Dr. Jeannie Callum, RBC Transfusion

REASONABLE APPROACH FOR INPATIENTS

Patient scenario	Hemoglobin	Transfusion approach
Young patient with severe iron or B12 deficiency anemia with only fatigue and pallor	Any	Iv iron (or B12 im/po)
Young patient with reversible asymptomatic anemia (eg. Postpartum, recovering young trauma)	<50 g/L	1 unit
Average patient without symptoms or cardiac history (eg. ICU, CVICU, hem-onc)	<70 g/L	1 unit
Cardiac history without symptoms	<70-80 g/L	1 unit
Hemodynamic symptoms (tachycardia, pre-syncope, etc)	<90 g/L	1 unit
Myocardial infarction with only fatigue and pallor	<80 g/L	1 unit GO SLOW
Slow bleeding and asymptomatic anemia	<70 g/L	1-2 units
Rapid hemorrhage (eg. Stabbing, gunshot, varices)	Keep 60-110 g/L	As many as you need! Order uncrossmatched!

Summary

- RBCs are expensive and associated with adverse events
- Adhere to a restrictive transfusion strategy – 70 g/L and 1 unit at a time = default strategy unless brisk hemorrhage
- The largest risk is TACO – be thoughtful with onboarding
- We have an extensive literature base to support a restrictive transfusion strategy
- Guidelines support a restrictive approach

5 things I hope you will do in 2022/2023

1. Give iron deficient patients iron instead of blood unless clear hemodynamic instability
2. Make extra efforts for young women to prevent transfusion and alloimmunization risk
3. Adopt a restrictive transfusion approach for most patients
4. ***Transfuse one at a time*** (even in the operating room) unless brisk bleeding – check hemoglobin after every unit
5. Thoughtfully onboard red cells in patients at higher risk of TACO

Dr. Katerina Pavenski, Platelet Transfusion

PLT (x 10^9/L)	Clinical Setting	Suggest
<10	Non-immune thrombocytopenia	Transfuse 1 pool of platelets[45]
<10	Non-immune thrombocytopenia & HLA-alloimmunized	Transfuse 1 unit of HLA-matched apheresis platelets[45]
<20	Procedures not associated with significant blood loss (e.g., central line placement)	Transfuse 1 pool of platelets[15]
20-50	Procedures not associated with significant blood loss	1 pool of platelets on hold, transfuse only if significant bleeding[38]
<30	Patient on anticoagulants that should not be stopped	Transfuse 1 pool of platelets
<50	Epidural anesthesia and lumbar puncture	Transfuse 1 pool immediately before procedure[15,47]
<50	Procedures associated with blood loss or major surgery (>500 mL expected blood loss)	Transfuse 1 pool immediately before procedure[38,48]
<50	Immune thrombocytopenia	Transfuse platelets only with life-threatening bleeding[49]
<100	Pre-neurosurgery or head trauma	Transfuse 1 pool of platelets[50,51]
Any	Platelet dysfunction and marked bleeding (e.g., post cardiopulmonary bypass). **Exception: Transfusing platelets for intracranial hemorrhage not requiring surgical management in patients on antiplatelet agents leads to increased morbidity**	Transfuse 1 pool of platelets[38,52]

Clinical Pearls

- 1 adult dose = 1 apheresis unit = 1 buffy coat pool (derived from 4 donors in Canada)
  - Transfused over 60 minutes
  - Will raise platelet count by 30-40 x 10^9/L
- For platelet refractoriness
  - Confirm refractoriness with 2 consecutive post-transfusion count increments
  - Poor 1 hour post-transfusion count increase is consistent with immune refractoriness
  - Adequate 1 hour post-transfusion with poor 18-24 hour count increase is most often associated with non-immune refractoriness
  - Immune platelet refractoriness may be caused by HLA (+/-HPA antibodies) and may be managed by HLA selected platelet transfusions

Dr. Yulia Lin – Blood Bank Testing Basics

What does the group test?	ABO & Rh
What does the antibody screen test?	Antibodies against non-ABO antigens
How long does a fast crossmatch take?	2-5 minutes
When can the Blood Bank use a fast crossmatch?	Antibody Screen negative
How long does a full/slow crossmatch take?	45 minutes
If there is a positive antibody screen, what does this mean for your patient?	There may be a delay in blood 

Clinical Pearls

- Antibody screen negative
  - = FAST crossmatch = No need to crossmatch units ahead of time
- Antibody screen positive
  - = Possible DELAY in getting blood because of extra steps to find blood
  - Blood bank has to identify antibody, find antigen negative units and do a full crossmatch
- Uncrossmatched blood
  - Used in an emergency where the risk of delaying transfusion outweigh the risks of acute hemolysis
  - To get uncrossmatched blood, call Blood Bank and ask for blood NOW
- O negative uncrossmatched RBCs are reserved for patients of childbearing potential
  - O negative just means O RhD negative – it is not necessarily negative for other antigens
- What's all this talk about a 2nd sample?
  - The purpose of a 2nd sample is to confirm the ABO type – this is a check using a historical group or independent 2nd sample drawn at a different time
  - NEVER draw 2 tubes at the same time and hold one back to send later – this is a dangerous practice and you could be drawing the wrong blood twice!
- What to do if you don't end up needing a unit?
  - Return back to blood bank as soon as possible (60 minutes or less; otherwise blood bank may have to discard the unit)
  - If you received it within a cooler, than you may have 4 hours (check with your local blood bank)
  - Return the products as you received them
    - In a plastic bag, return as is (do not put in cooler).
    - In a cooler, keep in cooler with lid closed.

Dr. Justyna Bartoszko, Albumin

Disclaimer: This evidence may be low quality and does not replace clinical judgement

LIVER PATIENTS

- **Spontaneous bacterial peritonitis** - 25% albumin 1.5 g/kg within 6 hours of diagnosis, then 1 g/kg on day 3
- **Large volume paracentesis** - 25% albumin, 6-8 g for every litre removed, administer soon after procedure to avoid procedural complications (hypovolemia, hyponatremia, renal impairment)
- **Acute Onset Hepatorenal syndrome Type 1** – If eligible for liver transplant, 25% Albumin 1 g/kg on Day 1, 100-200 ml on days 2-14

SPECIAL POPULATIONS

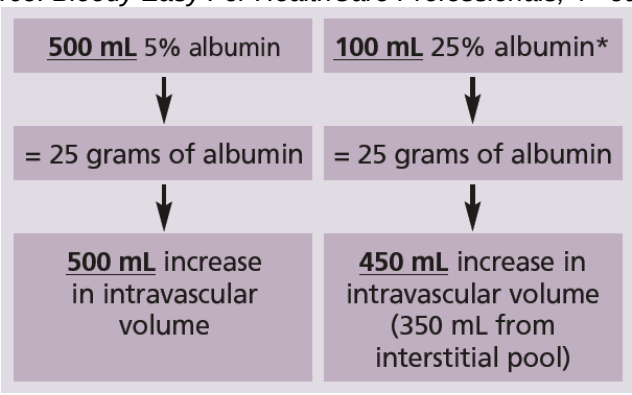
- **Ovarian HyperstimulationSyndrome** – Treatment, not prevention. 25% albumin, 50-100 g over 4 hours, q4-12 h prn
- **Plasma exchange** - 5 % albumin, titrated to plasma volume removed
- **Burns > 50% TBSA** – In general poor quality evidence supporting use and not routinely recommended. Historically was used if unresponsive to crystalloid, 5% albumin at 0.3-0.5 ml/kg/BSA (50-100 mL/hour).

Table 1. Reported Characteristics of Colloids (Albumin) vs. Balanced Crystalloids

Characteristics	Balanced Crystalloid Solution (Plasmalyte-148)	Albumin (5% or 25% Albumin)
Approximate Cost	$2 per 1 L	$62 per dose (25% 100 ml or 5% 500 ml)
Typical *in vitro* pH	4-6.5	6.4-7.4
Typical constituents	Sodium: 140 mEq/L Potassium: 5 mEq/L Chloride: 148 mEq/L Magnesium: 3 mEq/L Acetate: 27 mEq/L Gluconate: 23 mEq/L	Sodium: 130-160 mEq/L Chloride: 109-137 mEq/L
Oncotic Pressure Effects	Lower, with intravascular and interstitial fluid replacement effect but potential for protein dilution and greater peripheral edema	Higher, allowing for translocation of interstitial fluid into plasma volume. Less peripheral edema but potential for pulmonary edema in capillary leak states and excessive intravascular volume expansion with mobilization of fluid intravascularly.
Plasma Volume Expanding Effect	Variable depending on serum oncotic pressure	450 ml per 25 g dose
Perceived Effect on Fluid Balance	Greater interstitial edema and higher cumulative fluid balance	Lower interstitial edema and lower cumulative fluid balance
Perceived Hemodynamic Effect	Shorter lived increase in plasma volume	Sustained increase in plasma volume (likely less in critically ill patients)

Figure 1. Intravascular Volume Expansion Effect by Albumin Formulation

Source: Bloody Easy For HealthCare Professionals, 4th edition (new version coming soon)



Dr. Aditi Khandelwal, Plasma, PCC, and Fibrinogen Replacement

Summary – Plasma

- Different patient populations have different INR thresholds for plasma before procedures
  - You must know why the INR is high
- In liver disease, plasma for INRs 1.3 to 1.8 is unlikely to even change the INR let alone patient outcomes
  - Don't transfuse plasma if INR<1.8 in a patient with liver disease without hemorrhage
- In liver disease, the use of plasma does not reduce bleeding risk before procedures
  - Don't transfuse plasma if INR elevated before low-risk procedures (PLT>20)
  - limit to high-risk procedures (PLT>30, INR<2.5, FIB>1.0 only)
  - use lower risk techniques (transjugular liver biopsy)

Summary – Prothrombin Complex Concentrate

Emergency reversal

- Vitamin K 10 mg IV
- PCC:
  - INR<3 – 1000IU
  - INR 3-5 – 2000IU
  - INR>5 – 3000IU
  - INR unknown – 2000IU
  - Each 1000IU (5mL) over 5 min

Non-emergency

- Vitamin K only!
- INR > 8 to 10: 2 mg po
- Urgent surgery: 10 mg IV
- Non-critical bleeding: 1 mg IV

Summary – Fibrinogen Concentrate

- Fibrinogen replacement:
  - Transfuse fibrinogen or cryoprecipitate for bleeding patients <1.5-2.0 g/L
  - Acute promyelocytic leukemia patients if fibrinogen<1.5 g/L in acute phase even without bleeding (no other non-bleeding patients)