

Clinical audit of preoperative anaemia assessment and management in elective surgical procedures 2015

blood matters



Australian Red Cross
BLOOD SERVICE



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anaemia assessment and
management in elective
surgical procedures 2015**

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Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.

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(1606008)

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Acknowledgements

Blood Matters would like to thank everyone who contributed to this audit of preoperative anaemia assessment and management in elective surgical procedures in 2015.

The efforts to collect and report data have enabled Blood Matters to prepare this report on the assessment and management of preoperative anaemia in elective surgical patients.

Thank you to the project team involved in the various stages of the audit:

- Blood Matters team
- Blood Matters Advisory Committee
- Dr Chris Hogan

Thank you to the reviewers for their time and suggestions:

- Trudi Verrall – Clinical Education Lead, BloodSafe eLearning Australia
- Dr Jeyanthi Kunadhasan – Anaesthetist, Ballarat Health Service
- Dr Amanda Ormerod – Transfusion Medicine Specialist, Australian Red Cross Blood Service
- Ms Jane Howell – CNC Patient Blood Management, Albury Wodonga Health
- Ms Clare Hennessy – Transfusion Nurse, Eastern Health

Abbreviations, acronyms and definitions

ACT: Australian Capital Territory	Module 2: National Blood Authority (NBA) 2012, <i>Patient blood management guidelines</i> , 'Module 2: Perioperative'.
CRP: C-reactive protein	NBA: National Blood Authority
eGFR: estimated glomerular filtration rate	NT: Northern Territory
ENT: ear, nose and throat	PAD: preoperative autologous donation
FBE: full blood examination	PBM: patient blood management
Fe: iron	RBC: red blood cell
GIT: gastrointestinal	RCH: Royal Children s Hospital
GP: general practitioner	Tas: Tasmania
Hb: haemoglobin	the Blood Service: Australian Red Cross Blood Service
IV: intravenous	Vic: Victoria
	WHO: World Health Organization

Definitions

- Blood Matters: Victorian Government funded program run in collaboration with the Australian Red Cross Blood Service to measure and promote the quality, safety and appropriate use of blood and blood products.
- Elective surgery: planned, non-emergency surgery that is medically necessary or beneficial to the patient but does not need be done at a particular time.
- Patient blood management (PBM): the management and preservation of patients' own blood to reduce or avoid the need for a blood transfusion. (NBA 2012)
- Preoperative period: 'pertaining to the period before a surgical procedure. Commonly the preoperative period begins with the first preparation of the patient for surgery, such as when the surgery is scheduled'. (Mosby 2009)
- Postoperative period: defined as within seven days of surgery.
- Documented anaemia: auditor reported that the clinical notes documented that the patient had anaemia preoperatively.
- Module 2 defined anaemia: the recorded haemoglobin fits the World Health Organization (WHO) definition of anaemia as used in the Module 2 guideline.
- Pathway: defined course of action or route to guide actions. It is expected that preoperative anaemia screening pathways for surgical patients with or at risk of anaemia will vary across health services.

Limitations

The following limitations of the audit should be noted:

- The auditors are not formally instructed to collect the data in a consistent way.
- Blood Matters relies on auditors to follow the audit tool instructions to ensure consistency of data.
- The patient episodes reported were selected at the auditor's discretion, and may have been influenced by their knowledge and understanding of anaemia assessment and management.
- The auditor determined if anaemia had been assessed. Blood Matters did not include parameters around assessment, such as timeliness or blood test in the instructions.

Executive summary

Iron deficiency is the most prevalent nutritional deficiency worldwide (Geisel 2014); and iron deficiency anaemia is an important public health problem in Australia (Pasricha 2010). Undiagnosed anaemia is common in the surgical setting and is associated with increased perioperative morbidity (Halm 2004; Myers 2004). Anaemia should be viewed as a serious and treatable medical condition, rather than simply an abnormal laboratory value (Goodnough 2011).

Anaemia, if uncorrected, increases the likelihood of blood transfusion, which is independently associated with increased morbidity, mortality and hospital length of stay (PBM 'Module 2: Perioperative'). According to data collected by the American College of Surgeons National Surgical Quality Improvement Program® (NSQIP®) preoperative anaemia was associated with a 35 per cent increased risk of one major postoperative complication and a 42 per cent increased risk of death (Clevenger 2015). Indeed, data collected in this audit demonstrates that patients are more likely to receive a blood transfusion when they are not assessed preoperatively, compared with those who have been assessed preoperatively.

Overall, although a high percentage of patients were reported by the local auditors to be assessed for anaemia preoperatively (93 per cent), the quality of that assessment varied significantly, and often did not meet with recommendations of the Perioperative Module 2 guidelines. In our audit only 20 of 56 responding health services have a formal preoperative anaemia management pathway. More than half of the patients in our audit, who had haemoglobin levels consistent with anaemia, were not identified by that diagnosis or followed up preoperatively. Also, 68 per cent of patients in the audit were seen with fewer than four weeks prior to their elective surgical date. Only 25 per cent of patients had a serum ferritin, despite iron deficiency being the most common cause of preoperative anaemia.

Implementation of anaemia management will improve patient outcomes (Ferrais 2007). The introduction of appropriate and effective pathways for the recognition, definitive diagnosis and treatment of preoperative anaemia presents a challenge to health services. The application of such pathways will often involve significant changes for surgical referral services, including the earlier referral of patients at risk of anaemia, to allow appropriate time for pre-operative diagnosis and intervention. There is an increasing and key role for general practitioners in this domain (Minck 2013).

Blood Matters recommends that health services review and assess their compliance with the recommendations regarding appropriate quality preoperative anaemia assessment and management.

Note: The checklist on p. ix will help health services undertake this assessment.

Summary of recommendations

Blood Matters recommends that health services review their current pathways of preoperative anaemia assessment and management in light of our audit findings, to determine the level of alignment of those pathways with the *National patient blood management guidelines*, 'Module 2: Perioperative', and the ACSQHC *National safety and quality health service standards*.

Health services should ensure:

- they have in place or develop a multidisciplinary, multimodal patient blood management (PBM) program that includes preoperative anaemia assessment and optimisation
- the PBM program clearly defines the roles and responsibility for anaemia assessment and follow-up
- the PBM program clearly defines timing of assessment to appropriately manage anaemia within the clinical urgency of surgery
- the PBM program includes strategies to educate staff, such as the use of BloodSafe eLearning Australia Patient Blood Management courses, in particular the 'Perioperative' and 'Iron deficiency anaemia' courses
- a process is in place to review current pathways or implement a pathway where no pathway is in place (see Appendix 6 for examples)
- compliance with the pathway is regularly monitored, reported and actions undertaken to address any gaps identified.

The checklist on p. ix will assist health services to comply with the PBM guidelines and audit recommendations.

Patient blood management preoperative checklist

Health services can use this checklist to determine compliance with strategies included in the *National patient blood management guidelines*, 'Module 2: Perioperative', and the *ACSQHC National safety and quality health service standards* to optimise blood volume and red cell mass.

Element	Yes	No	WIP*
Does your health service have a staff education program about patient blood management?			
Does your health service have a preoperative anaemia screening pathway for surgical patients with or at risk of anaemia? (PBM Module 2 recommendation 1; ACSQHC National Standards 7.1 and 7.9)			
If your health service has multiple sites, does the preoperative anaemia screening pathway for surgical patients cover all sites?			
Does the anaemia screening pathway stipulate the timing of preoperative assessment to allow optimisation of the patient's haemoglobin and iron stores? [according to surgical priorities] (PBM Module 2, practice point (PP) 1, PP 4, PP 5)			
Are general practitioners or shared care options included in the anaemia screening pathway? (PBM Module 2, recommendation 1)			
Does the pathway include a preoperative haemoglobin assessment and optimisation template?			
Does the anaemia screening pathway/template include the following tests? <ul style="list-style-type: none"> • FBE • Iron studies including Ferritin • B12 • Folate • CRP • Renal function test 			
Does the anaemia screening pathway specify roles and responsibilities: <ul style="list-style-type: none"> • for all steps included • whose role it is to identify at-risk anaemia patients to refer for further investigation and/or treatment? (PBM Module 2, recommendation 1) 			
Does the screening pathway/template include appropriate treatment considerations? (PBM Module 2 – PP6, PP7, template)			
Does the pathway stipulate the provision of written consumer information?			

*Work in progress

Introduction

Undiagnosed anaemia is common in the surgical setting and is associated with increased perioperative morbidity and mortality. If it is uncorrected, it increases the likelihood of blood transfusion, which is independently associated with increased morbidity, mortality and hospital length of stay (Thomson A, 2009).

The PBM guidelines 'Module 2: Perioperative' (Module 2) was released in March 2012 (NBA 2012). It contains six recommendations, and five practice points related to the management of anaemia in the perioperative patient to:

- improve practice related to the assessment and management of reversible anaemia prior to surgery
- improve outcomes for patients undergoing elective surgical procedures.

Audit aims

This Blood Matters audit of preoperative anaemia assessment and management was designed to:

- determine what processes are in place within health services to assess anaemia in the elective preoperative patient
- explore if patients were presenting for elective surgery with anaemia that has not been evaluated and treated
- provide data to inform areas for improvement.

Objectives

To determine:

- if health services have a screening pathway for assessment of preoperative anaemia, as defined in Module 2
- where a screening pathway is in place, whether it uses a preoperative haemoglobin assessment and optimisation template
- where there are screening processes, +/- assessment and optimisation templates in place, whether they are being followed.

Inclusions

The audits included patients undergoing major elective orthopaedic, gastrointestinal or cardiothoracic surgical procedures occurring between September 2014 to August 2015.

Exclusions

The audit excluded:

- minor surgical procedures where there is a low or no expectation of, or need for transfusion, that is:
 - orthopaedic surgery such as arthroscopy
 - gastrointestinal surgery such as endoscopy and laparoscopic gastric banding
 - interventional cardiology such as coronary angiography and stent insertion
- emergency procedures or surgical management of traumatic injury.

Method

One hundred and forty health services from Victoria, Tasmania, Australian Capital Territory and the Northern Territory that perform surgery were invited to participate in the two-part audit. The auditors were not trained; however, the audit forms (see Appendix 1) were accompanied with definitions and instructions for conducting the audit (Appendix 2).

The Blood Matters secretariat was available to provide guidance and clarification throughout the audit.

Auditors submitted data via an online web tool, SelectSurvey, between 1 October to 4 December 2015.

Part A was a simple questionnaire aimed at ascertaining how many health services had formalised preoperative anaemia identification and management pathways.

All health services were invited to participate in part B regardless of having formal preoperative PBM programs in place.

Part B was a series of questions pertaining to a single care episode to ascertain whether anaemia was screened, identified and managed appropriately (compared against Module 2).

Health services were requested to audit up to 30 patients (from one site if there were multiple sites within a health service) who had undergone elective surgery in the previous 12 months (1 September 2014 to 31 August 2015) from **one** of the following clinical specialties **only**:

- orthopaedics, or
- gastrointestinal (upper and/or lower), or
- cardiothoracic.

Patient exclusion criteria for part B included patients who were re-admitted to theatre within seven days, only had minor surgical procedures (that is, substantial blood loss was not anticipated), and patients who were admitted as emergency procedures or surgical management of traumatic injury.

Data was extracted and imported into an audit-specific Access database for manipulation and analysis.

After the audit, each participating health service was sent a summary of their data for verification and invited to correct any discrepancies or incomplete records.

Each patient episode was compared with the Module 2 template to assess quality of the preoperative anaemia screening assessment.

Recommendations in Module 2 include that patients undergoing procedures in which substantial blood loss is anticipated should have preoperative anaemia identified, evaluated and managed to minimise red blood cell transfusion, which may be associated with an increased risk of morbidity, mortality and hospital length of stay.

For the **purposes of this audit**, a quality preoperative anaemia screening assessment was based on Module 2 recommendations and practice points (Appendix 4) and measured as defined below:

Process	Description	Measure
Screening	Assessment occurred with sufficient time to correct anaemia, if appropriate (Minck 2013; Goodnough 2011)	Preoperative assessment date was reported to be at least 28 days prior to scheduled surgery date
Testing	Blood tests likely to identify anaemia, and an appropriate intervention	Hb and ferritin available at assessment
Document	If present, that the anaemia is documented in patient's clinical notes	Compare the number of patients meeting PBM Module 2 anaemia definition, and those documented as anaemic by the health service
Manage	For patients with anaemia, treatment should occur prior to surgery to optimise the patient's haemoglobin and iron stores as appropriate	Patient was reported to have received: Oral iron supplements, IV iron infusion, B12 and/or folate, and/or erythropoietin. If patients were transfused preoperatively this was also captured
Evaluate	In order to assess the impact of treatment, it is advised that the Hb should be remeasured after treatment has been instigated, and prior to surgery	Hb reported to be measured after treatment and prior to surgery

For the purposes of this audit patients were considered anaemic if Hb was below the following values:

Age range	Sex	Haemoglobin (Hb) g/L
Adult*	male	< 130
Adult*	female	< 120
2–11 years#	boys and girls	< 115
6–24 months#	boys and girls	< 105

* Reference: Module 2 template (Appendix 5)

The Royal Children's Hospital Melbourne Clinical practice guidelines

Results

Part A

Patient blood management aims to improve the clinical outcomes of patients by avoiding unnecessary exposure to blood components. Recommendation 1 from Module 2 states that:

'Health-care services should establish a multidisciplinary, multimodal perioperative patient blood management program. This should include preoperative optimisation of red cell mass and coagulation status; minimisation of perioperative blood loss, including meticulous attention to surgical haemostasis; and tolerance of postoperative anaemia.'

This audit addressed preoperative optimisation of red cell mass. Module 2 includes an algorithm for preoperative screening and management of anaemia. Health services are encouraged to use the algorithm, adjusted to meet local circumstances (NBA 2012).

Fifty-six health services responded to part A of the audit (response rate 40 per cent). Table 1 outlines the demographics of the reporting health services.

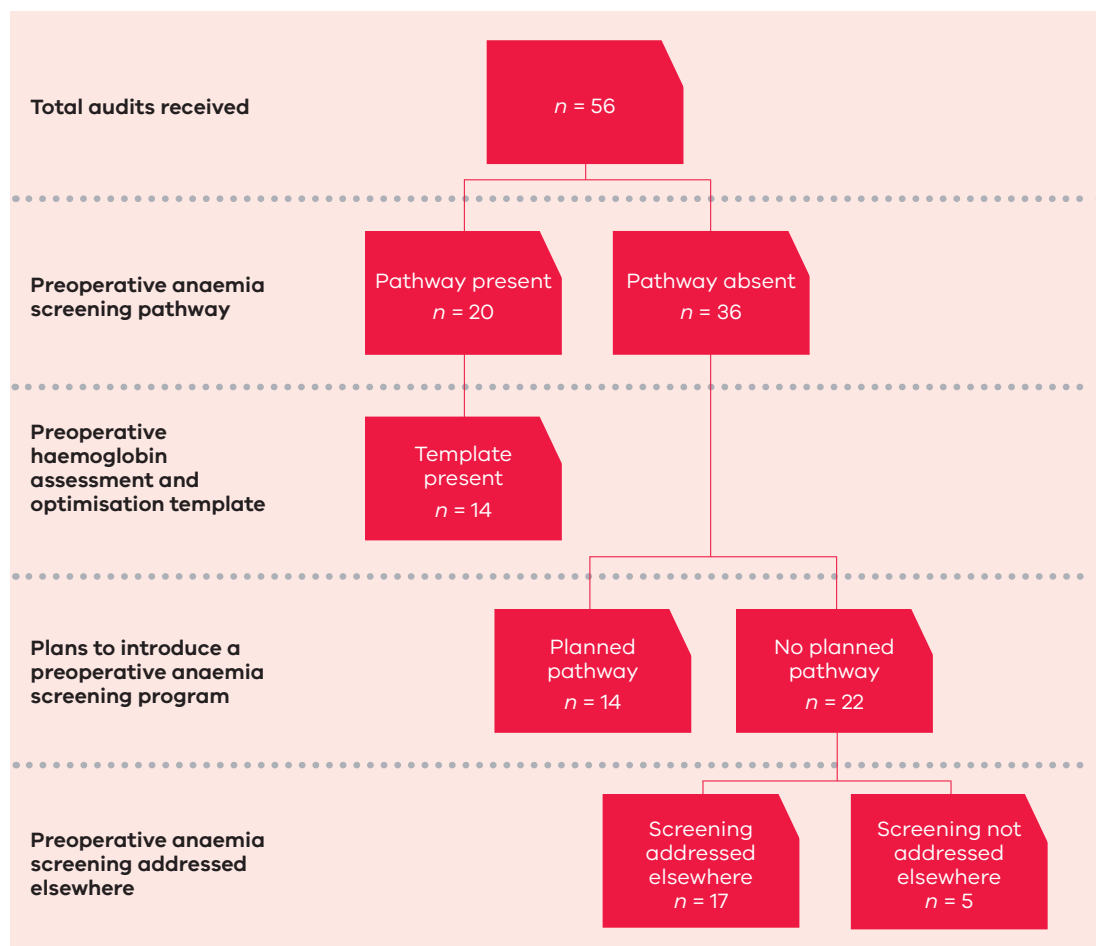
Table 1: Demographics of responding health services

	Private	Public	Total
Number invited	57	83	140
Metropolitan	9	13	22
Regional	2	19	21
Rural	0	13	13
Total	11 (response rate 19%)	45 (response rate 54%)	56 (response rate 40%)

The majority of responding health services ($n = 37$; 66 per cent) were single-site campuses, with 19 (34 per cent) reporting multiple sites ranging from two to five sites.

Figure 1 summarises information reported about the presence of preoperative anaemia pathways and the inclusions.

Figure 1: Information reported about preoperative anaemia screening pathways



Of the 56 reporting health services, 20 (36 per cent) reported that a preoperative anaemia screening pathway was in place for surgical patients with or at risk of anaemia. Seven of the 20 health services with a screening pathway reported they had multiple sites. Only one with multiple sites (five per cent) indicated that the pathway covered all sites, six of the seven (95 per cent) reported the pathway was not used at all sites. Where the pathway was not applied across all sites, this was due to surgery not being undertaken at all sites.

Where a screening pathway was in place 14 (70 per cent) reported the pathway included a preoperative haemoglobin assessment and optimisation template. Table 2 indicates the type of template used.

The most common surgical area covered by the anaemia screening pathway was orthopaedic ($n = 12$; 67 per cent) followed by gastroenterology ($n = 7$; 39 per cent).

Table 2: Type of anaemia screening template

Preoperative anaemia screening template	Number of health services
NBA template used	3
Modified NBA template	7
Hospital designed template	4

Thirty-six health services reported they did not currently have a preoperative anaemia screening pathway. Of these health services, 14 (39 per cent) reported plans to introduce one in the next 12 months.

Where the introduction of a pathway was not being considered ($n = 22$), the reasons reported are outlined in Table 3.

Table 3: Reasons why the introduction of anaemia screening pathway is not being considered

Reason	Number of health services (%)**
Limited surgery in the health service*	7 (32%)
Other priorities in the health service	7 (32%)
Limited clinical leadership/support (sponsorship) for this type of program	5 (23%)
Other (including lack of resources, never considered, no identified need†)	9 (41%)

* Rural and smaller regional health services

† This included responses from private health services where patients were reported as being assessed in the surgeons' rooms. Other services had conducted audits and had found little evidence of preoperative anaemia. One health service will be reviewing the need in light of the data collected.

** Total may be greater than 100 per cent as multiple responses could be selected

Where no screening pathway was in place, 29 of the 36 (81 per cent) health services reported that anaemia identification was addressed by preoperative assessment in the areas shown in Table 4.

Table 4: Area where preoperative assessment of anaemia occurs

Area where preoperative assessment of anaemia	Number of health services (%)
Preadmission clinic	23 (79%)
GP	13 (45%)
Specialist rooms	
Surgeon	16 (55%)
Anaesthetist	7 (24%)
Physician	8 (28%)
Other (including anaesthetic assessment, inpatient review, emergency department)	8 (28%)

* Total may be greater than 100 per cent as multiple assessment areas could be selected

Where a preoperative anaemia screening pathway is in place, health services were asked to report which pathology tests were included in the pathway (Table 5). The majority, but not all, included a FBE ($n = 17$, 85 per cent). Further tests that could help to diagnose the cause of anaemia were less commonly included with renal function ($n = 14$, 70 per cent) and iron studies ($n = 13$, 65 per cent) being the most common.

Table 5: Tests included in anaemia screening pathway

Tests	Number of health services (%)
FBE	17 (85%)
Renal function	14 (70%)
Iron studies, including ferritin	13 (65%)
CRP	10 (50%)
Other (including liver function tests, ESR)	4 (20%)
B12	3 (15%)
Folate	3 (15%)

Module 2 template recommends that all patients at risk of blood loss should have a full blood count (including haemoglobin), iron studies (including ferritin), CRP and renal function tests performed to assist with anaemia assessment. For the benefit of the patient and time efficiency, all these tests could be ordered and completed at the same time, to prevent patients requiring multiple blood tests, and to facilitate early recognition and management of any identified anaemia. Health services should consider the ordering of these tests as routine prior to surgery.

General practitioner involvement

The NBA recommends involving general practitioners (GPs) in the preoperative haemoglobin assessment process, which may include development of referral forms/ template letters for GPs highlighting their roles and responsibilities in preoperative anaemia investigation and management (NBA 2014). Seven (35 per cent) health services reported GPs were included in the screening pathway.

Screening follow-up

An imperative part of the assessment screening pathway is defining whose role and responsibility it is to review test results, identify anaemia in at risk patients, and subsequently commence the process of further investigation, or intervention as required. Health services were asked if roles and responsibilities were stipulated in their screening pathway. Sixteen (80 per cent) pathways included roles and responsibilities, although the audit did not ask which specific person or group this was. It is anticipated that this will vary between health services depending on how preoperative anaemia identification and management pathways have been set up.

Consumer information

The NBA (2014) recommends reviewing patient information materials that may be required in the preoperative haemoglobin assessment process. This may include patient blood management brochures, information on iron therapy, and information regarding the risks, benefits and alternatives to transfusion. Six (30 per cent) health services reported that their pathway stipulated the provision of written consumer information.

Where written consumer information was part of the pathway the following topics were included (Table 6).

Table 6: Consumer information (topics) included in screening pathway

Topics included	Number* of health services (%)
Patient blood management program	2 (33%)
Dietary, oral, IV iron	3 (50%)
Risks, benefits and alternatives to transfusion	3 (50%)
Other (including blood test information and PBM information in development,)	3 (50%)

*Percentage greater than 100, as multiple topics could be selected

Recommendations

Blood Matters recommends that health services review their processes of preoperative anaemia assessment and management in light of our audit findings, to determine the level of alignment of those pathways with the *PBM guidelines*, 'Module 2: Perioperative', and the *ACSQHC National safety and quality health service standards*.

Health services should ensure that:

- they have in place or develop a multidisciplinary, multimodal PBM program that includes preoperative anaemia assessment and optimisation
- the PBM program clearly defines the roles and responsibility for anaemia assessment and follow-up
- the PBM program clearly defines the timing of assessments to appropriately manage anaemia within the clinical urgency of surgery.

Part B: Demographics

For part B, data was submitted from 47 health services, providing 1,152 episodes for review. Five audits were excluded due to dates for pre-assessment and surgery not being logical; and another five audits were excluded as it was stated that the patient came to theatre through the emergency department. It should be noted that the online survey tool initially had some data-capture irregularities. For some health services, each new record entered overwrote an existing record. This error was corrected and health services were given an opportunity to correct and/or re-enter data.

Some health services that responded to part A did not undertake surgery in the specified areas for patient data collection and therefore did not contribute to part B.

The majority of data was submitted for the orthopaedic group ($n = 873$; 76 per cent) and 269 (24 per cent) for the gastrointestinal group. There was no data submitted for the cardiothoracic group.

Of the reports received, females accounted for 605 reports (53 per cent) and males 537 (47 per cent).

Age at last birthday ranged from eight years to 95 years, with the average age being 66 years. Only 22 (0.2 per cent) people were reported to be aged less than 16 years; and 299 (26 per cent) were aged greater than 75 years.

Figure 2: Flowchart of responses received



Who is at risk of anaemia?

The World Health Organization (WHO) estimates that eight per cent of preschool children, 12 per cent of pregnant women and 15 per cent of non-pregnant women of reproductive age in Australia have anaemia, with iron deficiency anaemia (IDA) a major cause. Indigenous populations are particularly at risk, where 55 per cent of females and 18 per cent of males have been found to be anaemic (Pasricha et al. 2010).

The Australian Bureau of Statistics Health Survey 2011–12 found 4.5 per cent of the Australian population over 18 years of age were at risk of anaemia (based on WHO guidelines). Women are more likely to be at risk than men (6.4 per cent compared with 2.5 per cent). The risk of anaemia is higher among older Australians: 16 per cent of people aged over 75 years are at risk of anaemia, compared with 3.6 per cent in those less than 75 years of age.

Preoperative anaemia screening

In this audit 20 (36 per cent) health services reported having an anaemia screening pathway in place. Where a pathway was not in place, 29 (81 per cent) addressed anaemia screening in other ways.

Of the 1,142 responses received in this part of the audit, it is pleasing to note that 1,057 (93 per cent) of patients were reported to have been assessed for anaemia preoperatively (Figure 2).

In order for anaemia management to occur, there must be sufficient time between the assessment and the surgery for management strategies to be implemented. The Network for Advancement of Transfusion Alternatives (NATA) guidelines recommend that haemoglobin is measured 28 days before scheduled orthopaedic surgery (Goodnough 2011; Minck 2013). The European Society of Anaesthesiology guidelines recommend that patients at risk of bleeding be assessed for anaemia four to eight weeks before surgery as this ensures adequate time to investigate and manage anaemia without resorting to transfusion or delaying surgery (Kozek-Langenecker 2013).

Data indicated a wide range in the time from assessment to surgery (0–316 days). Three hundred and thirty-five (32 per cent) patients were assessed greater than four weeks prior to surgery. These cases would adhere to most guidelines recommending assessment occurs at least 28 days prior to surgery.

Overall, 202 (19 per cent) were assessed less than one week prior to surgery, which does not allow adequate time for investigation of anaemia, if found, nor does it allow for adequate treatment to take place without delaying surgery, or perhaps resorting to transfusion (Table 7).

Table 7: Timing of anaemia assessment prior to surgery.

Time of assessment prior to surgery	Orthopaedic patients (%)	Gastrointestinal patients (%)	Total patients (%)
4 weeks and greater	292 (36%)	43 (18%)	335 (32%)
1 week and up to 4 weeks	324 (40%)	128 (52%)	452 (43%)
Less than 1 week	141 (17%)	61 (25%)	202 (19%)
0–1 day	56 (7%)	12 (5%)	68 (6%)

For the majority of patients, preoperative anaemia screening took place in the hospital clinic. Only small numbers of patients were reported to have been seen in other areas such as a general practitioner (GP) or physician’s rooms. This may be a missed opportunity to engage GPs in a shared care arrangement, where they may be able to review patients with greater time to surgery, thus making use of the time patients spend on waitlists. There are a growing number of GP practices offering the administration of intravenous iron therapy, which removes the need for patients to attend hospital for treatment, and the potential for therapy to be administered closer to home.

Module 2 includes the following as baseline tests for assessment and identification of anaemia: full blood count, iron studies, including ferritin, CRP and renal function.

It was reported that 1,028 of the 1057 (97 per cent) had some testing completed as part of the preoperative assessment. Of those reported as assessed, 1,027 (97 per cent) had full blood examinations (FBE).

Other tests that might help to determine the cause of anaemia were less commonly performed. Renal function was assessed in 875 (83 per cent), while 268 (25 per cent) had ferritin levels tested. Table 8 documents the screening tests reported in this audit. Note that while some testing was performed for most patients, there was a small number of patients where no preoperative screening tests were reported ($n = 24$; 2 per cent).

Table 8: Preoperative screening tests for patients reported as assessed ($n = 1,057$)

Test	Orthopaedic	Gastrointestinal	Total patients (%)*
FBE	785 (97%)	242 (99%)	1027 (97%)
Ferritin	192 (24%)	76 (31%)	268 (25%)
B12	9 (1%)	24 (10%)	33 (3%)
Folate	5 (1%)	21 (9%)	26 (2%)
CRP	218 (27%)	75 (31%)	293 (28%)
Renal function	688 (85%)	187 (77%)	875 (83%)
Other tests	406 (50%)	51 (21%)	457 (43%)
No testing†	22 (3%)	2 (1%)	24 (2%)

* Percentage greater than 100, as patients reported having multiple tests taken.

† It is unclear whether no tests were performed or if results were not documented in the medical notes, and therefore unavailable to the auditor.

Other tests reported included coagulation profile 288 (27 per cent of all assessed patients), liver function tests 186 (18 per cent), group and hold / cross match 125 (12 per cent), and urea, electrolytes and creatinine (UECs) 109 (10 per cent), as well erythrocyte sedimentation rate, thyroid function tests, HIV/HBV/HCV, lipid profile, and ECGs.

Screening results

Testing showed the Hb ranged from 56–197 g/L, average 135 g/L (results available for 1,026 of 1,027 patients where FBE was reported).

Table 9: Patients reported as anaemic by age and gender compared to Module 2.

Age range	Gender	Total number of patients preoperatively assessed (<i>n</i> = 1,057)	Patients determined anaemic by Module 2 template definition (%)	Patients documented as anaemic by health service*
Adult	male	504	110 (22%)	62 (12%)
Adult	female	551	102 (18%)	55 (10%)
2–11 years	boys and girls	2	0	0
6–24 months	boys and girls	na		

* Variations could include: anaemia reference ranges as identified by local laboratories may vary from Module 2 definitions; or lack of documentation, or lack of follow-up.

The Module 2 preoperative haemoglobin assessment and optimisation template includes the WHO definition of anaemia, and this has been used to define anaemia in this audit.

Table 9 reports the number of patients who are anaemic by age and gender as determined by the Module 2 anaemia definition and as documented by the health service.

Overall health services documented 117 (11 per cent) of all screened patients as anaemic, compared with 212 (20 per cent) of all patients being anaemic as defined by the Module 2 template. The data highlights the variations in health service definitions of anaemia compared with Module 2 definitions. This variation continues for patients reported to be anaemic by surgery type (Table 10).

Where lower Hb limits are applied by health service standards, and where ferritin is not routinely performed, this may represent a missed opportunity to assess and treat patients who are at risk of anaemia. As demonstrated by current literature, treating underlying iron deficiency early may enhance postoperative recovery (NBA 2012).

Table 10: Patients reported as anaemic by surgery type compared to Module 2*

	Total number of patients preoperatively assessed (n = 1057)	Patients determined anaemic by Module 2 template definition (%)	Patients documented as anaemic by health service	Patients who are anaemic as defined by Module 2, but not identified by health service
Orthopaedic	813	113 (14%)	63 (8%)	50 (44%)
Gastrointestinal	244	99 (41%)	54 (22%)	45 (45%)

* No cardiothoracic cases were reported by the participating health services.

In an anaemic adult, a ferritin level below 15 g/L is diagnostic of iron deficiency, and levels between 15 and 30 g/L are highly suggestive. Lower thresholds (from 10 to 12 g/L) have been used for children.

Ferritin levels alone are of limited value in diagnosing iron deficiency as they can become elevated in inflammation, infection, liver and kidney disease, malignancy, obesity and advanced age. This may obscure the decrease that one might expect in iron deficiency (Pasricha 2010).

Of the 1,057 patients reported as having a preoperative assessment, 268 (25 per cent) had ferritin levels evaluated as part of the assessment; however, results were available for only 266 of these patients (99 per cent). Of the patients documented as anaemic by the health service (n = 117), 65 (56 per cent) did not have a ferritin level taken as part of the investigations. For those with a ferritin level (n = 52), 35 had the ferritin and FBE performed at the same time (67 per cent).

The Module 2 template recommends that patients identified as anaemic with a ferritin level of between 30 and 100, should have a CRP level tested. Of the 17 patients fitting this cohort, nine (53 per cent) had a CRP available at the preoperative assessment (Table 11).

Of the 940 patients not documented as anaemic, only 214 had ferritin tested. Of these 15 (two per cent) were iron deficient, as defined by Module 2, with a further 76 (eight per cent) possibly iron deficient (ferritin level between 30 and 100 mcg/L).

Table 11: Ferritin levels of patients with documented anaemia as reported by the health service

Anaemia documented in patient clinical notes	Number of patients			
	Ferritin levels (n = 266)#			
	< 30 mcg/L	30–100 mcg/L	> 100 mcg/L	No ferritin level reported
Anaemic (n = 117)	16 (14%) (iron deficiency anaemia) 7 of 16 patients (44%) had CRP*	17 (15%) (possible iron deficiency) 9 of 17 patients (53%) had CRP	19 (16%) (possible anaemia of chronic disease or inflammation, or other cause) 9 of 19 patients (47%) had CRP	65 (56%) 18 of 65 patients (28%) had CRP
Non anaemic (n = 940)	15 (2%) 7 of 15 patients (47%) had CRP	76 (8%) 56 of 76 patients (74%) had CRP	123 (13%) 66 of 123 patients (54%) had CRP	726 (77%) 121 of 726 patients (17%) had CRP

268 reported as having ferritin levels evaluated as part of the assessment however results only available for 266.

* CRP results were not collected as part of the audit, only if the test had been ordered.

The treatment required for anaemia is dependent on the cause. Investigation of causes of anaemia will include obtaining a reliable patient history, physical assessment, as well as testing other parameters which may include B12, folate or ferritin levels. Where it is likely that anaemia is related to chronic disease, CRP and eGFR may be tested.

Table 12 shows what other tests were performed at preoperative assessment for patients with anaemia as documented by the health service.

Table 12: Additional tests reported for patients with documented anaemia

Test	Orthopaedic (n = 63)	Gastrointestinal (n = 54)	Total (%)
Ferritin	25 (40%)	28 (52%)	53 (45%)
B12	3 (5%)	11 (20%)	14 (12%)
Folate	4 (3%)	8 (15%)	10 (9%)
CRP	24 (38%)	19 (35%)	43 (37%)
Renal function	60 (95%)	42 (78%)	102 (87%)
Other tests	38 (60%)	11 (20%)	49 (42%)

Other tests reported included coagulation profile, liver function tests, group and hold/crossmatch, urea, electrolytes and creatinine (UECs), erythrocyte sedimentation rate, thyroid function tests, HIV/HBV/HCV, and ECGs.

Screening follow up

To facilitate appropriate treatment of identified anaemia, health services need to have processes to follow up results and take appropriate action.

In part A of the audit, health services were asked if their pathway identified who is responsible for identifying at-risk patients, and referring them on for further investigation or treatment. Of the 20 health services that had a pathway, 16 (80 per cent) assigned a role to this task, for example surgical registrar or anaesthetic nurse, making the process role dependent rather than person dependent.

For health services with no pathway, these tasks are often the responsibility of named staff members, making them dependent on an individual.

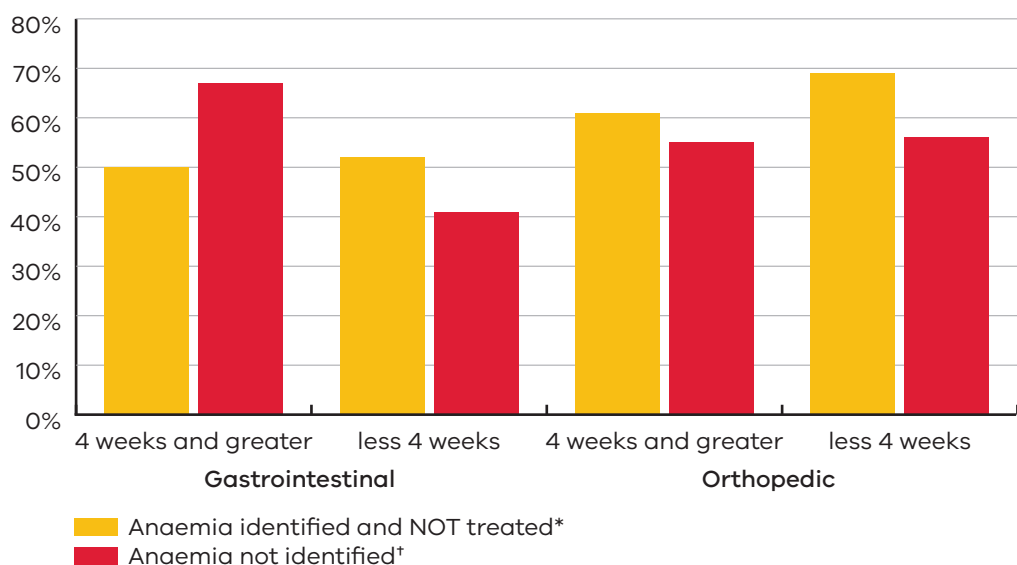
Table 10 shows 95 patients with haemoglobin levels considered to be anaemic by Module 2, were not identified as anaemic by the health services. Orthopaedic accounted for 50 patients and gastrointestinal 45 patients.

Failure of identification and treatment of anaemia is disappointing, as health services are missing opportunities to optimise patients' haemoglobin preoperatively. This accounts for 18 per cent (45 of 244) of gastrointestinal patients and six per cent (50 of 813) of orthopaedic patients assessed. Current literature suggests that the anaemic patient is at increased risk of transfusion and subsequent increased length of hospital stay, and preoperative anaemia is associated with increased patient morbidity and mortality following surgery.

In addition, screening follow up failure could be seen in 61 patients documented by health services as anaemic but without evidence of a treatment plan (52 per cent of patients with documented anaemia).

The failure of screening follow up appears to be independent of the timeframe between assessment and surgery date, as shown in Figure 3.

Figure 3: Screening failures by surgery type and timeliness of assessment



* Denominator for 'anaemia identified and not treated' was patients documented as anaemic by health service, with the numerator being patients with no reported interventions.

† Denominator for 'anaemia not identified' was patients determined to be anaemic as defined by PBM Module 2, with the numerator being patients not identified by health services.

Interventions

Treatment of anaemia was instigated in 56 patients (48 per cent of all patients with anaemia identified by the health service, which accounts for only 26 per cent of patients identified as anaemic by Module 2 [$n = 212$]).

The type of treatment received varied, with a number of patients receiving several types of treatment (Table 13). For the purposes of this audit interventions included preoperative red cell transfusions, iron therapies and investigations such as scopes (endoscopy/colonoscopy) and haematology referrals based on preoperative assessment.

Table 13: Types of treatment received for anaemia as documented by health services

Treatment	Number of patients (%) [*] $n = 56$	Average Hb (range) (g/L) at assessment		Average ferritin (range) (mcg/L) at assessment
		Male	Female	
Oral iron supplements	21 (38%)	103 (79–129) ($n = 8$)	114 (98–138) ($n = 13$)	108 (24–721) ($n = 11$)
IV iron infusion	23 (41%)	100 (70–119) ($n = 10$)	104 (56–128) ($n = 13$)	129 (3–721) ($n = 19$)
Scopes – (endoscopy / colonoscopy)	12 (21%)	92 (73–97) ($n = 6$)	110 (62–139) ($n = 6$)	90 (3–446) ($n = 9$)
Haematology referral	4 (7%)	99 (68–119) ($n = 3$)	86 ($n = 1$)	44 (25–58) ($n = 3$)
Red cell transfusion	18 (32%)	86 (62–115) ($n = 12$)	84 (56–115) ($n = 6$)	24 (3–97) ($n = 7$)
Erythropoietin	0 (0%)	–	–	–
Other [†]	3 (5%)	97 ($n = 1$)	95 (88–101) ($n = 2$)	446 ($n = 1$)
Unknown	1 (2%)	97 ($n = 1$)	–	–

^{*} Percentage greater than 100 as patients may have received more than one treatment type

[†] Other included: 2 GP follow up, 1 oral vitamin B12.

As outlined in Table 13, 18 patients received a red cell transfusion as part of their treatment for anaemia prior to surgery, with nine (50 per cent) having transfusion as the only treatment reported.

We are unable to comment on the appropriateness of these transfusions; however, even where it may be appropriate to transfuse the patient due to symptomatic anaemia, the underlying cause of the anaemia must still be investigated and treated.

Table 14 outlines the treatments reported in conjunction with preoperative red cell transfusion.

Table 14: Treatment in conjunction with preoperative red cell transfusion

Treatment	Number of patients (%) <i>n</i> = 18	Average Hb (range) (g/L) at assessment		Average ferritin (mcg/L) at assessment	Average days between preoperative assessment and surgery date
		Male	Female		
Red cell transfusion only	9 (50)	82 (62–107) (<i>n</i> = 6)	98 (87–115) (<i>n</i> = 3)	5 (<i>n</i> = 1)	12
Fe infusion, red cell transfusion	3 (17)	106 (96–115) (<i>n</i> = 2)	56 (<i>n</i> = 1)	14 (<i>n</i> = 2)	38
Fe infusion, endoscopy, red cell transfusion	3 (17)	84 (73–95) (<i>n</i> = 2)	91 (<i>n</i> = 1)	36 (<i>n</i> = 3)	15
Oral Fe supplements, red cell transfusion	1 (5)	92 (<i>n</i> = 1)	–	24 (<i>n</i> = 1)	6
Haematology referral, red cell transfusion	1 (5)	68 (<i>n</i> = 1)	–	–	7
Endoscopy, red cell transfusion	1 (5)	–	62 (<i>n</i> = 1)	–	4

Overall, only 23 patients received intravenous iron therapy prior to their surgery, despite evidence that 31 patients were definitely iron deficient, and a further 93 may possibly have been iron deficient.

The type of product used is documented in Table 15. The majority of patients received ferric carboxymaltose (*n* = 11, 48 per cent).

Table 15: Intravenous iron product administered

Intravenous iron product administered	Patients (%) <i>n</i> = 23	Average Hb (g/L) at assessment		Where administered
		Male	Female	
Ferric carboxymaltose (FERINJECT®)	11 (48)	106 (70–119) (<i>n</i> = 6)	106 (91–120) (<i>n</i> = 5)	7 in hospital, 4 outpatient clinic
Iron polymaltose (FERROSIG®)	3 (13)	97 (<i>n</i> = 1)	105 (88–121) (<i>n</i> = 2)	3 in hospital
Iron polymaltose (FERRUM H®)	4 (17)	84 (73–95) (<i>n</i> = 2)	107 (86–128) (<i>n</i> = 2)	4 in hospital
Iron sucrose (VENOFER®)	0 (0)	–	–	–
Unknown	5 (22)	96 (<i>n</i> = 1)	97 (56–124) (<i>n</i> = 3)*	5 unknown

* One female patient did not have a haemoglobin level reported.

Where iron infusions were reported, the majority of these occurred in hospital ($n = 18$, 78 per cent), including outpatient clinics and medical day treatment unit. No infusions were reported to have been administered in GP rooms; however, for five infusions the location was reported as 'unknown'.

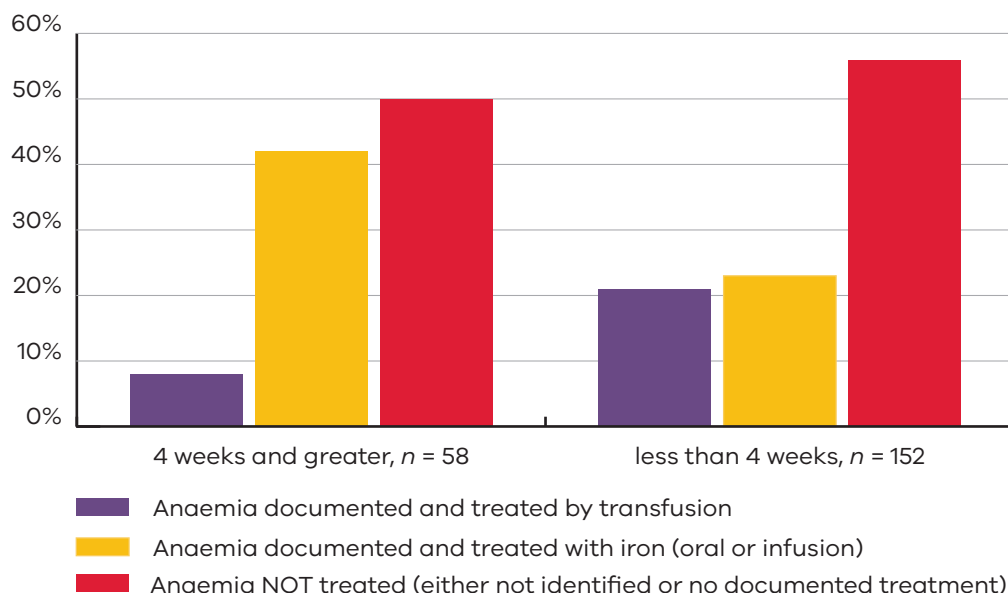
Historically, parenteral iron preparations were associated with high rates of adverse events including anaphylaxis; however, modern preparations have a significantly improved safety profile (Clevenger 2015). This makes these products much safer for use in GP rooms, or other non-hospital settings.

Oral iron was reported to be used for 21 patients. After therapeutic doses of oral iron, Hb levels should rise by about 20 g/L every three weeks. It is reasonable to replenish iron stores by continuing treatment for three to six months, in adults, beyond normalisation of Hb (Pasricha 2010).

No patients received erythropoietin as part of their treatment.

Audit data shows that timing of assessment may have an impact on treatment chosen for those patients identified with anaemia. The closer the surgery date was to preoperative assessment date, the more likely the patient was to receive red cell transfusion and less likely to receive iron infusion (Figure 4).

Figure 4: Treatment type for patients documented/identified with anaemia by timing of preoperative haemoglobin assessment



Patients assessed with less than four weeks to surgery were almost three times as likely to receive a transfusion as patients assessed four weeks or greater to surgery.

In order to assess the impact of treatment, it is advised that the Hb should be remeasured after treatment has been instigated and prior to surgery. Indications of response will be variable however an initial check might be considered two weeks following a non-transfusion intervention.

Testing to assess the impact of treatment was only reported in 37 of the 56 patients treated (66 per cent).

Overall, only five patients (nine per cent) receiving treatment had pathology results documented showing anaemia had been resolved prior to surgery (as defined by Module 2). This is excluding an additional six patients (all female) who received treatment for anaemia but had a haemoglobin level within the normal range at preoperative assessment.

Figures 5 and 6 highlight the preoperative assessment process per surgery type against quality assessment criteria outlined on page 3.

Figure 5: Quality of assessment process for orthopaedic surgery

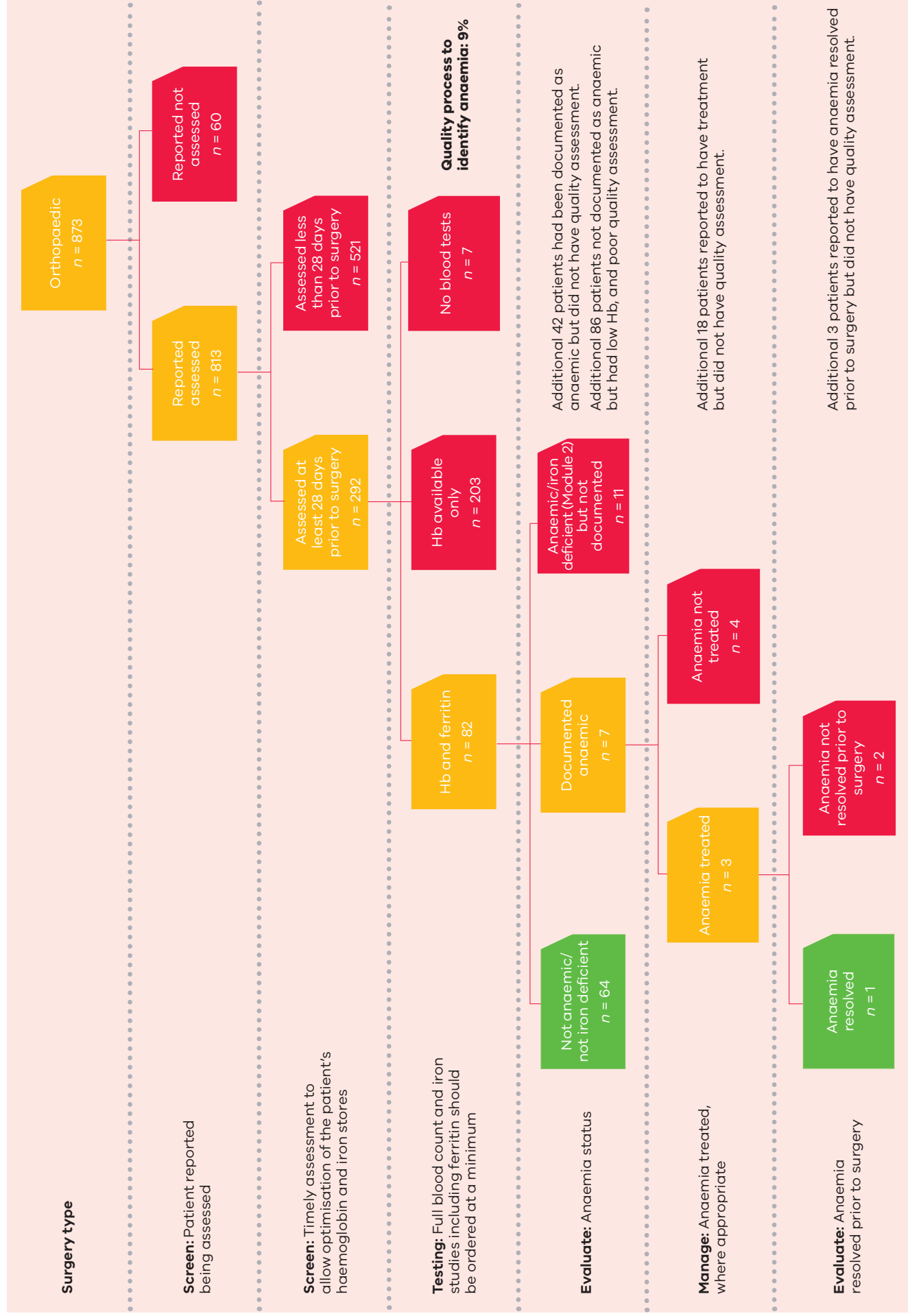
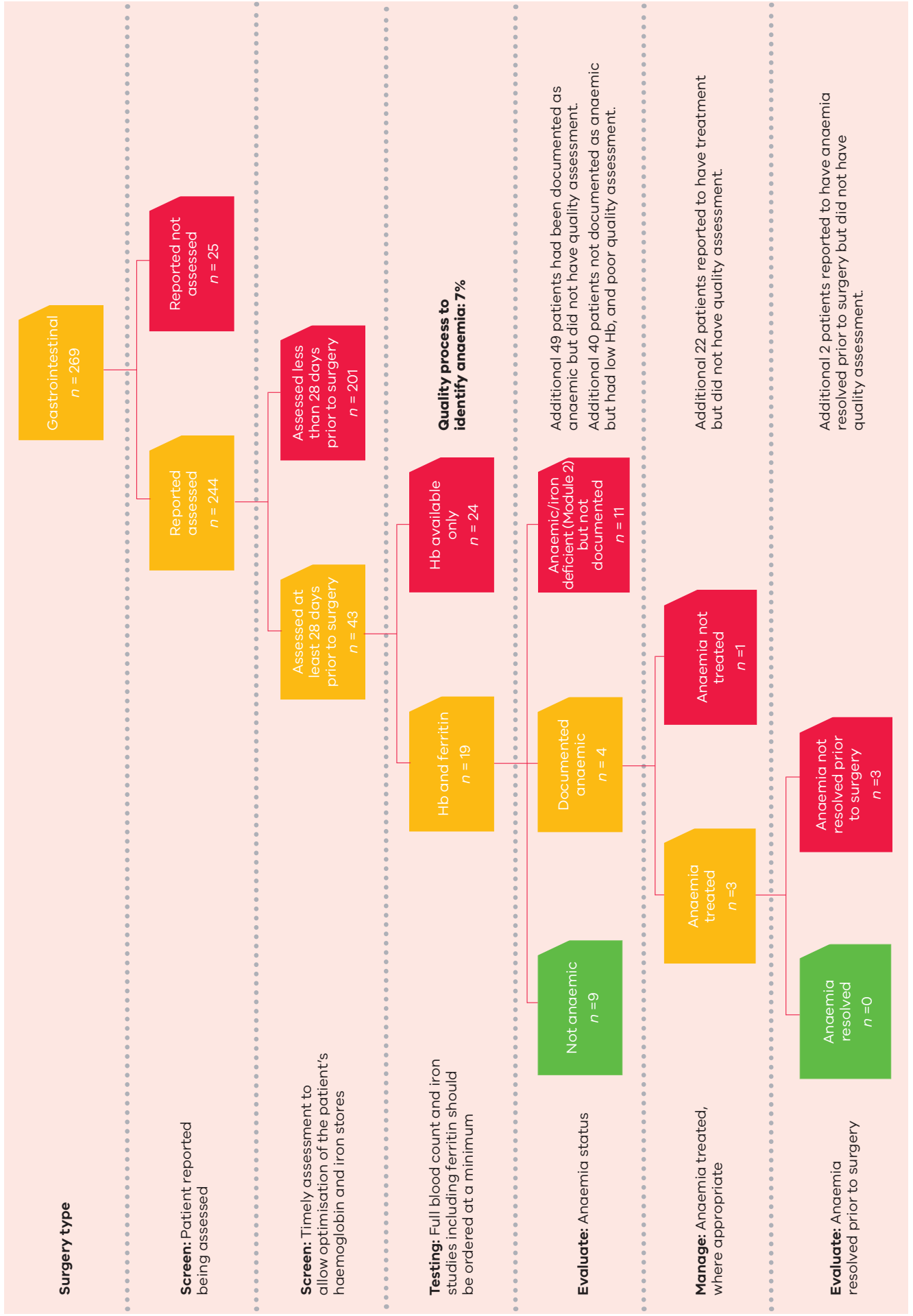


Figure 6: Quality of assessment process for gastrointestinal surgery



Intraoperative interventions

Blood loss during surgery

Of the total 1,142 patients audited, 310 reported a specific amount of blood loss had been documented during surgery (average 364 mL). An additional 49 reported a form of documentation, such as 'minimal' ($n = 30$), 'less than 50mL' ($n = 5$), 'less than 100 mL' ($n = 3$), 'less than 500 mL' ($n = 8$), or 'greater than 500 mL' ($n = 3$). The remaining 783 patients' blood loss was reported as unknown.

Intraoperative transfusion

Six of 14 patients who received an intraoperative blood transfusion were documented as anaemic at time of preoperative assessment. Three of these six patients received treatment for the anaemia preoperatively, with two of the three also receiving a red cell transfusion preoperatively. Three patients with normal Hb prior to surgery had significant blood loss during surgery (approximately two litres), which may explain why they needed transfusion during surgery and indicates these transfusions may have been appropriate.

Cell salvage

While intraoperative cell salvage does not appear to be used widely in the cases reported in the audit, it was used in 31 patients, with 25 of these patients receiving the salvaged blood. The volume of returned blood ranged from 64 to 715 mL, with an average return of 281 mL. Of the patients receiving cell salvaged blood, one also had an allogeneic red cell transfusion.

Five of the six patients who had blood salvaged (intraoperatively) but not returned during surgery went on to have an allogeneic red cell transfusion.

A Cochrane review found the use of cell salvaged reduced the relative rate of allogeneic RBC transfusion by 38 per cent saving on average 0.68 units of allogeneic RBCs per patient (Carless 2010).

The decision to use intraoperative cell salvage could be considered as part of the preoperative assessment in health services where this service is available, and for procedures where this is appropriate.

Postoperative anaemia management

Postoperative transfusion

In the postoperative period 131 patients (11 per cent) received transfusions. The characteristics of those receiving transfusion is explained in Table 16.

Table 16: Characteristics of patients receiving an allogeneic red cell transfusion in the postoperative period

Surgery type	Patient assessed for anaemia preoperatively (%)	Anaemia documented preoperatively (%)	Anaemia treated preoperatively*
Gastrointestinal (<i>n</i> = 32, 13% of all patients in this speciality)	31 (97%)	16 (52%)	8 (50%) 7 – transfusion 4 – iron infusion 1 – oral iron
Orthopaedic (<i>n</i> = 99, 12% of all patients in this speciality)	91 (92%)	21 (23%)	11 (52%) 1 – transfusion 3 – iron infusion 5 – oral iron 2 – unknown/other

* Total treatments may be greater than total patients treated, as multiple treatments may have occurred.

Postoperative cell salvage

Postoperative cell salvage was reported to be used in 40 patients (3.5 per cent of total audits). Of these 40 patients, 23 (57 per cent) went on to have salvaged blood reinfused in the postoperative period.

The volume reinfused ranged between 50 and 850 mL, with an average return of 347 mL.

Length of stay

Length of stay was reported for 1,139 of 1,142 responses and ranged from 1–79 days, average eight days.

Table 17 indicates the average length of stay by surgical group looking at the preoperative Hb and if anaemia was treated and if the patient received a transfusion intra or postoperatively.

Our data would support the literature indicating longer lengths of stay for patients with anaemia compared to those without anaemia (Hogan 2015).

De Santo (2009) reported that anaemic patients remained in the ICU on average one day longer than non-anaemic patients. Anaemic patients stayed between two and four additional days in hospital than non-anaemic patients (Hogan 2015).

Table 17: Average length of stay by surgical type

	Preoperative Hb result		Documented anaemic		Transfusion intra or post-operatively	
	Documented as anaemic	Not documented as anaemic*	Not treated	Treated†	Yes	No
Gastrointestinal	12 days (n = 54)	10 days (n = 215)	13 days (n = 28)	11 days (n = 26)	15 days (n = 33)	9 days (n = 236)
Orthopaedic	9 days (n = 63)	7 days (n = 810)	9 days (n = 33)	8 days (n = 30)	13 days (n = 102)	6 days (n = 771)

* This includes patients who may have been anaemic as defined by Module 2 template, but not documented by health service.

† Patient may have received treatment for anaemia, however; only five patients had anaemia reported as resolved preoperatively.

Transfusion rate and impact on length of stay was considered for the subgroup of patients reported with only minimal blood loss during surgery (n = 185) to remove the confounding variable of surgical blood loss.

For all groups the average length of stay was longer where patients received a transfusion as shown in Table 18.

Table 18: Impact of anaemia status and management on transfusion rate and length of stay in patients with minimal documented surgical blood loss (less than 250 ml).

Anaemia status – as defined by Module 2	Transfusion – intraoperatively or postoperatively		Average length of stay (days)	
	No	Yes	No transfusion (intra or postoperative)	Transfused
Not anaemic (n = 149)	142 (95%)	7 (5%)	8	9
Anaemic and treated* (n = 11)	6 (55%)	5 (45%)	9	14
Anaemic and not treated (n = 25)	19 (76%)	6 (24%)	12	17

* Patient may have received treatment for anaemia, however; only five patients had anaemia reported as resolved preoperatively.

Intra and/or postoperative transfusion rate for patients who were not anaemic at the preoperative anaemia assessment was only five per cent (n = 7), compared with 31 per cent for patients who were anaemic (treated or untreated) preoperatively. Average length of stay ranged from eight days for non-transfused non-anaemic patients to 17 days for transfused anaemic untreated patients.

Of the patients treated for anaemia preoperatively, only five had the anaemia reported as resolved prior to surgery. Of these patients, one was transfused and the average length of stay was six days.

Audit summary

The audit data indicates that few health services have a process for optimising patient red cell mass prior to elective surgery (32 per cent) – that is, a pathway or algorithm that sets out the process for assessment and management of these patients in the preoperative period. A number of health services are considering adopting such a pathway.

Despite this, most health services have some process for assessing patients prior to surgery (79 per cent), usually in hospital. However, the quality of assessment was lacking in the majority of cases, with only 32 per cent of patients being assessed with enough time to investigate, identify and treat any anaemia found.

While the majority of patients had investigations that included an FBE (97 per cent), other tests that may indicate the type of anaemia or underlying conditions that have not yet caused anaemia, for example iron deficiency, were far less frequently performed.

We note that many health services were using either a lower Hb level to diagnose anaemia than the Module 2 definition, or were not recognising a proportion of patients with anaemia, and as such missing the opportunity to optimise red cell mass and haematinics prior to surgery.

This is a concern considering 20 per cent ($n = 212$) of audit patients presented for surgery with anaemia, as defined by Module 2.

In this audit quality assessment includes:

- patient assessed at least 28 days prior to surgery
- Hb and ferritin results (as a minimum) available at the time of assessment
- evaluation of results in the context of the patient's clinical picture, and documentation of anaemia if identified
- appropriate management of anaemia (if identified)
- evaluation of impact of treatment.

This lack of quality assessment has impacts both for the patient and the health service, as patients who were anaemic at surgery were more likely to be transfused and in general had a longer length of stay.

It appears there is still much work to be done to achieve quality preoperative anaemia assessment in health services.

We recommend that health services review their processes for preoperative anaemia assessment. A checklist to assist health services with this review is included at the beginning of this report. Formal recommendations are listed on page viii.

We also note that the Australian Commission on Safety and Quality in Healthcare is leading a National Patient Blood Management Collaborative to support improvements in the management of anaemia for patients having selected elective gastrointestinal, gynaecological and orthopaedic surgery procedures. Information on this collaborative can be found in Appendix 7. Resources from this collaborative will be available to assist health services in adopting pre-operative patient blood management initiatives.

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Appendix 1: Audit tools

Part A: Gap analysis

Background

1. Name of your health service: _____ [drop down box] (response required)
2. Is your health service: (response required)
 - Public
 - Private
3. Location of your health service: (response required)
 - Metropolitan
 - Regional
 - Rural
4. Number of sites within your health service: _____ (response required)
(The value must be between 1 and 5, inclusively)
5. Your contact email: _____ (response required)
(The address Blood Matters will use to email if any clarification is required)
6. Do you have a preoperative anaemia screening pathway for surgical patients with or at risk of anaemia? (response required)
 - Yes, go to Qu7
 - No, go to Qu18

If you have multiple sites (as answered in question 4), otherwise go to Qu10

7. Is the preoperative anaemia screening pathway for surgical patients across all sites within the health service? (response required)
 - Yes, go to Qu10
 - No, go to Qu8
8. At which site(s) does the preoperative anaemia screening pathway for surgical patients apply to? (response required) Please specify: _____
9. Please indicate why a preoperative anaemia screening pathway for surgical patients has not been implemented across all sites? (response required)
 - Limited surgery in some sites
 - Other priorities in some sites
 - Limited clinical leadership/support in some sites for this type of program

Other, please specify: _____

If a preoperative anaemia screening pathway for surgical patients with or at risk of anaemia exists in your health service:

10. Does the pathway include a preoperative haemoglobin assessment and optimisation template? (response required)

- Yes, go to Qu11
- No, go to Qu12

11. If yes, is the template:

- NBA template
- Modified NBA template
- Hospital designed template (Please attach a copy of the pathway and/or template)

12. Are GPs included in the screening pathway? (response required)

- Yes
- No

13. Does the screening pathway identify whose role it is to identify at-risk anaemia patients to refer for investigation and/or treatment? (response required)

- Yes
- No

14. Which surgical groups does the preoperative anaemia screening pathway apply to? (Multiple groups can be selected) (response required)

- Orthopaedic
- Cardiothoracic
- Gynaecology
- Vascular
- Urology
- GIT – upper and/or lower
- Hepatobiliary
- General surgery (breast, plastics)
- ENT
- All surgery
- Other – please specify (text): _____

15. What tests are included as part of the preoperative anaemia screening pathway? (response required)

- FBE
- Iron studies including Ferritin
- B12
- Folate
- CRP
- Renal function
- Other – please specify (text): _____

16. Does the pathway stipulate the provision of written consumer information? (response required)

- Yes, go to Qu17
- No – SURVEY COMPLETED – THANK YOU

17. If yes, what topics does this written information cover? (response required)

- Patient blood management (PBM) program,
- Dietary / oral / IV iron,
- Risks, benefits and alternatives to blood transfusion
- Other, please specify: _____

SURVEY COMPLETED – THANK YOU

If no preoperative anaemia screening pathway:

18. Is there a plan to introduce a preoperative anaemia screening program in the next 12 months?
(response required)

- Yes, go to Qu19
- No, go to Qu20

19. If yes, which surgical specialities will be covered? (then go to Qu21) (response required)

- Orthopaedic
- Cardiothoracic
- Gynaecology
- Vascular
- Urology
- GIT – upper and/or lower
- Hepatobiliary
- General surgery (breast, plastics)
- ENT
- All surgery
- Other – please specify (text): _____

20. If no, please indicate reasons a preoperative anaemia screening program is not being considered:
(then go to Qu21) (response required)

- Limited surgery in the health service
- Other priorities in the health service
- Limited clinical leadership/support (sponsorship) for this type of program
- Other – please specify (text): _____

21. Is identifying anaemia addressed in any other preoperative assessments? (response required)

- Yes, go to Qu22
- No – SURVEY COMPLETED – THANK YOU

22. If yes, where is anaemia addressed preoperatively? (response required)

- Preadmission clinic
- GP
- Specialist rooms (drop down box – surgeon, anaesthetist, physician)
- Unknown
- Other (please state)

SURVEY COMPLETED – THANK YOU

Part B: Audit of current preoperative anaemia management practice

All health services are invited to participate. No formal preoperative PBM program required.

Choose up to 30 patients (from one site if multiple sites with your health service) who have undergone surgery in previous 12 months (1 September 2014 to 31 August 2015) from **ONE** of the following clinical specialties **ONLY**:

(Please refer to audit instructions for exclusions)

- orthopaedics, or
- gastrointestinal (upper and/or lower), or
- cardiothoracic.

Limiting data collection to one clinical specialty will provide more robust data for use within your health service.

Please choose patients who did not return to theatre within the first seven days after surgery.

Demographics

1. Name of your health service: _____ [drop down box] (response required)
2. Your contact email: _____ (response required)
(The address Blood Matters will use to email if any clarification is required)
3. Audit no: 1–30 (please do not record MRN): _____ (response required)
(The value must be between 1 and 30, inclusively)
4. Type of surgery: (response required) [please refer to audit instructions]
 - Orthopaedic
 - Cardiothoracic
 - Gastrointestinal –upper and/or lower
5. Gender: (response required)
 - Male
 - Female
6. Age: (at last birthday, in years): _____ (response required)
(The value must be between 1 and 110, inclusively)

Preoperative screening

7. Was the patient assessed for anaemia preoperatively? (response required)
 - Yes, go to Qu8
 - No, go to Qu16

8. If yes, where were they assessed? (response required select 1)

- Hospital clinic
- Physicians room
- GP
- Unknown
- Other, please specify: _____

9. Date of the preoperative assessment: dd/mm/yyyy ____/____/____ (response required)

10. Which tests were performed at or were available for the preoperative assessment

(where applicable, enter results that are most recent): (response required)

- FBE Result: Hb ____ g/L, date: ____/____/____
- Iron studies including Ferritin Result: Ferritin: ____ mcg/L, date: ____/____/____
- B12
- Folate
- CRP
- Renal function
- No tests done/ available
- Other – please specify (text): _____

11. Was anaemia identified/documentated before the surgery? (response required)

- Yes, go to Qu12
- No, go to Qu16
- Unknown, go to Qu16

12. If yes, did the patient receive treatment/intervention for anaemia? (response required)

- Yes, go to Qu13
- No, go to Q15
- Unknown, go to Q15

13. If yes, what treatment/intervention (choose all that apply)? (response required)

- Oral Fe supplements
- Fe infusion

13a. If Fe infusion, IV Iron product type: (response required)

- Ferric carboxymaltose (FERINJECT®)
- Iron polymaltose (FERROSIG®)
- Iron polymaltose (FERRUM H®)
- Iron sucrose (VEROFER®)
- Unknown

13b. If Fe infusion, was this iron product administered (one answer only) (response required)

- In hospital
- GP rooms
- Unknown
- Other, please specify: _____

- Scopes – endoscopy / colonoscopy
- Haematology referral
- Red cell transfusion
- Erythropoietin (EPO)
- Unknown
- Other, please specify (text): _____

14. Was Hb measured after treatment and before surgery? (response required)
(Then go to Qu16)

- Yes Result: Hb _____ g/L, date: ____/____/____
- No
- Unknown

15. If no treatment/intervention (response required)

- Please specify reason if documented (text):

- Unknown

16. Was preoperative autologous donation (PAD) collected? (response required)

- Yes, go to Qu16a
- No, go to Qu18

16a. If yes, how many units donated? _____(response required)

(The value must be ≥ 1)

16b. If yes, date last unit collected: dd/mm/yyyy ____/____/____ (response required)

(The value must be between 01/06/2014 and 01/09/2015, inclusive)

Intraoperative

17. Surgery date: dd/mm/yyyy ____/____/____

(The value must be between 01/08/2014 and 01/09/2015, inclusive)

18. Amount of blood loss during surgery, if documented (ml)? (response required)

- Unknown
- Specify volume: _____(ml)

19. Did the patient receive an allogeneic red cell transfusion during surgery?

- Yes, go to Qu19a
- No, go to Qu20

19a. If yes how many units? _____ (The value must be ≥ 1)

20. Did the patient receive PAD blood transfusion during surgery? (If responded YES in Qu16, otherwise go to Qu21)

- Yes, go to Qu20a
- No, go to Qu21

20a. If yes, how many units? _____ (The value must be ≥ 1)

21. Was intraoperative cell salvage used? (response required)

- Yes, go to Qu22
- No, go to Qu23

22. If yes, was the salvaged blood returned to the patient during surgery? (response required)

- Yes, go to Qu22a
- No, go to Qu23

22a. If yes, volume (ml) if known? _____ (Enter 0, if unknown)

Postoperative

23. Did the patient receive an allogeneic red cell transfusion in the postoperative period (within 7 days)? (response required)

- Yes, go to Qu23a
- No, go to Qu24

23a. If yes, how many units? _____ (The value must be ≥ 1)

24. Did the patient receive PAD blood transfusion in the postoperative period (within 7 days)? (response required)

(If responded YES in Qu16, otherwise go to Qu25)

- Yes, go to Qu24a
- No, go to Qu25

24a. If yes, how many units? _____ (The value must be ≥ 1)

25. Was postoperative cell salvage collected? (response required)

- Yes, go to Qu25a
- No, go to Qu26

25a. If yes, was it reinfused?

- Yes, go to Qu25b
- No, go to Qu26

25b. If yes, volume (ml) if known? _____ ml (Enter 0, if unknown)

Discharge

26. Total length of stay (LOS):_____ days (response required)

27. Last Hb prior to discharge? (response required)

- Result available: Hb _____ g/L (date) dd/mm/yyyy ____/____/____
- No result available

28. Was the patient discharged on oral iron?

- Yes
- No
- Unknown
- Not applicable

SURVEY COMPLETED – THANK YOU

Appendix 2: Audit information and instructions

Clinical audit of preoperative anaemia assessment and management in elective surgical procedures 2015

Information and instructions

Background

Undiagnosed anaemia is common in the surgical setting and is associated with increased perioperative morbidity and mortality. If it is uncorrected, it increases the likelihood of blood transfusion, which is independently associated with increased morbidity, mortality and hospital length of stay (Blood Matters website).

The National Blood Authority (NBA) *Patient blood management guidelines*, 'Module 2 Perioperative' was released in March 2012. It contains six recommendations, and five practice points related to the management of anaemia in the perioperative patient.

This audit has been designed to determine what processes are in place within health services to assess anaemia in the perioperative patient. It will also explore if patients are presenting for surgery with anaemia. Data will inform areas for improvement.

Audit aims

To provide information to improve practice related to the assessment and management of reversible anaemia prior to surgery, and improve outcomes for patients undergoing elective surgical procedures.

Objectives

To determine:

- if health services have a screening pathway for assessment of preoperative anaemia as defined in the NBA PBM guidelines Module 2, Perioperative
- where a screening pathway is in place, it uses a preoperative haemoglobin assessment and optimisation template
- where screening processes, +/- assessment and optimisation templates are in place, that they are being followed.

Inclusions

- patients undergoing major elective orthopaedic, gastrointestinal or cardiothoracic surgical procedures occurring between September 2014 to August 2015

Exclusions

- minor surgical procedures where there is low or no expectation of need for transfusion i.e.
 - orthopaedic surgery such as arthroscopy
 - gastrointestinal surgery such as endoscopy and laparoscopic gastric banding
 - cardiothoracic surgery such as angiogram and insertion of stent
- emergency procedures or surgical management of traumatic injury

Methodology

This is a two-part audit.

Part A – Gap analysis

- This is a desktop audit of processes currently in place at your health service to assess and manage preoperative anaemia

These data may assist health services that are intending to introduce a preoperative anaemia assessment and optimisation template/screening pathway.

Part B – Retrospective audit

- A retrospective audit of up to 30 patients who have attended for elective surgical procedures (as defined above)

These data will enable health services to assess if they are following their own processes (if preoperative anaemia assessment is in place) or highlight areas where preoperative anaemia assessment and optimisation would be beneficial.

Definitions

Considered anaemic if Hb is below the following values:

Age range	Sex	Haemoglobin (Hb) g/L
Adult *	male	<130
Adult *	female	<120
2–11 years#	boys and girls	<115
6–24 months#	boys and girls	<105

*Reference – NBA PBM algorithm Module 2 p. 122 (NBA 2012)

The Royal Children's Hospital Melbourne Clinical Practice guidelines (RCH 2015)

- Elective surgery – is planned, non-emergency surgery, which is medically necessary or beneficial to the patient but does not need be done at a particular time
- Patient blood management (PBM) is the management and preservation of patients' own blood to reduce or avoid the need for a blood transfusion.^(NBA 2012)
- PAD – preoperative autologous donation
- Preoperative period – 'pertaining to the period before a surgical procedure. Commonly the preoperative period begins with the first preparation of the patient for surgery, such as when the surgery is scheduled'.^(Mosby 2009)
- Postoperative period – defined as within seven (7) days of surgery

Timeframe

Data entry from 1 October 2015 with a final return date of **27 November 2015**.

Data entry

Data is to be entered **electronically** using the hospital name via the Blood Matters website located at <http://www.health.vic.gov.au/bloodmatters/audit.htm> and can be entered anytime from 1 October 2015 to 27 November 2015.

For hospitals that do not have access to the internet, or are having difficulties submitting data, please contact Blood Matters on 03 9694 0102 or email bloodmatters@redcrossblood.org.au

Health service details Part A & B

Open the relevant survey and enter your health service information.

- please select your health service from the drop down box
- please ensure a valid email address for the contact person is provided. This is the address that will be used should Blood Matters need to clarify any information you provide. A draft summary of individual health service data will be prepared on closure of the audit and will be sent to this email address for review and verification.

Part B

Enter up to 30 responses –

Patients who have undergone surgery in the previous 12 months (1 September 2014 to 31 August 2015), from **ONE** clinical specialty **ONLY** – orthopaedics, gastroenterology or cardiothoracic.

- please enter audit number (1–30 to correspond with data you are entering)
- select type of surgery from the drop down box
- select patient gender
- patient age at last birthday in whole numbers
- all dates – please enter in dd/mm/yyyy

Data collection

The Transfusion Committee (or equivalent) should designate member(s) of staff to complete the information requested.

The Department of Health and Human Services (the department) is committed to protecting privacy. Information collected during this audit is not capable of identifying any individual and names will not be provided to the department.

The Blood Matters secretariat is coordinating the audit, and is responsible for the distribution of audit collection tools, data processing and analysis. Data will be validated and the report will follow. Blood Matters will disseminate individual results to the participating health services with the final report.

References

National Blood Authority 2012 *Patient blood management guidelines, 'Module 2 – Perioperative'* <http://www.blood.gov.au/system/files/documents/pbm-module-2.pdf>

The Royal Children's Hospital (2015) Melbourne Clinical Practice guidelines: anaemia http://www.rch.org.au/clinicalguide/guideline_index/Anaemia/

Mosby's Medical Dictionary, 8th edition. © 2009, Elsevier
<http://medical-dictionary.thefreedictionary.com/preoperative>

If further information is required please contact:

Ms Linley Bielby, Program Manager – Tel: 03 96940102
or email: bloodmatters@redcrossblood.org.au

Appendix 3: Detailed summary of the data submitted

Summary responses from Part A audit – all hospitals

Audit question	Count
Number audits submitted:	56
Background	
2. Health service	
Public	45 (80%)
Private	11 (20%)
3. Location of health service	
Metropolitan	22 (39%)
Regional	21 (38%)
Rural	13 (23%)
6. Do you have a preoperative anaemia screening pathway for surgical patients with or at risk of anaemia?	18 (32%)
If a preoperative anaemia screening pathway for surgical patients with or at risk of anaemia exists in your health service:	
10. Does the pathway include a preoperative haemoglobin assessment and optimisation template? Yes	13 (72%)
11. If yes, is the template	
NBA template	3 (23%)
Modified NBA template	7 (54%)
Hospital designed template	3 (23%)
12. Are GPs included in the screening pathway? Yes	7 (39%)
13. Does the screening pathway identify whose role it is to identify at-risk anaemia patients to refer for investigation and/or treatment?	14 (78%)
14. Which surgical groups does the preoperative anaemia screening pathway apply to?	
Orthopaedic	12 (67%)
Cardiothoracic	2 (11%)
Gynaecology	6 (33%)
Vascular	2 (11%)
Urology	2 (11%)
GIT – upper and/or lower	7 (39%)
Hepatobiliary	2 (11%)
General surgery (breast, plastics)	2 (11%)

Audit question	Count
ENT	1 (6%)
All surgery	3 (17%)
Other	6 (33%)
15. What tests are included as part of the preoperative anaemia screening pathway?	
FBE	16 (89%)
Iron studies, including ferritin	13 (72%)
B12	3 (17%)
Folate	3 (17%)
CRP	10 (56%)
Renal function	14 (78%)
Other	4 (22%)
16. Does the pathway stipulate the provision of written consumer information? Yes	6 (33%)
17. If yes, what topics does this information cover?	
Patient blood management (PBM) program	2 (33%)
Dietary/Oral/ IV iron	3 (50%)
Risks, benefits and alternatives to blood transfusion	3 (50%)
Other	3 (50%)

Summary responses from Part B audit – all hospitals

Audit question	Count	Average (range)
Number audits submitted:	1,142	
Demographics		
4. Surgery type:		
Orthopaedic	873	
Cardiothoracic	0	
Gastrointestinal	269	
5. Gender:		
Male	537	
Female	605	
6. Average age		66 (8–95 years)
Preoperative screening		
7. Patients assessed for anaemia preoperatively?	1,057 (93%)	
8. If yes, where were they assessed?		
Hospital clinic	845 (80%)	
Physicians	70 (7%)	
GP	55 (5%)	
Unknown	28 (3%)	
Other	59 (6%)	
9. Time preop assessment prior to surgery (days)		29 (0–316) days
10a. Tests performed/ordered:		
FBE	1,027 (97%)	
Ferritin	268 (25%)	
B12	33 (3%)	
Folate	26 (2%)	
CRP	293 (28%)	
Renal function	875 (83%)	
Other tests	457 (43%)	
No tests	24 (2%)	
10b. Test results		
FBE	1026	135 (56–197) g/L (Hb)
Ferritin	266	172 (3–1412) mcg/L

Audit question	Count	Average (range)
11. Was anaemia identified/documentated before the surgery? Yes	117 (11%)	
12. If yes, did the patient receive treatment/intervention for anaemia? Yes	56 (48%)	
13. If yes, what treatment/intervention		
Oral iron supplements	21 (38%)	
Iron infusion	23 (41%)	
Scopes – endoscopy / colonoscopy	12 (21%)	
Haematology referral	4 (7%)	
Red cell transfusion	18 (32%)	
Erythropoietin (EPO)	0 (0%)	
Unknown	1 (2%)	
Other	3 (5%)	
13a. If Fe infusion, IV Iron product type:		
Ferric carboxymaltose (FERINJECT®)	11 (48%)	
Iron polymaltose (FERROSIG®)	3 (13%)	
Iron polymaltose (FERRUM H®)	4 (17%)	
Iron sucrose (VEROFER®)	0 (0%)	
Unknown	5 (22%)	
13b. If Fe infusion, was this iron product administered		
In hospital	14 (61%)	
GP rooms	0 (0%)	
Unknown	5 (22%)	
Other	4 (17%)	
14. Was Hb measured after treatment and before surgery? Yes	37 (66%)	
If yes, Hb result		112 (62–147) g/L
15. If no treatment/intervention		
16. Was preoperative autologous donation (PAD) collected? Yes	0 (0%)	
Intraoperative		
18. Amount of blood loss during surgery, if documented (ml)?	310 (27%)	364 (5–2000) ml

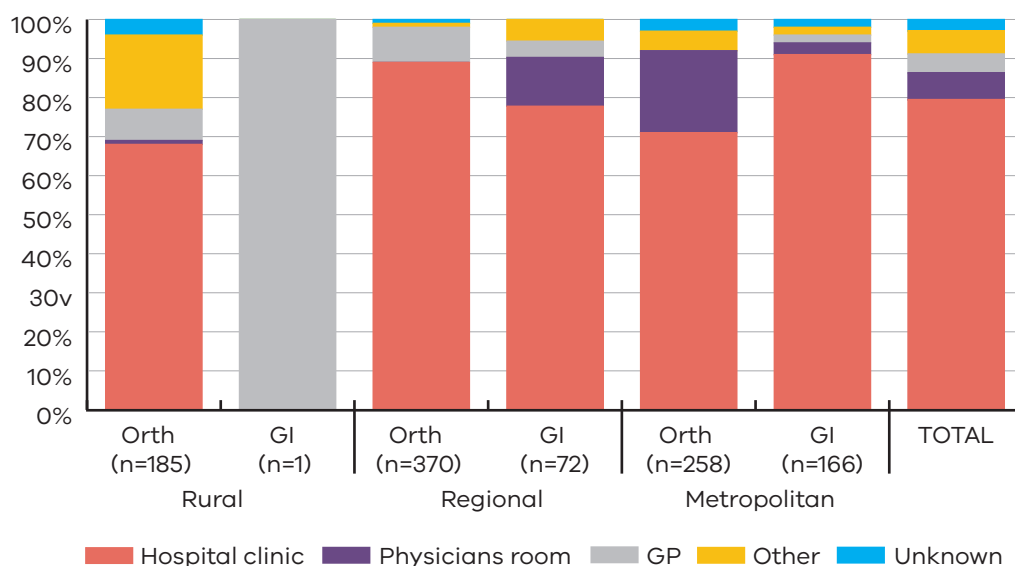
Audit question	Count	Average (range)
Documented as 'minimal'	35 (3%)	
Blood loss not documented	783 (69%)	
19. Did the patient receive an allogeneic red cell transfusion during surgery? Yes	14 (1%)	
a. If yes how many units?		2 (1–5) units
20. Did the patient receive PAD blood transfusion during surgery?	n/a	
21. Was intraoperative cell salvage used? Yes	31 (3%)	
22. If yes, was the salvaged blood returned to the patient during surgery?	25 (81%)	
22a. If yes, volume (ml) if known?	25	281 (64–715) ml
Postoperative		
23. Did the patient receive an allogeneic red cell transfusion in the postoperative period (within seven days)?	131 (11%)	
23a. If yes, how many units?		2 (1–5) units
24. Did the patient receive PAD blood transfusion in the postoperative period?	n/a	
25. Was postoperative cell salvage collected?	40 (4%)	
25a. If yes, was it reinfused?	23 (58%)	
25b. If yes, volume (ml) if known?		347 (50–850) ml
Discharge		
26. Total length of stay (LOS)	1,139	8 (1–79) days
27. Last Hb prior to discharge?	1,068 (94%)	110 (70–164) g/L
28. Was the patient discharged on oral iron? Yes	38 (3%)	

Surgical groups included in anaemia screening pathway

Type of surgery	Number (%)*
Orthopaedics	12 (67%)
GIT (upper and/or lower)	7 (39%)
Gynaecology	6 (33%)
Other (including obstetrics)	6 (33%)
Vascular	2 (11%)
All surgery	3 (17%)
Urology	2 (11%)
Cardiothoracic	2 (11%)
Hepatobiliary	2 (11%)
General surgery (breast, plastics)	2 (11%)
ENT	1 (6%)

* Greater than 100 per cent as multiple surgical groups could be selected.

Where did preoperative anaemia assessment take place (by surgery type and location)?



Other mainly included inpatient (n = 17) and anaesthetist (n = 28).

Appendix 4: Module 2 – Perioperative recommendations

Recommendations and practice points relevant to preoperative anaemia assessment and management from PBM Module 2 – Perioperative.

Patient blood management program

RECOMMENDATION – establishment

R1

GRADE C

Health-care services should establish a multidisciplinary, multimodal perioperative patient blood management program (Grade C). This should include preoperative optimisation of red cell mass and coagulation status; minimisation of perioperative blood loss, including meticulous attention to surgical haemostasis; and tolerance of postoperative anaemia.

PRACTICE POINT – implementation

PP1

To implement the above recommendations, a multimodal, multidisciplinary patient blood management program is required. All surgical patients should be evaluated as early as possible to coordinate scheduling of surgery with optimisation of the patient's haemoglobin and iron stores.

Anaemia and haemostasis management

RECOMMENDATIONS – preoperative anaemia assessment

R2

GRADE C

In patients undergoing cardiac surgery, preoperative anaemia should be identified, evaluated and managed to minimise RBC transfusion, which may be associated with an increased risk of morbidity, mortality, ICU length of stay and hospital length of stay (Grade C).

R3

GRADE C

In patients undergoing noncardiac surgery, preoperative anaemia should be identified, evaluated and managed to minimise RBC transfusion, which may be associated with an increased risk of morbidity, mortality, ICU length of stay and hospital length of stay (Grade C).

PRACTICE POINTS – preoperative anaemia assessment

PP1	To implement the above recommendations, a multimodal, multidisciplinary patient blood management program is required. All surgical patients should be evaluated as early as possible to coordinate scheduling of surgery with optimisation of the patient's haemoglobin and iron stores.
PP4	All surgical patients should be evaluated as early as possible to manage and optimise haemoglobin and iron stores
PP5	Elective surgery should be scheduled to allow optimisation of patients' haemoglobin and iron stores.

RECOMMENDATIONS – iron and erythropoiesis-stimulating agents

R4 GRADE B	<p>In surgical patients with, or at risk of, iron-deficiency anaemia, preoperative oral iron therapy is recommended (Grade B).</p> <p>Refer to the preoperative haemoglobin assessment and optimisation template [Appendix 5] for further information on the optimal dosing strategy.</p>
R5 GRADE A	<p>In patients with preoperative anaemia, where an ESA is indicated, it must be combined with iron therapy (Grade A).</p>
R6 GRADE B	<p>In patients with postoperative anaemia, early oral iron therapy is not clinically effective; its routine use in this setting is not recommended (Grade B).</p>

PRACTICE POINTS – iron and erythropoiesis-stimulating agents

PP6	<p>Surgical patients with suboptimal iron stores (as defined by a ferritin level $<100 \mu\text{g/L}$) in whom substantial blood loss (blood loss of a volume great enough to induce anaemia that would require therapy) is anticipated, should be treated with preoperative iron therapy.</p> <p>Refer to the preoperative haemoglobin assessment and optimisation template [Appendix F] for further information on the evaluation and management of preoperative patients.</p>
PP7	<p>In patients with preoperative iron-deficiency anaemia or depleted iron stores, treatment should be with iron alone. In patients with anaemia of chronic disease (also known as anaemia of inflammation), ESAs may be indicated.</p> <p>Refer to the preoperative haemoglobin assessment and optimisation template [Appendix F] for further information on the evaluation and management of preoperative patients.</p>

ESA. erythropoiesis-stimulating agent

RECOMMENDATION – intraoperative cell salvage

R15

GRADE C

In adult patients undergoing surgery in which substantial blood loss (blood loss of a volume great enough to induce anaemia that would require therapy) is anticipated, intraoperative cell salvage is recommended (Grade C).

PRACTICE POINT – intraoperative cell salvage

PP13

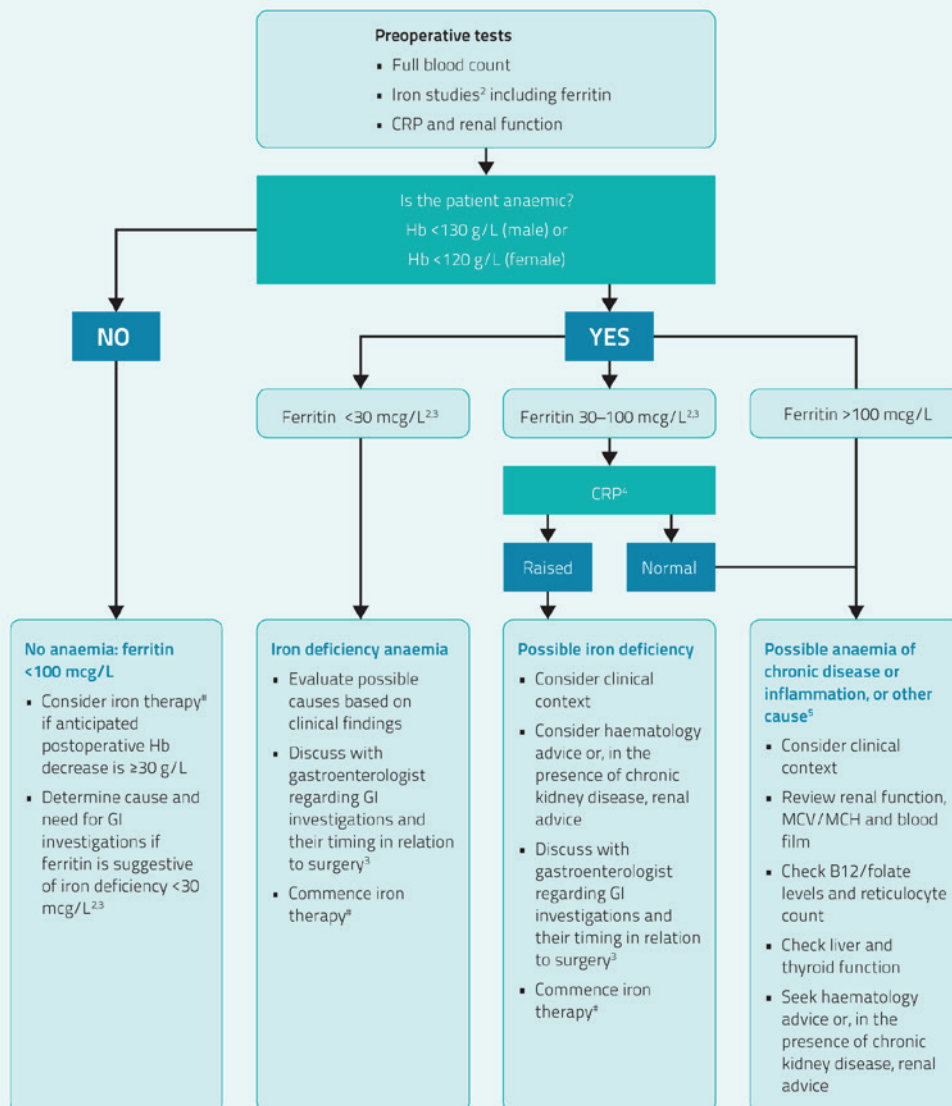
Intraoperative cell salvage requires a local procedural guideline that should include patient selection, use of equipment and reinfusion. All staff operating cell salvage devices should receive appropriate training, to ensure knowledge of the technique and proficiency in using it.

Appendix 5: Preoperative haemoglobin assessment and optimisation template

Preoperative haemoglobin assessment and optimisation template

This template¹ is for patients undergoing procedures in which substantial blood loss is anticipated such as cardiac surgery, major orthopaedic, vascular and general surgery. Specific details, including reference ranges and therapies, may need adaptation for local needs, expertise or patient groups.

An editable electronic copy of this template is available on the National Blood Authority's website (www.nba.gov.au).



Appendix 5 (cont.)



Iron therapy

Oral iron in divided daily doses. Evaluate response after 1 month. Provide patient information material.

IV iron if oral iron contraindicated, is not tolerated or effective; and consider if rapid iron repletion is clinically important (e.g. <2 months to non-deferrable surgery).

NOTE: 1 mcg/L of ferritin is equivalent to 8–10 mg of storage iron. It will take approximately 165 mg of storage iron to reconstitute 10 g/L of Hb in a 70 kg adult. If preoperative ferritin is <100 mcg/L, blood loss resulting in a postoperative Hb drop of ≥ 30 g/L would deplete iron stores.

In patients not receiving preoperative iron therapy, if unanticipated blood loss is encountered, 150 mg IV iron per 10g/L Hb drop may be given to compensate for bleeding related iron loss (1 ml blood contains ~0.5 mg elemental iron)

Abbreviations

CRP = C-reactive protein

GI = gastrointestinal

Hb = haemoglobin

IV = intravenous

MCV = mean cell/corpuscular volume (fL)

MCH = mean cell/corpuscular haemoglobin (pg)

Footnotes

- 1 Anaemia may be multifactorial, especially in the elderly or in those with chronic disease, renal impairment, nutritional deficiencies or malabsorption.
- 2 In an anaemic adult, a ferritin level <15 mcg/L is diagnostic of iron deficiency, and levels between 15–30 mcg/L are highly suggestive. However, ferritin is elevated in inflammation, infection, liver disease and malignancy. This can result in misleadingly elevated ferritin levels in iron-deficient patients with coexisting systemic illness. In the elderly or in patients with inflammation, iron deficiency may still be present with ferritin values up to 60–100 mcg/L.
- 3 Patients without a clear physiological explanation for iron deficiency (especially men and postmenopausal women) should be evaluated by gastroscopy/colonoscopy to exclude a source of GI bleeding, particularly a malignant lesion. Determine possible causes based on history and examination; initiate iron therapy; screen for coeliac disease; discuss timing of scopes with a gastroenterologist.
- 4 CRP may be normal in the presence of chronic disease and inflammation.
- 5 Consider thalassaemia if MCH or MCV is low and not explained by iron deficiency, or if long standing. Check B12/folate if macrocytic or if there are risk factors for deficiency (e.g. decreased intake or absorption), or if anaemia is unexplained. Consider blood loss or haemolysis if reticulocyte count is increased. Seek haematology advice or, in presence of chronic kidney disease, nephrology advice

For more information on the diagnosis, investigation and management of iron deficiency anaemia refer to Pasricha SR, Flecknoe-Brown SC, Allen KJ et al. Diagnosis and management of iron deficiency anaemia: a clinical update. *Med J Aust*, 2010, 193(9):525–532.

Disclaimer

The information above, developed by consensus, can be used as a guide. Any algorithm should always take into account the patient's history and clinical assessment, and the nature of the proposed surgical procedure.

Appendix 6: Tools and resources

Australian Commission on Safety and Quality in Healthcare: National patient blood management collaborative

<http://www.safetyandquality.gov.au/national-priorities/pbm-collaborative/latest-news/>

Australian Red Cross Blood Service – Iron deficiency anaemia http://www.transfusion.com.au/transfusion_practice/anaemia_management/iron_deficiency_anaemia

BloodSafe eLearning Australia – Iron deficiency anaemia app <https://bloodsafelearning.org.au/resource-centre/other-resources/ida-app/>

British Society of Gastroenterology – Guidelines for the management of iron deficiency anaemia <http://www.bsg.org.uk/clinical-guidelines/small-bowel-nutrition/guidelines-for-the-management-of-iron-deficiency-anaemia.html>

National Blood Authority – Iron product choice and dose calculation guide for adults <http://www.blood.gov.au/iron-product-choice-and-dose-calculation-guide-adults>

National Blood Authority – Preoperative anaemia identification, assessment and management case study <http://www.blood.gov.au/preoperative-anaemia-identification-assessment-and-management-case-study>

NPS MedicineWise – Fit for surgery: managing iron deficiency anaemia <http://www.nps.org.au/topics/surgery>

SA Health BloodSafe – the following resources are available: <http://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/clinical+topics/blood+management/anaemia+management>

- IV iron preparations chart and oral iron dosing chart for clinicians including colour illustrations and preparation table of oral and IV iron preparations available in Australia.
- Prescribing checklist for IV iron – guidance on the indications, contradictions and precautions for the use of IV iron.
- Treatment of iron deficiency anaemia in pregnancy – Guide to treatment of iron deficiency anaemia in pregnancy from the Women’s Hospital, Melbourne
- Iron therapy – ‘Boosting your blood with iron’ fact sheet in 10 languages, ‘Are you getting enough iron and intravenous (IV) iron infusions fact sheet in 10 languages.
- Iron disorders patient information resources list – resources for consumers related to both haemochromatosis and iron deficiency.

Victorian State Government – Better health channel: Iron deficiency – adults <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/iron-deficiency-adults>

Victorian State Government – Better health channel: Iron <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/iron>

Western Australian Department of Health – About patient blood management http://healthywa.wa.gov.au/Articles/N_R/Patient-blood-management

Appendix 7: National PBM collaborative

AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE

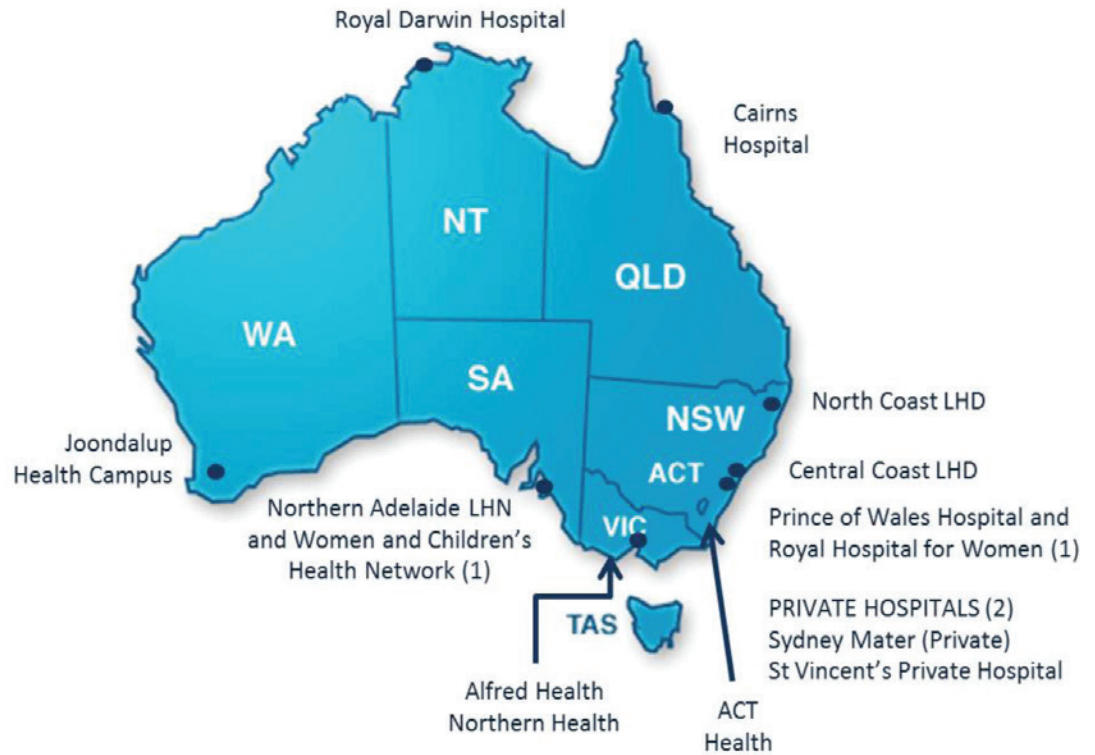


National Patient
Blood Management
Collaborative

While blood and blood products can be lifesaving, their administration may also be hazardous for patients. Patients undergoing major elective surgery are at increased risk of needing a transfusion. Blood transfusions can be avoided in many patients through better patient blood management (PBM). PBM involves optimising blood volume and red cell mass, minimising blood loss and optimising the patient's tolerance of anaemia. The National Blood Authority's PBM Guidelines, and the Australian Commission on Safety and Quality in Health Care (the Commission) National Safety and Quality Health Service Standard 7: Blood and Blood Products assist clinicians to improve PBM. For elective surgical patients pre-operative anaemia management reduces the likelihood a transfusion will be required.

The Australian Commission of Safety and Quality in Health Care is leading a National Patient Blood Management Collaborative to support improvements in the management of anaemia for patients having selected elective gastrointestinal, gynaecological and orthopaedic surgery procedures. Following a national expression of interest, the Collaborative commenced in April 2015 with 12 participating Health Services from across Australia. The Collaborative will encompass the scope of the patient journey, from the time that the need for surgery is identified, through inpatient care, and then subsequent care back in the community.

The Collaborative sites are:



Activity to date

- Collaborative health service teams provide data on a monthly basis via the qiConnect web portal which was developed for the Collaborative. The measures include:
 - Which procedure was performed from an agreed range of diagnostic related groups
 - Indication of whether the patient received a pre-operative assessment for anaemia or iron deficiency
 - Where the assessment occurred, i.e. in hospital, specialist rooms, primary care setting
 - Was the anaemia or iron deficiency confirmed?
 - Where was it managed?
 - Was there evidence of improvement?
 - Units of red blood cells transfused (pre-, intra- and post- operatively).

Intended outcomes

By improving anaemia management for patients in the pre-operative phase of care, the Collaborative may help to:

- reduce the risk of post-operative infections and adverse reactions from blood products
- reduce the risk of transfusion related inflammatory events
- reduce hospital length of stay
- reduce the risk of readmission from infectious complications of transfusion, and
- reduce elective surgery cancellations.

As the Collaborative collects data on pre-operative anaemia management and depleted iron stores, if it was managed, how it was treated and whether there were improved outcomes, an engaged interface with general practice is vital. These partnerships are encouraged to improve the integration of the acute setting and primary health and will improve patient care.

The Collaborative will run to April 2017 and resources developed by Collaborative teams will be shared more broadly in 2016, in consultation with the National Blood Authority, as part of the Collaborative process.

More information can be found at <http://www.safetyandquality.gov.au/national-priorities/pbm-collaborative/latest-news/>

