

## Special Interest Articles:

- Emergency Blood Management
- TACO or TRALI

## Individual Highlights:

- Emergency Management and Blood Bank Inventories 1
- TACO or TRALI – A Clinical Enigma 2
- Choosing Wisely Campaign 3
- CBS Blood Shortage – Public Appeal 4
- Case Study # 21 4
- Case Study # 20 Interpretation 4



## Newfoundland and Labrador Provincial Blood Coordinating Program

# Emergency Management and Blood Bank Inventories: *Is your Blood Bank Ready?*

### Blood Bank Mandate

Blood bank technologists prepare each day for the unknown. Advanced Training in the areas of emergency management and protocol efficiency, lead technologists to face some of the most challenging circumstances in their careers.

All areas of medical services depend greatly upon the support and knowledge of their transfusion medicine team. Blood banks work together with a team consisting of: specialist, emergency response personnel, ethical and medical advisory, and Canadian Blood Services to establish and review the urgent and emerging threats to the blood supply in Newfoundland and Labrador.

Blood Bank inventory minimum levels are essential to each region of the province. The ability to provide services in response to traumatic events can present challenges. For this reason, it is essential that each facility be prepared for such an event.

### How do Blood Banks prepare?

**Emergency Training:** All blood bank technologists should receive extensive training in the area of emergency protocols related to transfusion medicine. Highlight contingency planning measures and

accessible blood bank inventory.

**Address** the importance of a good communication networks during **Massive Transfusion** or **Traumatic Events**.

**Educate** technologists regarding the significance of organizational skills required during such events.

**Appoint** an individual to address communication and consistency amongst all parties involved.

**Run** mock simulation exercises to allow staff the opportunity to learn and carry out necessary measures within a controlled environment.

**Inventory Management:** Inspect inventory levels daily to ensure adequate reserve. Establish minimum and maximum levels within each facility to promote good inventory management practice.

Use group specific Red Blood Cells whenever possible to decrease usage of O negative inventory.

Facilities should make use of the inter-hospital transfer system to redistribute any unused blood products. Allow for a specified time limit from date of expiry.

Work collaboratively with other facilities within each

region to successfully use all products currently in inventory.

**Teamwork** – As a Laboratory Technologist, little time spent on the job will quickly identify the need for teamwork.

Henry Ford quoted- “*Coming together is the beginning. Keeping together is progress. Working together is success.*”

Many factors can play a role in emergency management and blood bank inventories. However, strategic planning, emergency training and teamwork efforts can help reduce or eliminate the stress out of the situation.

Technologists need to focus their skill-sets and energy into providing lifesaving efforts. When the need for blood arises, such as an unplanned event, blood banks can and should be prepared.

Spend time preparing to ensure everyone is aware of emergency management measures and ask the question- Is your blood bank ready?





Dr. R. Charles Drew (1904–1950), an African-American researcher, pioneered the method of storing blood plasma for transfusion that has led us to today's modern technology of plasma separation from red blood cells. He organized the first large-scale blood bank in the U.S. He also managed two of the largest blood banks during World War II.

Graduating in 1933 from McGill University in Montreal, Drew earned both Doctor of Medicine and Master of Surgery degrees. Drew completed his internship and residency at the Royal Victoria Hospital and the Montreal General Hospital.

Drew returned to Howard University in 1941 where he served as a professor as head of surgery. Drew also became the chief surgeon at Freedmen's Hospital and later became the first African-American examiner for the American Board of Surgery.

In 1944, Drew was honored with the 1943 Spingarn Medal for "the highest and noblest achievement" by an African-American, from National Association for the Advancement of Colored People. This award was given in recognition of Drew's blood plasma collection and distribution efforts.

## TRALI or TACO? A Clinical Enigma

Transfusion Associated Acute Lung Injury – TRALI, a complex clinical condition, can present a conundrum for clinicians with respect to differential diagnosis of the adverse transfusion reaction event. Physiological symptoms are quite similar to transfusion associated circulatory overload, or TACO; recipients present with acute respiratory distress, hypoxemia, and bilateral infiltrates on chest x-ray.

Hypoxemia associated with TRALI is further defined as partial pressure of oxygen to fraction of inspired oxygen ratio of less than or equal to 300 millimeters of mercury (expressed as  $PaO_2/FiO_2 \leq 300$ mmHG), and oxygen saturation less than 90 percent on room air.

Several criteria differentiate TRALI from TACO. Symptoms suggestive of TRALI usually present within two to six hours of transfusion; there is an *absence* of pre-existing cardiac dysfunction; ejection fraction is 45 percent or greater; and positive pressure ventilation is effective in ameliorating the respiratory distress and associated clinical findings. Fever, elevated leukocyte counts, and hypotension are often present. Also of significance, diuretic therapy is *ineffective* in treatment of TRALI.

The pathogenesis of TACO is similar to other causes of elevated hydrostatic pressure resulting in congestive heart failure.

Symptoms of TACO present during or within six hours of completion of transfusion. Unlike TRALI, with TACO

there is often evidence of pre-existing heart failure (with elevated central venous pressure), ejection fraction is 45 percent or less, and respiratory distress is minimally if at all improved by positive pressure ventilation. Other clinical evidence of circulatory overload may be present, particularly jugular venous distension and S3 on cardiac auscultation. Diuretic therapy is usually effective.

A laboratory test to detect a recipient's level of brain natriuretic peptide (BNP) can be used to achieve a differential diagnosis; TACO or TRALI. BNP is secreted by the ventricles as a result of stretching of the cardiomyocytes in response to fluid overload. Elevated BNP level can *imply* circulation overload, transfusion-precipitated, whereas a normal BNP can support a diagnosis of TRALI.

There are other symptoms and clinical findings that the presence or absence thereof directs the clinician in diagnosis of the particular type of adverse transfusion reaction event. Likewise, treatment is determined by the clinical diagnosis.

In the absence of pre-existing cardiac compromise, clinicians may have difficulty determining the cause of new onset shortness of breath in a patient without co-morbidities. TRALI is more likely to develop in post-operative or critically ill patients than any other subgroup. The onset of the acute lung injury has been attributed to neutrophil mediated damage to the pulmonary microvasculature. A 'two-hit' theory has been proposed in that a primary stimulus such as surgery,

tissue injury or infection 'primes' the neutrophils. A second 'hit' or activation follows when blood components with neutrophil-specific or anti-human leukocyte antigen (HLA) antibodies or bioactive lipids are transfused. As a result of the 'two hits' or neutrophil priming and activation, the pulmonary endothelium is damaged, allowing migration of neutrophils to the pulmonary alveoli, which produces an inflammatory exudate in the alveoli, which in turn presents clinically as an acute lung injury, transfusion-precipitated. It is well recognized in transfusion practice that TRALI is a permeability type edema; TACO is hydrostatic edema.

Interestingly, the requirement for priming *and* activation—two hits—explains why a blood component containing HLA antibodies (for example) may precipitate TRALI in a surgical patient following transfusion, but not in an otherwise healthy anemic patient.

The Canadian Consensus conference adopted a definition of TRALI in 2004. Despite the differential diagnostic criteria, there is no single criterion to distinguish TRALI from TACO. It is imperative that clinicians obtain a thorough presentation of the current clinical course, including presenting signs and possible precipitating factors in order to attribute the cause of the acute respiratory distress and implement the appropriate interventions. At present, TRALI is considered under-recognized and under-reported.



## 'Choosing Wisely' Campaign – What does it mean for transfusion?

The American Board of Internal Medicine (ABIM) Foundation launched a campaign titled **Choosing Wisely** to help providers and patients engage in conversation about the overuse of tests and procedures and supports efforts to help patients make smart and effective care choices. Since its launch, many health care provider organizations, including Consumer Reports (US based) have joined the campaign to help improve the quality and safety of health care in America.

As part of **Choosing Wisely**, participating organizations created top five lists of "Five Things Physicians and Patients Should Question" that provide specific, evidence-based recommendations to improve decision-making. The lists are for information purposes and not intended as a substitute for medical professional consultation. Interestingly, the statements begin with "Don't" are intended to prompt rethinking of some of the long-standing practices.

The AABB and the American Society of Hematology are two of the more than 70 organizations participating in the Campaign.

By now, you are saying "What does this have to do with Transfusion?"

Transfusion of blood components is a common hospital procedure. The American Society of Hematology, the Society for Hospital Medicine and the Critical Care Societies Collaborative and more recently by the AABB, has addressed overuse of blood

components.

The AABB has developed the following five statements for physicians and patients to consider when prescribing blood with each statement supported by brief explanations.

**Statement #1: Don't transfuse more units of blood than absolutely necessary.**

*A restrictive threshold (7.0 - 8.0g/dL) should be used for the majority of stable hospitalized patients, excluding patients with pre-existing cardiovascular disease. Single unit transfusions should be the standard for non-bleeding hospitalized patients. Additional units should only be prescribed after re-assessment of the patient and their hemoglobin value.*

**Statement #2: Don't transfuse RBCs for iron deficiency without hemodynamic instability.**

*Pre-operative patients with iron deficiency and patients with chronic iron deficiency without hemodynamic instability (even with low hemoglobin levels) should be given oral and/or intravenous iron.*

**Statement #3: Don't routinely use blood products to reverse warfarin.**

*Patients requiring reversal of warfarin can often be reversed with vitamin K alone. Prothrombin complex concentrates or plasma should only be used for patients with serious bleeding or requiring emergency surgery.*

**Statement #4: Don't perform serial blood counts on clinically stable**

**patients.**

*Transfusion of red blood cells or platelets should be based on the first laboratory value of the day unless the patient is bleeding or otherwise unstable. Multiple blood draws to recheck whether a patient's parameter has fallen below the transfusion threshold (or unnecessary blood draws for other laboratory tests) can lead to excessive phlebotomy and unnecessary transfusions resulting in iatrogenic anaemia.*

**Statement #5: Don't transfuse O Negative blood except to O Negative patients and in emergencies for women of childbearing potential with unknown blood group.**

*O negative blood units are in chronic short supply due in part to overutilization for patients who are not O negative. O Negative red blood cells should be restricted to 1) O negative patients; or 2) women of childbearing potential with unknown blood group who require emergency transfusion before blood group testing can be performed.*

The Society for Hospital Medicine asks physicians and patients to question statement #3: **Avoid transfusions of red blood cells for arbitrary hemoglobin or hematocrit thresholds and in the absence of symptom of active coronary disease, heart failure or stroke.**

This statement supports the AABB recommendation for adherence to a more restrictive transfusion strategy (of 7 to 8 g/dL hemoglobin) in hospitalized, stable patients. This is further supported by a

National Institutes of Health Consensus Conference finding that states that *no single criterion should be used as an indication for red cell component therapy, but instead multiple factors related to the patient's clinical status and oxygen delivery should be considered.*

The American Society of Hematology (ASH) supported the third AABB statement regarding warfarin reversal with similar wording. ASH also further states: **Don't administer plasma or prothrombin complex concentrates for non-emergency reversal of vitamin K antagonists (i.e. outside of the setting of major bleeding, intracranial hemorrhage or anticipated emergent surgery).**

*In non-emergent situations, elevations in the international normalized ratio are best addressed by holding the vitamin K antagonist and/or by administering vitamin K.*

Two years after the launch of the groundbreaking Choosing Wisely campaign, its influence has formally gone international. The Canadian Medical Association and nine of the country's physician specialty societies have launched **Choosing Wisely Canada**, with the unveiling of those societies' own lists of five tests, treatments or procedures for which there is strong evidence of overuse, waste, or even possible harm to patients.

**For more information see:** <http://www.choosingwisely.org/octor-patient-lists/american-association-of-blood-banks/>



## **CBS Recent Blood Shortage – How did we respond?**

On September 29, 2014, the Provincial Blood Coordinating Program convened a meeting of the Transfusion Safety Officers to discuss the current hospital inventory, as CBS inventory report for that day indicated provincial O Negative red blood cells levels were below the three days on hand level (Green Phase). There was also concern that the national level was severely diminished and further depletion of the national inventory could negatively impact hospital demands.

On September 30, 2014, Canadian Blood Services

national inventory of red blood cells reached critically low levels. A national appeal was communicated to the general public requesting eligible donors, particularly type O and A donors, to immediately donate blood. At the same time, CBS requested each province and territory provide CBS with a daily report of inventory on hand at each hospital within its jurisdiction.

All hospitals within Newfoundland and Labrador immediately responded to providing both

crossmatched and uncrossmatched inventory counts to CBS and the Provincial Blood Coordinating Program from September 30 to October 10.

Blood donors within the province responded quickly to CBS request. Donor collections in the permanent sites in St. John's and Corner Brook, and mobile collections in various communities exceeded normal collection targets by an average of 156%. This demonstrates once again, that Newfoundlanders and Labradorians are immediate responders to support the

blood supply when there is an appeal. There were no negative impacts related to transfusion requests for NL patients.

Approximately 4% of eligible Canadians donate blood. While Canadians have stepped up to the plate to respond to this most recent shortage, it is important to book an appointment to donate blood or platelets regularly. Red blood cells have a shelf life of 42 days. There is always a need for blood to treat patients with many types of illness.

**To Donate visit:**  
[www.blood.ca](http://www.blood.ca) or call 1-888-2Donate (1-888-236-6283)

## **Case Study #21**

An 84 year-old patient with end-stage chronic renal failure was transfused one unit of packed red blood cells and one adult platelet apheresis dose. The platelet apheresis was transfused first with 337 mLs transfused over 50 minutes. The red cell unit transfusion began two hours later. Within one hour, the recipient's blood pressure, heart rate and respiratory rate were increased. Oxygen saturation was '70's' on room air. The transfusion was stopped. 200mLs of red cells were

transfused, for a total transfusion volume of 537 mLs.

Pre transfusion  
 B/P 110/48  
 Heart Rate 60  
 Respiratory Rate 20

Post Transfusion  
 B/P 140/70  
 Heart Rate 90  
 Respiratory Rate 24

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?*

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For reference documents including policies visit:  
<http://www.health.gov.nl.ca/health/bloodservices/index.html>



## **Case Study #20 Interpretation**

1. *Type of Reaction – Delayed Hemolytic*
2. *Relationship of adverse event to transfusion – Probable*
3. *Severity of the reaction – Grade 2*
4. *Outcome –. Minor or no sequelae*

*Inventories can be managed, but people must be led.*

*H. Ross Perot, businessman Born: June 27, 1930 (age 84), Texarkana, Texas*

