Guideline for Red Blood and Plasma Transfusion A Summary

Introduction

This guideline is updated from the Expert Working Group: Guidelines for Red Blood Cell and Plasma Transfusion for Adults and Children[1] Updated 2009

Transfusion: Risks and Informed Consent

- Physicians ordering transfusion must have current knowledge of the risks of (see appendix 1) and alternatives to (see appendix 2) red blood cell and plasma transfusion
- Patients may benefit from comparison of risks associated with daily life (see appendix 3)
- Risk estimations are updated frequently. Websites useful for transfusion and risk information include:
  - Canadian Blood Services: http://www.bloodservices.ca/
  - Department of Family Medicine, Univerrsity of Calgary: www.talksfordocs.com
  - Pat Letendre Consulting – Transfusion complications: http://www.patletendre.com/tm-readingcomplications.html
  - British Columbia Provincial Blood Coordinating Office www.pbco.ca
  - UK Blood Transfusion Guidelines: http://www.transfusionguidelines.org.uk/
  - Bloody Easy Drs. JL Callum and PH Pinkerton, Sunnybrook and Women's College Health Sciences Centre: http://sunnybrook.nextmovelearning.com/
  - Capital Health http://www.capitalhealth.ca/AboutUs/OurOrganization/AreasofService/LaboratoryMedicine/LabMedicine/TransfusionMedicine/default
  - Alberta Health Services Octaplex request form: http://www.capitalhealth.ca/nr/rdonlyres/u3fnchbz46avhmvm3jkmtdcjivxto6ytwefnnzzzneujjeddngeuscq5wuo2gudwcvcg/octaplexrequestfinalversion.pdf
- Patients should be informed of the possibility of transfusion and informed of benefits, risks, and available alternatives, far enough in advance of planned medical or surgical interventions to allow consideration of transfusion alternatives
- Patients should be informed that they have received a transfusion subsequent to its administration

PRACTICE POINTS

The attending physician should explain to the patient the reason for transfusion, obtain informed consent and document the discussion in the patient's record.

Red Blood Cells

- Red blood cell transfusion is one of several alternatives or adjunctive therapies for patients with clinically significant anemia, or anticipated anemia with scheduled surgery. Suitable alternatives must be considered whenever time is available for their implementation
- In acute blood loss, transfusion **should not** be used to expand vascular volume when oxygen carrying capacity is adequate
- In chronic anemia, physiologic adaptation may be sufficient to allow time for use of transfusion alternatives

Toward Optimized Practice

The above recommendations are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances. They should be used as an adjunct to sound clinical decision making.

2009 update

- Red blood cell transfusion should not be dictated by a single hemoglobin trigger, but should be based on complete evaluation of the patient including volume status, tissue perfusion and comorbid disease.
  - Red blood cell transfusion is recommended to prevent or alleviate symptoms, signs or morbidity due to inadequate tissue oxygen delivery caused by anemia
  - Red blood cell transfusion is rarely indicated when the hemoglobin concentration is >100 g/L and is almost always indicated when it is < 60 g/L
  - A Canadian randomised controlled trial in critically ill adult patients showed that a transfusion threshold hemglobin level of 70 g/L (average achieved 85 g/L) was associated with less red blood cell transfusion, but similar morbidity and mortality to a transfusion threshold of 100 g/L (average achieved 107 g/L).[2] The applicability of the results of this trial to patients with cardiac disease is uncertain
- There are no well-defined criteria for red blood cell transfusion in children, and clinical assessment of tissue perfusion is required

Autologous Blood

- Autologous blood transfusion avoids the very low risks of transmission of undetected infectious agents that is associated with allogeneic transfusion
- Risks of hemolytic reaction (wrong unit) and bacterial sepsis (contamination) are the same for autologous and allogeneic blood
- Based on comorbid conditions in an individual patient, the risk of collection and transfusion of autologous blood may be more or less than the risk of transfusion of allogeneic blood
- Predonation of autologous blood is a therapeutic option for appropriate patients undergoing elective surgery if the likelihood of transfusion is high
- Patients may choose to accept criteria for transfusion of autologous blood which differ from those for transfusion of allogeneic blood
- In order to optimize use of autologous collection and transfusion and minimize iatrogenic anemia, risk and transfusion criteria for autologous blood must be discussed with patients before autologous collection is performed

Plasma Transfusion

- Plasma transfusion is recommended where there is clinically significant bleeding in patients with liver disease and increased PT, INR or aPTT
- Plasma transfusion is recommended in patients with acute disseminated intravascular coagulation (DIC) with active bleeding associated with increased PT, INR or aPTT. The condition triggering the DIC must also be treated
- Plasma should be administered in the context of massive transfusion (usually > 1 patient blood volume in 24 hours) if there is microvascular bleeding associated with a significantly increased PT, INR or a PTT
  - If PT, INR or aPTT cannot be measured quickly, plasma may be transfused in an attempt to stop diffuse nonsurgical bleeding
- Plasma should be used in the treatment of thrombotic thrombocytopenic purpura or adult hemolytic uremic syndrome
  - Plasma transfusion or exchange is not recommended in the classic form of pediatric hemolytic uremic syndrome

Single Coagulation Deficiency

- Plasma should be used in patients with acquired deficiencies of a single coagulation factor only when DDAVP or appropriate recombinant factors or factor concentrates are ineffective or unavailable
  - Plasma should be used in these patients only when bleeding has occurred or is reasonably expected to occur from surgery or other invasive procedures

PRACTICE POINT

Whenever time is avaliable, correct warfarin effect by allowing for spontaneous or vitamin K induced normalization of PT or INR. Only if time is not available, life or limb threatening bleeding is occurring or anticipated, and INR is >1.5 due to warfarin, then Prothrombin Complex Concentrate (Octaplex) should be administered, followed immediately by Vitamin K.

Multiple Coagulation Deficiency

- Prothrombin Complex Concentrate (Octaplex) is a fractionation product manufactured from plasma, containing the |Vitamin K dependent coagulation factors II, VII, IX, and X. It is indicated to correct warfarin effect in a dosage of 40 mL (1000 IU Factor IX acitivity) IV followed immediately by Vitamin K 10mg IV, to treat INR >1.5 in adult patients with life or limb threatening bleeding. Octaplex is not recommended in massive transfusion, coagulopathy of liver dysfunction, or in patients with recent history of thrombosis, myocardial infarction, recent ischemic stroke or disseminiated intravascular coagulation
- During warfarin therapy, small doses (1-2 mg) of vitamin K may be effective to normalize PT or INR, without producing prolonged warfarin insensitivity (sc or im administration preferred to iv)
- Plasma may be administered to prepare for surgery or invasive procedures when the results of PT, INR, aPTT or other coagulation assays are abnormal due to causes other than warfarin.
- A framework for the off-label use of Recombinant Factor VIIa (rFVIIa) in a dosage of 20-50 ug/kg IV to treat the coagulopathy of massive transfusion has been developed by the Canadian National Advisory Committee on Blood and Blood Products, The reference with this document must be reviewed before considering this treatment
- Plasma is not indicated for percutaneous liver biopsy, thoracentesis or paracentesis in patients with liver disease and INR of 2.0 or less

Per Red Blood Cell Unit or Platelet Pool (5 donors) Risks Associated with Transfusion in Canada 2003[a]

Acute haemolytic reaction		1:40,000 per transfusion episode
Delayed hemolytic reaction		1:7,000
Febrile non-hemolytic	Red blood cells	1:300 per red cell unit
	Platelet pool	1:10 per platelet dose
Transfusion related acute lung injury (TRALI)	Red blood cells	1:5,000 per transfusion episode
Allergic minor		1:100
Anaphylaxis		1:40,000
Graft vs. host disease		Rare; risk is in immunocompromised or with related donor
Circulatory overload		1:7,000 units; but up to 8% of at risk pts (heart disease, elderly)
Air embolism		Very rare
Exogenous material		Very rare
Hypothermia		With rapid or large (>0.5 blood volume) transfusion
Citrate toxicity		With rapid or large (>0.5 blood volume) transfusion
Hyperkalemia/hypokalemia		With rapid or large (>0.5 blood volume) transfusion
Iron overload		1 unit of PRBC + 250 mg iron; susceptibility depends on iron status of patient
Alloimmunization	Platelet pool	Up to 50%; unpredictable
Immunoglobin-related reactions	IVIG	Mild: common; Severe: uncommon
Viral infections	HIV	1: 5,000,000
	HTLV I & II	1:4,300,000; but disease virtually zero with leukoreduction[b]
	HAV	1:10,000,000
	HBV	1:153,000; but 5% chronicity so 1:3,000,000 chronic HBV+ (consider immunization status)
	HCV	1:2,300,000
	CMV	Leukoreduction[b] to <5 x 106 wbc per rbc unit is considered by many as equivalent to seronegativity, though 35-50% of population seropositive; high risk groups receive seronegative products
	West Nile Virus	<1:1,000,000
	EBV	Rare for clinically significant disease (90% of popln. seropositive)
	HPV-B19	50% of popln. seropositive; may be significant in high risk groups: hemolytic anemias, immunocompromised & pregnant
Prisons	CJD & variant CJD	Theoretical risk; degree of risk unknown
Bacterial agents	Sepsis	Platelet pool: sepsis: 1:10,000; fatal: 1:40,000 Red blood cells: sepsis: 1:100,000; fatal: 1:500,000
	Syphilis	Extremely rare
	Lyme disease	Theoretical risk only
	Malaria	1:4 million
Parasites	Babesiosis; Chagas disease; Leishmaniasis; Microfiliariasis	Rare; risk of severe clinical disease is small in healthy recipients

Notes

a. Risk data are updated frequently. They differ depending on jurisdiction (Canada, USA, UK) and derivation, whether from transfusion related incidence data or from estimations of residual risk based on current testing methods. Update this data at the recommended websites.

b. Allogeneic and autologous blood supplied by the Canadian Blood Service is leukoreduced by filtration.

c. No cases of transfusion-acquired WNV infection identified in Canada since initiation of donor testing by PCR for WNV in July 2003.

d. Transfusion complications with potential for severe outcomes; excludes febrile non-hemolytic and minor allergic reactions.

These are well described in references 3 and 4

Therapeutic agents for managing anemia	• Iron • Folic acid • Vitamin B-12 • Recombinant erythropoietin • Hemoglobin-based oxygen carriers (not marketed in Canada as of 2009) • Perfluorocarbon emulsions (not marketed in Canada as of 2009)
Autologous donation and blood salvage	• Preoperative autologous donation • Intraoperative hemodilution • Intraoperative cell saving techniques
Surgical	• Choice of surgical procedure • Hemostasis technique (e.g., topical hemostats, argon beam coagulation)
Volume expanders	• Crystalloids: Ringer's lactate; normal saline • Colloids: Dextrans; Hydroxyethyl Starches
Pharmacological agents for bleeding	• DDAVP • ε−Aminocaproic acid • Tranexamic acid • Vitamin K

Cause of Death	Risk in Canada
Infant < 1yr	1:1,159
MVA 15-19 yr	1: 4,763[a]
MVA all ages	1: 9,594[a]
Accidental fall	1: 12,463[a]
Childbirth	1: 27,508
Pedestrian MVA	1: 40,000[a,b]
Drowning	1: 91,985[a]
Fire	1: 97,830
General anesthesia	1: 65,000[b]
Airplane crash	1: 471,795[a]

Notes:

a. Annual

b. USA

1. Expert Working Group: Guidelines for Red Blood Cell and Plasma Transfusion for Adults and Children. CMAJ, 1997; 156(11): Special Supplement (S1-S24).Kleinman S, Chan P, Robillard P. Risks associated with transfusion of cellular blood components in Canada. Transfus med Rev, 2003; 17: 120-162
2. National Advisory Committee on Blood and Blood Products. Recommendations for the use of Octaplex in Canada, 2008. http://209.217.107.132/Web/tmws.nsf/resources/Featured+Pics/$file/NAC+octaplex+recommendations+September+16th+final+corrected.pdf
3. Herbert P, Wells G, Blajchman M et al. A multicenter, randomized controlled clinical trial of transfusion requirements in critical care. N Engl J Med, 1999; 340: 409-417
4. Moltzan C, Anderson D, Callum J, Frenes S, et al. The evidence for the use of recombinant factor VIIa in massive bleeding: development of a transfusion policy framework. Transfusion Medicine, 2008; 18: 112=120

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For complete guideline refer to:
http://collection.nlc-bnc.ca/100/201/300/cdn_medical_association/cmaj/vol-156/issue-11/blood/