

Management of anaemia in the pre-operative period

Draft Guidelines and protocols

Scope

This paper has been produced by the pre-operative assessment subgroup, of the Oxford Regional Transfusion Committee. It has been developed to aid pre-operative assessment teams investigate and treat iron deficiency anaemia (IDA), with the intension of avoiding unnecessary transfusion in this group of patients.

It is widely accepted that there is a correlation between higher pre-operative haemoglobins and a reduced need for peri-operative transfusion. It has also been suggested that allogenic peri-operative transfusion may alter the incidence of disease recurrence or otherwise induce a poorer prognosis in patients undergoing surgery.

Recommendation 1: Screening

A FBC should be performed on all patients undergoing major surgery where blood loss is expected: NICE has produced in June 2003: Pre-operative tests. The use of routine pre-operative tests for elective surgery (National Collaboration centre for Acute care). These include consideration of when a full blood count is necessary.

These tests should be carried out as soon as possible to allow maximum amount of time for treatment, if required.

In the Oxford region audit, results showed that in many cases patients undergoing general surgery were on the waiting list for 8 weeks or more but were only pre-assessed 9 days before surgery.

To facilitate early diagnosis tests should be carried out at the stage when the decision to operate is made:

Appendix 1: model of best practice

Recommendation 2: Investigation

Red cell indices:

These are performed as part of a routine FBC and the following are highly suggestive of iron deficiency anaemia:

- Microcytic RBC (MCV <76)
- Hypochromic RBC (MCH < 27)

These indices, especially in conjunction with a raised RBC are also indicative of haemoglobinopathies, and this should be ruled out especially in patients of ethnic origin. A raised RDW will often indicate co-existent B12 or folate deficiency.

Morphology of red cells is microcytic and hypochromic, often with pencil cells.

Serum ferritin:

This is the best diagnostic test for iron deficiency

A serum ferritin of less than 12-15 ug/dl indicates iron deficiency.

However these measurements may be unreliable in patients with concurrent acute or chronic inflammatory conditions. In these cases a ferritin < 50ug/dl with an elevated CRP is still indicative of IDA.

(Taken from Guidelines for the management of iron deficiency anaemia BSG Guidelines in Gastroenterology May 2005).

Serum iron, total iron binding capacity and transferrin saturation (iron and iron binding capacity).

These should only be performed when ferritin levels are either normal or high and IDA is strongly suspected. See table below for differential diagnosis of anaemia.

Diagnosis	Ferritin	Serum iron	MCH/MCV	TIBC/Tf	sTfR	CRP
IDA	Low	Low	Low	Raised	Raised	Normal
ACD	Normal or raised	Low	Normal /low	Low	Normal	Raised
IDA + Inflammation	Normal or raised (<100ug/dl)	Low	Low	Low	Raised	Raised
β Thalassaemia	Normal	Normal	Low	Normal	Normal	Normal

Total iron binding capacity (TIBC), Transferrin (Tf), serum transferrin receptor assay (sTfR)

Often the best way to confirm true IDA is by trial of oral iron for three weeks, or parenteral iron if poor compliance. A measurable change in MCH should occur within 7 days when there is true IDA.

Recommendation 3: The cause of iron deficiency must be determined

The cause of IDA may already be known, if not the reason for IDA must be investigated in order to identify any other serious underlying causes such as colon cancer.

Recommendation 4: Treatment

It is important that as well as correcting the anaemia, iron stores are replenished. This is particularly important for patients undergoing surgery where blood loss is expected.

IDA can be treated in two ways:

1. Oral iron therapy: this is the preferred treatment and should always be the first choice.
2. Parenteral (IV iron).

This should only be used when:

- Oral iron is not tolerated
- Oral iron cannot be absorbed
- Patient has continued blood loss

See appendix 2 and 3 for the management guidelines

See appendix 4 for treatment regimes and calculation of iron deficit

See appendix 5 for standard patient information letter

Appendix 2-Treatment
Oral iron

Therapeutic response the haemoglobin should rise by about 1-2 g/l per day. When the haemoglobin is normal, treatment should continue for a further 3 months to replenish stores

Recommended dose:

100-200mg of elemental iron daily

200-300 mg of elemental iron daily for patients on erythropoietin or with chronic renal failure (BNF 48, September 2004)

Preparation	Tablet (mg)	Elemental iron	Therapeutic Dose
Ferrous sulphate dried	200	65	1 tab 3 times daily
Ferrous sulphate	300	60	1 tablet 3 times daily
Ferrous gluconate	300	35	4-6 tabs per day divided into doses and taken before food
Ferrous fumerate:	200	65	
Fersamal-tab	210	68	1-2 tabs three times daily
Fersamal syrup	140	45	10-20 ml twice
Galfer-capsule	305	100	1 capsule 1 to 2 times daily before food
Galfer- syrup	140	45/ml	10ml 1-2 times daily
Fersaday	322	100	1 tab twice a day

Parenteral Iron

Preparation	Method	Dose	Administration	Instructions for dilution	Compatibility	Comments
Iron dextran (Cosmofer)	Infusion via an infusion pump. Preferred method.	Total dose required should be calculated according to the patient's iron deficit-see table below. Recommended dose 100-200mg iron up to three times per week. OR Total dose infusion up to a total replacement dose corresponding to 20mg iron/kg body weight.	Test dose 25mg over 15 minutes Treatment dose should be given at a rate of not more than 100ml per 30 minutes Before administering the first dose to a new patient, a test dose of cosmofer corresponding to 25mg iron or equal to ½ ml solution is recommended, if no adverse reactions are seen after 60 minutes the remaining dose may be given For subsequent total dose infusions, the first 25 mg of iron should be infused over a period of 15 min if no adverse reactions occur the remaining dose should be transfused over 4-6 hours. The rate of infusion can be increased progressively from 45-60 drops per min	Dilute 100-200mg to 100ml with sodium chloride 0.9% or glucose 5% to produce a concentration of 1-2 mg in 1ml	Do not infuse with any other medicines	Discard ampoules if any sedimentation is present. Infusion expiry: 24 hours Observe patient carefully for any signs of anaphylaxis, especially hypotension have resuscitation equipment available. The higher the doses the greater the risk of side effects. Flush sodium chloride 0.9% Contraindications: Non-iron deficiency anaemia First trimester of pregnancy HO Asthma, Eczema, other atopic allergy Drug hypersensitivity Decompensated liver cirrhosis and hepatitis Acute or chronic infection Rheumatoid arthritis Signs and symptoms of active inflammation
	IV bolus	100-200mg by slow IV injection at <0.2ml/min	Test dose 25 mg over 2 minutes Wait 15 minutes, then administer remaining dose	Dilute 100-200 mg in 10-20ml sodium chloride 0.9% or glucose 5% to produce a solution containing 10-20mg in 1ml		
	IM injection	Series of undiluted injections of 100 mg iron determined from the patients total iron deficit-See table	Recommended to use Z-track technique	Undiluted		
Iron sucrose (Venofer)	Infusion via an infusion pump. Preferred method	Recommended dose should be calculated using the iron deficit table below. The recommended dose is 100-200 mg administered not more than three times per week.	Test dose 25mg over 15 mins, then if no adverse reactions occur infuse remaining dose at a maximum of 50ml in 15 mins	Dilute 100mg in 100ml sodium chloride 0.9%	Do not infuse with any other medicines	Discard ampoules if any sedimentation is present. Infusion expiry 3 hours. Observe patient carefully for any signs of anaphylaxis, especially hypotension have resuscitation equipment available. Give IV hydrocortisone and chlorphenamine before iron for patients with a history of asthma, severe atopy or known medicine allergy. Flush sodium chloride 0.9%
	IV bolus	No more than 200mg iron should be administered per injection. This can be administered no more than three times per week	Test dose 1ml (20mg iron), over 1-2 minutes, wait 15 minutes and if no reactions give remaining dose at 1ml/min. After injection raise and elevate arm and apply pressure for at least 5 min to reduce the chance extravasation			Contraindications: Never be given by IM route Children First trimester of pregnancy

Iron deficit chart

Before administering IV iron the total iron deficit should be calculated using the table below or by the following calculation:

$$\text{Total iron deficit (mg)} = \text{body weight (Kg)} \times \text{target Hb g/dl} - \text{actual Hb g/dl} \times 2.4 + \text{depot iron (mg)}$$

Hb/Kilo	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
6	1076	1148	1220	1292	1364	1436	1508	1580	1652	1724	1796	1868	1940	2012	2080
6.5	1028	1094	1160	1226	1292	1358	1424	1490	1556	1622	1688	1754	1820	1886	1952
7	980	1040	1100	1160	1220	1280	1340	1400	1460	1520	1580	1640	1700	1760	1820
7.5	932	986	1040	1094	1175	1202	1256	1310	1364	1418	1472	1526	1580	1634	1688
8	884	932	980	1028	1076	1124	1172	1220	1268	1316	1364	1412	1460	1508	1556
8.5	836	878	920	962	1004	1046	1088	1130	1172	1214	1256	1298	1340	1382	1424
9	788	824	860	896	932	968	1004	1040	1076	1112	1148	1184	1220	1256	1292
9.5	740	770	800	830	860	890	920	950	980	1010	1040	1070	1100	1130	1130
10	692	716	740	764	788	812	836	860	884	908	932	956	980	1004	1028
10.5	644	662	680	698	716	734	752	770	788	806	824	842	860	878	896
11	596	608	620	632	644	656	668	680	692	704	716	728	740	752	764
11.5	548	555	560	566	572	578	584	590	596	602	608	614	620	626	632

Appendix 3: Guidelines for the management of surgical patients presenting at pre-assessment with anaemia

Purpose

1. To identify patients' anaemia prior to surgery with adequate time for treatment.
2. To reduce the number of patients who are significantly anaemic at surgery
3. To reduce the need for transfusion both pre- and peri-operatively

Approach

1. Identify all patients whose Hb are reduced.
2. Advise, arrange or institute treatment in identified patients
3. Identify higher risk patients:
 - With significant co-morbidities
 - With very low Haemoglobin levels
 - Whose surgery may result in significant blood loss

Definitions

1. Anaemia- haemoglobin below 12g/dl in males and 11g/dl in females
2. Severity of anaemia
 - Mild- Hb 10-12g/dl
 - Moderate- 8-10g/dl
 - Severe below 8g/dl
3. Red blood cell size
 - Normocytic –MCV 76-96
 - Microcytic MCV <76
 - Macrocytic MCV>96

Note: When deciding which category of anaemia applies in an individual patient, consider also red cell count, mean cell haemoglobin, and mean cell haemoglobin concentration.

Diagnosis

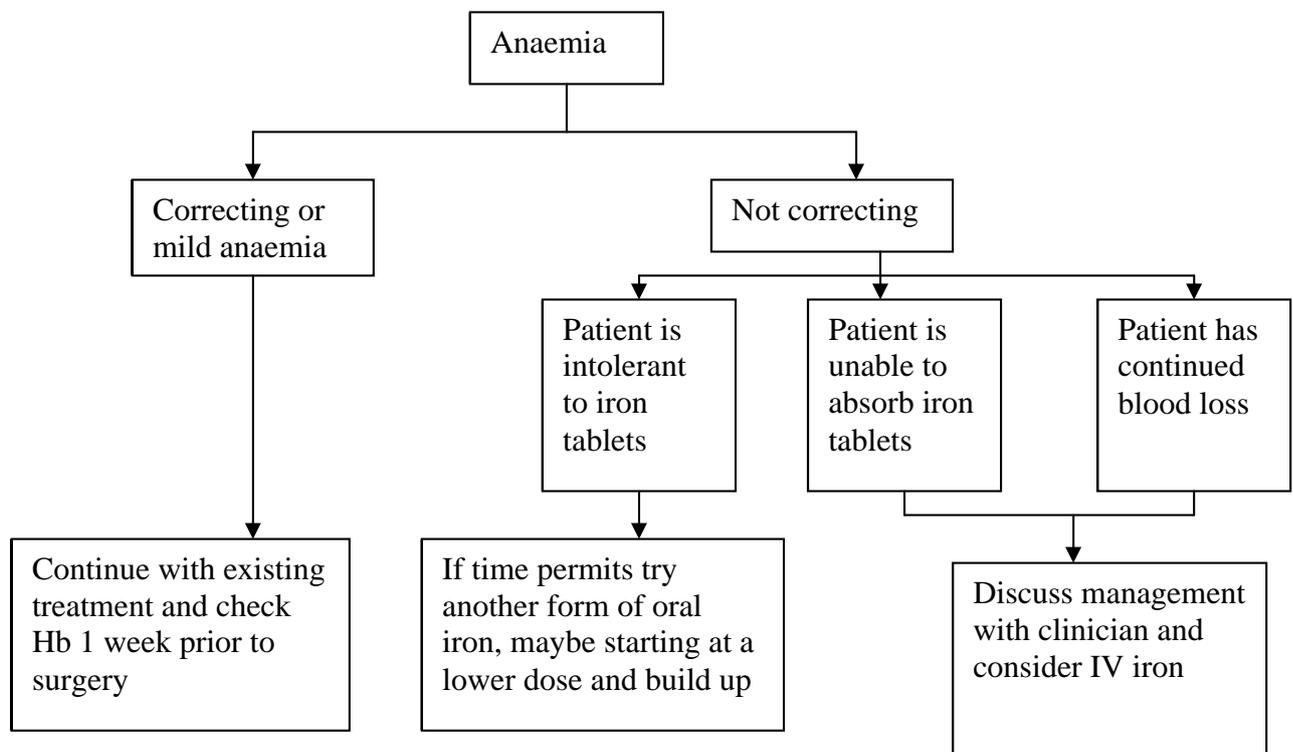
1. Check previous Hb and further investigations
2. Classify anaemia as above
3. For all anaemic patients check urea, creatinine, liver function tests, CRP, ESR and TSH.
4. For microcytic patients check serum iron, ferritin and transferrin levels
5. For normocytic patients as above but with the addition of serum folate and Vit B12

Note: Serum ferritin is an acute phase protein and may be raised if CRP is elevated.

Management

Patient with existing anaemia:

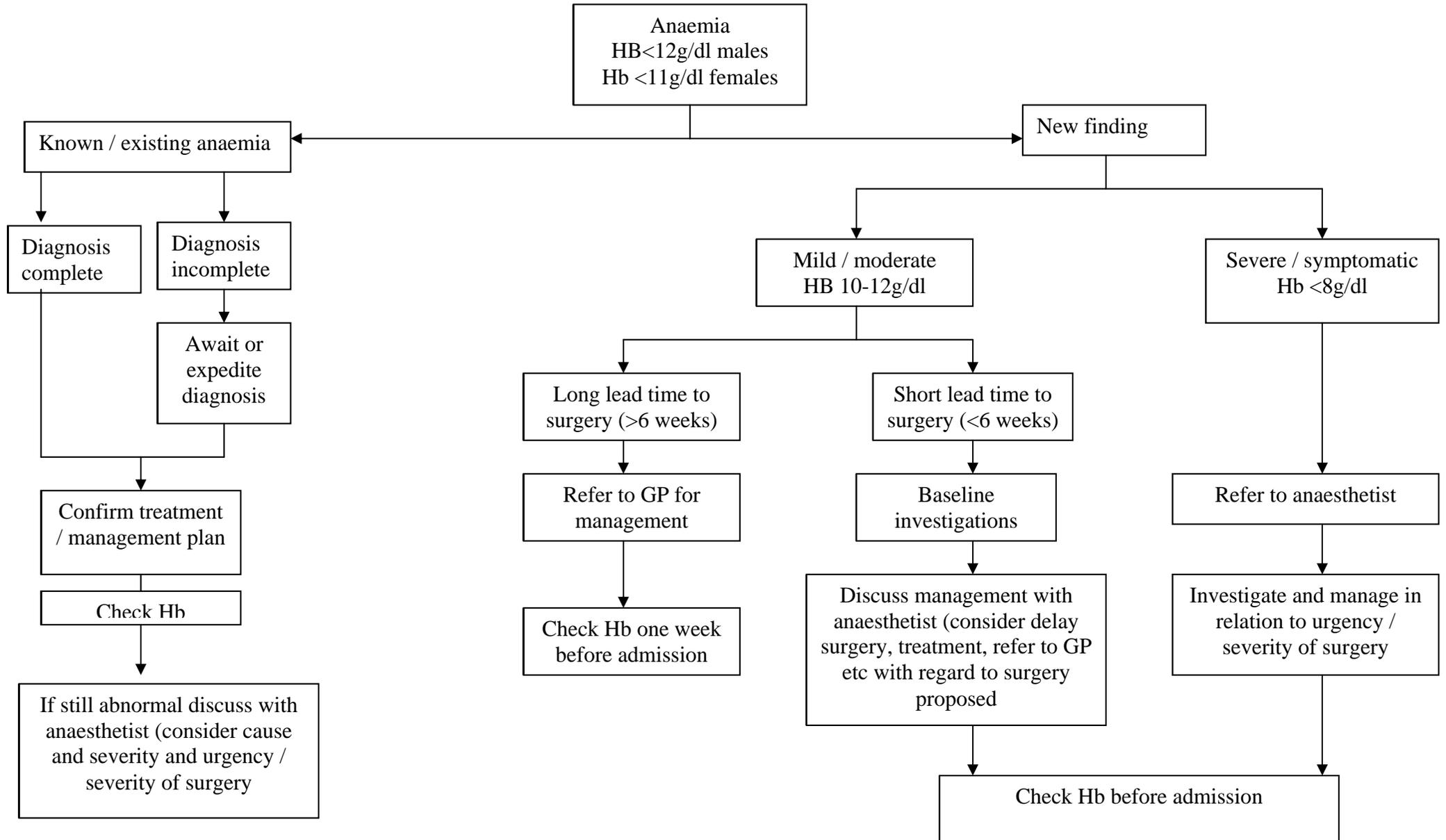
1. Check whether diagnosis of anaemia has been made and review results.
2. Check all baseline investigations have been arranged, if not arrange.
3. Check current treatment and duration, if any.
4. Evaluate response to treatment
5. Obtain actual or estimated time of surgery, and severity of proposed procedure.
6. Plan further management considering above information.



Patient recently found to be anaemic

1. Review available results
2. Classify anaemia i.e. normocytic
3. Ensure appropriate baseline investigations have been ordered and completed, if not arrange
4. Obtain actual or estimated time of surgery
5. If anaemia is mild/moderate and time allows refer to GP for treatment
6. If anaemia is moderate/ severe or symptomatic, obtain clinicians opinion on management
7. If peri-operative blood loss is associated with procedure, expedite diagnosis and management plan even if only mild anaemia

Appendix 4: **Management of patients found to be anaemic pre-operatively**



Dear patient

Information for patients who are advised to take an oral iron supplement pre-operatively

One of the routine blood tests taken when you came to the outpatients clinic has showed that you are mildly anaemic. This is not a serious problem but correction of anaemia prior to surgery will reduce your need for transfusion either during or after your surgery, and will make you feel better and help speed up your recovery.

Your treatment for anaemia is to take iron (ferrous sulphate) tablets three times a day for up to four weeks.

After four weeks your response to the tablets will be assessed by a further blood test.

The form for this is supplied along with this letter and can be taken to your local GP or hospital phlebotomy area.

Things you need to do are:

1. Obtain a supply of ferrous sulphate 200mg tablets. A prescription is enclosed for you to take to your chemist.
2. One tablet should be taken three times a day preferably with or after each meal.
If you take antacid tablets, do not take them at the same time as the iron tablets.
3. After completion of the tablets (four weeks) please take the blood request form to either your GP or local hospital phlebotomy service and have the repeat blood samples taken (form enclosed)
4. If you experience any problems or need any additional help or advice please contact:

Please note: Iron tablets sometimes have side effects, which make it difficult to continue with the treatment. These are: sickness, some discomfort in the upper part of your stomach, diarrhoea or constipation. These are common and not serious but if it makes it difficult to continue with the course of tablets please contact either your GP or hospital on the above number; they may be able to suggest another type of treatment.