Transfusion Best Practice Recommendations in Adult Patients – Saskatchewan

Blood transfusion is the most commonly performed procedure in the hospital setting. The decision to order a blood transfusion should be made carefully, ensuring that transfusion benefits, risks and alternatives have been considered. Informed consent must be obtained by the most responsible health practitioner prior to the administration of a blood transfusion.

Pre-transfusion testing must be completed prior to blood issue for transfusion. Uncrossmatched blood is only used in emergency situations. Patient identifiers including a patient name and unique identification number (even if temporarily assigned due to unknown patient identity) are required for issue of blood components or products from the lab. At the bedside, orders for blood transfusion must be properly written and include the following information:

- Indication for transfusion
- Product dose (number of units or doses)
- Rate of infusion
- Special attributes, if applicable (washed, irradiated; specific equipment required, etc.)

This document summarizes best practice recommendations for adult patients receiving transfusion of blood components, which include red blood cells (RBC), platelets, plasma and cryoprecipitate. The transfusion triggers listed are in alignment with evidence-based transfusion medicine practices and reflect published clinical practice guidelines. Strong evidence is available in the literature guiding blood transfusion practices in stable hospitalized inpatients. However, since there is insufficient evidence to guide transfusion in the outpatient setting, local expert opinion has been incorporated to standardize transfusion practices and enhance the safety of these recipients.

Red Blood Cells (RBCs)

General RBC Transfusion Considerations

- One RBC unit usually raises the hemoglobin (Hb) by approximately 10 g/L in an average size adult patient, though the degree of Hb rise is dependent upon patient size and overall blood volume.
- A post-transfusion CBC may be drawn anytime between 15 minutes and 24 hours following RBC transfusion.
- The RBC unit age (time from collection) is irrelevant and does not impact patient outcomes.
- RBC crossmatching must be completed within an accredited laboratory by trained Medical Laboratory Technologists. There may be a delay of up to 72 hours in obtaining crossmatched RBCs for transfusion in rural communities if the specimen must be sent to another testing site.
    - Consult the Saskatchewan *Current State Blood Drop Map* for details regarding existing laboratory service categories, available at the following link: http://saskblood.ca/blood-drop-map/
    - Turn-around time for crossmatched blood is dependent on several factors, including proximity of the closest facility which can perform crossmatch testing, the day of the week and transportation logistics.
    - Contact the on-call Transfusion Medicine Physician to discuss urgent RBC transfusion needs in rural communities where on-site RBC crossmatching is unavailable.
- The underlying cause of anemia should be investigated with the intent of avoiding RBC transfusion, if possible.
    - Treat identified nutritional deficiencies (iron, vitamin B12, folate) with the goal of maintaining a Hb of at least 120 g/L in women and a Hb of at least 130 g/L in men.
- Patients with hemoglobinopathies (ex. sickle cell disease, thalassemia) should only be transfused under the direction of a Hematologist – transfusion may sometimes be absolutely contraindicated in these patients.
- **The patient clinical context and other causes of anemia signs/symptoms *must* be considered and excluded before administration of RBC transfusion.**
    - Signs/symptoms of anemia may include:
        - Presyncope or syncope;
        - Dyspnea with or without exertion;
        - Tachycardia; chest pain with or without exertion;
        - Severe postural dizziness with hypotension or postural pulse increment of 30 beats/min or more in the setting of significant acute blood loss.

- Pre-medications:
    - Antihistamines should be considered if there is a history of recurrent, severe allergic reaction with previous transfusion;
    - Antipyretics for prevention of fever have not been found to be effective and are not recommended;
    - Diuretics should be administered *before* transfusion to patients at risk for transfusion-associated circulatory overload (TACO), if the patient is not hypovolemic and is hemodynamically stable.
        - TACO risk factors include:
            - Acute or chronic renal insufficiency
            - Positive fluid balance
            - Age 70 and over
            - Congestive heart failure or left ventricular dysfunction
            - History of myocardial infarction
- Administer each RBC unit (about 300 mL volume per unit) at a rate appropriate for the patient volume status:
    - Hypovolemic – over 1-1.5 hours
    - Normovolemic – over 2 hours
    - Hypervolemic – over 3-4 hours
- Whenever possible, **all** transfusions should be completed during the day shift, for optimum patient safety.
- All transfusion adverse reactions should be reported to the Transfusion Medicine Laboratory.

RED BLOOD CELL (RBC) TRANSFUSION – INPATIENT	
Clinical Setting	**Recommendation and dose**
Hemoglobin (Hb) less than or equal to 60 g/L*	Transfusion should be considered. Exceptions: • Young patients may tolerate Hb levels under 60g/L without transfusion • Patients with chronic iron deficiency anemia without anemia symptoms; IV iron supplementation should be given instead Transfuse 1-2 units and re-check patient symptoms and Hb.
Hb less than or equal to 70 g/L*	Transfusion of 1 unit RBC is likely acceptable. If RBC transfusion is given, re-check patient symptoms and Hb before giving second unit. Exceptions: • Young patients may tolerate Hb levels under 60 g/L without transfusion • Patients with chronic iron deficiency anemia without anemia symptoms; IV iron supplementation should be given instead • Patients with sickle cell disease
Hb less than or equal to 80 g/L*	Consider RBC transfusion in patients with pre-existing cardiovascular disease with or without symptoms of anemia. Transfuse 1 unit and recheck patient symptoms and Hb before giving second unit.
Hb 81-90 g/L*	RBC transfusion likely inappropriate, unless there is symptomatic anemia or clinical evidence of impaired tissue oxygenation.
Hb greater than 90 g/L*	RBC transfusion likely inappropriate. If transfusion is ordered, clearly document indication in patient's chart and discuss reason with patient.
Bleeding patient	Low cardiovascular risk patient – maintain Hb greater than 70 g/L Pre-existing uncorrected cardiovascular disease – maintain Hb greater than 80g/L

* Assumes patient is NOT bleeding

- Transfusion should not be administered to stable, hospitalized inpatients based on a Hb value alone.
    - Anticipatory pre-operative RBC transfusion is discouraged.
- Inpatient RBC transfusion is indicated for treatment of anemia with clinically significant symptoms.
    - Fatigue alone is not a symptom of anemia which should lead to RBC transfusion.
- For non-bleeding inpatients, the usual adult dose is 1 unit RBC; transfuse 1 unit RBC then re-check Hb and patient symptoms before transfusing a second unit.

RED BLOOD CELL (RBC) TRANSFUSION – OUTPATIENT	
Clinical Setting	**Recommendation and dose**
Hb less than or equal to 80 g/L*	Transfusion of up to 2 units RBC is likely acceptable. If RBC transfusion is given, re-check patient clinical status before giving second unit. Exceptions: • Young patients may tolerate Hb levels under 60 g/L without transfusion • Patients with chronic iron deficiency anemia without anemia symptoms; IV iron supplementation should be given instead • Patients with sickle cell disease
Hb 81-89 g/L*	RBC transfusion likely inappropriate, unless there is symptomatic anemia or clinical evidence of impaired tissue oxygenation.
Hb greater than or equal to 90 g/L*	RBC transfusion likely inappropriate. If transfusion is ordered, clearly document indication in patient's chart and discuss reason with patient.

* Assumes patient is NOT bleeding

- Outpatient RBC transfusion in patients with marrow failure related to the underlying diagnosis or chemotherapy may receive up to 2 units RBC for anemia prophylaxis if the pre-transfusion hemoglobin is under 90 g/L.
    - Requests for RBC with a pre-transfusion hemoglobin 90 g/L or higher may be reviewed by the Transfusion Medicine Physician.
- A maximum of 2 units RBC may be transfused in one outpatient appointment. Requests for transfusion of 3 or more RBC units in the outpatient setting may require approval by a Transfusion Medicine Physician.
- A post-transfusion CBC may be requested at the discretion of the most responsible health practitioner, and may be drawn as soon as 15 minutes following completion of the RBC infusion.

Platelets

General Platelet Transfusion Considerations

- Platelet transfusion is indicated for prophylaxis against bleeding or for management of acute bleeding in patients with thrombocytopenia or platelet dysfunction.
- Platelets are routinely stocked in Saskatoon and Regina only, but can be shipped to any transfusing facility from Canadian Blood Services, upon request.
    - Requests for platelet transfusion in rural facilities for indications other than prophylaxis of bleeding in patients with hypoproliferative thrombocytopenia with a count less than 10 x 10^9/L may be subject to approval by the on-call Transfusion Medicine Physician.
- Request for 1 adult dose platelets will lead to issue of 1 buffy coat pool (comprised of a pool of 4 donor units) or 1 apheresis single-donor unit.
    - Buffy coat pool and apheresis platelets are considered equivalent in terms of clinical effectiveness.
    - It is acceptable practice to transfuse ABO incompatible platelets if compatible platelets are unavailable from the transfusion medicine laboratory due to inventory restrictions. Hemolysis risk is minimal.
    - Rh negative females under 50 years old who receive a platelet transfusion from an Rh positive donor should receive a dose of 120 mcg Rh immune globulin (WinRho) to prevent against RhD alloimmunization.
        - Rh immune globulin prophylaxis is not necessary for Rh negative males or females 50 years of age and older.
- 1 dose of platelets should raise the platelet count by at least 15 x 10^9/L, and often raises the count by approximately 25-40 x 10^9/L.
    - A post-transfusion CBC should be drawn within 10-60 minutes following the completion of a platelet transfusion to evaluate for an appropriate platelet increment prior to a major procedure, or if there is a clinical concern of platelet refractoriness.
- Pre-medications:
    - Antihistamines should be considered if there is a history of recurrent or severe allergic reaction with previous transfusion;
    - Antipyretics for prevention of fever have not been found to be effective and are not recommended.
- Administer each unit (about 300 mL volume per dose) at a rate appropriate for the patient volume status.
    - Normovolemic – over 1-1.5 hours
    - Hypervolemic – over 2-3 hours
- Whenever possible, **all** transfusions should be completed during the day shift, for optimum patient safety.
- All transfusion adverse reactions should be reported to the Transfusion Medicine Laboratory.

PLATELET TRANSFUSION – INPATIENT OR OUTPATIENT		
Clinical Setting		**Recommendation and adult dose**
Diagnosis/Indication	**Platelet Count x 10^9/L**	
Asymptomatic patients with chronic bone marrow failure (including those taking low dose oral chemotherapy or azacitidine) or immune thrombocytopenia	Any	No platelet transfusion
Non-immune, hypoproliferative thrombocytopenia due to bone marrow failure on intensive treatment (prophylactic transfusion)	Less than 10	1 dose
Procedures with a low risk† of bleeding, including: • PICC line placement • Tunneled and untunneled central venous line (CVL) placement or removal • Paracentesis, thoracentesis • Endoscopy without biopsy • Bone marrow aspirate and biopsy	Less than 20 Tunneled CVL placement: Less than 20-30	1 dose
Prophylactic anticoagulation that cannot be stopped	Less than 30	1 dose
Therapeutic anticoagulation that cannot be stopped	Less than 30-50	1 dose, and consult thrombosis specialist
Severe, life threatening bleeding	Less than 50	1 dose at a time, clinical judgement and platelet count should guide repeat dosing
Major procedure with a high risk† of bleeding, including: • Lumbar puncture or spinal procedure with hematoma risk • Arterial intervention • Biliary tract intervention or TIPS procedure • Deep abscess drainage • Urinary tract intervention • Solid organ biopsy	Less than 50 Patients with chronic liver disease: Less than 30	1 dose, immediately before procedure, and check platelet response before starting procedure
Epidural anesthesia placement or removal	Less than 80	1 dose, immediately before procedure, and check platelet response before starting procedure
Neurologic bleeding or surgery: • Head trauma or CNS hemorrhage • Neuraxial surgery	Less than 100	1 dose, and check platelet count
Platelet dysfunction **and** significant bleeding • Congenital platelet function defects • Post cardiopulmonary bypass • Life-threatening bleeding with antiplatelet therapy (clopidogrel, ticagrelor, ASA 325 mg)	any	1 dose <u>Exception:</u> Platelet transfusion NOT recommended for intracranial hemorrhage not requiring surgery, due to increased mortality risk
Immune thrombocytopenia (ITP) or Thrombotic Thrombocytopenic Purpura (TTP) **and** life-threatening bleeding	any	1 dose, and **consult a Hematologist**

† Consult Table 3 of the Society of Interventional Radiology Consensus Guideline for details *(J Vasc Interv Radiol 2019; 30:1168-84)*

Plasma

General Plasma Transfusion Considerations

- Plasma transfusion is indicated for prophylaxis against bleeding or for management of acute bleeding in patients with a significant coagulopathy in the setting of multiple coagulation factor deficiencies and when an appropriate coagulation factor concentrate is not available.
- Fresh frozen plasma and frozen plasma are clinically equivalent, and collectively are referred to as plasma.
- The correct adult dose of plasma is 10-15 mL/kg (3-4 units, at about 250 mL/unit), which raises coagulation factor levels by approximately 20%.
    - The duration of efficacy is dependent on the factor half-life being replaced;
    - The effectiveness of plasma in reversing an elevated INR is dependent upon the etiology of the coagulopathy.
- Pre-thawed plasma is not routinely stocked by hospitals in Saskatchewan, with a minimum of 30 minutes required for product thaw and preparation from the time of product order.
- Request for plasma transfusion in facilities that do not routinely stock plasma or in the outpatient setting may be subject to approval by the on-call Transfusion Medicine Physician.
- Pre-medications:
    - Antihistamines should be considered if there is a history of recurrent or severe allergic reaction with previous transfusion;
    - Antipyretics for prevention of fever have not been found to be effective and are not recommended;
    - Diuretics should be administered *before* transfusion to patients at risk for transfusion-associated circulatory overload (TACO), if the patient is not hypovolemic and is hemodynamically stable.
        - TACO risk factors include:
            - Acute or chronic renal insufficiency
            - Positive fluid balance
            - Age 70 and over
            - Congestive heart failure or left ventricular dysfunction
            - History of myocardial infarction
- Administer each unit (about 250 mL volume per unit) at a rate appropriate for the patient volume status:
    - Hypovolemic – over 1-1.5 hours
    - Normovolemic – over 2 hours
    - Hypervolemic – over 3-4 hours
- Whenever possible, **all** transfusions should be completed during the day shift, for optimum patient safety.
- All transfusion adverse reactions should be reported to the Transfusion Medicine Laboratory.

PLASMA TRANSFUSION – INPATIENT		
Clinical Setting		Recommendation and dose
Diagnosis/Indication	INR	
Asymptomatic elevated INR without bleeding (regardless of cause)	Any	No plasma transfusion
Procedure with a low risk† of bleeding, including: • PICC line placement • Tunneled and untunneled central venous line (CVL) placement or removal • Paracentesis, thoracentesis • Endoscopy without biopsy • Bone marrow aspirate and biopsy	Testing not recommended Any INR is acceptable in the setting of chronic liver disease	No plasma transfusion
Major procedure with a high risk† of bleeding, including: • Lumbar puncture or spinal procedure with hematoma risk • Arterial intervention • Biliary tract intervention or TIPS procedure • Deep abscess drainage • Urinary tract intervention • Solid organ biopsy	Patients with chronic liver disease: Greater than 2.4 General population: Greater than 1.7 or unknown and cannot wait for result	3-4 units (10-15 mL/kg)
Major non-neuraxial surgery or surgery with expected blood loss greater than 500 ml	Greater than 1.7 or unknown and cannot wait for result	3-4 units (10-15 mL/kg)
Acquired multiple factor deficiency (disseminated intravascular coagulation, decompensated acute or chronic liver failure) with active bleeding or prior to a major procedure or surgical intervention with a high risk of bleeding	Greater than 1.7 or unknown and cannot wait for result	3-4 units (10-15 mL/kg)
Massive transfusion	Greater than 1.7 or unknown and cannot wait for result	3-4 units (10-15 mL/kg) Included with initial massive transfusion protocol product ratio; further use should be guided by PTT/INR or point-of-care testing (TEG)
Urgent warfarin reversal due to • Life threatening bleeding • Urgent surgical procedure required within 6 hours	Greater than 1.4	**Do not use plasma** Administer 10 mg IV Vitamin K plus Prothrombin Complex Concentrates (PCC) Plasma is indicated ONLY IF: • PCC are unavailable • The patient has a history of heparin-induced thrombocytopenia (HIT).
Congenital coagulation factor deficiency where a factor concentrate is not available **and** • Life threatening bleeding • Urgent surgical procedure required	Greater than 1.4	**Consult a hematologist**
Thrombotic thrombocytopenic purpura (TTP)	Any	Pending plasma exchange; **Consult a hematologist**

† Consult Table 3 of the Society of Interventional Radiology Consensus Guideline for details *(J Vasc Interv Radiol 2019; 30:1168-84)*

Cryoprecipitate

General Cryoprecipitate Transfusion Considerations

- Cryoprecipitate is an unmodified concentrate of coagulation factor proteins (Factor 8, von Willebrand factor, Factor 13, fibronectin) separated from frozen plasma during a controlled thaw process.
- Cryoprecipitate administration is indicated for treatment of bleeding in the setting of acquired or congenital hypofibrinogenemia, or congenital Factor 13 deficiency (in the absence of concentrated factor therapy).
    - Bleeding in the setting of Hemophilia A and von Willebrand disease should be treated with specific factor concentrate therapies only – cryoprecipitate it is NOT appropriate.
- The correct adult dose of cryoprecipitate is 1 unit per 10 kg (average 10 units per adult dose).
- Cryoprecipitate may be issued by the Transfusion Medicine Laboratory as a product pool of 8-10 units per bag or as individual mini-pack units for extraction at the bedside prior to administration.
- Fibrinogen concentrate use should be considered instead of cryoprecipitate for the treatment of acquired hypofibrinogenemia due to its enhanced safety profile (lyophilized, virally inactivated).
    - Consultation with the Transfusion Medicine Physician on-call is recommended to discuss fibrinogen concentrate dosing.
    - The use of fibrinogen concentrate in acquired hypofibrinogenemia is currently off-label in Canada.
- All transfusion adverse reactions should be reported to the Transfusion Medicine Laboratory.

CRYOPRECIPITATE TRANSFUSION – INPATIENT		
Clinical Setting		Recommendation and dose
Diagnosis/Indication	Fibrinogen Level (g/L)	
Acquired hypofibrinogenemia **and** bleeding or pre-operatively in a pregnant or post-partum patient	Less than 2.0	1 unit per 10 kg°
Acquired hypofibrinogenemia **and** bleeding or pre-operatively in disseminated intravascular coagulation or decompensated liver disease (non-pregnant patient)	Less than 1.5	1 unit per 10 kg°
Chronic liver disease and prior to major procedure with a high risk† of bleeding, including	Less than 1.0	1 unit per 10 kg°

°Consideration should be given to use of Fibrinogen Concentrate. Contact the on-call Transfusion Medicine Physician.
† Consult Table 3 of the Society of Interventional Radiology Consensus Guideline for details *(J Vasc Interv Radiol 2019; 30:1168-84)*

To consult with an on-call Transfusion Medicine Physician (available 24/7), please call:

- **Saskatoon and Northern Saskatchewan** – 306-655-1000
- **Regina and Southern Saskatchewan** – 306-766-4444

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