in British Columbia and Alberta nearly tripled. While Ontario and the Atlantic provinces did not change. Seroprevalence also varied by age groups; notably, donors aged 17-24 years old had the most pronounced increase from 0.76% in Wave 1 to 2.97% in November. Disparities by socioeconomic status widened; seroprevalence increased three-times among donors living in the most materially deprived neighbourhoods between Wave 1 (0.8%) and November (2.43%), compared to < 2x by donors living in affluent neighbourhoods (0.66% to 1.1%). No substantial differences were observed by ABO groups.

Conclusions: Worldwide, blood services have leveraged their operational capacity to inform public health. SARS-CoV-2 seroprevalence remained low in Canada but there were significant variations by regions and sociodemographic factors. Our results may be limited by waning antibodies. Widescale seroprevalence studies will continue to play a pivotal role in helping authorities evaluate public health policies, monitor disparities and as access expands, track vaccine coverage.

Abstract ID :

246

Current challenges and implication for SARS-CoV-2 seroprevalence studies among blood donors: A Scoping Review

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

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Abstract Summary :

Background: A common and convenient population to conduct SARS-CoV-2 seroprevalence studies are blood donors. We conducted a scoping review to understand the methodological gaps related to seroprevalence studies in this population and propose recommendations for future research.

Methods: PubMed and MedRvix databases were searched for seroprevalence studies among blood donors between January 2020 to 2021. Data were extracted on the sampling region, unadjusted SARS-CoV-2 seroprevalence rates (number of reactive samples/populations tested) and when available adjusted seroprevalence estimate confidence interval or ranges. Prespecified methodological challenges pertaining to population sampling, periodicity, assay characteristics and antibody kinetics were systematically summarized. We also included publicly available statistics on case detection and social distancing policies for each country.

Results: Thirty-four studies representing 1,416,486 blood donors from 20 countries were included. There was significant heterogeneity by both seroprevalence rates ranging from 0-66% and factors that influenced seroprevalence estimates. The majority (71%) of the studies initiated serosurveys within three months of the pandemic declaration by the World Health Organization on March 10, 2020. 53% of studies reported seroprevalence at a single time point. Stratification by age and sex were most common (62%), followed by region (53%). Overall, less than 1 in 3 studies, standardized seroprevalence rates to general population demographics. From 34 studies, 27 unique assay combinations were identified; 74% used a single commercial assay. However less than half of the studies adjusted estimates for imperfect test characteristics.

Conclusion: Overall 85% of studies reported prevalence rates < 10%; levels far from reaching herd immunity. In addition to differences in community transmission and diverse public health policies, study design and methodology were likely contributing factors associated with seroprevalence heterogeneity.

Abstract ID :

253

A CASE OF MISTAKEN B: DISCOVERY AND EVALUATION OF A DONOR ABO MISTYPE

Type of abstract : Scientific

Abstract Topics : Serology

Authors:

Heather Purcell [1] *, MLT, Canadian Blood Services

Michiko Ng [2], MLT, Canadian Blood Services

Balkar Gill [3], MLT, Canadian Blood Services

Gwendolyn Clarke [4], MD,

Abstract Summary :

Introduction/Objective: At Canadian Blood Services (CBS), routine serological testing of blood donors includes ABO, RH1, and KEL1 typing. This testing is Health Canada licenced and performed on the PK7300 automated platform (Beckman Coulter Brea, CA). A potential ABO typing discrepancy was identified when hospital ABO retesting (automated gel and manual tube method) differed from CBS' blood group typing.

Design and Methods: All available methods were used for ABO testing: PK7300, NEO automated platform (ImmucorGamma Norcross, GA) and manual tube. Phenotyping and investigation of the suspected anti-A1 was performed via manual tube testing. All methods use commercially available ABO blood grouping reagents. Samples were sent to reference laboratories for ABO genotyping (Nordic Reference Laboratory and Versiti Wisconsin, Inc.) and flow cytometric assessment of A antigen expression (Nordic Reference Laboratory).

Results: The PK7300 typed the index donation as group B. Hospital ABO testing on segments detected weak reactivity with Anti-A and CBS reproduced the hospital's observation. Additional samples were collected and repeat testing on the PK7300 matched the index donation. Reactivity with Anti-A was detected by the NEO and manual tube testing. No reactivity with A2 cells confirmed presence of anti-A1 and phenotype testing indicated A1 negative status . Both reference laboratories reported ABO genotype: *ABO*AW.09/ABO*B.01*. Predicted phenotype is a weak expression of the A antigen and normal expression of the B antigen. The *ABO*AW.09* allele is rare and flow cytometry showed an A antigen expression lower than that of the of A^x-1 (*AW30.01*) control. Results of the vendor's investigation indicated the PK7300 instrument and reagents functioned as expected.

Conclusions: Automation of blood group typing can increase standardization and efficiency while decreasing risk of error, but it has its limitations. In this case, failure of the automated testing platform to detect the A antigen while detecting presence of anti-A1 lead to a group AweakB donor typing as group B. Whether transfusion of these red cells to an individual with an anti-A would pose a clinically significant risk is unknown. In-vitro assessment of hemolytic potential may assist in determining what new strategies would be required to prevent this type of rare ABO discrepancy.

Abstract ID :

239

Meeting the Challenges Associated with Blood Transfusion in a Remote New Brunswick Location

Type of abstract : Administrative

Abstract Topics : Transfusion Safety

Authors:

Claire Wright [1] *, MLT, B.Tech, MTM, Saint John Regional Hospital, Horizon Health Network

Abstract Summary :

Meeting the Challenges Associated with Blood Transfusion in a Remote New Brunswick Location

Introduction The Saint John Regional Hospital Transfusion Medicine (TM) Laboratory provides blood products for transfusion at the Grand Manan Hospital (GMH), a 10 bed hospital located on Grand Manan Island in the Bay of Fundy. The GMH serves a population of 2,500 and is accessible to the mainland by a 1.5 hour daily ferry service. No Medical Laboratory Technologists work at GMH.

Objective: To describe the methods used to provide safe transport and storage of blood for transfusion at GMH, according to the Guidance Document: Blood Regulations (Health Canada, 2016).

Methods: Continuous quality improvement of the GMH blood transfusion process by using Plan, Do, Check, Act (Deming Cycle).

Results:

- Safe Blood Storage is maintained by monitoring Blood Bank (BB) refrigerators, chart recorders, digital alarm modules, and thermometers. Clinical Engineering performs scheduled maintenance. GMH Nurses record equipment temperatures daily, and change temperature charts weekly. BB fridge alarms are monitored by maintenance.

- Temperature charts and logs are faxed weekly to TM for review. GMH Equipment Maintenance forms are updated weekly by TM.

- Red Blood Cells (RBC) are transported using validated transport containers (1°C-10°C). Nurses trained in packing/unpacking transport boxes perform temperature verification of RBC on receipt. The completed shipping form is faxed to TM for review. The RBCs in GMH are traceable through the Laboratory Information System.

- 4 O Pos RBC and 2 O Neg RBC are stored for emergency issue and segments are kept at TM for crossmatch if needed. Expiry dates are checked weekly to replace RBC before outdating.

- The GMH nursing binder includes procedures for the emergency dispense of uncrossmatched blood, transportation and receipt of blood, monitoring the temperature of RBC, quarantine of blood and refrigerator maintenance.

- Non-conformances are followed up through Occurrence Laboratory Reports. Follow-up requires communication and collaboration between TM Manager and staff, GMH Nursing, plus Clinical Engineering and/or maintenance as required.

Conclusion: Providing safe transport and storage of blood for transfusion at GMH is challenging due to its remote location. Success depends on constant:

- Plan: Monitoring the entire blood transfusion process
- Do: Ensure staff have clear expectations of requirements and procedures to follow
- Check: Reviewing all required records and communicating as needed
- Act: Follow up with any non-conformances in real time, and continue to monitor that any changes made are working

Abstract ID :

192

Building Evidence for Transfusion Practice: Infusion Sets and Bacterial Adhesion/Growth

Type of abstract : Scientific

Abstract Topics : Transfusion Safety

Authors:

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Sandra Ramirez-Arcos [5] *, BSc, MSc, PhD, Canadian Blood Services

Abstract Summary :

Background:

According to Canadian standards, infusion of blood/blood components shall occur through an administration set with a filter "designed to retain particles potentially harmful to the recipient". Infusion sets are changed due to a theoretical risk of bacterial adhesion and growth. Lacking meaningful evidence, recommendations have been based on expert opinion and product inserts. A recent manufacturer's recommendation led to standardization at 4 hours. The safety benefit gained in relation to the costs was uncertain.

Objective:

Using a test system that simulates routine red blood cell (RBC) transfusion, the authors sought to assess bacterial adhesion and growth in blood administration set lines.

Methods:

The test system used a clinically relevant organism (biofilm-forming *Serratia marcescens*), a commonly used infusion set and both culture media and red blood cell (RBC) units. Bacterial adhesion and growth were assessed by culture/Gram stain, biofilm examination and scanning electron microscopy (SEM). The study first established proof of concept of the test system. The investigators then assessed the impact of varying bacterial concentration, number of "units" and timing of culture.

Results:

The first phase tested culture media spiked with high concentrations of *S. marcescens* and demonstrated adhesion and biofilm formation, even when the "transfusion" is followed by saline flushes or a second unit. The second phase tested media and RBC units at clinically relevant concentrations (10 and 1 CFU/ml). Bacterial adhesion was inconsistent (1 out of 6 trials) but demonstrable. Finally, the infusion set was exposed to an entire RBC unit spiked at 1 CFU/ml, followed by 24h room temperature incubation, then transfusion of an unspiked unit. Proliferation to clinically significant levels was demonstrated by culture in these trials.

Conclusions:

This pilot study has demonstrated bacterial adhesion in blood infusion sets at high concentrations. There is minimal/inconsistent adhesion at low concentrations, but incubation of the set for 24h results in growth to concentrations (~10^5 CFU/ml) that may lead to adverse consequences for the recipient. Further work is needed to determine the optimal time frame between 4 and 24 hours for changing infusion sets in routine transfusion practice.

Abstract ID :

213

Infusion Pump Related Hemolysis

Type of abstract : Scientific

Abstract Topics : Transfusion Safety

Authors:

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Andrew Shih [6], ,

Dana Devine [7], PhD, Canadian Blood Services

Abstract Summary :

Introduction / Objective

Mechanical stress on red blood cells and the resulting hemolysis is a concern associated with using infusion pumps for the administration of red cell concentrate(RCC). Literature review from studies submitted to Health Canada for pump approval demonstrates no standard protocol and inadequate study design.

This project investigates RCC quality after passage through four infusion pumps(one peristaltic, two linear peristaltic, and one piston pump) used across Canada. Useful lab measurements for the evaluation of pump safety and the significance of age/condition of RCC for such evaluations were assessed.

Design and Methods

RCCs were pumped on **d22**(22 days after collection), **d40**, d28 after gamma irradiation on d14(**I14d28**), and d22 after irradiation on d21(**I21d22**). For each experiment, 3 ABO-matched RCC units were pooled and split among four bags, each used for one pump. Samples were collected at gravity(no pump) and after pumping at 50, 150 and 300 mL/h against simulated blood vessel resistance. Hemolysis %, mechanical fragility index(MFI), microvesicles(RMV), potassium, LDH levels, and morphology evaluations were measured. Data were analyzed by applicable parametric/non-parametric tests (n=5-6); $p < 0.05$ was considered statistically significant.

Results

For all tested pump rates and RCC conditions, hemolysis levels of piston and both linear peristaltic samples were not different from hemolysis of corresponding gravity samples. Peristaltic samples, however, had significantly higher hemolysis compared to gravity. The peristaltic pump also showed significantly higher hemolysis than other pumps(maximum mean difference: 0.03%). Pumping at 50 mL/h resulted in the highest hemolysis level(0.135±0.015 in d22 and 0.299±0.013 in d40). Change in hemolysis% due to pumping(Δ hemolysis%) was significantly higher in d40 and I21d22 RCCs than in d22 and I14d28. No combination of pumps and parameters led to hemolysis > 0.8%.

MFI, RMV and morphology were not sensitive measures of pump effect. Potassium levels in pump samples were not different from the corresponding gravity samples. Among pumps, linear peristaltic samples had significantly lower potassium levels compared to piston and peristaltic. Besides hemolysis, LDH was the only marker that demonstrated some differences between infusion via pump vs gravity. Consistent with hemolysis results, the peristaltic pump had significantly higher LDH levels than all other pumps(95% CI of mean difference:3 to 13 mU/mL on d40).

Conclusion

The pump mechanism affects the degree of hemolysis. However, for all tested pumps and RCC conditions, this increase was deemed minimal and clinically insignficant. Hemolysis% and LDH measurement on d40 and I21d22 at 50 mL/h were concluded to be appropriate parameters for pump evaluation.

Abstract ID :

238

Antibacterial Activity of a SiO2 Nanoparticle Coating to Improve Blood Product Safety

Type of abstract : Scientific

Abstract Topics : Transfusion Safety

Authors:

Sahra Fonseca [1] *, B. Sc., Héma-Québec

Marie-Pierre Cayer [2], , Héma-Québec

K M Tanvir Ahmmed [3], , TriPhyll

Nima Khadem-Mohtaram [4], , TriPhyll

Danny Brouard [5], PhD, Héma-Québec

Abstract Summary :

Introduction: Despite scientific advances and the establishment of quality control systems to improve safety in blood supply organizations and transfusion practices, the risk of bacterial contamination is still relevant. An innovative strategy to prevent infections linked to medical devices is based on the application of antibacterial and antifouling coating. To this end, a Medical Antibacterial and Antiadhesive Coating (MAAC) exploiting functionalized silica nanoparticles was recently developed. The main objective of this project aimed at assessing the MAAC antibacterial activity (AA) applied on polymeric materials (PM) used in the design of medical devices (polyurethane (PU) and silicone (SI)) and to the internal surface of blood product storage bags (polyvinylchloride (PVC)).

Methods: The MAAC was deposited on PM sections (d_{MAAC}~50 µm, A_{PVC}=2500 mm^2) composed of PVC ± plasticizer (red cell concentrate (RCC) and platelet concentrate (PC) storage bags), PU or SI. The physical and adhesion properties of PM treated with MAAC (PM-MAAC) or not (PM-CTL) were characterized by optical and electron microscopy. The AA of PM-MAAC was tested in accordance with ISO 22196:2011 standards against selected Gram-positive (*Staphylococcus aureus, Staphylococcus epidermidis*, *Enterococcus faecalis*) and Gram-negative (*Escherichia coli*, *Serratia marcescens*, *Klebsiella pneumoniae*) bacterial species. PM-MAAC and PM-CTL sections were subjected to 5.8 log_{10} CFU/mL bacterial inoculum in minimal nutrient medium for 24 h at 35°C and bacterial count on agar plates were compared (n = 3). The MAAC cytotoxicity was evaluated on the L929 cell line, according to ISO 10993-5 standards.

Results: Electron microscopy revealed a smoother surface and a reduced bacterial adhesion for PM-MAAC compared to PM-CTL. PM-MAAC exhibited a significant AA for all bacterial strains tested (≥ 1 log reduction). The AA was higher for Gram-positive *S. aureus* (4.0 ± 1.4 log_{10} CFU/mL) compared to Gram-negative *E. coli* (3.7 ± 1.8 log_{10} CFU/mL). Bacterial growth was significantly reduced for PVC-MAAC, PU-MAAC and SI-MAAC (99-99.999%) compared to plasticized PVC-MAAC (90-99.9%). The lower AA observed for plasticized PVC-MAAC seems to be particularly noticeable with PC bags; this is likely related to the chemical composition of the plasticizer. The viability of L929 cells in the presence of MAAC was ≥90%.

Conclusions: This study suggests the MAAC could help in preventing current safety risks associated with blood products contaminated with low levels of bacteria. The MAAC antiviral properties are currently under evaluation.

Abstract ID :

208

A Retrospective Audit of Group O-Negative Red Blood Cell Transfusion Appropriateness and O-Negative Utilization in Women Age 45-49

Type of abstract : Clinical

Abstract Topics : Utilization

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Abstract Summary :

Introduction:

Group O Rh(D)-negative (O-negative) blood is a limited resource with disproportionately greater demand for use relative to the Canadian O-negative donor base. In 2016, the National Advisory Committee on Blood and Blood Products (NAC) published best practice recommendations on appropriate O-negative red blood cell (RBC) utilization. Mandatory indications include O-negative females age ≤45, all O-negative persons with known anti-D alloantibodies, emergencies in females age ≤45 of unknown blood type, and intrauterine transfusions. Locally, age < 50 is our cut-off for females of childbearing potential. We completed a quality assurance audit of O-negative RBC transfusion to assess adherence with best practice recommendations and impact of our local policy for females of childbearing potential.

Methods:

A retrospective manual chart review was conducted on all units of O-negative RBC transfused to inpatients at the 2 largest hospitals in Saskatoon, SK during January-December 2018. Data including patient age, sex, blood group, and pre-transfusion hemoglobin were collected and analyzed. Transfusions initiated prior to arrival and incomplete charts were excluded.

Results:

Data analysis included 328 charts and 723 units of O-negative RBC. Appropriate usage comprised of 63 units (8.7%) for mandatory indications, and 345 units (47.7%) for generally acceptable indications including 321 units (44.4%) to O-negative patients in non-massive transfusions, 8 units (1.1%) to infants where group-specific blood was unavailable, and 16 units (2.2%) to non-O negative patients requiring phenotypically matched/antigen-negative units. In addition, 23 units (3.2%) were transfused to O-negative donor stem cell transplant recipients, 32 units (4.4%) to very low birthweight preterm infants or infants with hemolytic disease of the newborn, and 4 units (0.6%) to non-O-negative patients with chronic transfusion needs. Conversely, 83 units (11.5%) were transfused to non-O negative patients for units approaching expiry and 119 units (16.5%) as emergency transfusions to males and females > 45 years. Only 2 units (0.3%) were transfused to females age 45-49. Usage indications were not clearly documented for 54 units (7.5%).

Conclusions:

Our data shows that 64.6% of O-negative RBC were administered appropriately for mandatory, highly recommended, or generally acceptable indications. Minimal O-negative RBC transfused to females 45-49 years justifies our current practice. Local policies should be re-evaluated to optimize O-negative RBC utilization in the setting of emergency uncrossmatched RBC transfusion and reduce numbers of short-dated units.

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Enhancing Ig Utilization Management in British Columbia through Patient Centered Care and Evidence Based Analysis

Type of abstract : Clinical

Abstract Topics : Utilization

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Abstract Summary :

Introduction/Objective

The British Columbia Provincial Blood Coordinating Office (PBCO) plays a key role in provincial blood and blood product utilization management. In collaboration with provincial stakeholders PBCO facilitates the advancement of transfusion medicine practices through unique initiatives that support the effective and appropriate use of blood and blood products across the province.

Since 2000 PBCO has focused its efforts on strategies to manage appropriate utilization of Intravenous Immune Globulin (IVIg).

In 2007 PBCO developed the Central Transfusion Registry IVIg Request Module (RM) as an online application to support the Provincial Rheumatology Screening panel in reviewing and screening of IVIg requests.

The RM was developed as an electronic replica of the paper based IVIg Screening Request form capturing detailed request information (condition, dose, and ordering physician). Linking the RM information to the actual disposition data contained in the Central Transfusion Registry provides a comprehensive understanding of IVIg utilization across the province.

Design and Methods

In 2018 an opportunity arose to create the Blood Product Request Portal (BPRP) as a replacement of the RM.

In collaboration with provincial stakeholders including technologists, utilization management coordinators, physicians and Provincial Screening Panel members, PBCO recognized the current application's limitations and collectively identified the following enhancements that were incorporated into BPRP:

- ability to manage both SCIg and IVIg requests
- capability to accommodate titrated dosing regimes
- viewing access across Health Authorities
- redesigned and redeveloped IVIg and SCIg dose calculators
- capacity to capture outcome information
- improve look and feel and increase intuitiveness and ease of use

Results

The new application was named the Blood Product Request Portal (BPRP) to reflect the expanded capability to accommodate both IVIg and SCIg. The term Portal signifies access to a variety of information in a manner that supports patient centered care and evidence based analysis.

Building this complex application relied on developing a cohesive team and strong collaborative relationship between the clinical, technical, analytical and IT development teams.

Conclusions

The BPRP is a valuable tool to ensure appropriate Ig utilization in support of a patient centered system of care in British Columbia.

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- PBCO staff
- Provincial stakeholders including technologists, utilization management coordinators, physicians and Provincial Screening Panel members