Australian Red Cross Lifeblood®

2021 Edition

Safe and appropriate transfusion practice

Transfusion Orientation Pack
for junior medical officers

Australian Red Cross Lifeblood has developed this pack to promote safe transfusion practice and deliver education and training materials to junior medical officers.

What tools are included?

- Blood Component Prescribing Checklist
- Prescribing Red Cells
- Prescribing Platelets
- Prescribing Fresh Frozen Plasma
- Acute Transfusion Reactions poster
- Quick reference cards: Acute Transfusion Reactions, Blood Compatibility, Blood Prescribing and Warfarin Reversal

How to use the tools

If considering a transfusion for a patient, refer to the relevant prescribing tool:

- Prescribing Red Cells
- Prescribing Platelets
- Prescribing Fresh Frozen Plasma

If a patient needs a transfusion refer to:

- Blood Component Prescribing Checklist
- Blood Prescribing Card

If a suspected transfusion reaction occurs:

- Stop the transfusion
- Check the Acute Transfusion Reactions card or poster

Always refer to your local health service policy and procedures.

These tools are also available in the iTransfuse app.
Download the app at **itransfuseapp.com**

For more information visit **transfusion.com.au/jmo_education**
or email transfusionlearning@redcrossblood.org.au

Blood Component Prescribing Checklist

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If blood components are required in an emergency, contact your Transfusion Service Provider immediately.

Task	Checklist
Confirm patient identity	**Check three patient identifiers:** ☐ Ask the patient to state their full name and date of birth. ☐ Check unique hospital ID number. ☐ Confirm these are identical on the prescription and the patient's wristband.
Obtain and document consent	**Explain the transfusion to the patient, obtain and document consent (follow your local policy).** ☐ Ensure you cover the following: • reasons for transfusion • risks, benefits and alternatives (including no treatment) • process of transfusion, and • provide the patient or carer with written information and the opportunity to ask questions. ☐ Document consent or refusal.
Collect pretransfusion sample	**Contact your Transfusion Service Provider to determine if a current pretransfusion sample/ cross-match is available and valid. If not, complete the following:** ☐ Complete a pretransfusion testing request form, recording the clinical indications and the date and time blood product is required. ☐ When collecting the patient sample: • confirm patient identity • label samples immediately after collection with full patient name, date of birth and/or unique hospital ID number • record date and time of collection • confirm patient details on blood sample and request form are identical, and • sign both the blood sample and collector's declaration on request form. ☐ Transport the sample to your Transfusion Service Provider.
Documentation and communication	**Blood component prescription must be documented, consented, and communicated to ward and clincal staff.** ☐ Ensure you complete documentation with the following information: • full patient name, location of patient, date of birth and/or unique hospital ID number • number and type of blood components requested (avoid using abbreviations) • any special requirements or modifiers e.g. IgA deficient • date and time required, including degree of urgency • patient information including indication for transfusion, patient's diagnoses and relevant transfusion and obstetric history, and • identity and signature of prescriber with date. ☐ Inform clinical staff caring for the patient that the blood component has beeen prescribed.
Monitor for signs of transfusion reactions	**If suspected transfusion reaction occurs:** ☐ Stop the transfusion. ☐ Activate emergency procedures if required. ☐ Follow your local transfusion reaction protocols.
Review response to transfusion	☐ Assess to determine if desired outcome has been achieved. ☐ Assess patient for further blood component transfusions as necessary. ☐ Document the patient assessment.

Version 6.0 19 September 2019. The disclaimer found at **transfusion.com.au** applies to this resource.

Prescribing Red Cells

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Always remember that red cell transfusion:

- should be dictated by clinical status (i.e. symptomatic anaemia) and not by haemoglobin (Hb) alone
- may not be required in well-compensated patients or where other specific therapy (e.g. iron therapy) is available, and
- is not without risk, consider patient blood management principles.

Single unit transfusion followed by clinical reassessment to determine the need for further transfusion is current best practice in adults.

Haemoglobin threshold table

Haemoglobin (g/L)	60	70	80	90	100+
Postoperative with acute myocardial ischaemia (AMI) or cerebrovascular ischaemia (CVI)	Transfusion is appropriate.				Transfusion is usually inappropriate.
Postoperative without acute myocardial ischaemia (AMI) or cerebrovascular ischaemia (CVI)	Transfusion may be appropriate.		Transfusion may be inappropriate.		Transfusion is usually inappropriate.
Acute coronary syndrome	Transfusion likely to be appropriate.[1]		Transfusion may be associated with an increased risk of recurrence of AMI.		Transfusion is usually inappropriate.[2]
General medical and surgical unless otherwise specified (includes heart failure, cancer, chronic kidney disease, chemotherapy, haematopoietic stem cell transplant)	Transfusion likely to be appropriate.[1]	Transfusion may not be required.[3]			Transfusion is usually inappropriate.
Acute upper GI bleed[5]	Transfusion is appropriate.	Transfusion likely to be unnecessary.		Transfusion is usually inappropriate.[4]	
Critically ill[6]	Transfusion is likely to be appropriate.	Transfusion may not be required.[3]		Transfusion is usually inappropriate.	
Obstetrics	Transfusion may be appropriate.[1]	Transfusion may not be required.[3]		Transfusion is usually inappropriate.	
Paediatrics (excluding neonates)	Transfusion is often appropriate.	Transfusion may be appropriate.		Transfusion is often unnecessary and may be inappropriate.	
Thalassaemia	Patients transfused at regular (e.g. monthly intervals) to maintain pretransfusion Hb 90–100 g/L. Generally managed by a thalassaemia specialist, often as outpatient. May be prescribed a predetermined number of units.				A pretransfusion Hb threshold > 100 g/L may be appropriate in some patients.
Myelodysplasia	Decision around appropriate Hb thresholds and frequency of transfusion should be personalised and guided by patient's anaemia-related symptoms, functional or performance status, and response to previous transfusions.				

This table may not be relevant to patients undergoing active resuscitation.

1. Red blood cell transfusion may be associated with reduced mortality.
2. Red blood cell transfusion is associated with increased mortality.
3. Red blood cell transfusion is not associated with reduced mortality.
4. A restrictive transfusion strategy (Hb <70 g/L) results in improved morbidity and mortality compared to a liberal transfusion strategy (Hb <90 g/L).
5. Villanueva C, Colomo A, Bosch A, Concepción M, Hernandez-Gea V, Aracil C et al. *Transfusion Strategies for Acute Upper Gastrointestinal Bleeding*. NEJM 2013;368:11–21.
6. Critically ill refers to patients who are physiologically unstable and at risk of significant morbidity and/or mortality. They require treatment in an intensive care unit.

Neonate and paediatric dose calculation

0.5 x patient weight (kg) x desired Hb rise (g/L)

Prescribing Platelets

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Always remember that platelet transfusion:

- should be dictated by clinical status and not by platelet count alone
- may not be required in well-compensated patients or where other specific therapy is available, and
- is not without risk, consider patient blood management principles.

Single unit transfusion followed by clinical reassessment to determine the need for further transfusion is current best practice in adults.

Prophylactic platelet transfusion threshold table

for prevention of bleeding

Platelet count (x 10^9/L)	0 – 10	10 – 20	20 – 30	30 – 50	50 – 100
Neurosurgery (intracranial, intraocular and neuraxial)	Transfuse 1 adult dose. Calculate paediatric dose.				Transfusion is usually inappropriate.
Invasive procedures	Transfuse 1 adult dose. Calculate paediatric dose.			Transfusion is usually inappropriate.	
Childbirth	Transfuse 1 adult dose.			Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.
Central venous catheter (CVC)	Transfuse 1 adult dose. Calculate paediatric dose.		Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.	
Critically ill patients[2]	Transfuse 1 adult dose. Calculate paediatric dose.		Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.
Chemotherapy with risk factors	Transfuse 1 adult dose. Calculate paediatric dose.		Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.
Chemotherapy without risk factors	Transfuse 1 adult dose. Calculate paediatric dose.	Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.	
Post-cardiac surgery	Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.		
Preterm and low birthweight babies	Calculate paediatric dose.		Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.
Preterm neonate with fetal and neonatal alloimmune thrombocytopenia (FNAIT)	Calculate paediatric dose.			Transfusion is usually inappropriate.	
Term neonate with FNAIT	Calculate paediatric dose.			Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.

1. Consider comorbidities e.g. anticoagulant and antiplatelet agents; significant renal, liver, cardiac or haematological disease; fever and/or infection; predicted platelet count and previous response to platelet transfusion; proximity to care, inpatient vs outpatient care.
2. Critically ill refers to patients who are physiologically unstable and at risk of significant morbidity and/or mortality. They require treatment in an intensive care unit.

Therapeutic platelet transfusion threshold table

The use of a massive transfusion protocol (MTP) which includes platelet transfusions may reduce the risk of mortality in critically bleeding patients.

Platelet count (x10^9/L)	0	10	20	30	50	100
Thrombocytopenia with clinically significant bleeding (e.g. prolonged epistaxis, extensive skin bleeding, haematemesis, melaena, WHO grade 2)	Transfuse 1 adult dose. Calculate paediatric dose.			Transfusion usually unnecessary, consider comorbidities.[1]		Transfusion is usually inappropriate.
Thrombocytopenia with severe bleeding (e.g. bleeding that requires a red cell transfusion, WHO grade 3–4)	Transfuse 1 adult dose. Calculate paediatric dose. Second dose may be appropriate.				Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.
Thrombocytopenia with bleeding at critical sites (e.g. CNS, eyes)	Transfuse 1 adult dose. Calculate paediatric dose. Second dose may be appropriate.					Transfusion is usually inappropriate.
Disseminated intravascular coagulopathy (DIC) Some institutions use viscohaemostatic assay (e.g. ROTEM or TEG) to guide transfusion	Transfuse 1 adult dose, aim for > 50 x 10^9/L. Calculate paediatric dose.				Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.
Fetal and neonatal alloimmune thrombocytopenia (FNAIT) with non-intracranial bleeding	Calculate paediatric dose.				Transfusion usually unnecessary, consider comorbidities.[1]	Transfusion is usually inappropriate.
Fetal and neonatal alloimmune thrombocytopenia (FNAIT) with intracranial bleeding	Calculate paediatric dose.					Transfusion is usually inappropriate.
Functional platelet defects	Platelet counts are not a reliable indicator. Transfuse only if bleeding or to meet individual clinical needs.					Transfusion is usually inappropriate.
Immune thrombocytopenia (ITP), thrombotic thrombocytopenia purpura (TTP), heparin-induced thrombocytopenia (HIT)	Transfuse only if severe bleeding.			Transfusion is usually inappropriate.		

1. Consider comorbidities e.g. anticoagulant and antiplatelet agents; significant renal, liver, cardiac or haematological disease; fever and/or infection; predicted platelet count and previous response to platelet transfusion; proximity to care, inpatient vs outpatient care.

Neonate and paediatric dose calculation

Neonates and infants < 5 kg	10 mL/kg (volume based on apheresis platelet products)
5–9 kg	1 paediatric unit (approx 50 mL)
10–19 kg	2 paediatric units (approx 100 mL)
20–29 kg	3 paediatric units (approx 150 mL)
≥ 30 kg	1 adult dose (apheresis or pooled)

My patient is unresponsive to platelets

Platelet transfusion refractoriness is the repeated failure to achieve satifactory increments to platelet transfusions from random donors. Learn more at **transfusion.com.au/transfusion_practice/platelet_refractoriness**.

Prescribing Fresh Frozen Plasma

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Indications

Transfusion of fresh frozen plasma (FFP) is inappropriate in many settings.
Evidence-based indications for FFP transfusion include:

- replacement of single coagulation factor or protein deficiency if no factor specific concentrate is available:
  - severe hereditary protein S deficiency[1]
  - Factor V deficiency
- prevention of dilutional coagulopathy in the setting of massive transfusion (refer to your institutional massive transfusion protocol (MTP)
- disseminated intravascular coagulation (DIC)
- plasma exchange, for example, in thrombotic thrombocytopenic purpura (TTP)
- reversal of warfarin anticoagulation[2] for:
  - clinically significant bleeding and/or life-threatening critical organ bleeding **when Prothrombinex-VF is not available**
  - life-threatening critical organ bleeding (including intracranial haemorrhage) [150–300 mLs] **in addition to Prothrombinex-VF**.

FFP may have a role in treating coagulopathy with active bleeding in children:

- undergoing surgery[1, 3] or prior to invasive procedures with risk of significant bleeding[1]
- critically ill patients,[3] and
- preterm and low birthweight infants.[3]

Dose

In most cases the dose will be 15 mL/kg. Consider:

- 15–20 mL/kg for adults, and
- 10–20 mL/kg for paediatric patients < 30 kg.

For patients on warfarin, refer to the *Warfarin reversal* card for indications and dosing of FFP.

Warning: Consider lower dose range in patients at risk of fluid overload e.g. neonates and congestive cardiac failure.

Outcomes

When prescribing FFP, evaluate clinical outcomes to determine success e.g. cessation of bleeding.
International normalised ratio (INR) changes may not correlate with clinical effect of FFP transfusion:[4]

- the effect of plasma transfusion on INR is transient
- for the same volume of transfused plasma, a greater reduction in INR is observed at a higher initial INR, and
- the effect of plasma transfusion on INR reduction diminishes as more plasma is transfused.

References

1. New HV, Berryman J, Bolton-Maggs PHB, Cantwell C, Chalmers EA, Davies T, Gottstein R et al. on behalf of the British Committee for Standards in Haematology. Guidelines on transfusion for foetuses, neonates and older children. British Society for Haematology 2016. Available at: https://b-s-h.org.uk/guidelines/guidelines/transfusion-for-fetuses-neonates-and-older-children/
2. Tran HA, Chunilal SD, Harper PL, Tran H, Wood EM, Gallus AS. An update of consensus guidelines for warfarin reversal. MJA 2013;198(4):198–199. Available at: https://www.mja.com.au/journal/2013/198/4/update-consensus-guidelines-warfarin-reversal
3. National Blood Authority. Patient Blood Management Guidelines: Module 6 – Neonatal and Paediatrics. 2016.
4. Bryan et al. Plasma Transfusion Demystified: A Review of the Key Factors Influencing Response to Plasma Transfusion. Lab Medicine 2017;48:108–112.

Acute Transfusion Reactions

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If you suspect a transfusion reaction:

1. **Stop transfusion and activate emergency procedures if required**
2. **Check vital signs**
3. **Maintain current IV access, but do not flush existing administration line**
4. **Repeat all clerical and identity checks**
5. **Notify medical staff and Transfusion Service Provider**
6. **Collect blood and urine samples, save blood pack and IV line for culture if required**

Signs and symptoms	Investigations	Causes and clinical management
Fever		
≥ 38°C and rise ≥ 1°C from baseline within 4 hours of starting transfusion No other symptoms (but may have chills or rigors).	No investigation required.	**Mild febrile non-haemolytic transfusion reaction** · Exclude other serious or severe reactions. · Give antipyretic. · If reaction subsides and product still viable, **restart transfusion slowly.** · If no improvement or worsening of symptoms, **stop transfusion and do not restart**, and investigate for a severe febrile reaction.
≥ 38°C and rise ≥ 1°C from baseline within 15 minutes of starting transfusion With other symptoms such as chills, rigors, hypotension, shock, tachycardia, anxiety, dyspnoea, back/chest pain, haemoglobinura/oliguria, bleeding from IV sites, disseminated intravascular coagulation, nausea, vomiting. **or** **≥ 39°C** ⚠ **Potentially life-threatening**	**Sepsis work-up** Gram stain on blood product bag; blood cultures on both patient and products. **Incompatible blood work-up** Group, screen and DAT on pre and post-transfusion samples. **Haemolysis work-up** FBC, LDH, bilirubin, haptoglobin, electrolytes, creatinine, urinalysis. **DIC work-up** Disseminated intravascular coagulation (DIC) may complicate a severe reaction – perform aPTT, PT, fibrinogen, D-Dimer (or FDP).	**Severe febrile non-haemolytic transfusion reaction** · **Do not restart transfusion.** · Investigate to exclude other serious or severe reactions with sepsis and incompatible blood work-ups. Consider haemolysis and DIC work-ups. **Transfusion-transmitted bacterial infection** · **Do not restart transfusion.** · Start broad-spectrum IV antibiotics, IV fluids and inotropes to provide cardiovascular support and maintain urine output. · Ask your Transfusion Service Provider to notify Lifeblood to ensure quarantine and testing of components from same donation. **Acute haemolytic transfusion reaction** · **Do not restart transfusion.** · IV fluids and inotropes to maintain blood pressure and urine output. · Induced diuresis may be needed. · For further transfusions, consider consultation with a haematologist.
Dyspnoea		
Within 15 minutes of starting transfusion but may be later Hypotension, fever, with/without tachycardia. ⚠ **Potentially life-threatening**	**Sepsis work-up** Gram stain on blood product bag; blood cultures on both patient and products. **Incompatible blood work-up** Group, screen and DAT on pre and post-transfusion samples. **Haemolysis work-up** FBC, LDH, bilirubin, haptoglobin, electrolytes, creatinine, urinalysis. **DIC work-up** Disseminated intravascular coagulation (DIC) may complicate a severe reaction – perform aPTT, PT, fibrinogen, D-Dimer (or FDP). **Anaphylaxis work-up** Check haptoglobin, tryptase and IgA levels. Test for anti-IgA if IgA deficient.	**Transfusion-transmitted bacterial infection** · **Do not restart transfusion.** · Start broad-spectrum IV antibiotics, IV fluids and inotropes to provide cardiovascular support and maintain urine output. · Ask your Transfusion Service Provider to notify Lifeblood to ensure quarantine and testing of components from same donation. **Acute haemolytic transfusion reaction** · **Do not restart transfusion.** · IV fluids and inotropes to maintain blood pressure and urine output. · Induced diuresis may be needed. · For further transfusions consider consultation with a haematologist. **Anaphylaxis** · **Do not restart transfusion.** · Implement basic life support. Maintain airway and blood pressure. Adrenaline, IV fluids, oxygen and other resuscitation as indicated. · To prevent recurrence, consider corticosteroid and antihistamine premedication. If IgA-deficiency with anti-IgA present, consider IgA-deficient or washed red cells. · For further transfusions, consider consultation with a haematologist.
1–2 hours following transfusion Typically with **hypertension**, also cyanosis, orthopnea, increased venous pressure/jugular venous distension, tachycardia, pulmonary oedema, elevated BNP, cardiomegaly. ⚠ **Potentially life-threatening**	Assess chest X-ray for pulmonary oedema. Elevated BNP/N-terminal pro-BNP levels are more common in this reaction.	**Transfusion associated circulatory overload** · **Do not restart transfusion.** · Give oxygen, diuretics and sit patient upright. · For future transfusions in susceptible patients (i.e. paediatric or elderly patients, severely anaemic or CHD): infuse slowly and consider diuretic.
Within 6 hours following transfusion (usually within 1–2 hours) Typically with **hypotension**, also bilateral pulmonary oedema, severe hypoxemia, cyanosis, fever, bilateral interstitial and alveolar infiltrates (pulmonary oedema), without elevated pulmonary pressures. No evidence of circulatory overload or pre-existing lung injury. ⚠ **Potentially life-threatening**	Assess chest X-ray for pulmonary infiltrates. Normal BNP/N-terminal pro-BNP levels are more common in this reaction. HLA/HNA typing and antibodies. Transfusion-related acute lung injury is a clinical diagnosis – investigations to exclude other reactions.	**Transfusion-related acute lung injury** · **Do not restart transfusion.** · Provide cardiovascular and airway support; give oxygen and ventilation as necessary; diuretics are not beneficial and may worsen this reaction. · Notify Lifeblood to ensure quarantine and testing of components from the same donation.
Urticaria or rash		
Over less than 2/3 of the body 2–3 hours into transfusion Localised urticaria (hives), pruritus with no other symptoms/signs.	No investigation required.	**Minor allergic reaction** · Give antihistamine. · If reaction subsides and product still viable, **restart transfusion slowly.** · If no improvement or worsening of symptoms, **stop transfusion and do not restart**, and manage as a severe allergic reaction (see below). · Consider premedication with antihistamine for future transfusions if recurrent minor allergic reactions occur.
Over more than 2/3 of the body early in transfusion Localised urticaria (hives), pruritus with no other symptoms/signs.	No investigation required.	**Severe allergic reaction** · **Do not restart transfusion.** · Give antihistamine and corticosteroid as required. · If recurrent severe allergic reactions occur, consider premedication with antihistamine or transfusing with plasma-depleted or washed red cells.
Over more than 2/3 of the body, within 45 minutes of starting transfusion (majority within 5 minutes) With other symptoms such as: · dyspnoea, upper or lower airway obstruction (hoarseness, stridor, wheezing, chest pain, anxiety) · severe hypotension, bronchospasm, cyanosis · GI symptoms (nausea, vomiting). ⚠ **Potentially life-threatening**	**Anaphylaxis work-up** Check haptoglobin, tryptase and IgA levels. Test for anti-IgA if IgA deficient.	**Anaphylaxis** · **Do not restart transfusion.** · Implement basic life support. Maintain airway and blood pressure. Adrenaline, IV fluids, oxygen and other resuscitation as indicated. · To prevent recurrence, consider corticosteroid and antihistamine premedication. If IgA-deficiency with anti-IgA present, consider IgA-deficient or washed red cells. · For further transfusions, consider consultation with a haematologist.

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