PRIMER FOR TRANSFUSION IN ADULT CRITICAL CARE

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Disclosure

Relevant relationships with commercial entities

- Research Support: Novartis
- Consulting: Pfizer

Potential for conflicts of interest within this presentation

- Pfizer (manufacture of iv iron)

Steps taken to review and mitigate potential bias

- Use of generic names

Overview

1. Informed consent for blood transfusion
2. Review current guidelines for blood components

CONSENT FOR BLOOD TRANSFUSION

Consent for Blood Transfusion

Consent is the responsibility of the physician or nurse practitioner who orders the transfusion

Consent is mandatory except in life-threatening circumstances where consent cannot be provided

Discussion should include

- Description of treatment: What?
- Benefits: Why?
- Risks
- Alternatives
- Opportunity to answer patient's questions

Risk of Event	Event
1 in 13	Red cell sensitization, increasing risk of hemolytic transfusion reaction and hemolytic disease of the fetus and newborn[70]
1 in 20	Febrile non-hemolytic transfusion reaction per pool of platelets[71]
1 in 100	Transfusion-associated circulatory overload per transfusion episode[72]
1 in 100	Minor allergic reactions (urticaria)
1 in 300	Febrile non-hemolytic transfusion reaction per unit of RBC (1 'donor exposure')
1 in 7,000	Delayed hemolytic transfusion reaction
1 in 10,000	Transfusion-related acute lung injury (TRALI)
1 in 10,000	Symptomatic bacterial sepsis per pool of platelets
1 in 40,000	ABO-incompatible transfusion per RBC transfusion episode
1 in 40,000	Serious allergic reaction per unit of component
1 in 100,000	Post-transfusion purpura
1 in 200,000	Death from bacterial sepsis per pool of platelets
1 in 250,000	Symptomatic bacterial sepsis per unit of RBC
1 in 500,000	Death from bacterial sepsis per unit of RBC
<1 in 1,000,000	Transmission of West Nile Virus
1 in 4,000,000	Transmission of Chagas disease per unit of component
1 in 7,500,000	Transmission of hepatitis B virus per unit of component
1 in 7,600,000	Transmission of HTLV per unit of component
1 in 13,000,000	Transmission of hepatitis C virus per unit of component
1 in 21,000,000	Transmission of human immunodeficiency virus (HIV) per unit of component

Transfusion Risks

1. Common 1 in 100 (fever, hives, fluid overload)
2. Rare < 1 in 1 million (HIV, Hepatitis B, C)
3. Serious reactions 1 in 10,000 (lung injury, bacterial sepsis, major allergic reaction, incompatible blood)

Callum J et al. BloodyEasy4. 2016

Current evidence and risk modelling suggests…

COVID-19 is not transmissible through blood transfusion

CURRENT GUIDELINES FOR BLOOD COMPONENTS

Transfusing RBCs

When to transfuse RBCs?

Don’t transfuse more than 1 unit at a time in a non-bleeding patient.
Don’t transfuse RBCs in asymptomatic, non-bleeding patient with Hb greater than 70 g/L.

Choosing Wisely Canada

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Hb < 70 g/L

Hb < 60 g/L

Transfusion likely appropriate although younger patients may tolerate lower Hb (i.e. Hb < 60 g/L)

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Hb < 90 g/L	Clear signs and symptoms of impaired tissue oxygen delivery
Hb < 80 g/L	(Cardiac disease, elderly)
Hb < 75 g/L	Cardiac surgery patients
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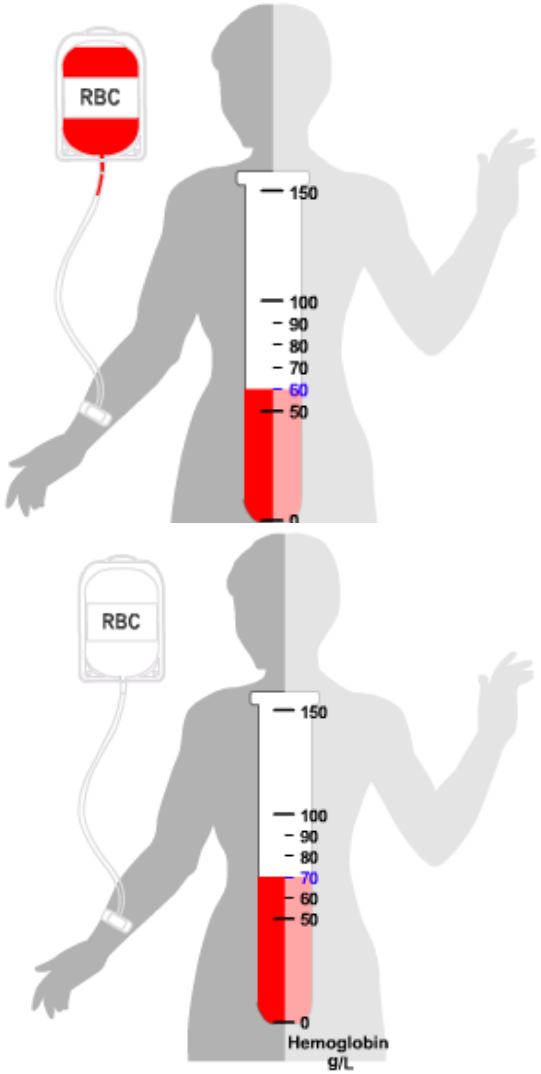
Restrictive Hb levels in event of blood shortage with COVID-19

How to transfuse RBCs?

- **Transfuse one unit at a time** over 2 hours and not more than 4 hours
- For patients age > 65 yrs, with impaired cardiac function or renal dysfunction, use slower rate and furosemide iv pre-transfusion
- Assess the outcome (clinical, hemoglobin level) before transfusing further
- Each unit will increase Hb by ~ 10 g/L in non-bleeding patient



Transfusing Platelets

Platelet Transfusion

- Determine why the plt count is low
- Relative contraindications to plt transfusion:
  - Thrombotic thrombocytopenic syndromes
    - May theoretically add “fuel to the fire”
    - Thrombotic thrombocytopenic purpura
    - Heparin induced thrombocytopenia
    - Antiphospholipid antibody syndrome
  - Immune thrombocytopenia
    - Other therapies more effective (e.g. prednisone)

When to transfuse platelets?

Any plt count	To treat severe bleeding in setting of platelet dysfunction (antiplatelet agents, post CPB)
Plt < 100 x 10^9/L	To treat bleeding in sanctuary sites (CNS, eye) To prevent bleeding in sanctuary sites
Plt < 50 x 10^9/L	To treat major bleeding To prevent bleeding with major procedures
Plt < 10 x 10^9/L	To prevent spontaneous bleeding (except ITP)

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	Massive bleeding
Plt < 50 x 10^9/L	To treat major bleeding To prevent bleeding with major procedures
	Minor bleeding and minor procedures
Plt < 10 x 10^9/L	To prevent spontaneous bleeding (except ITP)

How to Transfuse Platelets?

- Transfuse each dose over 1-2 hours (max 4 hours)
  - For patients age > 65 yrs, with impaired cardiac function or renal dysfunction, use slower rate and furosemide iv pre-transfusion
- Assess the outcome (clinical, platelet count) before transfusing further
- Each platelet dose increases plt count by 15-50 x 10^9/L

Transfusing Plasma

When to transfuse plasma?

Multiple clotting factor deficiencies where a more specific concentrate is not available

AND

1. Major bleeding or procedure with INR ≥ 1.8
   - Most minor procedures: line placement, thoracentesis, paracentesis can be done safely at any INR

   OR

2. Microvascular bleeding, massive transfusion and cannot wait for labs

Plasma is rarely needed prior to minor procedures
Don't transfuse for DIC without bleeding
Don't use plasma to reverse anticoagulants – use specific antidotes

How to Transfuse Plasma?

- Each unit of FP is ~250 mL
- Contains all necessary clotting factors for hemostasis
  - The half life of plasma is only 6-8 hrs (non-bleeding patient)
- Dose = 15 mL/kg (3-4 units) which ↑clotting factors by 20%
- Plasma is frozen so it takes 30 minutes to thaw

Transfusing Prothrombin Complex Concentrates

When to transfuse Prothrombin Complex Concentrates (PCCs)?

- Contain vitamin K dependent factors (II, VII, IX, X, Protein C, S)
  - Pooled, virally inactivated fractionated products made from human plasma
  - Indicated for urgent or emergent reversal of warfarin or vitamin K deficiency (and off label for urgent or emergent reversal of oral Factor Xa inhibitors (rivaroxaban, apixaban, edoxaban)
  - Typical dose is 1000 units (40mL) but depends on INR elevation
  - Effect lasts only ~6 hours

How to Transfuse PCCs?

- Infuse 1000 units PCC IV over 15 minutes
  - Reconstituted at the bedside

- Vitamin K required for prolonged reversal of warfarin
  - Therapeutic INR and emergency bleeding/procedure = vitamin K 10mg IV (works in ~6 hrs)
  - Supratherapeutic INR and not bleeding = may require small dose vitamin K PO alone (works in ~24 hrs)

Transfusing Fibrinogen Concentrate

When to Transfuse Fibrinogen concentrate?

Fibrinogen < 1.5-2g/L	To treat life-threatening hemorrhage
Fibrinogen < 1g/L	To treat microvascular bleeding

Dose = 4 g iv push (each 1 g over 5 min) or minibag over 30 min

Reconstituted at the bedside

Each dose↑ fibrinogen by ~ 0.7 g/L

Use fibrinogen concentrate instead of cryoprecipitate (when cryoprecipitate is made from donation, platelets cannot be made)

Summary

Ask yourself:

Why does the patient have the lab abnormality?
To make sure to think about alternatives and possible contraindications to transfusion

Is the patient symptomatic or bleeding?
To make sure that there is a reason to transfuse

What is the indication to transfuse?
To make sure you order the correct component, dose and infusion rate

Additional Comments RE: COVID-19

- The donor supply is at risk with COVID-19 thus transfusion thresholds may become more restrictive as the pandemic progresses
- IVIG is not suggested
  - As of Mar 26, 2020, there is no data to support the use of IVIG. During SARS, IVIG was associated with increased thromboembolic events.
- Convalescent plasma is not suggested
  - As of Mar 26, 2020, this is not available in Canada but studies are underway.

Additional Resources

- Ontario Regional Blood Coordinating Network www.transfusionontario.org
  - Download PDF of BloodyEasy4: A guide to transfusion medicine
  - Download PDF of BloodyEasy Coagulation Simplified Edition 2
- COVID-19 What does it mean for the blood supply?
  - South Africa NBS Flip Book https://wrap.co/wraps/5b43d5bf-11ac-4da2-b3fe-c8a6b9755928

WHY GIVE 2 WHEN 1 WILL DO?

Especially now, to help conserve the blood supply.

- Don't transfuse more than one red cell unit at a time in non-bleeding patients.
- Don't transfuse red blood cells in asymptomatic, non-bleeding patients with hemoglobin greater than 70 g/L.
- Don't transfuse blood if other therapies (e.g. iron) would be effective.

Choosing Wisely Canada™

For more information, visit:
www.choosingwiselycanada.org/transfusion-medicine.

PANDEMIC PREPAREDNESS

Blood shortages during COVID-19: YOU can make a difference

#1 Follow red blood cell guidelines

For non-bleeding, asymptomatic patients:

- **Transfuse 1 unit at a time with ongoing reassessment**
- **Blood is rarely needed when hemoglobin is > 70g/L**
- Do not transfuse RBCs for iron deficiency

#2 Follow platelet guidelines

- *Prophylactic* platelet transfusion generally not required when platelets ≥ 10 x 10^9
- *Therapeutic* platelet transfusion: varies with indication. Follow published guidelines -

Transfusion Medicine – Medical Policy Manual: 5.2 Transfusion of Platelets to Adults

#3 Carefully consider frozen plasma (FP)

- FP does not improve mildly elevated INRs (< 1.8) and is not indicated.
- Correction of mildly elevated INRs or PTTs before most procedures is not recommended[1].
- Non-bleeding patients with cirrhosis or end-stage liver disease rarely need FP (including pre-procedure).
- Use PCCs only for reversal of warfarin only when clinically indicated (bleeding or prior to high blood loss *emergency* procedure).

Vitamin K (regional guideline and PPO)

#4 Avoid Iatrogenic anemia

Don't perform laboratory blood testing unless clinically indicated or necessary for diagnosis or management.

#5 TXA for Hemorrhage Control

Use tranexamic acid (TXA) early for trauma, TBI, orthopedic, spine and cardiac surgery, and obstetrical hemorrhage

If you feel well, please donate blood: www.blood.ca

1. Choosing Wisely Recommendations - Transfusion Medicine
2. Blood Easy 4 guide
3. [1]Society of Interventional Radiology Consensus Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions.

Credit J. Trudeau, VGH, 2020