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Bloody Good News

Newfoundland and Labrador Provincial Blood Coordinating Program

Special Interest Articles:

- Prothrombin Complex Concentrates
- Fetomaternal Hemorrhage
- Overnight Transfusions and Risk

Individual Highlights:

The Skinny on Lean – Efficiencies in Health Care

Quality improvement strategies have been used by many organizations since the early twentieth century to improve processes and reduce waste. Several approaches have made their mark such as Six Sigma, Lean Thinking and the Theory of Constraints.

The cost of health care in Canada, as well as worldwide, continues to escalate and preventable errors still occur. Many health care facilities throughout Europe, the US and Canada employ lean management principles throughout the system in efforts to reduce waste and prevent errors.

The Toyota Production System (TPS) model of lean manufacturing is being embraced by many healthcare facilities in an effort to curtail waste and increase capacity.

There are seven types of waste (muda in Japanese) identified in the TPS model: **T**ransportation, **I**nventory, **M**otion, **W**aiting, **O**verproduction, **O**verprocessing and **D**efects/Rework. (acronym **TIMWOOD**). Lean production changes how people work. By using spaghetti diagrams to track work flow and creating work cells dedicated to specific functions, efficiencies can be attained by identifying items such as travel time between areas of the laboratory. To effect change, all staff should be included in the assessment process. This reduces stress among laboratory staff and assists in the workflow analysis. Eastern Regional Health Authority in NL has embarked upon Lean education for members of the Laboratory sector under the guidance of Dr. Stephen Raab. For more information: www.shmula.com/toyota-style-management

Winston Churchill said, "*There is nothing wrong with change, if it is in the right direction.*"

Prothrombin Complex Concentrates

Prothrombin Complex Concentrates (PCC) are recommended for the rapid correction of prothrombin complex levels in situations such as major bleeding or emergency surgery. In addition to the availability of octaplex®, a second product Beriplex® will now be distributed. These products are human derived and have undergone solvent detergent treatment and/or nanofiltration. Both products contain Vitamin K dependent factors – II, VII,IX and X as well as anticoagulant factors Protein C, Protein S and Heparin. Beriplex® also contains Antithrombin. It is recommended that these products not be mixed.

These products are contraindicated for patients with a history of Heparin Induced Thrombocytopenia. Octaplex® has an infusion rate of 2-3 mL/ min and Beriplex® has an infusion rate of 8mL/min. The single dose for octaplex® should not exceed 3000 IU. The single dose for Beriplex® should not exceed 5000 IU.

Canadian Blood Services will begin distributing a second PCC product 'Beriplex®' in August 2011. A Customer Letter (#2011-20) has been forwarded to all hospital customers. This letter contains a comparison table with product information for octaplex® and Beriplex®.

The National Advisory Committee on Blood and Blood Products has developed guidelines for the use of both octaplex® and Beriplex®. These guidelines are available on the NAC website at: http://www.nacblood.ca/resources/guidelines/nac-pcc-recommendations-june-2011-final.pdf

The Provincial Blood Coordinating Program is revising the existing Guidelines for the use of octaplex® to reflect the use of Beriplex®. These guidelines are expected to be available in early September.

Fetomaternal Hemorrhage

Dr. Morris Blajchman

Dr. Blajchman graduated as a physician in 1964 from McGill University in Montreal, Canada. His post-graduate training in internal medicine occurred at the University of Pennsylvania and in heamatology at the Royal Postgraduate Medical School in London, England with the renowned heamatologist Sir John Dacie. Dr. Blajchman is an Emeritus Professor in both Pathology and Medicine at McMaster University in Hamilton, Ontario and he is Medical Director of the Southern Ontario Centres of Canadian Blood Services. He is a prolific author and researcher, and has received several prestigious awards such as the Emily Cooley Award (AABB), the Canadian Blood Services Lifetime Achievement Award in 2004 and has presented the Royal College of Pathologists Foundation Lecture.

Success is to be measured not so much by the position that one has reached in life as by the obstacles that one has overcome while trying to succeed.

Booker T. Washington Educator, (1856-1915)

A Fetomaternal Hemorrhage (FMH) can cause Rh immunization when the fetal red cells have a paternal antigen, which is foreign to the mother. Rh immunization in pregnancy most often occurs during delivery when fetal blood enters the maternal circulation. Fetal red cells can also enter the mother's circulation during invasive fetal diagnostic procedures (amniocentesis, spontaneous or induced abortion, chorionic villous sampling, and cordocentesis), rupture of an ectopic pregnancy or blunt trauma to the abdomen. A FMH may also occur in normal pregnancies.

Cord blood from neonates born to Rh-negative mothers should be tested for the D-antigen including a test for weak D. If the neonate is D-negative, no further RhIg therapy is required. If the neonate is D-positive, the mother should have a post-partum blood sample collected and screened for FMH in order to determine the additional dose of RhIg required.

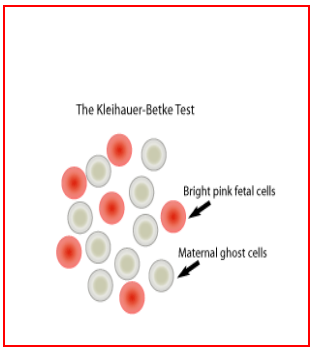
Several screening methods are available to detect FMHs that may require additional RhIg. The rosette test is done only on a post-partum specimen from an Rh-negative woman who has delivered an Rh-positive neonate. The rosette test detects the fetal Rh-positive red blood cells in maternal Rh-negative blood. The rosette test will not detect red blood cells with a weak D phenotype causing false negative results. If the mother is weak D, this test is not appropriate. If the rosette test is negative, no further laboratory testing is required and the dose administered should be according to the hospital policy for administration of Rh immune globulin. If the rosette test is positive, a quantitative test such as the Kliehauer-Betke (acid/elution) or flow cytometry must be preformed to calculate the required dose of RhIg.

The Kliehauer-Betke test is based on the principle that red cells containing fetal hemoglobin are more resistant to acid treatment than cells containing adult hemoglobin. A thin smear of the patient's sample, along with positive and negative controls are treated with acid, rinsed, counter stained and read microscopically. Fetal cells will appear a dark reddish pink while the adult cells will appear as pale "ghosts" cells. The number of fetal red blood cells is reported as a percentage of blood cells counted. The greater the FMH, the larger the dose of RhIg to be administered to the mother. The physician will determine the number of vials to administer.

Flow cytometry is another method used to detect FMH. It uses monoclonal antibody directed against Hemoglobin F and is more sensitive in detecting small amounts of fetal blood. This method is more expensive, but compared to the Kliehauer-Betke test, flow cytometry offers superior sensitivity, specificity and reproducibility and eliminates the subjectivity of the Kliehauer-Betke test.

Transfusion Medicine laboratories play a vital role in the diagnosis and treatment of FMH. CSA and CSTM standards state that Rh Immune Globulin (RhIg) should be administered to all Rh-negative women at 28 weeks gestation and 72 hours after delivery, abortion, amniocentesis, or any other procedure that may cause fetomaternal hemorrhage. The exceptions would be if the fetus or neonate were confirmed Rh-negative or there is evidence of immunization to the D antigen not related to Rh immune globulin therapy.

It is essential that pregnant females at risk of Rh immunization receive sufficient and timely RhIg treatment in order to prevent fetal and neonate morbidity and mortality.



Do Overnight Transfusions Expose Patients to Unnecessary Risk?

According to the 2010 Serious Hazards of Transfusion (SHOT) Report the risk of error occurring with the transfusion of a blood component is estimated at 1:16,500, with inappropriate and unnecessary transfusions becoming an increasing concern.

The decision to transfuse should be based on clinical signs and symptoms, laboratory results and patient safety, therefore if a blood component transfusion can be delayed until morning without detrimental effects is it necessary to transfuse overnight ?

In 2005 the SHOT report confirmed that blood administration that took place outside of core hours is less safe than during core hours.

Thirty seven percent of incorrect blood components transfused were due to clinical error that took place between 2000 hours and 0800 hours.

Routine transfusions administered overnight are not always in the patient's best interest. Increased risk and potential error of overnight transfusions can be associated with delayed or missed transfusion reaction detection. Lower nursing and medical staff levels at night could compromise adequate patient monitoring and longer response times to a possible adverse reaction. Inappropriate overnight transfusions can compromise patient care; disrupting the patients sleep and the sleep of other patients in the same room. Most importantly regardless of the time there is always potential risk associated with all transfusions.

There will always be clinical situations where blood transfusions are required to be administered overnight. In an attempt to identify potential risk and reduce error associated with overnight transfusions, possible recommendations include:
a) examining institutional and facility transfusion practices; especially in specialties that perform transfusions outside core hours (Surgery, Oncology, Hematology),
b) considering the risks and benefits of transfusing overnight,
c) transfusing only when sufficient staff are available to monitor for and respond to possible adverse events,
d) avoiding routine transfusions overnight unless clinically significant and
e) establishing policies that promote best practice protocols for safe overnight transfusions.

Based on the above information inappropriate and unnecessary transfusions may result in more harm than benefit and can be considered a possible preventable transfusion error.

ABO Discrepancy

The majority of samples received in the laboratory for ABO grouping are straight forward, you perform the ABO grouping, the results are fine, and send the results to the physician within the appropriate turn around time. However, there are some samples that can be more time consuming, this is when working in the Transfusion Medicine laboratory becomes interesting and challenging for technologists.

An ABO discrepancy exists when the reactions of the forward group (red cells) do not match the reactions of the reverse grouping (serum), which can be caused by unexpected negative or unexpected positive reactions in either the forward or reverse grouping.

Technical errors in performing the test or various clinical conditions or diseases can contribute to an ABO discrepancy. Some of the categories of an ABO discrepancy include weak/missing red cell or serum reactivity, extra red cell or serum reactivity, mixed field red cell reactivity.

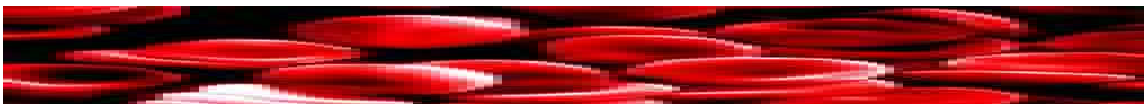
The first step in resolving the ABO discrepancy is to repeat the test using the same sample, to eliminate the possibility of technical error while performing the test. If there is any doubt as to the identity or suitability of the sample, a new sample must be collected. Performing a patient history check for information such as the patient's diagnosis, medication the patient is receiving, if the patient had any procedures such as a bone marrow transplant, previous transfusions or even the age of the patient may help resolve the discrepancy.

A discrepancy must be investigated and resolved with appropriate documentation before reporting the ABO group. If a transfusion is necessary before the discrepancy is resolved, Group O red blood cells and AB plasma must be issued.

Each facility must develop and maintain operating procedures for each activity that affects the safety of recipients.

Upcoming Events:

- NL Annual Transfusion Symposium – Date to be announced in Sept.
- AABB Annual Meeting and Exposition, San Diego, CA October 22-25, 2011
- CSTM – Halifax, NS May 24- 27, 2012



Infusion Pumps and Transfusion Safety

There are many types of infusion pumps available for use in Canada.

For information on infusion pumps visit Health Canada: http://www.hc-sc.gc.ca/home-accueil/search-recherche/a-z-eng.php#I

All infusion devices are approved for use by Health Canada. It is important to recognize and understand that many products are subject to advisories, warnings and recalls after approval is granted.

In Transfusion Medicine, intravenous infusion pumps are used to control and monitor the volume of blood a patient receives over a specified time.

Various infusion pumps are available on the market and depending on the model and make of the infusion pump blood components and blood products can be propelled through the tubing at a constant rate via peristaltic action, vacuum or pressure. The rate of infusion should be specified either by a physician or the specific facility's standard operating procedure for transfusion.

Most institutional protocols suggest a rate of 1-2 ml/minute during the first fifteen minutes of a transfusion increasing to a rate of 2-6 ml/minute for the remainder of the transfusion.

Although infusion pumps offer many benefits as compared to manual administration in the clinical setting they are not without risk. Some of the commonly reported problems include pump defects, mechanical and electrical malfunction and user errors.

According to the CSA standards, all infusion devices for transfusion shall be approved by Health Canada. The manufacturer of the infusion pump should be consulted to confirm the pump is approved and safe for the infusion of blood components. The infusion pump shall be used only by appropriately trained staff and as recommended by the manufacturer.

Validation and regular maintenance of the infusion pumps and reporting of any adverse event associated with the use of infusion pumps are recommended to enhance and/or sustain quality and safety in the transfusion process.

Case Study #13

A 64 year old immunocompromised female with a hematology/bone marrow transplant diagnosis was transfused Group A, apheresed platelets. It was unknown whether the patient had a prior pregnancy, but she had been transfused within the past three months.

Prior to receiving the platelets the patient was premedicated. The patient received benadryl 50 mg IV, hydrocortisone 100 mg IV and 650 mg of acetaminophen PO.

The patient's vital signs pre-transfusion were stable. Ten minutes into the platelet transfusion the patient complained of shortness of breath, neck and back pain and back spasms. The patient's post vital signs remained stable, with the patient's respirations increasing from 20 to 24. The transfusion was stopped, antihistamines were administered, an EKG was performed on the patient and a product culture.

The product culture was negative and the patient's EKG was normal. The patient's breathing returned to normal after receiving intervention. The patient was later transfused with Group B platelets with no complications reported.

1. Classify type of reaction

2. What was the relationship of the adverse event to the transfusion?

3. What was the severity of the reaction?

4. What was the outcome of the adverse event?

Case Study #12 Interpretation

1. *Type of Reaction – Febrile Non-Hemolytic & Minor Allergic*
2. *Relationship of adverse event to transfusion – Probable*
3. *Severity of the reaction –Grade 1(Non-Severe)*
4. *Outcome –Minor*

Each newsletter will contain an interesting case study for you to review. The type of adverse event and answers to the questions will be provided in the next edition of the newsletter.

Newfoundland and Labrador Provincial Blood Coordinating Program

P.O.Box 8700
St. John's, NL
A1B 4J6

PHONE:
(709) 729-5246
(709) 729-6573
(709) 729-5250

FAX:
(709) 729-4009

E-MAIL:
marilyncollins@gov.nl.ca
sharonlinehan@gov.nl.ca
cheryljacobs@gov.nl.ca

We're on the Web!

See us at:

http://www.health.gov.nl.ca/health/bloodservices/index.html