



Transfusion Reactions Review

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Disclosure

I have no disclosures

Transfusion Knowledge Questions Pre

Objectives

1. Transfusion Process Overview
2. Identification of an adverse reaction to a transfusion
3. Responsibility of the Transfusionist
4. Responsibility of the Transfusion Medicine Lab
5. Discuss the reporting to external agencies that Transfusion Medicine is obligated to complete
6. Case Studies

Transfusion Process

- Patient signs or symptoms and/or laboratory test results indicating a role for blood component or plasma derivative transfusion; prescriber orders transfusion
- Informed Consent to Transfusion is obtained and documented in the patient's medical record as per the organization's policy.
- The transfusionist administers the blood component or plasma derivative as per the organization's policy
- The transfusionist advises the patient to report any unusual symptoms or feeling differently during or within 4 hours after the transfusion (for dyspnea symptoms, up to 24 hours after)
- Ideally, the transfusion goes smoothly and there are no adverse signs and symptoms reported.
- That is not always the case....

What blood components/ plasma derivatives cause a transfusion Reaction?

- Potentially any blood component or plasma derivative that a patient receives
- During the prescriber-patient informed consent discussion, the risks as well as benefits and any alternatives of the specific blood component or plasma derivative to be transfused should be explained
- Blood Components
 - Red blood cells, Platelets, Plasma, Cryoprecipitate
- Plasma Derivatives such as Albumin (25%/5%), Intravenous Immune Globulin (IVIg), Rh(D) Immunoglobulin (RhIG), Prothrombin Complex Concentrate (PCC), Fibrinogen Concentrate (FC)



What is an adverse reaction to a transfusion?

Definition:

“An undesirable and unintended response to the administration of blood, blood components or blood products (plasma derivatives) that is considered to definitely, probably or possibly related to these components/products”

Reference: Transfusion Transmitted Injuries Surveillance System (TTISS) user manual: <https://ttiss.mcmaster.ca/wp-content/uploads/2016/10/Current-V3-CTAERF-Manual-E-2008-04-15.pdf>

How are adverse signs and symptoms identified?

- An adverse reaction during or after a transfusion can be identified through:
 - Vitals change: temperature, blood pressure, respiration or pulse
 - Observations of patients being symptomatic by the nurse: chills/rigors, hives, itchiness, sweating
 - Observations and reporting of the patient or their family members being symptomatic
 - In the outpatient setting: patient reports back adverse symptoms to the outpatient clinic or possible presents in an ED reporting adverse symptoms after the transfusion
- Knowing the patient's transfusion history is important to being able to potential identify a potential adverse reaction to a transfusion

What is the transfusionist looking for?

Key signs and symptoms include:

- Fever
- Urticaria
- Dyspnea
- Hypotension

Additional Signs and symptoms include:

- Airway or facial edema
- Anxiety
- Coughing
- Diffuse bleeding/oozing
- Hemoglobinuria
- Itching
- Nausea vomiting
- Pain (back, headache, IV site)
- Rash
- Shaking chills/rigors
- Subjective chills
- Tachycardia
- Urine colour – dark/red
- Wheezing

What is the transfusionist looking for?

- Acute - symptoms appear within 24 hours of the transfusion
 - These signs and symptoms could occur during or within 4 hours following the completion of the transfusion
 - Exception: Dyspnea reactions may occur during or up to 24 hours following the completion of a transfusion
- Delayed - symptoms appear greater than 24 hours of the transfusion

Reference: BEBA Handbook version 3 page 60

<https://transfusionontario.org/wp-content/uploads/2021/08/Bloody-Easy-Version-3-Interactive-English-Final-Page-Spreads.pdf>

Poll Question

Do you know where to find your organization's transfusion reaction policy and procedure?

- a) Yes
- b) No
- c) I don't know if we have a policy

What should the transfusionist do if a transfusion reaction is suspected?

1. Stop the transfusion and maintain IV access
 2. Notify the MRP
 3. Check vital signs and confirm patient identification on their armband matches that is on the transfusion label/tag
 4. Provide patient care as ordered by the prescriber and per organization's policy/procedure
 5. Report every reaction to TML. If clarification is need call TML
- Refer to your organization's transfusion reaction policy/procedure for specific requirements e.g., form to be completed, blood or urine testing

Reference: BEBA Handbook version 3 page 61

<https://transfusionontario.org/wp-content/uploads/2021/08/Bloody-Easy-Version-3-Interactive-English-Final-Page-Spreads.pdf>

When the transfusionist calls TML

- TML technologist may request the implicated unit with the blood tubing to be sent to TML
- When returning implicated unit to TML, ensure all blood tubing roller clamps are securely closed (to avoid leakage); use sterile cap to cap off blood tubing (to avoid contamination), and place in biohazard bag
- Depending on the patient's sign and symptoms, the TML technologist can confirm required blood or urine testing and follow up to be ordered per your organization's policy/procedure
- TML technologist may contact the TML Medical Director (designated physician or pathologist) for follow up with the MRP

Transfusion Reaction Job Aid

Example 1 – page job aid/reference adapted from Blood Easy Blood Administration Handbook version 2, page 46

An updated version is available, pages 124 to 130, Ontario Regional Blood Coordinating Network. Bloody easy blood administration. version 3. Toronto: Ontario Regional Blood Coordinating Network; 2020 [cited 2021 Nov 15]. 146p. Available from: <https://transfusionontario.org/en/category/bloody-easy-e-tools-publications/bloody-easy-blood-administration>

Transfusion Reaction Chart

| Signs & Symptoms | Usual Timing | Possible Etiology | Call Transfusion Medicine | Suggested Treatment and Actions | |
|---|---|---|---|---|---|
| Fever (at least 38°C and an increase of 1°C) | 38°C to 38.9°C but no other symptoms | During or up to 4 hours post | Febrile non-hemolytic transfusion reaction | No testing required | <ul style="list-style-type: none"> Antipyretic With physician approval transfusion may be resumed cautiously if product is still viable |
| And / or Shaking Chills/ Rigors | Less than 39°C but with other symptoms Or 39°C or more | Usually within first 15 minutes but may be later | Febrile non-hemolytic Transfusion reaction Bacterial contamination Acute hemolytic transfusion reaction | Transfusion Reaction Investigation Patient blood cultures Urinalysis if hemolysis suspected (red urine) CBC, electrolytes, creatinine, bilirubin, LDH, aPTT, INR, fibrinogen, haptoglobin, plasma Hgb | Do not restart transfusion <ul style="list-style-type: none"> Antipyretic Consider Meperidine (Demerol) for significant rigors If bacterial contamination suspected, antibiotics should be started immediately Monitor for hypotension, renal failure and DIC Return blood product to Transfusion Laboratory For additional assistance call Transfusion Lab |
| Urticaria (hives) | Less than 2/3 body but no other symptoms | During or up to 4 hours post infusion | Minor Allergic | No Testing Required | <ul style="list-style-type: none"> Antihistamine With physician approval transfusion may be resumed cautiously if product still viable |
| Itching | 2/3 body or more but no other symptoms | Usually early in transfusion | Minor Allergic (extensive) | No testing required | Do not restart transfusion <ul style="list-style-type: none"> Antihistamine May require steroid |
| Or Rash | Accompanied by other symptoms (eg dyspnea, hypotension) | Usually early in transfusion | Anaphylactoid reaction/ Anaphylaxis | Transfusion Reaction Investigation Chest X-ray (if dyspnea) Blood Gases (if dyspnea) Haptoglobin Anti-IgA testing | Do not restart transfusion <ul style="list-style-type: none"> Epinephrine Washed / plasma depleted blood products pending investigation Return blood product to Transfusion Laboratory For additional assistance call Transfusion Lab |
| Dyspnea | Typically with hypertension | Within several hours of transfusion | Transfusion associated circulatory overload (TACO) | Transfusion Reaction Investigation Chest X-ray Blood Gases if sepsis suspected: Patient blood culture(s) | Do not restart transfusion <ul style="list-style-type: none"> Diuretics, oxygen, High Fowler's position Return blood product to Transfusion Laboratory Slow transfusion rate with diuretics for future transfusions |
| Or Decrease in SpO2% to 90% or less (and change of at least 5% from baseline) | Typically with Hypotension | Within 6 hours of transfusion Usually within first 15 minutes but may be later | Transfusion related acute lung injury (TRALI) Bacterial Contamination Acute Hemolytic transfusion reaction Anaphylaxis | if hemolysis suspected: CBC, electrolytes, creatinine, bilirubin, LDV/H, aPTT, INR, fibrinogen, haptoglobin, plasma Hgb if anaphylaxis suspected: Haptoglobin, Anti-IgA | Do not restart transfusion <ul style="list-style-type: none"> Assess chest X-ray for bilateral lung infiltrates If TRALI, may require vasopressors and respiratory support If bacterial contamination suspected, antibiotics should be started immediately Monitor for hypotension, renal failure and DIC If anaphylaxis suspected, epinephrine Return blood product to Transfusion Laboratory For additional assistance call Transfusion Lab |

TML investigation of suspected reactions

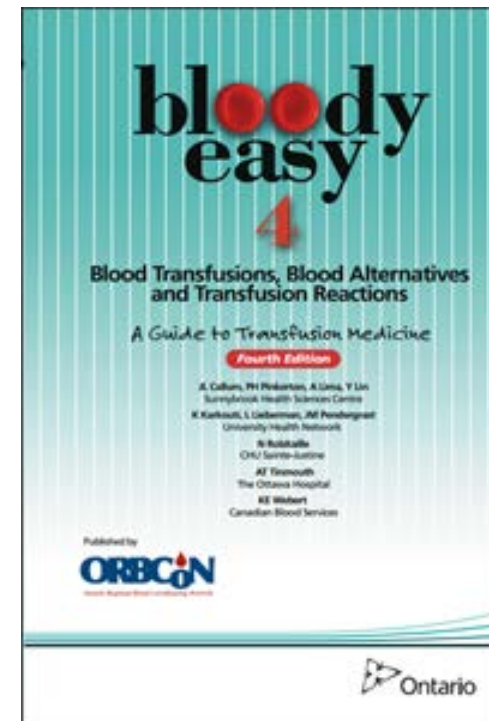
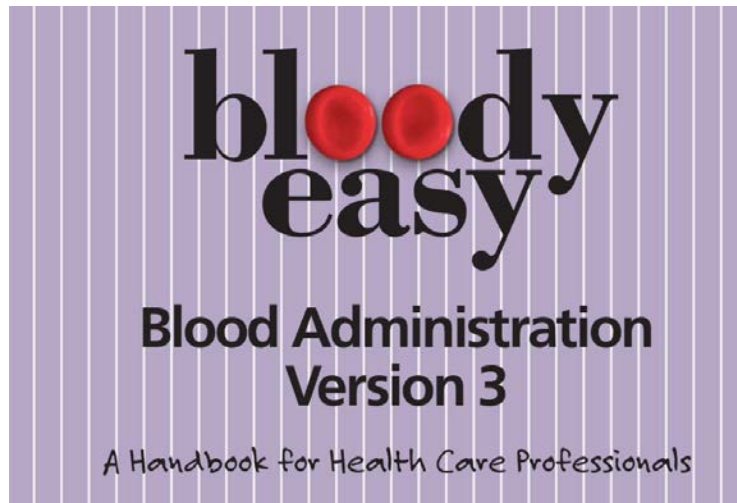
- Each TML designates a technologist or a Transfusion Safety Officer to review all reported reactions (review patient's health record, documentation and lab test results; follow up with the clinical area staff)
- The technologist or TSO compiles a report for TML Medical Director (designated physician or pathologist) review and classification (determining the type) of the reaction
- For serious transfusion reactions, it is important to ensure appropriate patient care and reporting as per organization's policy/procedure.
- The TSO role may include post transfusion reaction educational follow up with the clinical area.

Transfusion Reaction

- Common, not life threatening transfusion reaction include:
 - Non-hemolytic Febrile Transfusion Reaction, minor allergic
- Serious and life threatening, requiring some prevention/treatment measures transfusion reactions include
 - Developing red blood cells alloantibodies, Transfusion Associated Circulatory Overload (TACO), Transfusion Related Acute Lung Injury (TRALI), acute hemolytic reaction, anaphylaxis, bacterial sepsis
 - Reference: https://transfusionontario.org/wp-content/uploads/2021/10/BEBA_Informed_Consent_Information_for_patient_dialogue.pdf
- For more on transfusion reaction classifications refer to Ontario Regional Blood Coordinating Network (ORBCoN)

Bloody Easy Handbooks

- Go to www.transfusionontario.org and click on the resources tab to find the online PDF copies of the resources



TML Mandatory Reporting

- Canadian Transfusion Medicine and Accreditation Canada Diagnostics standards require that TML reports serious or acute or unusual transfusion reactions to blood components as well as serious or acute or clusters of minor transfusion reactions to plasma derivatives
- Reporting all transfusion reactions promotes patient safety by learning from these adverse events and taking action to minimize recurrence
- TML must report ASAP possible serious or acute or unusual reactions related to transfusion of blood component to Canadian Blood Services. Depending on the specific details, Canadian Blood Services follows up the co-components (the additional blood components manufactured from whole blood collection) to quarantine them or advise the receiving TML of a possible serious transfusion reaction
- Canada Vigilance Program, Health Canada has legislated mandatory TML transfusion reaction reporting

TML Mandatory Reporting

- Canada Vigilance Program, Health Canada has legislated mandatory TML transfusion reaction reporting requirements (include errors or accidents) for both blood components and plasma derivatives
- TML must report serious or acute or clusters of minor reactions to plasma derivatives to the Manufacturer of the plasma derivative
- Ontario Transfusion Transmitted Injuries Surveillance System (ON-TTSS) encourages reporting of all transfusion reactions. ON-TTSS collects data on transfusion reactions occurring in Ontario hospitals and reports to the National TTSS

Transfusionist Role in TML Mandatory Reporting

- Document all details of the reaction and its course, including patient's response to treatment provided
- If unsure, call a friend, TML for help or direction to the correct resources
- Report **all** possible transfusion reactions to TML, even if the MRP feels it has resolved or was not related to the transfusion. The TML Medical Director (designated physician or pathologist) is the transfusion expert and has access to additional resources
- Each organization's TML has a transfusion reaction policy/procedure. Refer to the policy/procedure to determine the appropriate patient care and testing requirements

Case 1

- An elderly patient from the outpatient oncology clinic.
- They are receiving one unit of red blood cells for a hemoglobin of 70 g/L and are symptomatic with shortness of breath
- The patient had previously received a unit of red blood cells with no adverse reactions reported
- After about 35 minutes and 100 mL of the RBC transfusion the patient reports hot flashes.

| Vitals | Pre transfusion | Reaction |
|---------------------|-----------------|------------|
| Temperature | 37.1 | 38.1 |
| Pulse | 74 | 84 |
| Blood Pressure | 120/66 | 124/70 |
| Respirations | 20 /minute | 20/ minute |
| O ₂ Sats | 98% | 97% |

Poll Question

The transfusionist stopped the transfusion and maintained IV access with 0.9% sodium chloride and checked the patient's vital signs. What is the transfusionist next action?

- a) Call TML and request another RBC to transfuse
- b) Discard the RBC unit in biohazardous waste
- c) Confirm patient identification on their armband matches that on the transfusion label/tag and call the prescriber
- d) Administer oxygen 40% face mask

Poll Question

The vital signs are repeated 20 minutes after the reaction: Temperature 38.1°C; pulse 80; BP 122/68; respirations 20/minute; O₂ saturation 98%. What patient care is the prescriber likely to order?

- a) Administer antipyretic, acetaminophen 650 mg PO
- b) 30 minutes post acetaminophen, check vital signs to assess if the temperature has gone down if so, re-start the transfusion at 50 mL/hr for 30 minutes, assess the patient q 15 minutes x2 ; if patient stable continue transfusion with close monitoring
- c) Discontinue RBC transfusion, return RBC unit and tubing to TML for clerical check and culture; patient blood tests: group and screen, direct antiglobulin test (DAT), blood cultures, hemolysis workup; urinalysis (first void post reaction) and administer antibiotic (cefurozime 1 g IV) stat
- d) Both a) and b)

Case 1 - Discussion

- Based on our organization's policy: increase in fever $> 1^{\circ}$ C and other reported symptoms
 - Transfusion reaction investigation sample was collected, the rest of the unit with tubing was returned was returned to Transfusion Medicine, which was then subsequently sent for blood cultures; blood cultures were also collected on the patient and the patient was given an antipyretic
- All the test results were negative and the adverse event was determined to be a febrile non-hemolytic transfusion reaction with a probable relationship to the transfusion
- The patient would be advised upon discharge to report any adverse signs and symptoms and go to the ED if there is any changes in symptoms or they spike a fever

Case 2

- Pediatric oncology patient undergoing chemotherapy protocol
- Per patient treatment protocol, as an outpatient receiving 1 dose of irradiated platelets for a platelet count of $12 \times 10^9 /L$
- This is the first time that the patient had a platelet dose transfused
- At the completion of the transfusion the patient reported itchiness and there was a visible rash on their waist travelling down their leg

| Vitals | Pre transfusion | Reaction |
|---------------------|-----------------|------------|
| Temperature | 37.1 | 36.9 |
| Pulse | 96 | 100 |
| Blood Pressure | 110/66 | 108/64 |
| Respirations | 22 /minute | 22/ minute |
| O ₂ Sats | 97% | 97% |

Poll Question

What patient care is the prescriber likely to order?

- a) Administer antihistamine (Diphenhydramine 25 mg PO) and monitor patient q 15 minutes x 4
- b) Administer epinephrine 1:1000 0.3 mL IM, patient to be admitted
- c) Patient blood tests: group and screen, direct antiglobulin test (DAT), haptoglobin, Anti-IgA testing
- d) Both b) and c)

Case 2 Discussion

- Due to the nature of the reaction our procedure does not require any specific testing to be done. The patient was given an antihistamine and assessed again by their prescriber before they were able to go home
- The reaction was determined to be an allergic reaction probably due to the platelets transfusion
- The MRP decided that prior any future platelet transfusion the patient requires antihistamine premedication. The MRP should have a conversation with the patient and their family on the nature of the reaction and signs and symptoms to look for once the patient has gone home.
- The transfusionist would remind the patient and family each time the patient came for a transfusion what signs and symptoms to report and why the patient was being premedicated
- There is limited information regarding the practice of premedication. The concern is that premedication could possible mask any future adverse reactions that could be missed

Case 3

- Elderly female, 1 day post-op after hip replacement surgery. Overnight she is given 500 mL 0.9% sodium chloride IV x 2 for low BP; this morning she is feeling “faint” and unable to ambulate per her physiotherapy routine
- Her prescriber orders a CBC and her Hemoglobin comes back as 69 g/L so they order 1 unit of RBCs to be given over 1.5 hours
- After about 45 minutes and 150 mL of the RBC transfusion the patient reports “trouble breathing”

| Vitals | Pre transfusion | Reaction |
|---------------------|-----------------|------------|
| Temperature | 36.8 | 37.2 |
| Pulse | 88 | 108 |
| Blood Pressure | 110/60 | 148/80 |
| Respirations | 20/ minute | 26/ minute |
| O ₂ Sats | 96% | 86% |

Poll Question

What patient care is the prescriber likely to order?

- a) Oxygen via nasal prongs up to 3lpm, titrate to maintain O₂ saturation ≥ 90%
- b) Administer diuretic (Furosemide 40 mg IV); monitor urine output
- c) Chest x-ray
- d) a), b) and c)

Case 3 Discussion

- TACO Risk Factors
 - Age
 - History of heart failure/ myocardial infarction
 - Left ventricular dysfunction
 - Renal dysfunction
 - Positive fluid balance
- TACO Prevention Strategies
 - Transfuse only 1 unit at a time
 - Transfuse slowly over longer time period (maximum 4 hours)
 - Pre-transfusion administration of diuretic as ordered by the prescriber
- All risks should be reviewed with the prescriber to determine which prevention strategy should be used

Case 4

- Middle age patient with neurological condition requiring IVIG in the outpatient clinic
- The patient was starting on IVIG at 2 g/Kg over two days as an induction dose and had not received IVIG before, patient received 87.5 grams of IVIG for two days.
- 5-10 post induction dose the patient reported back to the clinic that they had red, warm itchy skin on their shoulders, arms, back and legs. Later the patient also developed welts on their upper thigh

Case 4

- Transfusion Medicine was contacted regarding the reported reaction post IVIG infusion
- The MRP assessed the patient, noted that in terms of the IVIG they did respond to the IVIG infusion in regards to their neurological condition however, the patient was referred to a Dermatologist prior to resuming IVIG to ensure it was safe to do so.
- The symptoms did resolved and the patient continued with IVIG at the maintenance dose of 1 g/kg every 4 weeks with no adverse events reported
- TM medical director reported the reaction as Other: severe and diffuse eczematous skin eruption

Case 4

- Not all events fall into a prescribed formula for reporting. The key message is continuous and inclusive communication with all key stakeholders so that everyone is on the same page and nothing is missed
- The transfusionist were in constant communication with the patient, TML and prescriber ensured that the patient was appropriately cared for and treated.
- How our organization's policy/procedure is set up this scenario doesn't necessary fit our prescribe procedure however the transfusionist knew our policy enough to translate the process so that no steps were missed and all appropriate documentation was done
- We are currently looking at how we can better improve our Transfusion Reaction policy and procedure

Key Messages

1. Always follow your organization's policy and procedure blood components and plasma derivative transfusion reactions.
2. Always report all adverse signs and symptoms of a possible transfusion reaction (even if unsure of the relationship to transfusion, to ensure that no reactions are missed)
3. The transfusionist communication with MRP and TML is priority for patient safety.

References

1. Ontario Blood Coordinating Network: www.transfusionontario.org
2. Transfusion Transmitted Injuries Surveillance System: <https://ttiss.mcmaster.ca/>
3. Health Canada: <https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/adverse-reaction-reporting/mandatory-organization-reporting.html>

Questions



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Transfusion Knowledge Questions Post