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Bloody Good News

Newfoundland and Labrador Provincial Blood Coordinating Program

Special Interest Articles:

- Fibrin Sealants
- Patient Blood Management: A patient oriented approach to best-practice in Transfusion Medicine

Program Update – Change of Staff

Many of you have met our team at the Provincial Blood Coordinating Program and realize how importantly good communication and collaboration is when your program is small in size.

Sharon Linehan has been a part of our team for the past three years and is now taking on a new challenge as she returns to the Laboratory at the Health Science Centre in St. John's. Sharon has been very devoted and passionate about her work and has successfully brought to fruition several major projects in such a short time. We wish Sharon the best in her new role and thank her immensely for her contribution to the Blood Program. You will be missed.

Lindsay Parsons has assumed the role of Utilization Coordinator and is currently going through training under Sharon's guidance. Lindsay is very excited to begin this path forward and we anticipate great projects will unfold in the future. Lindsay comes to us from one of the regional hospital sites. She will bring the rural perspective to many of the program initiatives.

Lindsay will work closely with Daphne and I throughout the next few years as we continue to develop guidelines, set new objectives and provide continued support to the Transfusion Safety Officers throughout the Regional Health Authorities.

Please be sure to welcome Lindsay at our next meeting.

Transfusion medicine … differences in High and Low–income Countries.

Worldwide, approximately 92 million blood donations are collected, with almost half collected from high-income countries. In 159 countries 8,000 blood centers report collecting blood donations, with an average of 30,000 annual donations from high-income countries and 3,700 annual donations from low-income countries. Thirty percent of blood donations worldwide are given by women and emerge from three types of donors, those being voluntary unpaid, family/replacement and paid. Sixty-two countries have reported collecting greater than 99% of their blood from voluntary unpaid donors.

Twenty-six countries are still reporting collecting blood donations from paid donors, with voluntary unpaid donors having the lowest risk of carrying bloodborne infections. The World Health Organization would like all countries to receive blood supplies from voluntary unpaid donors by the year 2020.

Recommendations from the World Health Organization states all blood donations should be screened for infection before use and countries should be compelled to test for HIV, hepatitis B, hepatitis C and syphilis. Thirty-nine low-income countries were unable to test for one or more of these infections, with the most common reason being an inconsistent supply of proper test kits used in screening for these infections. In low-income countries, there is a 0.06% median prevalence rate of HIV infections and 0.5% in middle–income countries compared to 0.001% in high-income countries. Exposing patients to unnecessary transfusions poses risks of acquiring infections and/or adverse reactions; this also reduces the amount of blood that is available for patients in need.

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Individual Highlights:

The History of Blood Transfusion

Dr. Richard Lower performed the first successful blood transfusion in London in 1666. Lower, an expert anatomist, studied cardiac anatomy and physiology. In particular, he described circulatory movement and provided physiologic rationale for the differences in the color of venous and arterial blood.

Lower described the first transfusion as an 'experiment' in which he withdrew a volume of blood from a dog significant enough to induce hemorrhagic shock, then transfused the animal with blood from another larger dog. This was the foundation of transfusion practice.

Jean Baptists Denis in June 1667 and Dr. Lower in November of the same year, performed the first transfusions in human patients. Lower used blood from a lamb, which he transfused into a human recipient to 'improve the patient's dementia. 'He placed a quill in the vein of the human and the artery of the sheep and connected both using a silver pipe. The sheep's higher arterial pressure pumped the blood directly into the recipient's venous system.

Lower's patient tolerated the procedure well; Denis' patient died of what may have been a hemolytic reaction. Denis was criminally charged for the death (and acquitted). As a result of the death, blood transfusion was prohibited in Europe for the following 150 years.

Fibrin Sealants

Fibrin Sealants have become widely used internationally as operative sealants. Fibrin Sealants are human plasma derived products used as hemostatic agents, as skin graft or tissue flap adherents, or as tissue sealants for wound closure. The first commercially available product was launched in Europe in 1982.

Early Fibrin Sealants contained bovine thrombin with human plasma. The efficacy of the products did not exceed the risks associated with use. Therefore, clinical usage was halted while product development proceeded.

In addition, due to the perceived risk of infectious disease transmission from the human plasma used to produce fibrinogen during early introduction of the products, licensure and production of Fibrin Sealant products was initially stymied in North America

Fibrin Sealants currently produced and in use today are composed of human fibrinogen, human thrombin and sometimes, human factor XIII and bovine aprotinin. These agents mimic the final steps of fibrin clot formation.

As part of the production process, Fibrin Sealant components undergo procedures to reduce or eliminate a range of transmissible viruses. Manufacturing includes processes such as vapor heat, solvent detergent or pasteurization, thereby producing purified virus-inactivated products.

Fibrin sealants can be used in a range of surgical services, including cardiovascular, thoracic, vascular, abdominal, and neurosurgery. The composition of the commercially prepared products in use is essentially the same, however, indication, application, and storage differ. For example, some products are applied using a duplo-jet delivery device whereby the sealer protein (fibrinogen and aprotinin) and the thrombin solutions (thrombin and calcium chloride) mix and activate at the intended site of action when ejected from the device. Some are applied using a 'drop' method; others are heat treated before usage.

Storage of Fibrin Sealants varies amongst products, from a range of frozen at ≤-20ºC to a temperature of 25ºC.

The Fibrinogen concentration of fibrin sealants is approximately 15 to 25 times greater than physiologic concentration; clot formation forms much more rapidly and reliably than normal. Therefore, intravascular injection of Fibrin Sealants must be avoided to prevent formation of thromboembolic lesions.

Physicians, when determining amount of product to use, must consider maximal swell volume following administration. Some products may swell up to 20 percent, which may cause tissue congestion or compression, therefore compromising blood supply to the operative area.

Health Care professionals must be aware that the proteins in Fibrin Sealants may become denatured by contact with substances such as alcohol, iodine, or heavy metal ions, and therefore not react appropriately. For this reason, Fibrin Sealants should not be applied to surgical sites cleansed with any of these pre-operative skin cleansers.

As with all human protein - containing products, patient consent must be obtained before Fibrin Sealants are administered.

Fibrin Sealants are not meant to replace sound surgical technique or judgment. When used as an adjunct to the same, they have been shown to have a positive effect on surgical outcomes, specifically, time to hemostasis, reduced blood loss, and reduced incidence of dehiscence and anastomotic leak They are a safe and effective method to manage hemostasis and tissue sealing during surgery.

You can teach a student a lesson for a day;

but if you can teach him to learn by creating curiosity,

he will continue the learning process as long as he lives.

~Clay P. Bedford

1903-1991

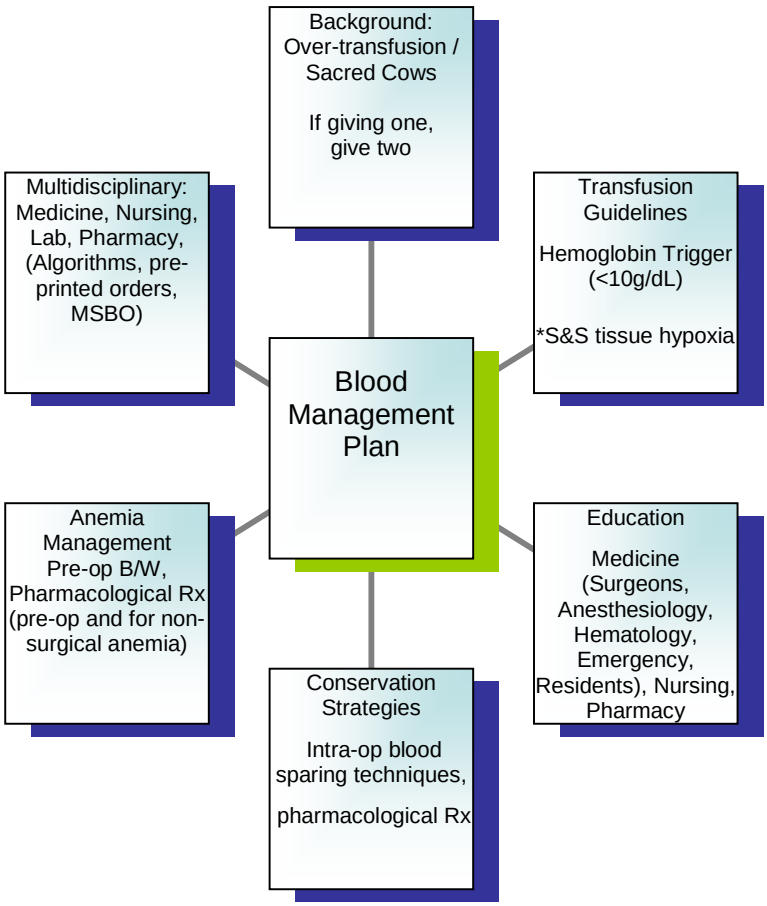
Patient Blood Management: A patient oriented approach to best-practice in Transfusion Medicine

The safety of the blood supply has increased significantly with respect to blood borne infectious disease transmission. However, adverse transfusion related events such as transfusion related acute lung injury (TRALI), transfusion related circulatory overload (TACO), and transfusion related immunomodulation (TRIM) remain major risks associated with allogenic blood transfusion.

In 2010, the World Health Authority (WHO) published an Assembly Resolution on availability, safety and quality of blood products. In the Resolution, the WHO urged the implementation of Patient Blood Management Plans (PBM) to ensure blood product quality and safety meets internationally recognized standards.

A Patient Blood Management Plan (PBM) is an evidence-based, multidisciplinary approach to optimizing the care of patients who might need transfusion. PBM interventions are implemented in the preparation of medical and surgical patients and focus on treatment of the individual patient, which is comprised of transfusion therapy and pharmacotherapy.

PBM interventions are implemented early in the preparation of medical and surgical patients.
Nursing and medical education, exploration of alternatives to transfusion, and the development of evidence-based best practice guidelines for clinicians are the basis of Blood Management Plans. Blood management is based on the following: (1) optimization of erythrocyte volume, (2) reduction of blood loss, and (3) increasing individual tolerance of anemia and transfusion triggers.
PBM therefore, encompasses all aspects of patient assessment and clinical management surrounding the decision to transfuse.
PBM requires an interdisciplinary approach between the specialties of Transfusion Medicine, Hematology, Anesthesiology, Internal Medicine, Surgery, and Pharmacology. Strategies start with early anemia detection and treatment to stabilize the patient's hemoglobin concentration, blood sparing surgical techniques to minimize blood loss early bleeding control by point of care



coagulation monitoring and use of hemostatic interventions to optimize hemostasis, and re-transfusion of salvaged blood during surgery in order to reduce the risk of allogenic transfusion, and transfusion associated adverse events.

Early anemia detection and treatment promotes optimization of erythrocyte volume. Transfusion requirements are greater in anemic patients who undergo surgery without pre-op anemia treatment, such as erythropoiesis stimulating agents, or administration of iron supplementation, by either oral or intravenous routes.

Blood sparing techniques such as minimally invasive surgical techniques, use of smaller lumen extracorporeal or intravascular devices, fibrin sealants, intraoperative tourniquets, or administration of anti-fibrinolytics reduce intra-operative blood loss.

Increasing individual tolerance to anemia, particularly in patients who are not at risk for cardiac events, and identification of appropriate transfusion triggers are strategies implemented to reduce the frequency of ad-hoc transfusion.

Patient Blood Management (cont'd)

Current practice indicates a tendency to transfuse if hemoglobin level is below 80g/L, and to transfuse two units of blood per treatment, although this is not clinically supported. The decision to transfuse should be patient specific, based on assessment of clinical symptoms and with careful consideration of co-morbidities.

Patient blood management plans have successfully been shown to reduce health care facility costs associated with transfusion, reduce transfusion related risk to patients, and ensure that blood supply is available for those in greatest need.

Transfusion medicine differences in High and Low–income Countries (cont'd)

Unnecessary transfusions should be avoided where possible. The World Health Organization recommends that all countries have a haemovigilance system in place to monitor the whole blood transfusion process to ensure timely access to safe blood. They also recommend that countries have transfusion committees that implement national guidelines and policies on the utilization of blood. One hundred and six countries have reported having guidelines for ensuring appropriate usage of blood. Fifty-seven countries have a haemovigilance system in place, 78% in high-income countries and 13% in low-income countries. Fifty percent of low-income countries have reported having a transfusion committee in place, with 53% in middle-income countries compared to 76% in high-income countries.

The World Health Organization has a plan of action that will help ensure the availability of safe blood by essentially addressing some important areas: establishment of a nationally organized blood transfusion service; collection of blood donations from voluntary unpaid donors in low risk populations; performing screening for bloodborne infections and compatibility testing; proper utilization of blood to reduce patients exposed to unnecessary transfusions; and implementing haemovigilance systems to cover the transfusion process. The World Health Organization aim is to provide access to safe blood and blood products and support countries in establishing a national blood service.

Case Study #18

An 82 year old female patient admitted under the services of Internal Medicine, with a diagnosis of congestive heart failure, was transfused one unit of packed red blood cells. The patient's blood group was O positive. This was the first transfusion for the patient. The obstetrical history was not known. No pre-transfusion medications were administered. Pre-op vital signs were unremarkable.

The unit of blood infused over three hours and twenty - five minutes. Following completion, the patient complained of shortness of breath; respiratory rate increased from 22 to 28 breaths per minute; oxygen saturation by pulse oximetry was 88%.

The following lab investigations were completed: Pre and post sample ABO/Rh screen, antibody screen, cross-match, direct antiglobulin test, and product culture. The product culture was negative.

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 reaction?

Case Study #17 Interpretation

1. *Type of Reaction – febrile non-hemolytic*
2. *Relationship of adverse event to transfusion – Probable*
3. *Severity of the reaction –Grade 1 (Non-Severe)*
4. *Outcome –Minor (No Sequelae)*

FNH is characterized by a temperature increase of ≥1ºC, and greater than 38ºC, usually accompanied by chills, rigors, and feeling cold. Other symptoms such as headache, nausea and vomiting may be present.

The answers to the case study will be printed in the next edition of Bloody Good News.

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