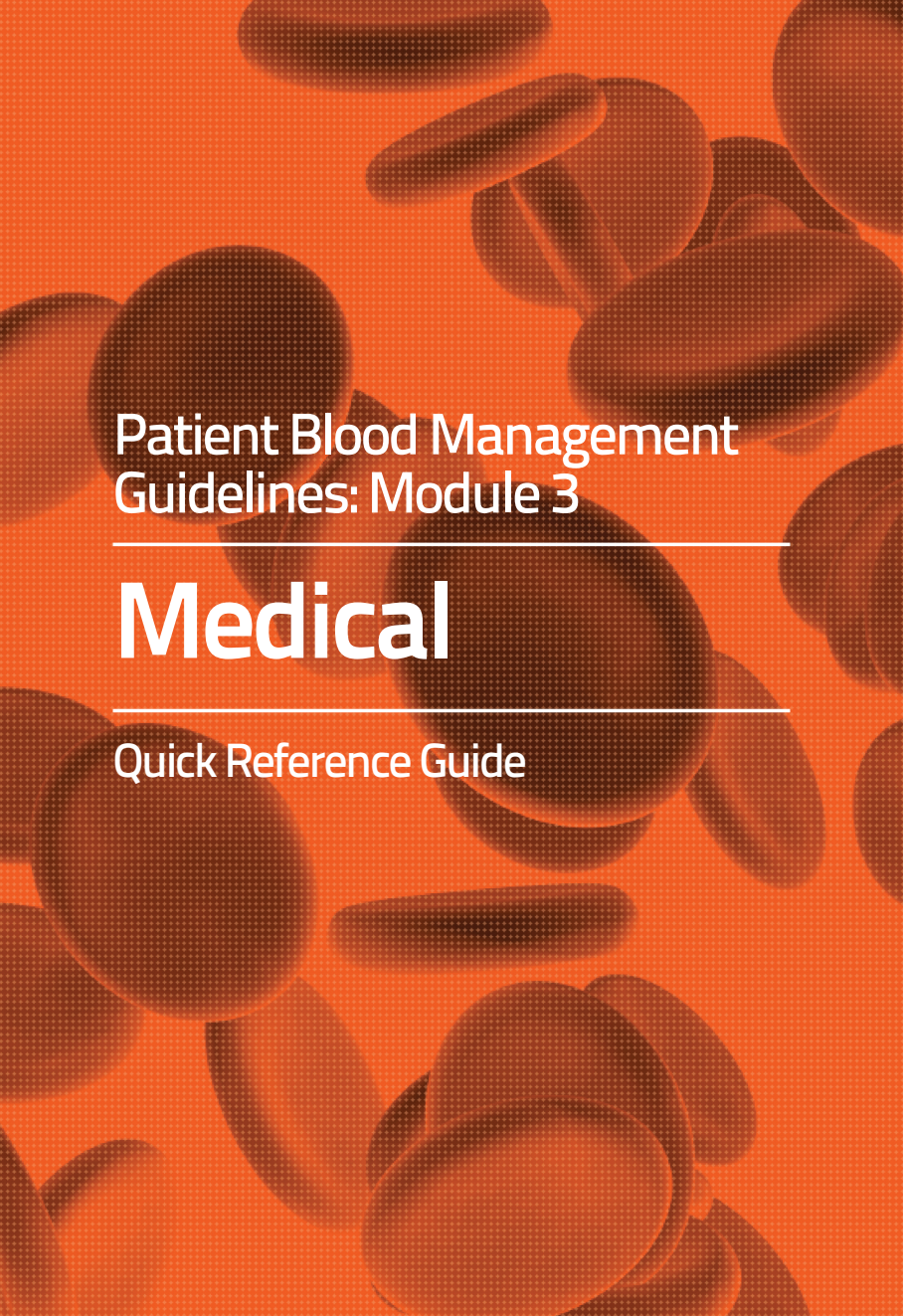

Patient Blood Management Guidelines: Module 3

Medical

Quick Reference Guide

Reprinted with corrections 2013.

ISBN 978-0-9872519-7-8

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Disclaimer

This document is a general guide to appropriate practice, to be followed subject to the circumstances, clinician's judgement and patient's preferences in each individual case. It is designed to provide information to assist decision making. Recommendations contained herein are based on the best available evidence published between 1966 and July 2010. The relevance and appropriateness of the information and recommendations in this document depend on the individual circumstances. Moreover, the recommendations and guidelines are subject to change over time.

Each of the parties involved in developing this document expressly disclaims and accepts no responsibility for any undesirable consequences arising from relying on the information or recommendations contained herein.

Patient Blood Management Guidelines: Module 3 – Medical

This module was developed through clinical input and expertise of representatives from the colleges and societies listed below, a patient blood management advocate, an independent consumer advocate, an independent gastroenterology expert and an independent nephrology expert (see Appendix A in the module).

Australian and New Zealand Intensive Care Society

Australian and New Zealand Society of Blood Transfusion

Australian Red Cross Blood Service

College of Intensive Care Medicine of Australia and New Zealand

Haematology Society of Australia and New Zealand

Royal Australian College of General Practitioners

Royal Australasian College of Physicians

Royal College of Nursing Australia

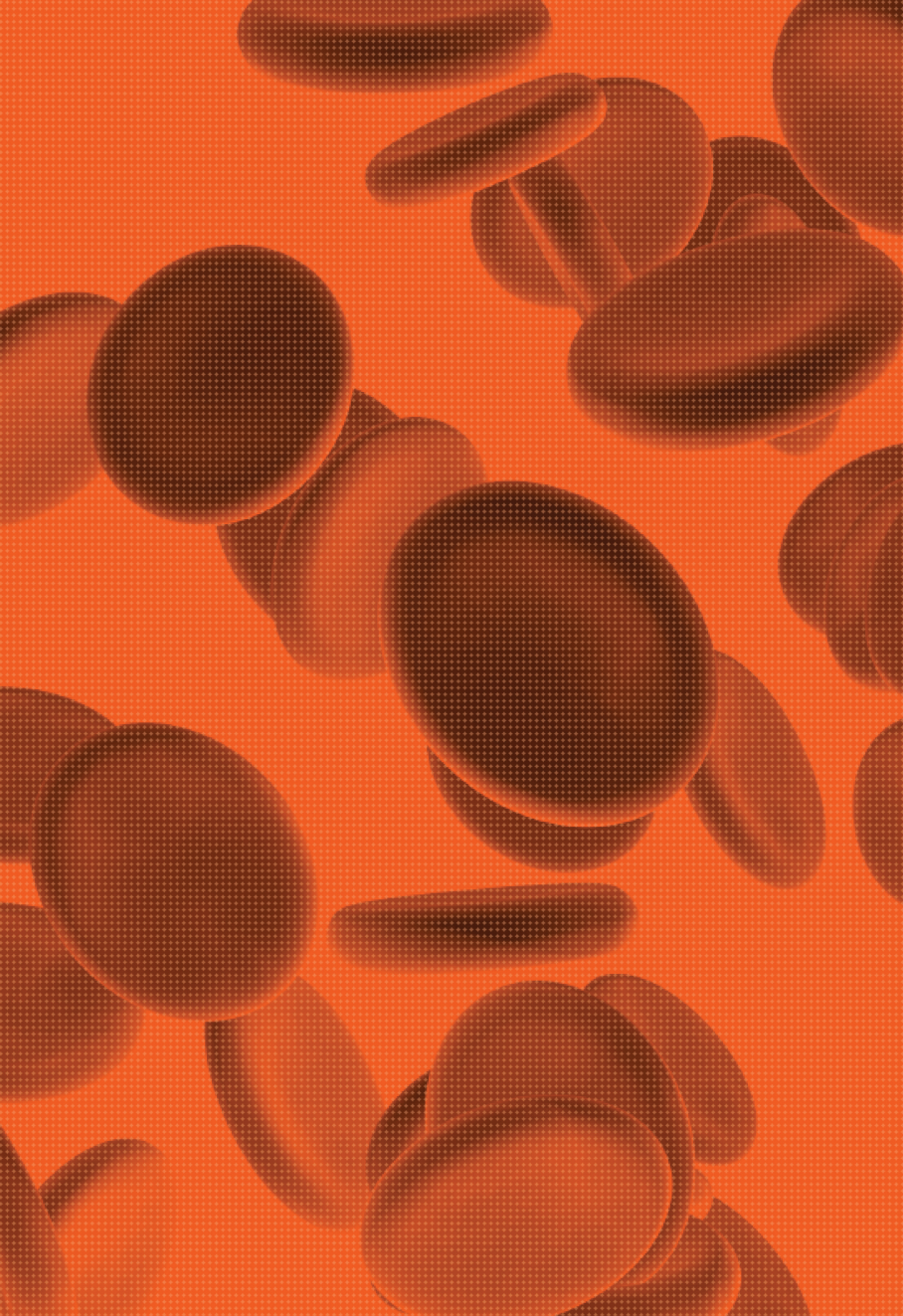
Royal College of Pathologists of Australasia

Thalassaemia Australia

The National Blood Authority gratefully acknowledges these contributions. College and Society endorsement of this Module can be found at www.blood.gov.au

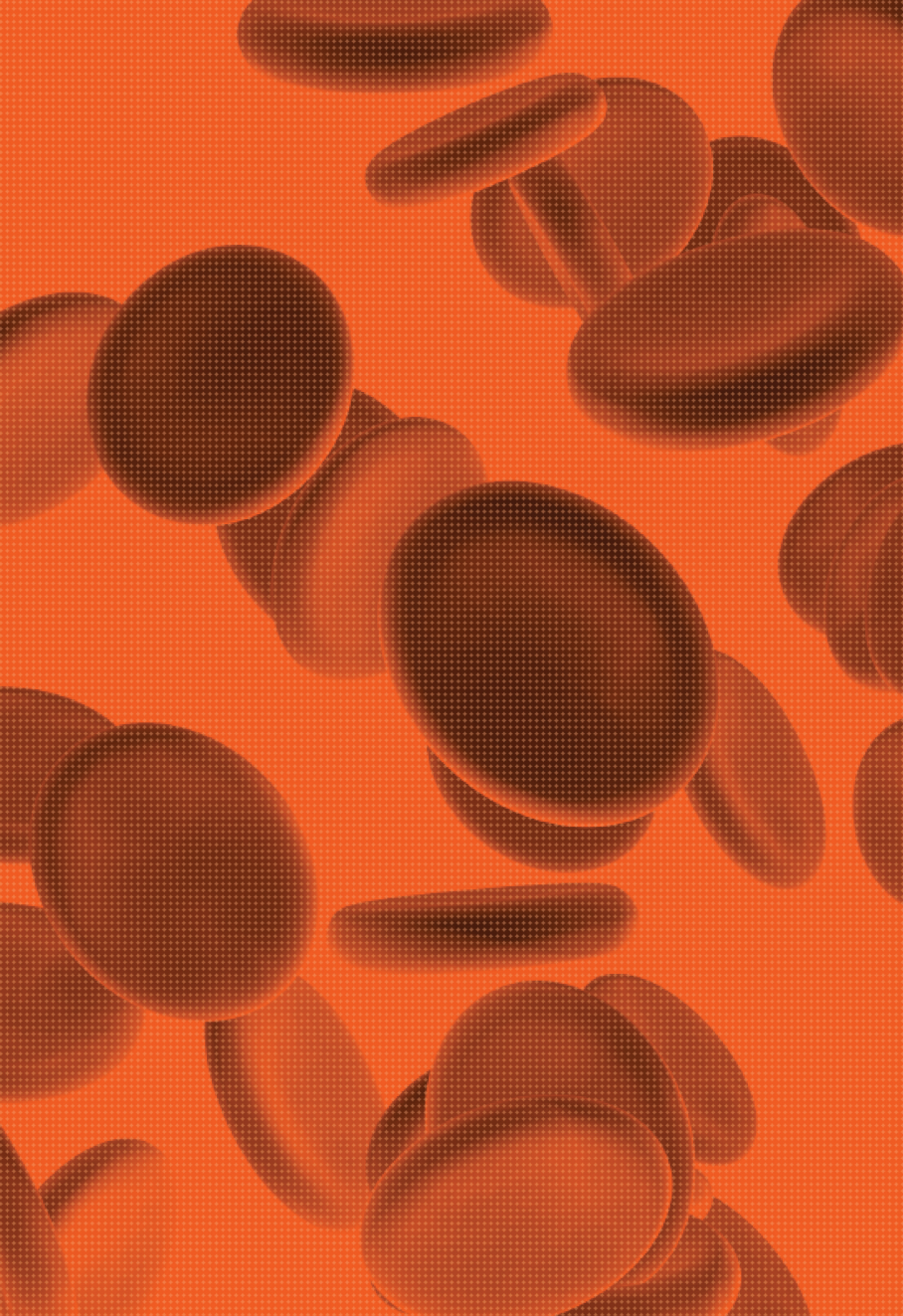
NATIONAL BLOOD AUTHORITY
AUSTRALIA

Funding, secretariat and project management was provided by the National Blood Authority, Australia. The development of the final recommendations has not been influenced by the views or interests of the funding body.



Abbreviations and acronyms

ACS	acute coronary syndrome
AHCDO	Australian Haemophilia Centre Directors' Organisation
ASBT	Australasian Society of Blood Transfusion
CARI	Caring for Australasians with Renal Impairment
CHF	chronic heart failure
CKD	chronic kidney disease
CRG	Clinical/Consumer Reference Group
DIC	disseminated intravascular coagulation
ESA	erythropoiesis-stimulating agent
FFP	fresh frozen plasma
Hb	haemoglobin
HIT	heparin-induced thrombocytopaenia
HSCT	haematopoietic stem cell transplantation
IBD	inflammatory bowel disease
IV	intravenous
MI	myocardial infarction
NBA	National Blood Authority
NHMRC	National Health and Medical Research Council
NYHA	New York Heart Association
PP	practice point
R	recommendation
RBC	red blood cell
TTP	thrombotic thrombocytopenic purpura



Contents

1. Introduction

T*he Patient Blood Management Guidelines: Module 3 – Medical*[1] (Module 3 – Medical), is the third in a series of six modules that focus on evidence-based patient blood management. The other five modules are critical bleeding/massive transfusion, perioperative, critical care, obstetrics and paediatrics/neonates. Together, Module 2 (Perioperative) and Module 3 (Medical) cover all the patient groups addressed by the 2001 *Clinical Practice Guidelines on the Use of Blood Components*[2] (National Health and Medical Research Council/Australasian Society of Blood Transfusion, NHMRC/ASBT). Thus, the 2001 guidelines have now been replaced.

Module 3 – Medical was developed by a Clinical/Consumer Reference Group (CRG) representing specialist colleges, organisations and societies, with the active participation of the clinical community.

This quick reference guide of Module 3 – Medical includes:

- a summary of the *recommendations* that were developed by the CRG, based on evidence from a systematic review
- a summary of the *practice points* that were developed by the CRG through consensus decision making

Details of the systematic reviews used in the development of Module 3 - Medical, for which the electronic searches included articles published between 1966 and July 2010, are given in the technical reports[3,4] available on the National Blood Authority (NBA) website.

2. Development of recommendations and practice points

Recommendations

The CRG developed recommendations where sufficient evidence was available from the systematic review of the literature. The recommendations have been carefully worded to reflect the strength of the body of evidence. Each recommendation has been given a grade, using the following definitions, which were set by the NHMRC:

GRADE A	Body of evidence can be trusted to guide practice
GRADE B	Body of evidence can be trusted to guide practice in most situations
GRADE C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
GRADE D	Body of evidence is weak and recommendations must be applied with caution.

Practice Points

The CRG developed practice points where the systematic review found insufficient high-quality data to produce evidence-based recommendations, but the CRG felt that clinicians require guidance to ensure good clinical practice. These points are based on consensus among the members of the committee.

This quick reference guide summarises the recommendations and practice points in a sequence that reflects clinical practice.

3. Categorisation of recommendations and practice points

The following table categorises the recommendations and practice points according to different elements of patient blood management. It also identifies where to find the recommendations and practice points within this quick reference guide and Module 3 - Medical, where references are provided.

This section is followed by a series of tables giving the full recommendations and practice points for each element.

ELEMENT OF PATIENT BLOOD MANAGEMENT	RECOMMENDATION	PRACTICE POINT	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	RELEVANT SECTION OF MODULE 3 - MEDICAL
General medical population				
Red cells		PP1-4	4.1	3.2.1
Cardiac - acute coronary syndrome				
Red cells	R1	PP1-6	4.2	3.2.1, 3.2.2
Cardiac – heart failure				
Iron and erythropoiesis-stimulating agents	R3		4.3	3.3.2
Red cells		PP1-4, PP7	4.3	3.2.1, 3.2.3
Cancer				
Red cells		PP1-4, PP8-9	4.4	3.2.1, 3.2.4, 3.3.1
Iron and erythropoiesis-stimulating agents	R2	PP12	4.4	3.3.1
Gastrointestinal				
Red cells		PP1-4, PP10-11	4.5	3.2.1, 3.2.5

ELEMENT OF PATIENT BLOOD MANAGEMENT	RECOMMENDATION	PRACTICE POINT	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	RELEVANT SECTION OF MODULE 3 - MEDICAL
Iron and erythropoiesis-stimulating agents		PP15	4.5	3.3.5
Chronic kidney disease				
Iron and erythropoiesis-stimulating agents	R4-7	PP13-14	4.6	3.3.3
Red cells		PP1-4	4.6	3.2.1
Chemotherapy and haematopoietic stem cell transplantation				
Red cells		PP1-4	4.7	3.2.1
Platelets	R8	PP20, PP22	4.7	3.4.3, 3.5.3
Thalassaemia and myelodysplasia				
Red cells		PP1-2, PP23-24	4.8	3.2.1, 3.6.1, 3.6.2
Platelets		PP21	4.8	3.4.3
Coagulopathy				
Fresh Frozen Plasma		PP16-17	4.9	3.4.1
Cryoprecipitate or fibrinogen concentrate		PP18-19	4.9	3.4.2
Thrombocytopenia				
Platelets		PP20-21	4.10	3.4.3

4. Recommendations and practice points

4.1 General medical

Red Cells

PRACTICE POINTS – medical population	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L**, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L**, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.

Red Cells

PRACTICE POINTS – medical population	
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.

ACS, acute coronary syndrome; CHF, chronic heart failure; CRG, Clinical/Consumer Reference Group; Hb, haemoglobin; PP, practice point; RBC, red blood cell

4.2 Cardiac - acute coronary syndrome

Red Cells

RECOMMENDATION – acute coronary syndrome	
R1 **GRADE C**	In ACS patients with a Hb concentration >100 g/L, RBC transfusion is not advisable because of an association with increased mortality.

PRACTICE POINTS – acute coronary syndrome	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.
PP5	In patients with ACS and a Hb concentration <80 g/L, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. (See PP1 and PP2).
PP6	In patients with ACS and a Hb concentration of 80 – 100 g/L, the effect of RBC transfusion on mortality is uncertain and may be associated with an increased risk of recurrence of MI. Any decision to transfuse should be made with caution and based on careful consideration of the risks and benefits. (See PP1 and PP2).

ACS, acute coronary syndrome; Hb, haemoglobin; MI, myocardial infarction; PP, practice point; R, recommendation; RBC, red blood cell

4.3 Cardiac - heart failure

Iron and erythropoiesis-stimulating agents

RECOMMENDATION – chronic heart failure	
R3 **GRADE B**	In patients with CHF, identification and treatment of iron deficiency (absolute and functional) is recommended to improve functional or performance status. This is consistent with the 2011 update to the *Guidelines for the Prevention, Detection and Management of Chronic Heart Failure in Australia*, 2006.[6] Note: The studies reviewed only included patients treated with IV iron, and of NYHA functional classes II or III.

CHF, chronic heart failure; IV, intravenous; NYHA, New York Heart Association; R, recommendation

Red Cells

PRACTICE POINT – heart failure	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.

PRACTICE POINT – heart failure	
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L,** RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L,** RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.
PP7	In all patients with heart failure, there is an increased risk of transfusion-associated circulatory overload. This needs to be considered in all transfusion decisions. Where indicated, transfusion should be of a single unit of RBC followed by reassessment of clinical efficacy and fluid status. For further guidance on how to manage patients with heart failure, refer to general medical or ACS sections, as appropriate (R1, R3, PP3–PP6).

4.4 Cancer

Red Cells

PRACTICE POINTS – cancer	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L**, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L**, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.

Red Cells

PRACTICE POINTS – cancer	
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.
PP8	In patients with cancer, the aetiology of anaemia is often multifactorial; where appropriate, reversible causes should be identified and treated.
PP9	There is a lack of specific evidence relating to the effects of RBC transfusion in patients with cancer. Any decision to transfuse should be based on the need to relieve clinical signs and symptoms of anaemia. When treating patients with cancer, refer also to the general medical population PP1–PP4.

PP, practice point; RBC, red blood cell

Iron and erythropoiesis-stimulating agents

RECOMMENDATION – cancer	
R2 **GRADE A**	In cancer patients with anaemia, the *routine* use of ESAs is not recommended because of the increased risks of mortality and thromboembolic events.

PRACTICE POINTS – cancer	
PP12	In anaemic patients with cancer receiving ESAs, evaluate iron status to guide adjuvant iron therapy.

ACS, acute coronary syndrome; CHF, chronic heart failure; CRG, Clinical/Consumer Reference Group; ESA, erythropoiesis-stimulating agent; Hb, haemoglobin; PP, practice point; R, recommendation; RBC, red blood cell

4.5 Gastrointestinal

Red Cells

PRACTICE POINTS – acute upper gastrointestinal blood loss	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L**, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L**, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.

Red Cells

PRACTICE POINTS – acute upper gastrointestinal blood loss	
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.
PP10	In well-compensated patients with acute upper gastrointestinal blood loss that is non-critical, there is no evidence to favour a liberal transfusion policy. Therefore, a more restrictive approach may be appropriate. There are no data to support a specific Hb treatment target in these patients.
PP11	For critically bleeding patients, refer to *Patient Blood Management Guidelines: Module 1 – Critical Bleeding/Massive Transfusion* (2011)[7].

ACS, acute coronary syndrome; CHF, chronic heart failure; CRG, Clinical/Consumer Reference Group; Hb, haemoglobin; IBD, inflammatory bowel disease; IV, intravenous; PP, practice point; RBC, red blood cell

Iron and erythropoiesis-stimulating agents

PRACTICE POINT – inflammatory bowel disease	
PP15	In patients with IBD, determine the cause of anaemia and treat reversible causes. IV iron may be required in patients who are intolerant of oral iron, or to avoid aggravation of intestinal inflammation.

ACS, acute coronary syndrome; CHF, chronic heart failure; CRG, Clinical/Consumer Reference Group; Hb, haemoglobin; IBD, inflammatory bowel disease; IV, intravenous; PP, practice point; RBC, red blood cell

4.6 Chronic kidney disease

Iron and erythropoiesis-stimulating agents

RECOMMENDATIONS – chronic kidney disease	
R4 **GRADE B**	In anaemic patients with CKD, ESA therapy to a low to intermediate Hb target may be used to avoid RBC transfusion, after consideration of risks and benefits for the individual patient. Note: The CARI guidelines recommend a Hb target between 100–115 g/L[8]
R5 **GRADE C**	In anaemic patients with CKD, ESA therapy to a low to intermediate Hb target may be used to relieve fatigue, after consideration of risks and benefits for the individual patient. Note: The CARI guidelines recommend a Hb target between 100–115 g/L[8]
R6 **GRADE B**	In anaemic patients with CKD, ESA therapy to a Hb target of over 130 g/L is not recommended because of increased morbidity.
R7 **GRADE B**	In anaemic patients with non dialysis-dependent CKD, type 2 diabetes and a history of malignancy, the *routine* use of ESAs is not recommended because of the increased risk of cancer-related mortality.
PRACTICE POINTS – chronic kidney disease	
PP13	ESA use is less effective in patients with chronic renal failure who have absolute or functional iron deficiency.
PP14	For comprehensive information about ESA and iron therapy in patients with CKD, refer to CARI iron guidelines.[8]

CARI, Caring for Australasians with Renal Impairment; CKD, chronic kidney disease; ESA, erythropoiesis-stimulating agent; Hb, haemoglobin; PP, practice point; R, recommendation; RBC, red blood cell

PRACTICE POINTS – chronic kidney disease	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L**, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L**, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.

ACS, acute coronary syndrome; CARI, Caring for Australasians with Renal Impairment; CHF, chronic heart failure; CKD, chronic kidney disease; CRG, Clinical/Consumer Reference Group; ESA, erythropoiesis-stimulating agent; Hb, haemoglobin; PP, practice point; R, recommendation; RBC, red blood cell

4.7 Chemotherapy and haematopoietic stem cell transplantation

Red Cells

PRACTICE POINTS – chemotherapy and haematopoietic stem cell transplantation	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L**, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L,** RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease. ▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.

Red Cells

PRACTICE POINTS – chemotherapy and haematopoietic stem cell transplantation	
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.

ACS, acute coronary syndrome; CARI, Caring for Australasians with Renal Impairment; CHF, chronic heart failure; CKD, chronic kidney disease; CRG, Clinical/Consumer Reference Group; ESA, erythropoiesis-stimulating agent; Hb, haemoglobin; PP, practice point; R, recommendation; RBC, red blood cell

Platelets

RECOMMENDATION – chemotherapy and haematopoietic stem cell transplantation	
R8 **GRADE B**	In patients undergoing chemotherapy and haematopoietic stem cell transplantation, the recommended strategy for prophylactic use of platelets is transfusion at a platelet count of $<10 \times 10^9$/L in the absence of risk factors, and at $<20 \times 10^9$/L in the presence of risk factors (e.g. fever, minor bleeding).

PRACTICE POINTS – chemotherapy and haematopoietic stem cell transplantation	
PP20	Platelet transfusion may be indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. Platelet transfusions are not indicated in all causes of thrombocytopenia, and may be contraindicated in certain conditions (e.g. TTP and HIT). Thus, the cause of the thrombocytopenia should be established and expert opinion sought.
PP22	In patients undergoing chemotherapy and haematopoietic stem cell transplantation, there is no evidence to support: ▪ a lower trigger for prophylactic platelet transfusion for patients with risk factors (e.g. fever, minor bleeding) ▪ a strategy of therapeutic-only platelet transfusions (i.e. for treatment of clinically significant bleeding). Further research to determine the safety and efficacy of a lower platelet transfusion trigger is underway.

ACS, acute coronary syndrome; CHF, chronic heart failure; CRG, Clinical/Consumer Reference Group; Hb, haemoglobin; HIT, heparin-induced thrombocytopaenia; PP, practice point; R, recommendation; RBC, red blood cell; TTP, thrombotic thrombocytopenic purpura

4.8 Thalassaemia and myelodysplasia

Red Cells

PRACTICE POINTS – thalassaemia and myelodysplasia	
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.
PP23	In patients with thalassaemia, the evidence does not support any change to the current practice of maintaining a pretransfusion Hb concentration of 90 – 100 g/L, with transfusions at about monthly intervals.
PP24	In patients with myelodysplasia who are regularly and chronically transfused, there is no evidence to guide particular Hb thresholds. Decisions around appropriate triggers and frequency of transfusion need to be individualised, taking into account anaemia-related symptoms, functional or performance status, and the patient's response to previous transfusions.

Hb, haemoglobin; PP, practice point

Platelets

PRACTICE POINTS – thalassaemia and myelodysplasia	
PP21	In patients with chronic failure of platelet production (e.g. myelodysplasia or aplastic anaemia), a specific threshold for transfusion may not be appropriate. These patients are best managed on an individual basis, in consultation with a relevant expert.[9] Long-term prophylactic platelet transfusions may be best avoided because of the risk of complications (e.g. alloimmunisation and platelet refractoriness). Therapeutic platelet transfusions could be considered for treatment of bleeding.

HIT, heparin-induced thrombocytopaenia; PP, practice point; TTP, thrombotic thrombocytopenic purpura

4.9 Coagulopathy

Fresh frozen plasma

PRACTICE POINTS – coagulopathy	
PP16	The *routine* use of FFP in medical patients with coagulopathy (including those with liver impairment) is not supported. Tests for coagulation correlate poorly with bleeding risk in liver impairment. The underlying causes of coagulopathy should be assessed. Where FFP transfusion is considered necessary, the risks and benefits should be considered for each patient, and expert guidance sought.
PP17	For guidance on the use of FFP in specific patient groups, refer to: ▪ *Patient Blood Management Guidelines: Module 1 – Critical Bleeding/Massive Transfusion* (2011)[7] ▪ *Patient Blood Management Guidelines: Module 2 – Perioperative* (2012)[10] ▪ *Warfarin Reversal: Consensus Guidelines, on behalf of the Australasian Society of Thrombosis and Haemostasis* (2004)[11] ▪ AHCDO guidelines for patients with specific factor deficiencies (www.ahcdo.org.au) ▪ TTP: *Guidelines for the Use of Fresh-Frozen Plasma, Cryoprecipitate and Cryosupernatant* (2004).[12]

AHCDO, Australian Haemophilia Centre Directors' Organisation; FFP, fresh frozen plasma; PP, practice point; TTP, thrombotic thrombocytopenic purpura

Cryoprecipitate or fibrinogen concentrate

PRACTICE POINTS – coagulopathy	
PP18	The *routine* use of cryoprecipitate or fibrinogen concentrate in medical patients with coagulopathy is not advised. The underlying causes of coagulopathy should be identified; where transfusion is considered necessary, the risks and benefits should be considered for each patient. Specialist opinion is advised for the management of DIC.
PP19	For guidance on the use of cryoprecipitate or fibrinogen concentrate in specific patient groups, refer to: ▪ *Patient Blood Management Guidelines: Module 1 – Critical Bleeding/Massive Transfusion* (2011)[7] ▪ AHCDO guidelines for patients with specific factor deficiencies (www.ahcdo.org.au) ▪ TTP: *Guidelines for the Use of Fresh-Frozen Plasma, Cryoprecipitate and Cryosupernatant* (2004).[12]

AHCDO, Australian Haemophilia Centre Directors' Organisation; DIC, disseminated intravascular coagulation; PP, practice point

4.10 Thrombocytopenia

Platelets

PRACTICE POINTS – thrombocytopenia	
PP20	Platelet transfusion may be indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. Platelet transfusions are not indicated in all causes of thrombocytopenia, and may be contraindicated in certain conditions (e.g. TTP and HIT). Thus, the cause of the thrombocytopenia should be established and expert opinion sought.
PP21	In patients with chronic failure of platelet production (e.g. myelodysplasia or aplastic anaemia), a specific threshold for transfusion may not be appropriate. These patients are best managed on an individual basis, in consultation with a relevant expert.[9] Long-term prophylactic platelet transfusions may be best avoided because of the risk of complications (e.g. alloimmunisation and platelet refractoriness). Therapeutic platelet transfusions could be considered for treatment of bleeding.

HIT, heparin-induced thrombocytopaenia; PP, practice point; TTP, thrombotic thrombocytopenic purpura

5. Recommendations summary table

IDENTIFIER AND GRADE	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
R1 **GRADE C**	In ACS patients with a Hb concentration >100 g/L, RBC transfusion is not advisable because of an association with increased mortality.	3.2.2	4.2		✓								
R2 **GRADE A**	In cancer patients with anaemia, the *routine* use of ESAs is not recommended because of the increased risks of mortality and thromboembolic events.	3.3.1	4.4				✓						

IDENTIFIER AND GRADE	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
R3 **GRADE B**	In patients with CHF, identification and treatment of iron deficiency (absolute and functional) is recommended to improve functional or performance status. This is consistent with the 2011 update to the *Guidelines for the Prevention, Detection and Management of Chronic Heart Failure in Australia*, 2006.[6] Note: The studies reviewed only included patients treated with IV iron, and of NYHA functional classes II or III.	3.3.2	4.3			✓								
R4 **GRADE B**	In anaemic patients with CKD, ESA therapy to a low to intermediate Hb target may be used to avoid RBC transfusion, after consideration of risks and benefits for the individual patient. Note: The CARI guidelines recommend a Hb target between 100–115 g/L[8]	3.3.3	4.6						✓					

IDENTIFIER AND GRADE	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
R5 **GRADE C**	In anaemic patients with CKD, ESA therapy to a low to intermediate Hb target may be used to relieve fatigue, after consideration of risks and benefits for the individual patient. Note: The CARI guidelines recommend a Hb target between 100–115 g/L[8]	3.3.3	4.6						✓				
R6 **GRADE B**	In anaemic patients with CKD, ESA therapy to a Hb target of over 130 g/L is not recommended because of increased morbidity.	3.3.3	4.6						✓				
R7 **GRADE B**	In anaemic patients with non dialysis-dependent CKD, type 2 diabetes and a history of malignancy, the *routine* use of ESAs is not recommended because of the increased risk of cancer-related mortality.	3.3.3	4.6						✓				

IDENTIFIER AND GRADE	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
RB **GRADE B**	In patients undergoing chemotherapy and haematopoietic stem cell transplantation, the recommended strategy for prophylactic use of platelets is transfusion at a platelet count of $<10 \times 10^9$/L in the absence of risk factors, and at $<20 \times 10^9$/L in the presence of risk factors (e.g. fever, minor bleeding).	3.5.3	4.7							✓			

ACS, acute coronary syndrome; CHF, chronic heart failure; CKD, chronic kidney disease; ESA, erythropoiesis-stimulating agent; Hb, haemoglobin; IV, intravenous; NYHA, New York Heart Association; R, recommendation; RBC, red blood cell; TTP, thrombotic thrombocytopenic purpura

6. Practice points summary table

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP1	RBC transfusion should not be dictated by a Hb concentration alone, but should also be based on assessment of the patient's clinical status.	3.2.1	4.1 – 4.8	✓	✓	✓	✓	✓	✓	✓	✓		
PP2	Where indicated, transfusion of a single unit of RBC, followed by clinical reassessment to determine the need for further transfusion, is appropriate. This reassessment will also guide the decision on whether to retest the Hb level.	3.2.1	4.1 – 4.8	✓	✓	✓	✓	✓	✓	✓	✓		

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP3	Direct evidence is not available in general medical patients.[a] Evidence from other patient groups and CRG consensus suggests that, with a: ▪ **Hb concentration <70 g/L,** RBC transfusion may be associated with reduced mortality and is likely to be appropriate. However, transfusion may not be required in well-compensated patients or where other specific therapy is available. ▪ **Hb concentration of 70 – 100 g/L,** RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia, and the patient's response to previous transfusions. No evidence was found to warrant a different approach for patients who are elderly or who have respiratory or cerebrovascular disease.	3.2.1	4.1, 4.3 – 4.7	✓		✓	✓	✓	✓	✓			

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP3 (CONT.)	▪ **Hb concentration >100 g/L**, RBC transfusion is likely to be unnecessary and is usually inappropriate. Transfusion has been associated with increased mortality in patients with ACS. [a] Recommendations and practice points for medical patients in a critical care setting will be found in the *Patient Blood Management Guidelines: Module 4 – Critical Care*.[5] Recommendations and practice points for specific medical subgroups (ACS, CHF, cancer, acute upper gastrointestinal bleeding and chronically transfused) appear elsewhere in this module.	3.2.1	4.1, 4.3 – 4.7	✓		✓	✓	✓	✓	✓			
PP4	In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores regardless of whether a transfusion is indicated.	3.2.1	4.1 – 4.7	✓	✓	✓	✓	✓	✓	✓			

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP5	In patients with ACS and a Hb concentration <80 g/L, RBC transfusion may be associated with reduced mortality and is likely to be appropriate. (See PP1 and PP2).	3.2.2	4.2		✓								
PP6	In patients with ACS and a Hb concentration of 80 – 100 g/L, the effect of RBC transfusion on mortality is uncertain and may be associated with an increased risk of recurrence of MI. Any decision to transfuse should be made with caution and based on careful consideration of the risks and benefits. (See PP1 and PP2).	3.2.2	4.2		✓								
PP7	In all patients with heart failure, there is an increased risk of transfusion-associated circulatory overload. This needs to be considered in all transfusion decisions. Where indicated, transfusion should be of a single unit of RBC followed by reassessment of clinical efficacy and fluid status. For further guidance on how to manage patients with heart failure, refer to general medical or ACS sections, as appropriate (R1, R3, PP3–PP6).	3.2.3	4.3			✓							

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP8	In patients with cancer, the aetiology of anaemia is often multifactorial; where appropriate, reversible causes should be identified and treated.	3.2.4 3.3.1	4.4		✓								
PP9	There is a lack of specific evidence relating to the effects of RBC transfusion in patients with cancer. Any decision to transfuse should be based on the need to relieve clinical signs and symptoms of anaemia. When treating patients with cancer, refer also to the general medical population PP1–PP4.	3.2.4	4.4				✓						
PP10	In well-compensated patients with acute upper gastrointestinal blood loss that is non-critical, there is no evidence to favour a liberal transfusion policy. Therefore, a more restrictive approach may be appropriate. There are no data to support a specific Hb treatment target in these patients.	3.2.5	4.5					✓					

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP11	For critically bleeding patients, refer to *Patient Blood Management Guidelines: Module 1 – Critical Bleeding / Massive Transfusion* (2011).[7]	3.2.5	4.5					✓					
PP12	In anaemic patients with cancer receiving ESAs, evaluate iron status to guide adjuvant iron therapy.	3.3.1	4.4				✓						
PP13	ESA use is less effective in patients with chronic renal failure who have absolute or functional iron deficiency.	3.3.3	4.6						✓				
PP14	For comprehensive information about ESA and iron therapy in patients with CKD, refer to CARI iron guidelines.[8]	3.3.3	4.6						✓				
PP15	In patients with IBD, determine the cause of anaemia and treat reversible causes. IV iron may be required in patients who are intolerant of oral iron, or to avoid aggravation of intestinal inflammation.	3.3.5	4.5					✓					

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP16	The *routine* use of FFP in medical patients with coagulopathy (including those with liver impairment) is not supported. Tests for coagulation correlate poorly with bleeding risk in liver impairment. The underlying causes of coagulopathy should be assessed. Where FFP transfusion is considered necessary, the risks and benefits should be considered for each patient, and expert guidance sought.	3.4.1	4.9									✓	

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS												
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP17	For guidance on the use of FFP in specific patient groups, refer to: ▪ *Patient Blood Management Guidelines: Module 1 – Critical Bleeding/Massive Transfusion* (2011)[7] ▪ *Patient Blood Management Guidelines: Module 2 – Perioperative* (2012)[10] ▪ *Warfarin Reversal: Consensus Guidelines, on behalf of the Australasian Society of Thrombosis and Haemostasis* (2004)[11] ▪ AHCDO guidelines for patients with specific factor deficiencies (www.ahcdo.org.au) ▪ TTP: *Guidelines for the Use of Fresh-Frozen Plasma, Cryoprecipitate and Cryosupernatant* (2004).[12]	3.4.1	4.9									✓	

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS										
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP18	The *routine* use of cryoprecipitate or fibrinogen concentrate in medical patients with coagulopathy is not advised. The underlying causes of coagulopathy should be identified; where transfusion is considered necessary, the risks and benefits should be considered for each patient. Specialist opinion is advised for the management of DIC.	3.4.2	4.9									✓	
PP19	For guidance on the use of cryoprecipitate or fibrinogen concentrate in specific patient groups, refer to: ▪ *Patient Blood Management Guidelines: Module 1 – Critical Bleeding/Massive Transfusion* (2011)[7] ▪ AHCDO guidelines for patients with specific factor deficiencies (www.ahcdo.org.au) ▪ TTP: *Guidelines for the Use of Fresh-Frozen Plasma, Cryoprecipitate and Cryosupernatant* (2004).[12]	3.4.2	4.9									✓	

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP20	Platelet transfusion may be indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. Platelet transfusions are not indicated in all causes of thrombocytopenia, and may be contraindicated in certain conditions (e.g. TTP and HIT). Thus, the cause of the thrombocytopenia should be established and expert opinion sought.	3.4.3	4.7, 4.10							✓			✓

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				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP21	In patients with chronic failure of platelet production (e.g. myelodysplasia or aplastic anaemia), a specific threshold for transfusion may not be appropriate. These patients are best managed on an individual basis, in consultation with a relevant expert.[9] Long-term prophylactic platelet transfusions may be best avoided because of the risk of complications (e.g. alloimmunisation and platelet refractoriness). Therapeutic platelet transfusions could be considered for treatment of bleeding.	3.4.3	4.8, 4.10								✓		✓

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP22	In patients undergoing chemotherapy and haematopoietic stem cell transplantation, there is no evidence to support: ▪ a lower trigger for prophylactic platelet transfusion for patients with risk factors (e.g. fever, minor bleeding) ▪ a strategy of therapeutic-only platelet transfusions (i.e. for treatment of clinically significant bleeding). Further research to determine the safety and efficacy of a lower platelet transfusion trigger is underway.	3.5.3	4.7							✓			
PP23	In patients with thalassaemia, the evidence does not support any change to the current practice of maintaining a pretransfusion Hb concentration of 90 – 100 g/L, with transfusions at about monthly intervals.	3.6.1	4.8								✓		

IDENTIFIER	GUIDANCE	RELEVANT SECTION OF MODULE 3 - MEDICAL	RELEVANT SECTION OF THIS QUICK REFERENCE GUIDE	CONDITIONS									
				General medical	Cardiac – acute coronary syndrome	Heart failure	Cancer	Gastrointestinal	Chronic kidney disease	Chemotherapy and haematopoietic stem cell transplantation	Thalassaemia and myelodysplasia	Coagulopathy	Thrombocytopenia
PP24	In patients with myelodysplasia who are regularly and chronically transfused, there is no evidence to guide particular Hb thresholds. Decisions around appropriate triggers and frequency of transfusion need to be individualised, taking into account anaemia-related symptoms, functional or performance status, and the patient's response to previous transfusions.	3.6.2	4.8								✓		

ACS, acute coronary syndrome; AHCDO, Australian Haemophilia Centre Directors' Organisation; CARI, Caring for Australasians with Renal Impairment; CHF, chronic heart failure; CKD, chronic kidney disease; CRG, Clinical/Consumer Reference Group; DIC, disseminated intravascular coagulation; ESA, erythropoiesis-stimulating agent; FFP, fresh frozen plasma; Hb, haemoglobin; HIT, heparin-induced thrombocytopaenia; IBD, inflammatory bowel disease; IV, intravenous; MI, myocardial infarction; PP, practice point; R, recommendation; RBC, red blood cell; TTP, thrombotic thrombocytopenic purpura

7. Product information

For information on blood products available in Australia, see the website of the Australian Red Cross Blood Service (www.transfusion.com.au).

For information on blood products available in New Zealand, see the website of the New Zealand Blood Service (www.nzblood.co.nz).

8. References

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11. Baker RI, Coughlin PB, Gallus AS, Harper PL, Salem HH and Wood EM (2004). Warfarin reversal: consensus guidelines, on behalf of the Australasian Society of Thrombosis and Haemostasis. *Medical Journal of Australia* 181(9):492-497.

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