Document No: 1401933

TITLE: Maternal Iron Optimisation

Contents

1. Purpose

To provide a standardised approach and guidance in the prevention, diagnosis, management and treatment of iron deficiency and iron deficiency anaemia in pregnant and postpartum women/people.

2. Scope

This guideline applies to all registered Midwives, Nurses, Senior House Officers (SHOs), Obstetricians and Lead Maternity Carers (LMCs) working with pregnant and postpartum women/people within the Health NZ Te Whatu Ora Lakes area. Also to all women/people who are pregnant or postpartum receiving care in the Lakes area.

3. Glossary

CRP	C-Reactive Protein
DAU	Day Assessment Unit
Hb	Haemoglobin
IDA	Iron Deficiency Anaemia
IV	Intravenous
LDHB	Lakes District Health Board
LMC	Lead Maternity Carer

4. Definitions

Anaemia

Defined in this guideline as;

- Hb < 110 g/L in the first trimester
- Hb < 105 g/L in the second and third trimester and
- Hb < 100 g/L in the postpartum period

which is consistent with other international guidelines.

A low haemoglobin defines anaemia, but does not identify the cause(s), which require further investigation.

If Hb < 90 g/L at any gestation: refer to obstetric secondary care as per Health NZ Te Whatu Ora Referral Guidelines.

If Hb < 70g/L at any gestation: *urgent* referral to obstetric secondary care is indicated.

Iron Deficiency

Defined in this guideline as;

- serum ferritin < 30 mcg/L
- serum ferritin < 15 mcg/L indicates absent iron stores, where iron is not available for production of red blood cells.

Serum ferritin is recognised as the best and most clinically useful measure of iron deficiency. However, it increases in the presence of inflammation (CRP > 5 mg/L) so for diagnosis of iron deficiency in the presence of inflammation a higher ferritin cut off of < 50 mcg/L, when CRP > 5 mg/L has been used in this guideline.

(N.B.: Laboratory reports may highlight low serum ferritin as ≤ 20 mcg/L)

5. Background

Iron is an essential mineral used by the human body to carry oxygen, ensure a healthy immune system and for energy. Iron is found mainly in the haemoglobin of red blood cells which are responsible for transportation of oxygen around the body, and in muscle cells – to accept, store and release oxygen. It is also stored in the liver, bone marrow and spleen, as Ferritin, which supports red cell production. In a normal balanced state, the body absorbs a regular supply of iron via the gut to precisely balance the daily iron loss.

If daily intake of iron is inadequate, the body draws on stores to maintain homeostasis. As iron stores fall, iron deficiency develops in several sequential stages with iron depletion coupled with anaemia being a late manifestation of a negative iron balance.

Possible outcomes of undetected and untreated iron deficiency and/or anaemia are: preterm labour, low birthweight baby, neonatal anaemia, developmental delays, postpartum depression, need for blood transfusion or iron infusion and increased length of hospital stay. It also impacts on wound healing, level of fatigue, cognition and activity tolerance.

This guideline has been developed following recognition of an increase in referrals for intravenous iron for pregnant or postpartum women/people in Lakes. A review of local data to look at the prevalence of iron deficiency and iron deficiency anaemia using data from 2020/21 showed that 68% of women/people who had Ferritin levels tested in the second trimester were iron deficient.

6. Assessment

1. Risk Factors for Iron Deficiency and/or Anaemia:

- Haemoglobinopathy (e.g. family history of anaemia, thalassaemia or abnormal haemoglobin variant
- Low socioeconomic status
- Inter-pregnancy interval <1 year
- Recent history of bleeding
- Meat-free or poor diet
- Obesity
- History of bariatric surgery
- Parity ≥ 3
- High risk of obstetric bleeding e.g. placenta praevia
- Teenage pregnancy
- Previous anaemia
- Gastrointestinal disorders e.g. crohns', coeliac

2. Possible Symptoms:

- Pale skin, lips, and nails
- Dizziness
- Shortness of breath
- Trouble concentrating
- Feeling tired or weak
- Headaches
- Rapid or irregular heartbeat
- Hair loss and brittle nails

3. Possible Causes:

The most common cause of anaemia is iron deficiency anaemia (IDA) which is usually secondary to a diet deficient in iron.

There are many other causes of **iron deficiency** including;

- increased requirements of pregnancy
- decreased intestinal absorption
- acute and chronic blood loss

Other causes of **anaemia** are;

- physiological haemodilution of pregnancy
- vitamin B12 and folic acid deficiency
- thalassaemia
- haemolytic states (pre-eclampsia, HELLP syndrome, sickle cell disease, malaria)
- infections (soil borne parasites, i.e. hookworm)
- anaemia of chronic disease or inflammatory states including obesity

7. Diagnosis and Management

1. Tests:

- Routine testing of Hb alone is an insensitive measure of iron status - while it detects anaemia it misses detection of iron deficiency.
- **Routine antenatal serum ferritin screening** in the first and second trimester of pregnancy is recommended in this guideline to test for iron deficiency.
- Ferritin may be tested in the third trimester if there was iron deficiency +/- anaemia in earlier trimesters.

As there may be serious underlying pathology, it is important to ensure the cause of iron deficiency or anaemia is established before or at the time of commencing treatment.

- **Haemoglobinopathy screening:** (for thalassaemia or sickle cell disease) should be undertaken in women/people who are from high risk populations (Mediterranean countries, Southern Europe, the Middle East, India, South East Asia, Africa and the Pacific Islands) who have unexplained anaemia

- **Further investigations:** If iron deficiency or IDA persists, or remains unexplained, despite iron supplementation (and/or exclusion of haemoglobinopathy) then other investigations for underlying cause should be considered (i.e. malabsorption from Inflammatory Bowel Disease (IBD), coeliac disease, GI tract blood loss, or other systemic disease).

2. Treatment:

- Routine iron supplementation is not recommended for all women/people in pregnancy. An individual approach is preferable, based on identification of women/people at increased risk, assessment of women/people and the results of blood screening tests.
- Iron deficiency occurring in pregnancy can usually be treated with dietary advice and oral iron supplementation therapy as first line management.
- Iron deficiency without anaemia progresses to IDA if it is untreated.
- Early management of iron deficiency reduces the risk of anaemia at birth.

Oral Iron;

See the Maternal Iron Optimisation Pathways (pages 6 -10) for treatment parameters and oral iron doses.

The patient information leaflet: *Oral Iron: Information for Pregnant Women/People 2499906,* includes advice for maximising absorption of oral iron.

- Elemental iron refers to the amount of actual iron in formulations.
- If daily doses of oral iron are not tolerated (usually due to side effects of nausea or constipation), consider alternate daily dosing of oral iron.
- Non-responsiveness to oral iron is defined as: persistent anaemia after 6-8 weeks of oral iron (< 10 g/L rise in Hb and ferritin remains low).
- Oral iron may be ineffective if inflammation levels are high (CRP).
- A trial of oral iron is warranted in cases with inflammatory bowel disease (IBD).
- Oral iron should not be given if Hb ≥ 130 g/L (even if iron deficient) due to possible association with increased blood pressure, low birth weight and small for gestational age infants.
- Monitor iron levels to ensure there is no iron overload, which is accompanied by high ferritin levels.

Intravenous iron infusion may be indicated in iron deficiency anaemia which is unresponsive or intolerant to oral iron supplements, or when a woman/person is unable to ingest an adequate iron dose or there is anaemia with impaired iron utilisation. See page 14 for more information on intravenous iron infusion and blood transfusion.

8. Maternal Iron Optimisation Pathway

First Trimester or Booking Visit

Maternal Iron Optimisation

FIRST TRIMESTER OR BOOKING VISIT

NOTE 1: If oral iron is not well tolerated e.g. causing nausea or constipation, consider alternate daily dosing or ↓ dose to 60 mg elemental iron or greater (e.g. Ferro-tab). Slow release enteric coated forms of iron should be avoided as not as well absorbed.

Each tablet equivalent to elemental iron 65.7 mg

Each tablet equivalent to elemental iron 100 mg

FIRST ANTENATAL VISIT ≤ 20 WEEKS

- Document the presence of any risk factors for anaemia (*see section in guideline)*
- Request **complete blood count (CBC)** and **ferritin** on all women as part of the booking bloods
- Encourage iron rich diet & discuss management of side effects
- Provide blood form for repeat blood tests at 26-28 weeks

Hb ≥ 110 g/L

Ferritin ≥ 30 mcg/L

Ferritin ≤ 29 mcg/L

Iron deficiency

Low dose oral iron supplements containing 60mg mg elemental iron daily Assess compliance, correct administration and enquire about side effects at every visit

Hb 90-109 g/L

Ferritin ≤ 29 mcg/L

Iron deficiency anaemia

Therapeutic dose oral iron supplements containing 100-200 mg elemental iron daily *(see Note 1 above)*

Assess compliance, correct administration and enquire about side effects at every visit

Ferritin ≥ 30 mcg/L

Other causes contributing to the anaemia (eg. folate deficiency or anaemia of chronic disease) need to be excluded

Request: B12, folate, CRP, renal function

Hb ≤ 89 g/L

Severe anaemia

Therapeutic dose oral iron supplements containing 100-200 mg elemental iron daily *(see Note 1 above)*

Request: B12, folate, CRP, renal function

Assess compliance, correct administration and enquire about side effects at every visit

REPEAT CBC AND FERRITIN AS PART OF THE ROUTINE 26-28 WEEK BLOOD TESTS

Refer to
Maternal Blood Optimisation: Second Trimester

REFERRAL TO OBSTETRIC SPECIALIST

Urgent: **Hb < 90 g/L**
Acute: **Hb < 70 g/L**

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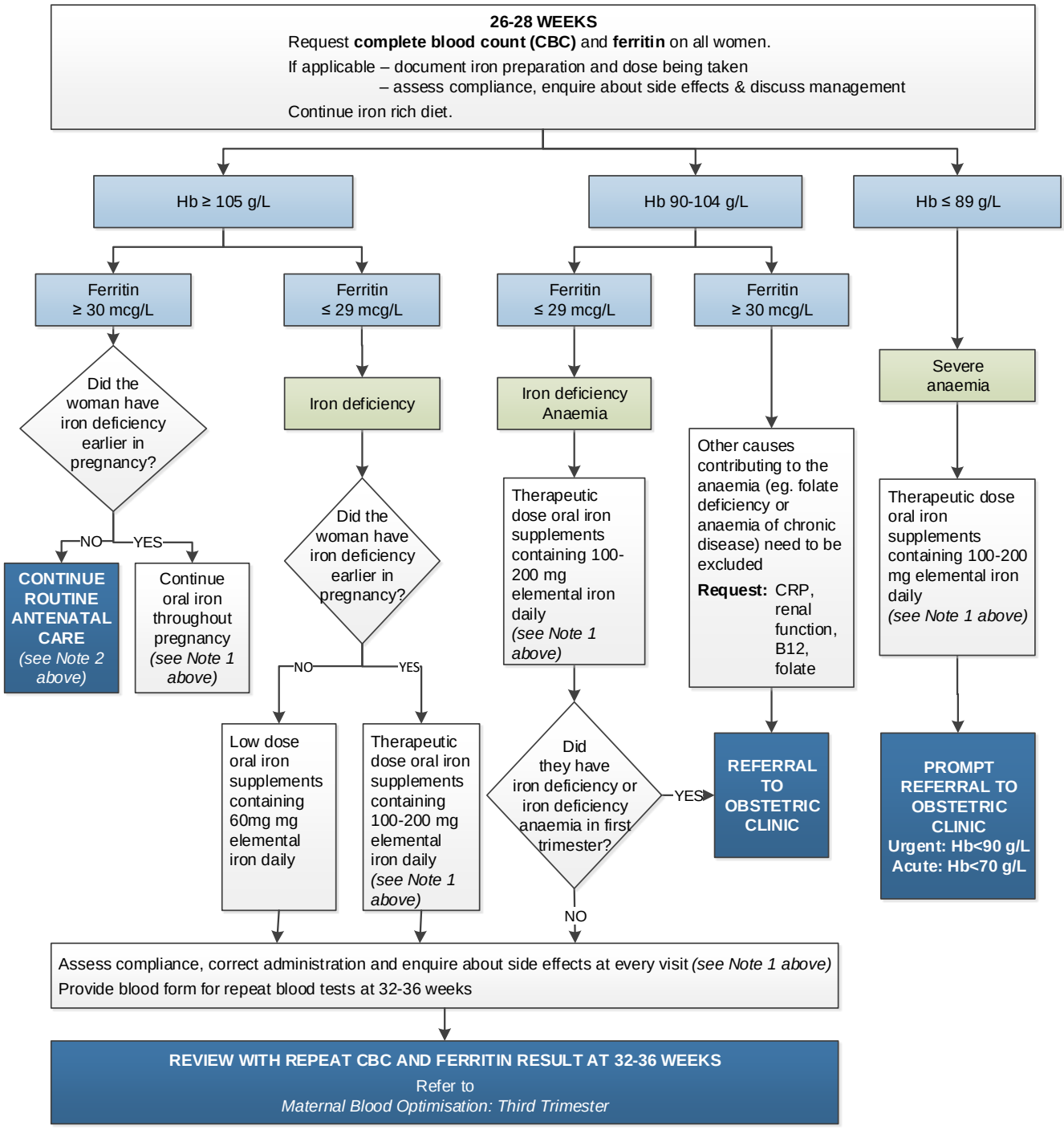
Second Trimester

Maternal Iron Optimisation

SECOND TRIMESTER

NOTE 1: If oral iron is not well tolerated e.g. causing nausea or constipation, consider alternate daily dosing or ↓ dose to 60 mg elemental iron or greater (e.g. Ferro-tab). Slow release enteric coated forms or iron should be avoided.

NOTE 2: Women who are not anaemic where estimation and optimisation of iron stores is necessary as significant blood loss may occur at delivery: Jehovah's Witness, recent history of bleeding, previous postpartum haemorrhage, placenta previa/accreta. Provide blood form for repeat blood tests at 32 – 36 weeks.



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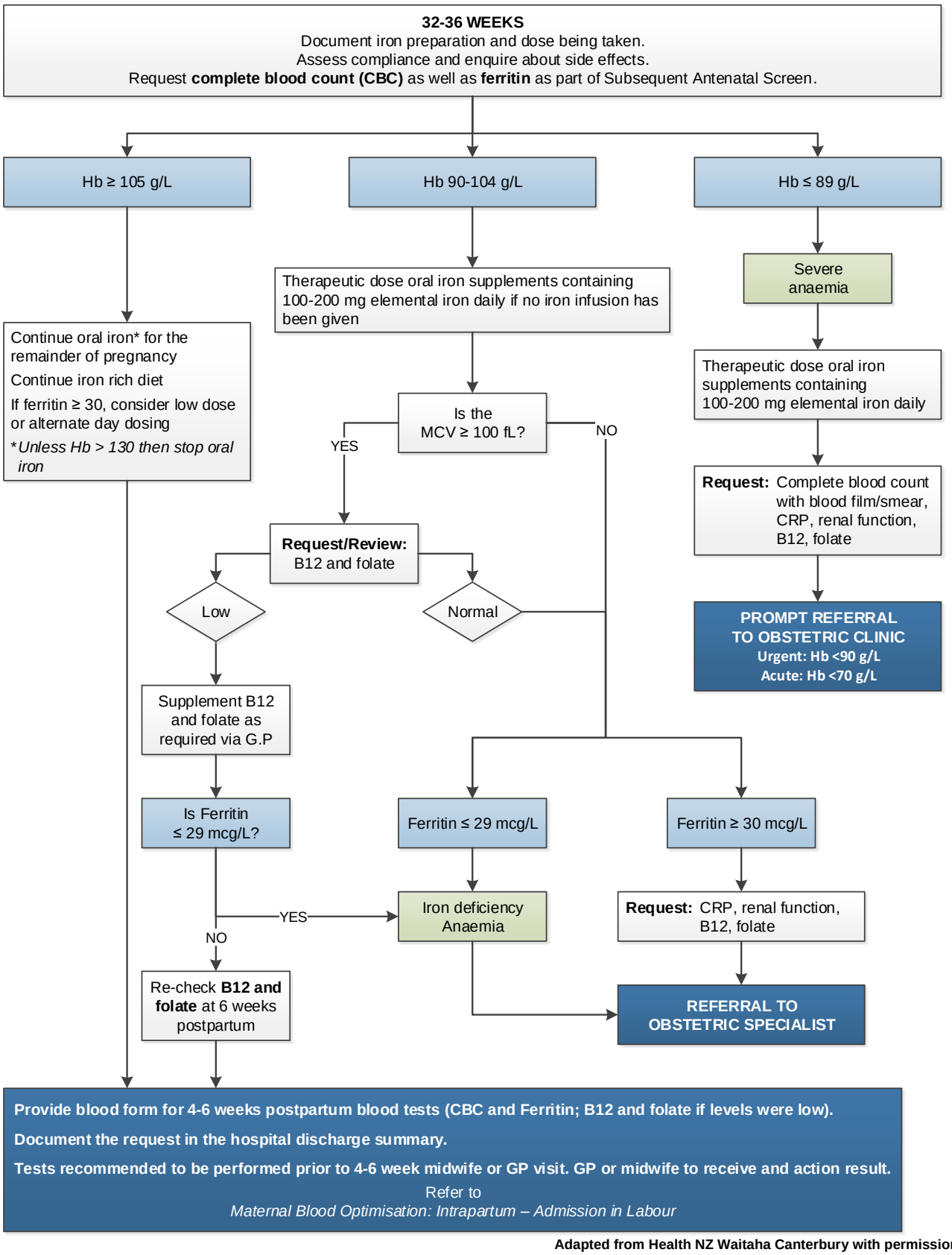
Third Trimester

Maternal Iron Optimisation

THIRD TRIMESTER



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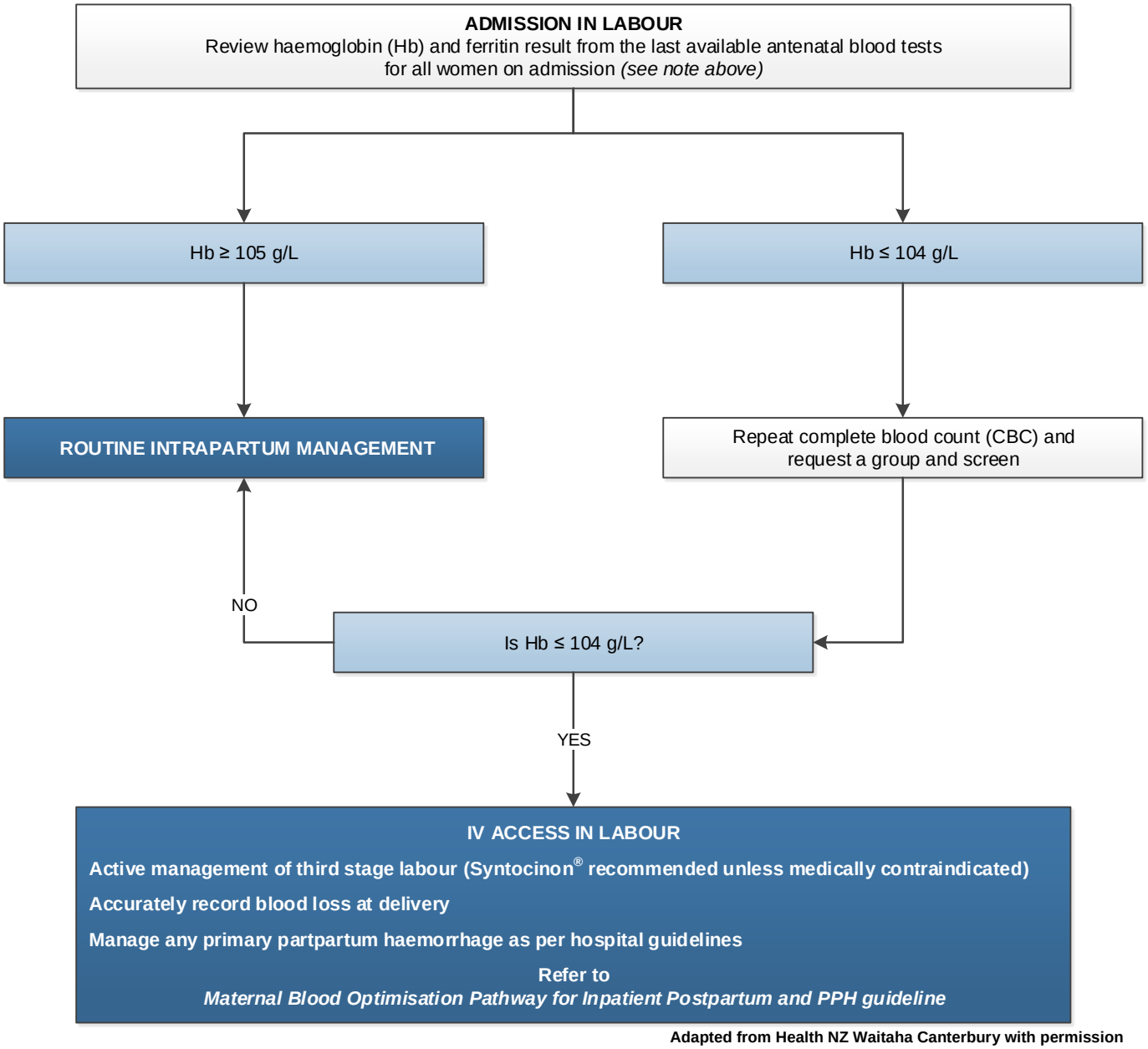
Maternal Iron Optimisation

INTRAPARTUM – ADMISSION IN LABOUR

Note: Women with anaemia may have a reduced tolerance to blood loss and will require active management at the time of birth



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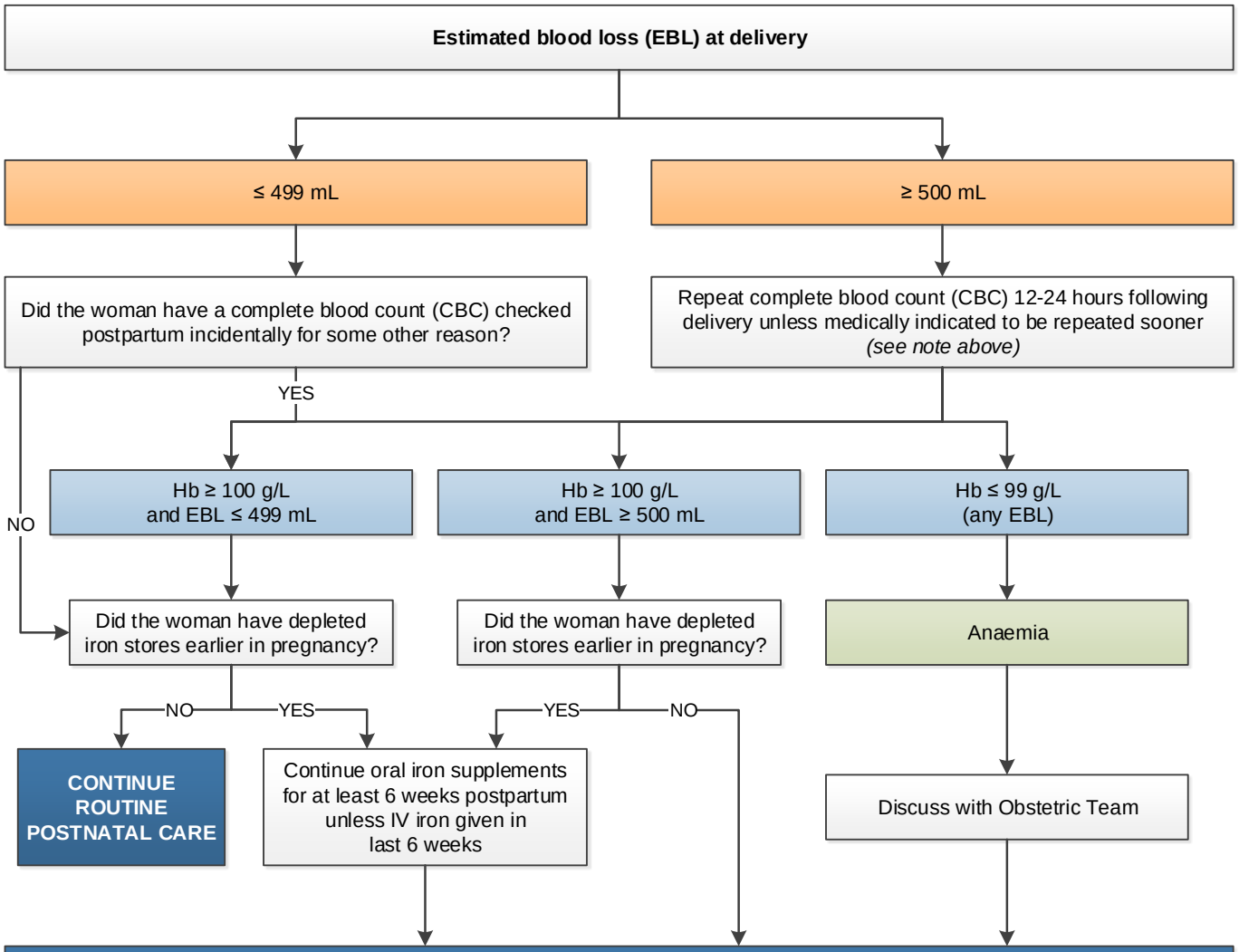
Maternal Iron Optimisation

INPATIENT POSTPARTUM

Note: Checking ferritin levels or iron studies are contraindicated in the immediate postpartum period as the results are not interpretable.



Ensure woman has blood form on discharge from hospital for 4-6 week postpartum blood tests (CBC and Ferritin; B12 and folate if levels were low in pregnancy).

Document the request for blood tests in the hospital discharge summary.

Tests recommended to be performed prior to the 4-6 week midwife or GP visit. Person requesting the test needs to receive and action results, requesting further blood tests or investigations as appropriate.

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9. Referral to Obstetric Clinic / Specialist

LMC Referral

1. Check the Maternal Iron Optimisation charts for each trimester to ensure all steps have been completed before making a referral
2. Arrange for any missing oral iron therapy to be commenced or blood tests taken (a referral can still be made even if results of additional blood tests are still pending)
3. Refer as directed by the Maternal Iron Optimisation charts using the *Maternity Assessment Referral - LMC Process Form – 219729.* Include on the referral form the following details;
    - Oral iron preparation: name, dose, duration, tolerance and compliance
    - Description of any symptoms
    - Maternal weight: pre-pregnancy or at booking

Obstetric Clinic / Specialist Triage

For referrals received for women/people with low haemoglobin (Hb) +/- low ferritin;

1. Review Hb and ferritin blood test results against the Maternal Iron Optimisation charts for each relevant trimester
2. Check all relevant tests have been taken (i.e. blood film/smear, CRP, renal function, B12 and folate) and obtain and review results
3. Check oral iron preparation, dose, duration, tolerance and compliance and recommend further oral iron or an increased dose, if appropriate.
4. Arrange for any missing tests to be completed.
5. Depending on results: arrange to see in clinic to;
    a. follow-up after further oral iron
    b. assess symptoms,
    c. treat any infection
    d. treat vitamin B12 or folate deficiency or anaemia of chronic disease or inflammation
6. Assess against criteria for intravenous iron infusion (see page 13) and ensure;
    - maximum cumulative IV iron dose in pregnancy of 1500mg (or 1000mg in a week) will not be exceeded.
    - If woman/person has had 2 or more IV iron infusions in the preceding 6 months or has BMI < 18, poor nutrition or chronic diarrhoea, check blood phosphate levels and contact medical team for advice if phosphate is <0.8 mmol/L.

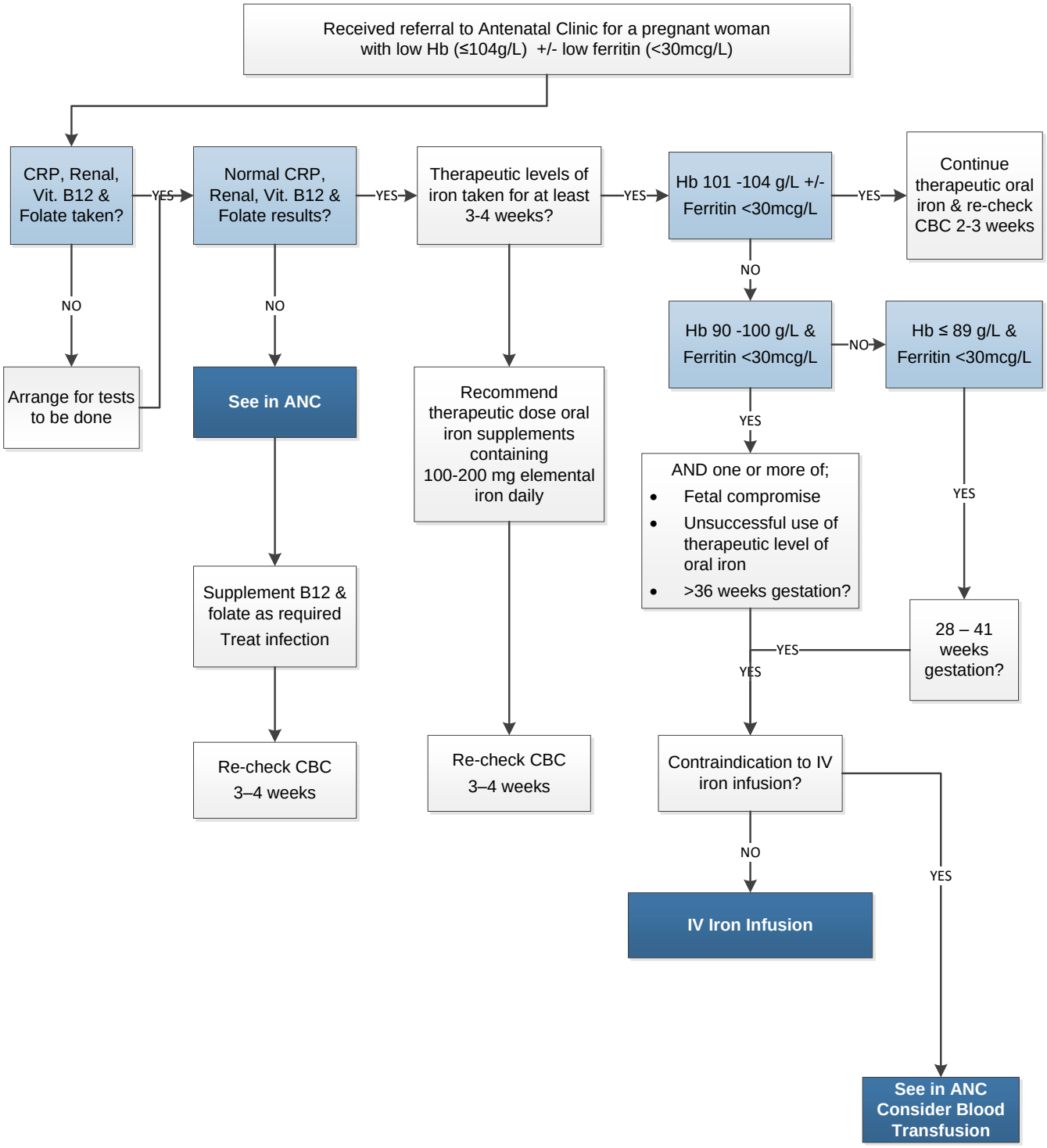
    If criteria are met;
    - complete *Maternity Intravenous Iron Infusion Form (2516097)*
    - obtain Special Authority and
    - prescribe Ferric Carboxymaltose on 1 Day Medication Chart and Hospital Prescription form.

    Antenatal: send all requests (Taupo/Turangi & Rotorua) to Day Assessment Unit (DAU)

    Postnatal Inpatient: give to ward staff

(See flow diagram on next page for more details)

Obstetric Specialist Review



10. Intravenous Iron Infusion

Intravenous (IV) iron is effective in rapidly replenishing Hb and iron stores. IV iron formulations (i.e. Ferinject) can cause side effects, so the benefits of using IV iron must outweigh the risks.

Key practice points:

- An adequate trial of oral iron as first-line treatment must be documented.
- In moderate to severe postpartum anaemia (especially with underlying third trimester iron-deficiency +/- anaemia), the response to oral iron may not be rapid enough to replenish Hb and ferritin.
- Review other factors that may increase the woman's/persons's risk of ongoing anaemia, such as grand multiparity or short pregnancy interval when considering IV iron.
- In addition to the obstetric indications, IV iron might be beneficial in the obstetric patient with co-morbidities that also increase the risk of ongoing iron-deficiency +/- anaemia e.g. IBD or gastric banding. Consultation with a haematologist, physician or medical team may be required.
- When prescribing IV iron for a woman/person weighing <35kg use the following calculation;

  Weight x (120 – current Hb g/dL) x 0.24 + (15mg/kg) = iron dose _____mg.
  (round down to the nearest 100 mg)

  Maximum (max.) single dose is 20 mg/kg. Chart LOWEST of calculated dose OR 20 mg/kg.

- Ensure women/people have received the *Intravenous (IV) Iron Infusion Patient Information Leaflet (2499907)* before receiving IV iron
- To request IV iron, obstetric staff need to complete the *Maternity Intravenous Iron Infusion Form (2516097)*

Criteria for Intravenous Iron Infusion

1. Antenatal – one of the following

1. **Iron deficiency anaemia, Hb ≤ 104 g/L, and ferritin < 30 mcg/L** (or ferritin < 50 mcg/L if CRP > 5 mg/L with other deficiencies excluded or corrected (vitamin B12 and folate)

   AND one or more of;

   - Fetal compromise e.g. intrauterine growth restriction
   - Unsuccessful use of oral iron therapy due to side effects, high iron requirements or persistent anaemia after 6 – 8 weeks (<10 g/L rise in Hb and ferritin remains low)
   - ≥ 36 weeks' gestation
   - SMO decision *(please state)*:……

OR

2. **Severe iron deficiency anaemia, Hb ≤ 89 g/L and ferritin < 30 mcg/L** (or ferritin < 50mcg/L if CRP > 5 mg/L) with other deficiencies excluded or corrected (vitamin B12 and folate) **in the second or third trimester**

2. Postnatal

Postpartum haemorrhage, haemodynamically stable, Hb ≤89g/L +/- blood transfusion

11. Red Blood Cell Transfusion

It is hoped that the implementation of the Maternal Iron Optimisation Pathways will reduce reliance on red blood cell transfusions.

Key practice points:

- In maternity patients who are not actively bleeding, non-transfusion therapies, including iron, should be considered in the treatment of anaemia.
- IV iron may be more effective than blood transfusion at replenishing iron stores.
- Blood transfusion should not be decided by Hb alone, but on assessment of the clinical status, i.e. actively bleeding or risk of further bleeding, imminent cardiac compromise, or symptoms requiring immediate attention.
- Transfusion should be based on symptoms especially when Hb > 70 g/L. However, objective criteria for blood transfusion can be challenging in the postpartum period as there may be many conflicting causes of symptoms (e.g. post-birth fatigue) attributed to anaemia.

For women/people who are postnatal, not actively bleeding:

Hb < 70 g/L:	Transfusion may be appropriate but is not always required. Consider IV iron as an alternative or adjunct to transfusion.
Hb 70 - 90 g/L:	Consider transfusion only if there are signs and symptoms of anaemia. Consider IV iron as an alternative or adjunct to transfusion.
Hb > 90 g/L:	Transfusion is usually inappropriate.

- Where indicated, transfuse a single unit followed by clinical assessment +/- repeat Hb test.
- In patients with iron deficiency anaemia, iron therapy is required to replenish iron stores even after transfusion – review antenatal ferritin levels as part of assessment.

Guidelines on obstetric/maternity infusion and transfusion practice can be found at;

- Maternity Intravenous Iron Infusion - Antenatal & Postpartum- Form 2516097
- New Zealand Blood Service: Blood Resource Info for DHBs
- Australian National Blood Authority: Patient Blood Management Guidelines: Module 5 Obstetric and Maternity

12. Associated Documents

- Maternity Intravenous (IV) Iron Infusion – Patient Information Leaflet - 2499907
- Maternity Assessment Referral - LMC Process Form – 219729
- Maternity Intravenous Iron Infusion – Antenatal & Postnatal - Form - 2516097
- Oral Iron – Information for Pregnant Women/People – Patient Information Leaflet - 2499906

13. Audit

Recommended audit measures for this guideline are;

1. Testing of Hb and Ferritin with first and subsequent antenatal bloods
2. Women/people receive treatment for iron deficiency or anaemia prior to giving birth
3. Completion of pathway steps prior to referral to Obstetric Clinic / Specialist
4. Adequate trial of oral iron is documented prior to administering IV iron
5. Criteria for IV iron infusion was met prior to it being administered

14. Acknowledgement

Health NZ Waitaha Canterbury for permission to adapt their clinical guideline.

15. References

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