Management of anaemia in the pre-operative period

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 intention 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 indicies:
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.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Ferritin</th>
<th>Serum iron</th>
<th>MCH/MCV</th>
<th>TIBC/Tf</th>
<th>sTfR</th>
<th>CRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDA</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Raised</td>
<td>Raised</td>
<td>Normal</td>
</tr>
<tr>
<td>ACD</td>
<td>Normal or raised</td>
<td>Low</td>
<td>Normal /low</td>
<td>Low</td>
<td>Normal</td>
<td>Raised</td>
</tr>
<tr>
<td>IDA + Inflammation</td>
<td>Normal or raised (&lt;100ug/dl)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Raised</td>
<td>Raised</td>
</tr>
<tr>
<td>Thalassaemia</td>
<td>Normal</td>
<td>Normal</td>
<td>Low</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Total iron binding capacity (TIBC), Transferrin (Tf), serum transferring 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 if 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 1: Pre operative assessment for non urgent surgery cases
Model for best transfusion practice

Decision to operate made at out patient appointment

Pre Op Assessment
1. Take FBC & sample for G&S in line with hospital MSBOS
2. Provide written information on transfusion and the alternatives

Do the results meet local criteria?

No

Refer patient to GP or appropriate consultant for investigations and treatment
Treat the cause of the anaemia

Yes

Inform/confirm operation date

Do the results meet local criteria?
Is surgery urgent?
Perform a risk/benefit analysis

Pre-assessment prior to operation date
Re-inforce information including transfusion leaflet given to patient
Take FBC & second G&S if required (this allows for electronic crossmatch)
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)

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Tablet (mg)</th>
<th>Elemental iron</th>
<th>Therapeutic Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous sulphate dried</td>
<td>200</td>
<td>65</td>
<td>1 tab 3 times daily</td>
</tr>
<tr>
<td>Ferrous sulphate</td>
<td>300</td>
<td>60</td>
<td>1 tablet 3 times daily</td>
</tr>
<tr>
<td>Ferrous gluconate</td>
<td>300</td>
<td>35</td>
<td>4-6 tabs per day divided into doses and taken before food</td>
</tr>
<tr>
<td>Ferrous fumarate:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fersamal-tab</td>
<td>210</td>
<td>68</td>
<td>1-2 tabs three times daily</td>
</tr>
<tr>
<td>Fersamal syrup</td>
<td>140</td>
<td>45</td>
<td>10-20 ml twice</td>
</tr>
<tr>
<td>Galfer-capsule</td>
<td>305</td>
<td>100</td>
<td>1 capsule 1 to2 times daily before food</td>
</tr>
<tr>
<td>Galfer- syrup</td>
<td>140</td>
<td>45/ml</td>
<td>10ml 1-2 times daily</td>
</tr>
<tr>
<td>Fersaday</td>
<td>322</td>
<td>100</td>
<td>1 tab twice a day</td>
</tr>
</tbody>
</table>
## Parenteral Iron

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Method</th>
<th>Dose</th>
<th>Administration</th>
<th>Instructions for dilution</th>
<th>Compatibility</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron dextran (Cosmofer)</td>
<td>Infusion via an infusion pump. Preferred method.</td>
<td>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.</td>
<td>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.</td>
<td>Dilute 100-200mg to 100ml with sodium chloride 0.9% or glucose 5% to produce a concentration of 1-2 mg in 1ml</td>
<td>Do not infuse with any other medicines</td>
<td>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. Asthma, Eczema, other atopic allergy. Drug hypersensitivity. Decompensated liver cirrhosis and hepatitis. Acute or chronic infection. Rheumatoid arthritis. Signs and symptoms of active inflammation.</td>
</tr>
<tr>
<td>IV bolus</td>
<td>100-200mg by slow IV injection at &lt;0.2ml/min</td>
<td>Test dose 25 mg over 2 minutes. Wait 15 minutes, then administer remaining dose.</td>
<td>Dilute 100-200 mg in 10-20ml sodium chloride 0.9% or glucose 5% to produce a solution containing 10-20mg in 1ml</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IM injection</td>
<td>Series of undiluted injections of 100 mg iron determined from the patients total iron deficit - See table. Recommended to use Z-track technique.</td>
<td>Undiluted</td>
<td></td>
<td></td>
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<tr>
<td>Iron sucrose (Venofer)</td>
<td>Infusion via an infusion pump. Preferred method.</td>
<td>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.</td>
<td>Test dose 25mg over 15 mins, then if no adverse reactions occur infuse remaining dose at a maximum of 50ml in 15 mins.</td>
<td>Dilute 100mg in 100ml sodium chloride 0.9%</td>
<td>Do not infuse with any other medicines</td>
<td>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%. Contraindications: Never be given by IM route. Children. First trimester of pregnancy.</td>
</tr>
<tr>
<td>IV bolus</td>
<td>No more than 200mg iron should be administered per injection. This can be administered no more than three times per week.</td>
<td>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</td>
<td></td>
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</table>
Iron deficit chart
Before administering IV iron the total iron deficit should be calculated using the table below or by the following calculation:
Total iron deficit (mg) = body weight (Kg) x target Hb g/dl - actual Hb g/dl x 2.4 + depot iron (mg)

<table>
<thead>
<tr>
<th>Hb/Kilo</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
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<tr>
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<td>560</td>
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<td>608</td>
<td>614</td>
<td>620</td>
<td>626</td>
<td>632</td>
</tr>
</tbody>
</table>
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 rests, 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.
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

- **Anaemia**
  - HB < 12g/dl males
  - HB < 11g/dl females

- **Known / existing anaemia**
  - **Diagnosis complete**
    - Await or expedite diagnosis
    - Confirm treatment / management plan
    - Check Hb
    - If still abnormal discuss with anaesthetist (consider cause and severity and urgency / severity of surgery)
  - **Diagnosis incomplete**
    - Await or expedite diagnosis

- **New finding**
  - **Severe / symptomatic**
    - Hb < 8g/dl
    - Refer to anaesthetist
    - Investigate and manage in relation to urgency / severity of surgery
    - Check Hb before admission
  - **Mild / moderate**
    - HB 10-12g/dl
    - Baseline investigations
    - Discuss management with anaesthetist (consider delay surgery, treatment, refer to GP etc with regard to surgery proposed)
    - Check Hb before admission
  - **Long lead time to surgery (>6 weeks)**
    - Refer to GP for management
    - Check Hb one week before admission
  - **Short lead time to surgery (<6 weeks)**
    - Confirm treatment / management plan

- **Diagnosis complete**
- **Diagnosis incomplete**
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.