NORTH YORK GENERAL
Making a World of Difference

Thinking Beyond

Blood Administration Basics
Red Blood Cells

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Disclosures

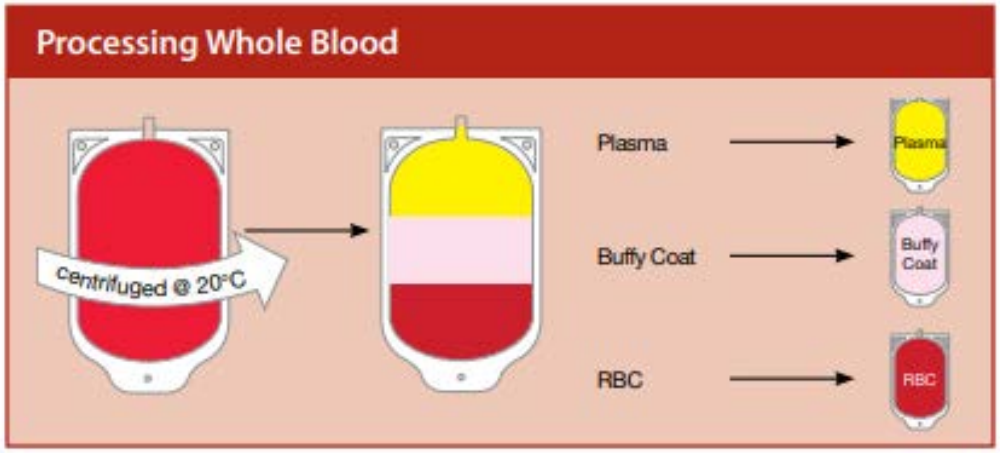
- No commercial product conflicts of interest to declare
- Member of The Transfusion Committee and Choosing Wisely Committee at NYGH

Objectives

- Learn About the ABO Blood Group Systems
- Understand the Clinical Indications for Red Cell Transfusions
- Examine the Informed Consent Process
- Study the Required Collection Standards from Regulating Bodies
- Explore 2 case studies.
- Learn the Need for Monitoring and Documenting a Blood Transfusion

Where Does the Blood Come From?

- Canadian Blood Services (CBS)
- Volunteer blood donor screening
- Whole Blood Collection
- Centrifuged/Spun in 3 layers

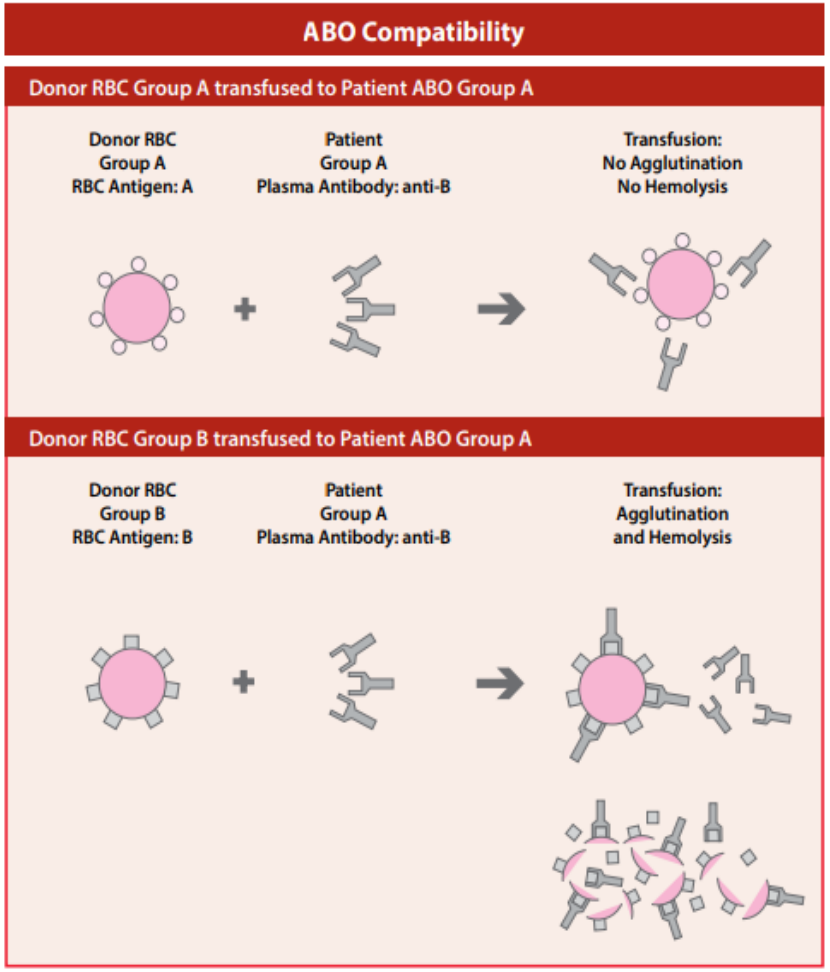


Blood Groups Systems

ABO Blood Group – Antigen(s)

- Antigen present, Antibody absent
- Antigen absent, Antibody present

ABO Blood Group System			
ABO Blood Group	Population Frequency	ABO antigen on red blood cell surface	ABO antibody in plasma
O	45%	None	anti-A and anti-B
A	40%	A	anti-B
B	11%	B	anti-A
AB	4%	AB	None



Blood Groups Systems – Cont'd

Rh (D) Group – Rhesus

- D present, blood group (+)
- D absent, blood group (-)

Rh(D) Blood Group System			
Rh(D) Blood Group	**Population Frequency**	**Rh(D) antigen on red blood cell surface**	**Rh(D) antibody in plasma**
Rh(D) Positive	85%	D	None
Rh(D) Negative	15%	None	None, unless exposed to Rh(D) antigen (transfusion or pregnancy), then may produce anti-D

For a compatible RBC transfusion, an Rh(D) negative patient should be transfused only Rh(D) negative RBC

Rh (D) negative in females:
- Development of Anti-D through exposure from fetus during pregnancy could cause Hemolytic disease of the Fetus and Newborn (HDFN); RhIG administration.
- Rh(D) Negative females <45 with childbearing potential should not be exposed to Rh (D) positive RBC to prevent development of Anti-D antibody

Why Red Blood Cells?

- Increase oxygen-carrying capacity of the blood
- Clinical decision to transfuse is made by the prescribing healthcare provider
- Nurses accountability for appropriateness
- Not on a single-basis to hemoglobin levels
- Clinical assessment must be considered

Choosing Wisely Guidelines: October 2020

- Don’t transfuse blood if other non-transfusion therapies or observation would be just as effective
- Don’t transfusion more than one red cell unit at a time when transfusion is required in stable, non-bleeding patients

Choosing Wisely Canada

Clinical Recommendations (For Non-Bleeding Patients)

Clinical Setting	Recommendation and Dose
Hb less than 60 g/L	Transfusion likely appropriate*. Transfuse 1 unit and re-check patient symptoms and Hb before giving second unit.
Hb less than 70 g/L	Consider transfusion. Transfuse 1 unit and recheck patient symptoms and Hb before giving second unit.
Hb less than 80 g/L	Consider transfusion in patients with pre-existing cardiovascular disease or evidence of impaired tissue oxygenation. Transfuse 1 unit and recheck patient symptoms and Hb before giving second unit.
Hb 80 to 90 g/L	Likely inappropriate unless evidence of impaired tissue oxygenation.
Hb greater than 90 g/L	Likely inappropriate. If transfusion is ordered clearly document indication in patient's chart and discuss reason with patient.

Lin, Y. & Thompson, T. (2019) Why give two when one will do? Toolkit for reducing unnecessary red blood cell transfusions in hospitals. *Choosing Wisely Canada.*

Case Study #1

A 60 year old male arrived to ED at 1800hrs with a hemoglobin of 65. His vitals were 123/75 HR 75 O2 98% on RA RR 16 and is not actively bleeding. The on call ED MD ordered 1 unit of Red blood cells to transfuse and sent in a consult to a specialist doctor. The group and screen has been completed. The specialist MD saw the patient around 1900hrs and ordered another 1 unit of red blood cells for the patient. The oncoming nurse was given report that 1 unit has already been given should she proceed to give the 2nd unit? What should the oncoming nurse do?

Informed Consent

- Hospital's policy and Procedures for informed consent
- Consent obtained by the prescribing healthcare provider
- Nurses are accountable to ensure the patient is fully informed and capable of giving consent (CNO Standards)
- Valid for the current course of treatment or hospital admission
- Documentation
- Criteria for Patient's capacity; Substitute Decision Maker

Informed Consent – Requirements

Transfusion Standards (IQMH, CSTM) **requires** prescribers to:

- ❑ Discuss which blood component/blood product is to be transfused
- ❑ Discuss reasons, benefits, and risks of the proposed transfusion
- ❑ Discuss alternative therapies
- ❑ Discuss the potential consequences of refusing treatment
- ❑ Opportunity for patient to ask questions

IQMH: Institute for Quality Management in Healthcare
CSTM: Canadian Society of Transfusion Medicine

The healthcare professional who administers blood must confirm informed consent has been obtained prior to beginning a transfusion.

Emergency situations – healthcare provider can allow transfusion without informed consent, but must be documented as soon as possible

Transfusion Order

- Must be prescribed by an authorized healthcare professional
- Must include the following information:

  - Patient's surname, first name and unique identification number
  - Date of transfusion
  - Blood component/blood product to be transfused
  - Number of units/dose
  - Rate or duration of infusion
  - Special requirements, if any
  - Medication orders related to transfusion
  - Use of blood warmer or rapid infuser (Except in areas with established protocols)
  - Sequence in which multiple components of products are to be transfused

Group and Screen Testing

- Determines patient's blood group: ABO and Rh(D) +/-
- Determine patient's antibody screen: Any significant antibody(ies)?
- Transfusion medicine uses the G&S to crossmatch RBC units for compatible for transfusion
- If the antibody screen is negative: G&S takes 45-60 minutes to complete from the time the sample was received
- If the antibody screen is positive: Depending on the antibod(ies) may take hours to days to locate and crossmatch
- Duration of a valid sample 96 hours or 4 days

Collection Standards

Early 2018, CSA Z902 requires 2 separate determinations of a patient's blood group:

- One determination must be from a current blood sample
- Second sample must be from
  a) Patient's previous record
  b) Testing of a separate sample collection
  c) Retesting of the same sample where positive patient identification technology was used.

Refer to your hospital's group and screen collection policy for the specific details

Collecting the Sample

- Identification of the patient is **mandatory**
- Patient **must** be wearing an identification armband
- Confirm the patient's surname, first name and unique identification number on the patient's armband and the sample label are identical (CSA, CSTM Standards)
- Include the patient in the identification process, if possible
- Any discrepancy must be resolved before collecting the sample
- Label the tube of blood **at the patient's bedside**
- Document that you collected the sample
- Do not sign for a sample collected by a co-worker

Preparing for Transfusion – Patient

- ✓ Patient must be wearing an identification band
- ✓ Informed Consent Completed
- ✓ Ask the patient if they've had a previous transfusion
  - If they have an antibody wallet card, notify Transfusion Medicine
  - Any transfusion reactions?
- ✓ Premedication : Antipyretics, antihistamines, diuretics, and steroids
  Timing: IV route: Just prior to transfusion
  PO Route: 30 minutes prior

Preparing for Transfusion – Patient (Cont'd)

✓ Assess patient's risk for TACO
(Transfusion Associated Circulatory Overload)

TACO and TRALI are not only historically underreported but are the two leading causes of transfusion-related fatalities and morbidity – Friedman et al (2021)

> TACO risk factors include:
Advanced age, History of heart failure, History of myocardial infarction, Left ventricular dysfunction, Renal dysfunction, Positive fluid balance

> Report significant risk factors to the prescriber.
> TACO Prevention Strategies:

1) Do not transfusion more than 1 unit at a time
2) Transfusion slowly over longer time period (Max 4 hours)
3) Administer **pre-transfusion** diuretic

Preparing for Transfusion – Equipment

- ✓ Ensure IV access
- ✓ Blood components/blood products **must not** come in contact with incompatible IV solutions or any IV medications
- ✓ Central venous access devices with multiple lumens (adults and pediatrics): medications or other IV fluids can be infused through other lumens without affecting the blood component/blood product.

Blood Component/ Blood Product	IV Access
RBC	
Adults: routine transfusion	20 to 22 gauge
Adults: rapid transfusion	14 to 18 gauge
Pediatrics	22 to 25 gauge
Other Blood Components/ Blood Products	Any size is adequate
All Blood Components/ Blood Products	Central venous access device

Case Study #2

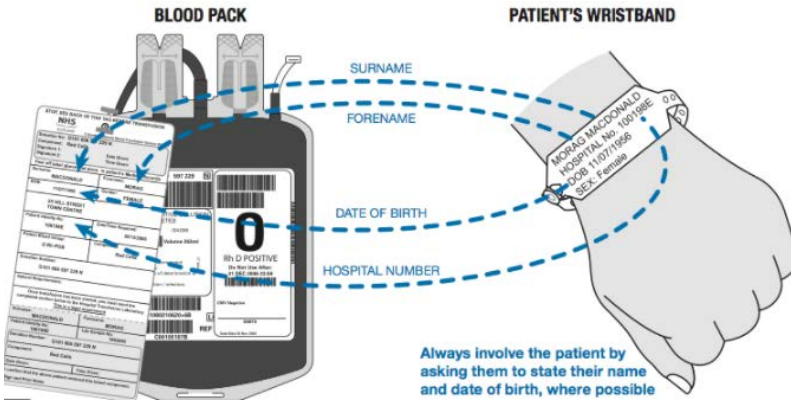
CS2. Your patient is currently receiving 1 unit of packed red blood cells that you started at 0930hrs. The unit of blood should be completed by 1200hrs. However, the patient has a scheduled IV antibiotic at 1000hrs. As the nurse, how will you proceed?

a. **Stop the blood transfusion and administer the IV antibiotic. Resume the blood transfusion once the antibiotic is completed**
b. **Hold the antibiotic until the blood transfusion is done**
c. **Administer the IV antibiotic as scheduled in a second IV access site**
d. **Administer the IV antibiotic via a secondary tubing in to the blood transfusion's y-site.**

Preparing for Transfusion – Equipment (Cont'd)

- ✓ Only 0.9% sodium chloride is compatible with RBC, platelets, plasma, and cryoprecipitate.
- ✓ Some IVIG brands are compatible with 5% dextrose in water, NOT 0.9% sodium chloride.
  Refer to the manufacturer's product monograph to confirm compatible IV fluid.
- ✓ RBC, platelets, plasma, and cryoprecipitate must be transfused through blood tubing with a 170 to 260 micron filter to capture any fibrin debris.
- ✓ Platelets should be transfused through **NEW/FRESH** blood tubing/filter (platelets will adhere to fibrin that has been captured in the filter)
- ✓ Blood tubing/filter must be changed after a maximum 4 hours of time

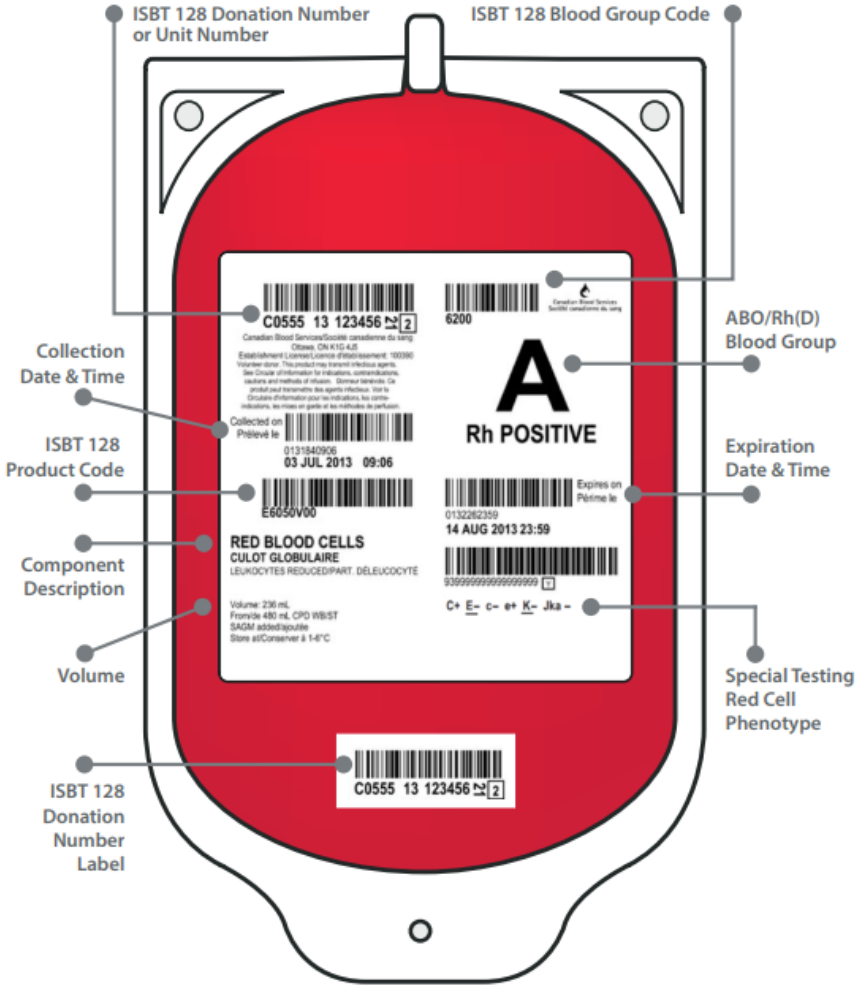
Checking Blood Components



- ✓ During the transfusion process, 2 regulated health care professionals must be available at all times
- ✓ Checking blood steps must be carried out in the physical presence of the patient
- ✓ Validate the blood received from Transfusion Medicine matches the transfusion order
- ✓ Patient must be wearing an identification armband
- ✓ Patient's surname, first name and unique identification number must match:
  > Patient's armband
  > Transfusion Order
  > Transfusion Label/Tag
- ✓ Any discrepancy must be resolved prior to transfusing
- ✓ The patient identification information must remain attached to the blood component for the duration of the transfusion

Checking Blood Components – Cont'd

- ✓ Confirm that the ABO and Rh(D) of the blood component issued from Transfusion Medicine are compatible with the patient's ABO and Rh(D) blood groups.
- ✓ Review that the unit number is an identical match.
- ✓ Inspect the blood component for clots, unusual color, and any leaking from the ports.
- ✓ Check expiry Time
- ✓ If any concerns are identified, contact Transfusion Medicine.

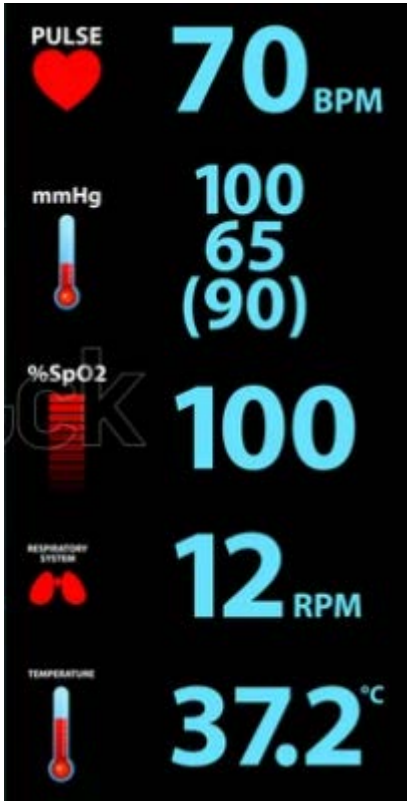


Rates of Infusion

- For the first 15 minutes, suggested rate is 50 mL/hour (Pediatrics: 1 mL/kg/hour to maximum of 50 mL/hour
- Assess patient and re-check vital signs 15 minutes after initiation
- If no signs/symptoms of transfusion reaction are identified, increase to rate of infusion ordered.
- If the blood tubing was primed with 0.9% sodium chloride, re-priming the tubing with the blood component is required to ensure the initial slow infusion rate is actually infusing the blood component (the volume of blood tubing is 12 to 15 mL)
- IVIG transfusion requires specific incremental infusion rates and patient monitoring to minimize reactions. (Refer to your hospital's policy and procedures as well as brand specific monograph.)

Monitoring

- Closely monitor/observe the patient during transfusion
- Vital signs to be completed:
  - Prior to the transfusion
  - Within 15 minutes after the start of transfusion
  - After the transfusion is completed.
- More frequent assessment is necessary for patients:
  - Unstable prior to beginning transfusion
  - With risk factors for TACO
  - With history of previous transfusion reactions
- All possible transfusion reactions must be reported to Transfusion Medicine



Documentation

The following information must be documented in the patient's health record (Transfusion Standards):

- ❑ Recipient's name and identification number
- ❑ Recipient and donor ABO/Rh
- ❑ Recipient compatibility status
- ❑ Unit number
- ❑ Type of blood component/blood product
- ❑ Date and time of issue
- ❑ Start and finish date and time of transfusion
- ❑ Identity of the transfusionist
- ❑ Volume Transfused
- ❑ Vital Signs
- ❑ Transfusion Reaction signs and symptoms, if any.

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Summary- Checklist

TRANSFUSION CHECKLIST

For references, refer to Bloody Easy Blood Administration Version 3, Summary: Transfusionist's Accountability: Transfusion Checklist (page 80-89).

Unequivocal (unmistakeable) identification of the patient is mandatory.

Patient must be wearing a patient identification armband. Patient identification information must remain attached to the blood for the duration of the transfusion.

PRE-TRANSFUSION

✓ **Informed Consent**
- Per policy/procedure, questions addressed
- Exception: emergent, life-threatening bleed

✓ **Transfusion Order**
- Indication supported: labs, signs, symptoms
- Complete, required information included

✓ **Group & Screen Testing**
- Required for compatible blood components
- ABO, Rh(D) blood groups, antibody screen (clinically significant antibodies)
- Label tube of blood at patient's bedside

✓ **Prepare the Patient**
- Educate: symptoms indicative of reaction
- Assess for transfusion history and TACO risk factors; follow up if indicated

✓ **Prepare the Equipment**
- Dedicated, patent IV (peripheral or central)
- Compatible IV fluid (only 0.9 % NaCl [sodium chloride] for blood components)
- Blood components – tubing/filter (170-260 microns); change after 4 units or 4 hours
- Platelets – always NEW/FRESH tubing/filter
- Prime tubing/filter: blood or compatible IV fluid
- IV setup to stop abruptly & maintain TKVO: 0.9% NaCl flush syringes + any fluid IV line or 0.9% NaCl IV line
- Infusion Devices: if Health Canada approved

✓ **Pick Up Blood from TML** (Transfusion Medicine Lab)
- Patient identification (surname, first name, unique identification number) and order

TRANSFUSION

✓ **Checking Blood Components/Blood Products**
- Blood received matches transfusion order
- At bedside, in physical presence of patient
- **1. Patient Identification:** surname, first name, unique identification number **identical** on armband, order, transfusion & chart label/tag
- **2. ABO, Rh(D) Blood Groups (only for Components): identical/compatible** on Group & screen test, CBS (Canadian Blood Services) label, transfusion & chart label/tag
- **3. Unit (Components) / Lot (Products) Number: identical on** CBS label (Components) / manufacturer label (Products), transfusion & chart label/tag
- **4. Visual Inspection & Expiry Components:** no clots, usual colour, ports intact, expires 4 hours after issue from TML **Products:** packaging/seal intact, colour as per manufacturer, vials/glass bottles – once entered/spiked, expires after 4 hours

✓ **Patient Assessment and Vital Signs** (for each unit)
- Close monitoring/observation required
- Minimum: within 30 minutes of starting, 15 minutes after starting, upon completion
- Temp, BP, pulse, respiratory rate, oxygen saturation; if TACO risk - chest auscultation

✓ **Infusion Rate** (for each unit)
- 50 mL/hour for first 15 minutes; can be deferred if acute bleeding
- Re-check after 15 minutes, if no indication of reaction then increase to rate as ordered

✓ **Possible Transfusion Reaction**
- If any adverse/unexpected/serious symptoms, **STOP** transfusion; refer to TTISS Reaction Chart

POST-TRANSFUSION

✓ **Completing the Transfusion**
- Comply with expiry time specific for blood component/blood product
  Outside the expiry time, discard remainder
- Component tubing: flush with 0.9 % NaCl
- Products given IV: flush (tubing/IV site) with compatible IV fluid
- Some hospitals require returning the empty blood bag to TML
  Otherwise dispose of blood tubing/bags in biohazardous waste
- Re-assess patient and re-check vital signs:
  - at end of transfusion
  - periodically post-transfusion (reactions may occur 4 hours post-transfusion; for dyspnea reactions up to 24 hours post transfusion)

✓ **Documentation**
- File completed chart label/tag for each component or product transfused on patient's health record (include start and stop times)
- Some hospitals require a completed "transfusion record" form returned to TML
- Record volume transfused, vital signs and patient assessments
- If a transfusion reaction is suspected: report to TML, document signs and symptoms, patient care

ORBCoN
Ontario Regional Blood Coordinating Network

June 2021, version 1.0 Ontario Regional Blood Coordinating Network

References

Berta, D (2021) Bloody easy: Blood administration 3. ORBCON. https://transfusionontario.org/wp-content/uploads/2021/08/Bloody-Easy-Version-3-Interactive-English-Final-Page-Spreads.pdf

CAN/CSA-Z902-15 (2015). Blood and blood components. CSA Group.

Canadian Society for Transfusion Medicine (2017) . CSTM standards for hospital transfusion services, version 4.

Choosing Wisely Canada (2020). Ten things physicians and patients Should question. *Canadian Society for Transfusion Medicine.* https://choosingwiselycanada.org/transfusion-medicine/

Friedman, M. T., Van den Akker, T. A., Grimes, M. Z. (2021). Transfusion-Associated circulatory overload and transfusion-related acute lung injury: A review of underreported entities with current updates. *American Journal of Clinical Pathology*, Volume 156, Issue 4, October 2021, Pages 529–539, https://doi.org/10.1093/ajcp/aqaa279

Institute for Quality Management in Healthcare (2019). IQMH medical laboratory accreditation requirement, version 8.

Ontario Regional Blood Coordinating Network (2021) Transfusion checklist. https://transfusionontario.org/wp-content/uploads/2020/12/Transfusion-Checklist-Poster-June-2021-ver-1.0-1.pdf

Lin, Y. & Thompson, T. (2019) Why give two when one will do? Toolkit for reducing unnecessary red blood cell transfusions in hospitals. *Choosing Wisely Canada.*

Thank You!

Questions?

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