

Document No: 1401933

This is a controlled document. The electronic version of this document is the most up to date and in the case of conflict the electronic version prevails over any printed version. This document is for internal use only and may not be accessed or relied upon by 3rd parties for any purpose whatsoever.

TITLE: Maternal Iron Optimisation

Contents

1. Purpose.....	1
2. Scope.....	1
3. Glossary.....	2
4. Definitions	2
5. Background.....	3
6. Assessment	3
7. Diagnosis and Management.....	4
8. Maternal Iron Optimisation Pathway.....	6
First Trimester or Booking Visit	6
Second Trimester	7
Third Trimester	8
Intrapartum – Admission in Labour	9
Inpatient Postpartum.....	10
9. Referral to Obstetric Clinic / Specialist	11
10. Intravenous Iron Infusion	13
11. Red Blood Cell Transfusion	14
12. Associated Documents	15
13. Audit.....	15
14. References	15

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.

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 within the Lakes District Health Board (LDHB) area. Also to all women who are pregnant or postpartum receiving care in the Lakes DHB area.

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 1 of 15	

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
MOH	Ministry of Health

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 MOH 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 will highlight low serum ferritin as ≤ 20 mcg/L)

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 2 of 15	

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 in Lakes DHB. 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 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

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 3 of 15	

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 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).

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 4 of 15	

2. Treatment:

- Routine iron supplementation is not recommended for all women in pregnancy. An individual approach is preferable, based on identification of women at increased risk, assessment of women 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 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 \geq 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 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.

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 5 of 15	

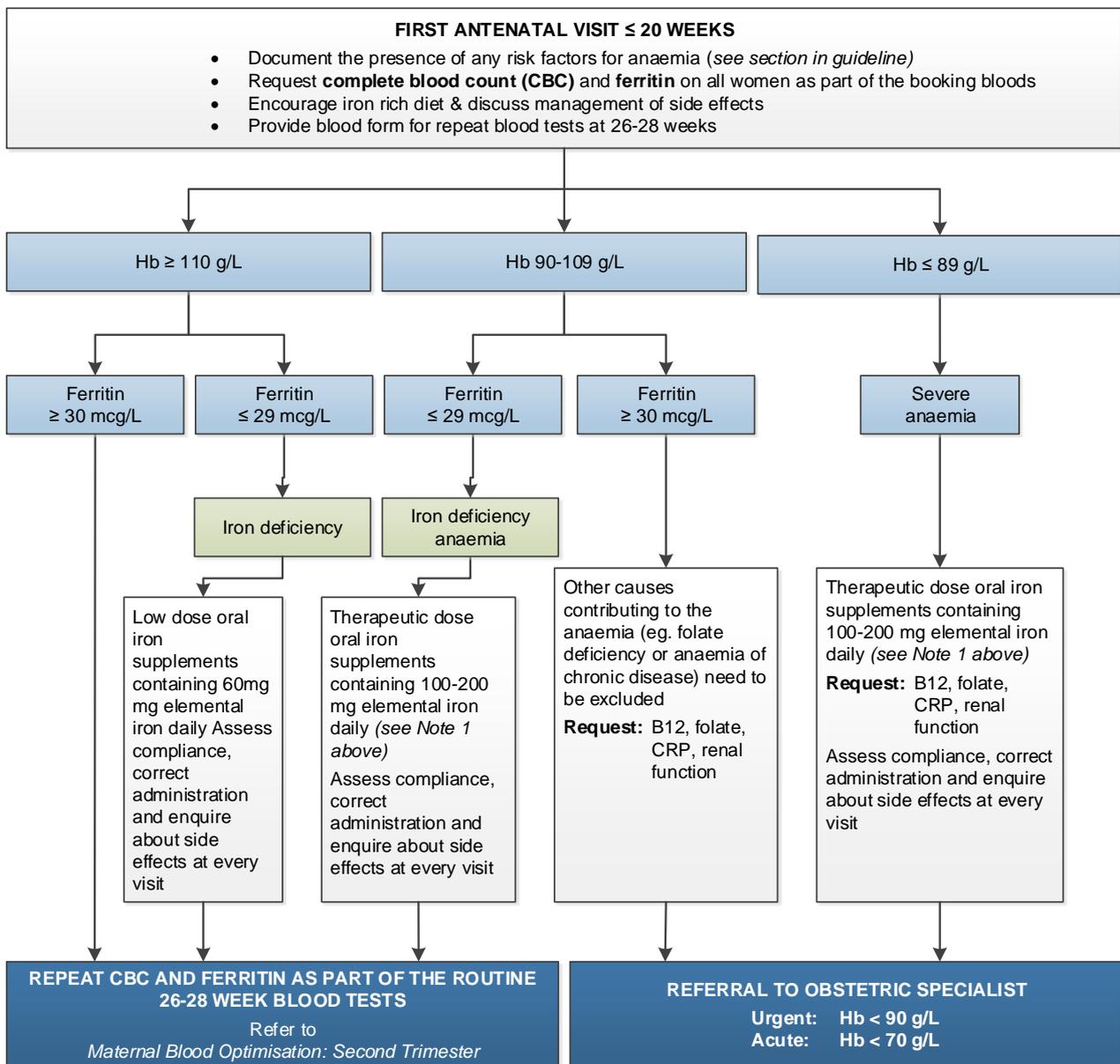
8. Maternal Iron Optimisation Pathway

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.



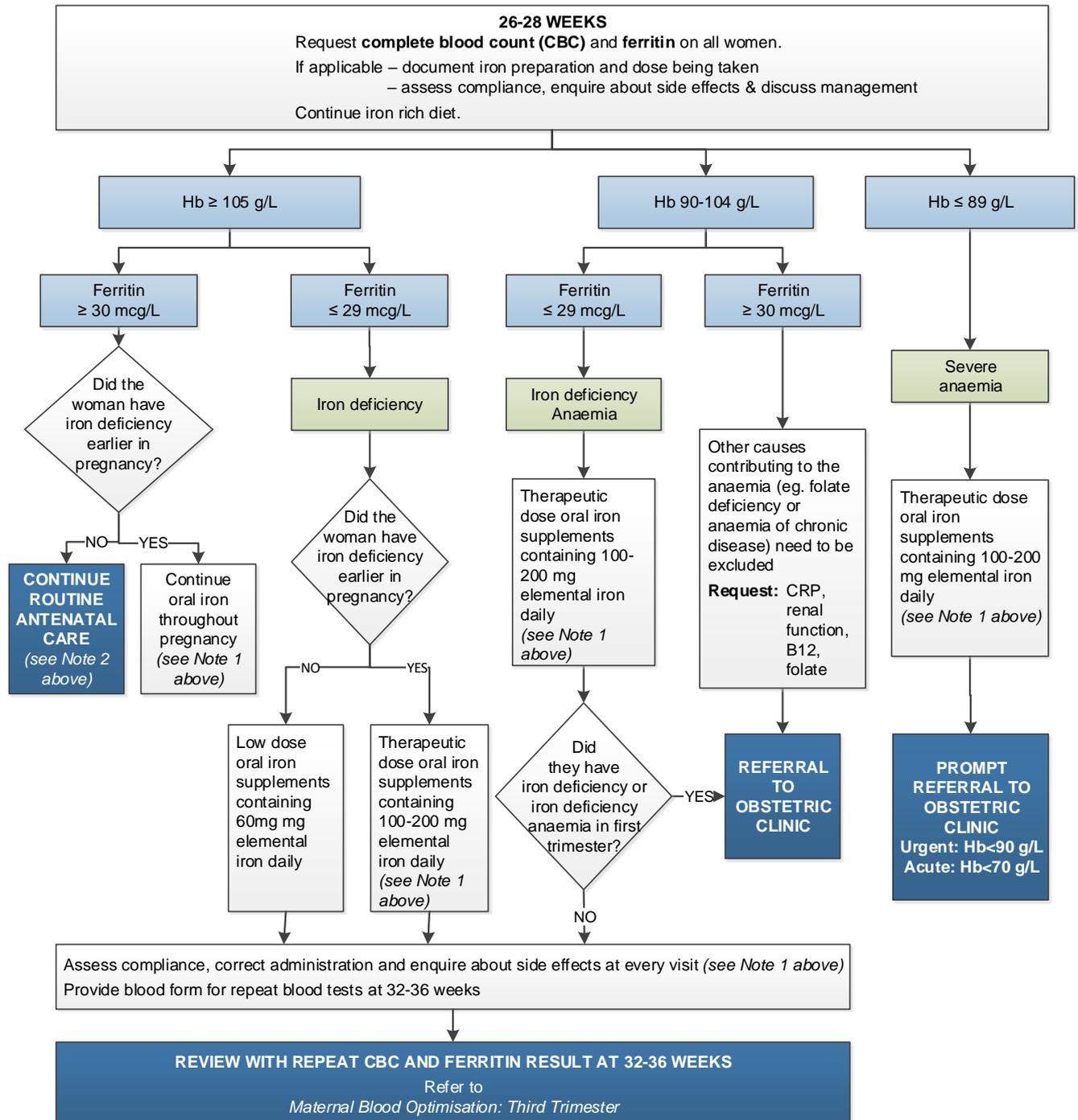
Adapted from Canterbury DHB with permission

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.



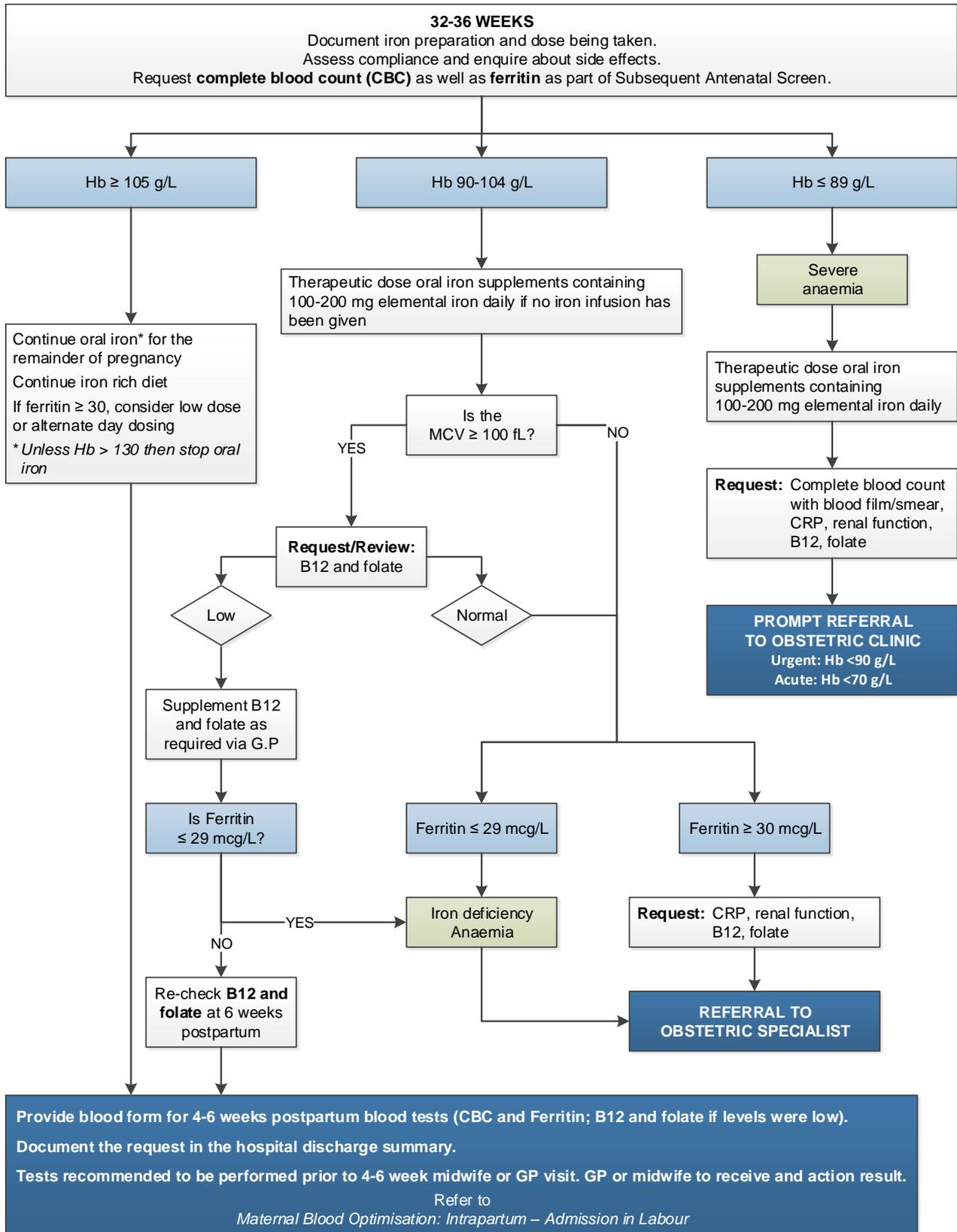
Adapted from Canterbury DHB with permission

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 7 of 15	

Third Trimester

Maternal Iron Optimisation

THIRD TRIMESTER



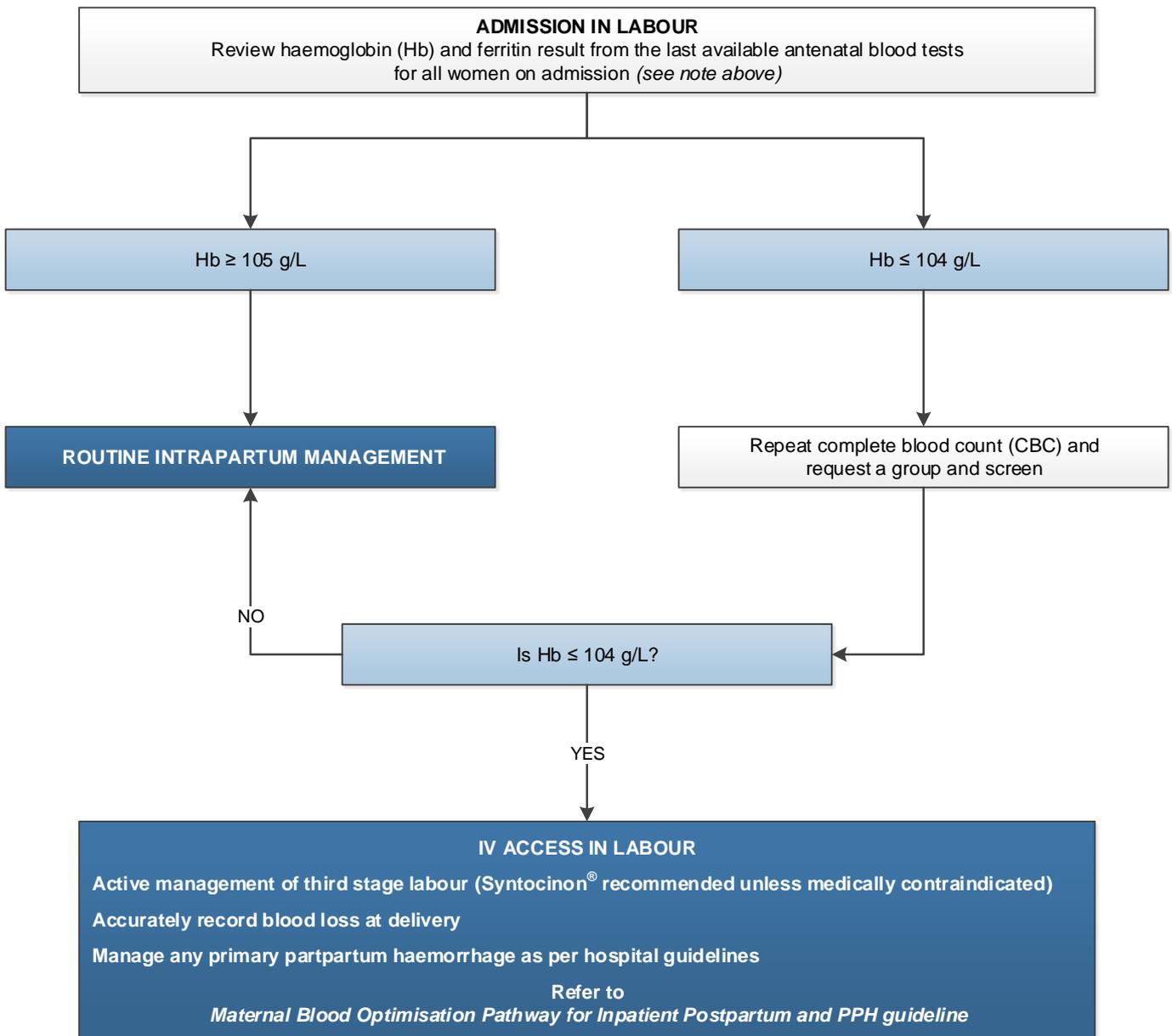
Adapted from Canterbury DHB with permission

Lakes District Health Board Maternity Services	Key Word(s): Iron deficiency, Iron, Anaemia, Maternal	Document Number: 1401933
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024
	Version: 1.0	Page 8 of 15

Intrapartum – Admission in Labour

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



Adapted from Canterbury DHB with permission

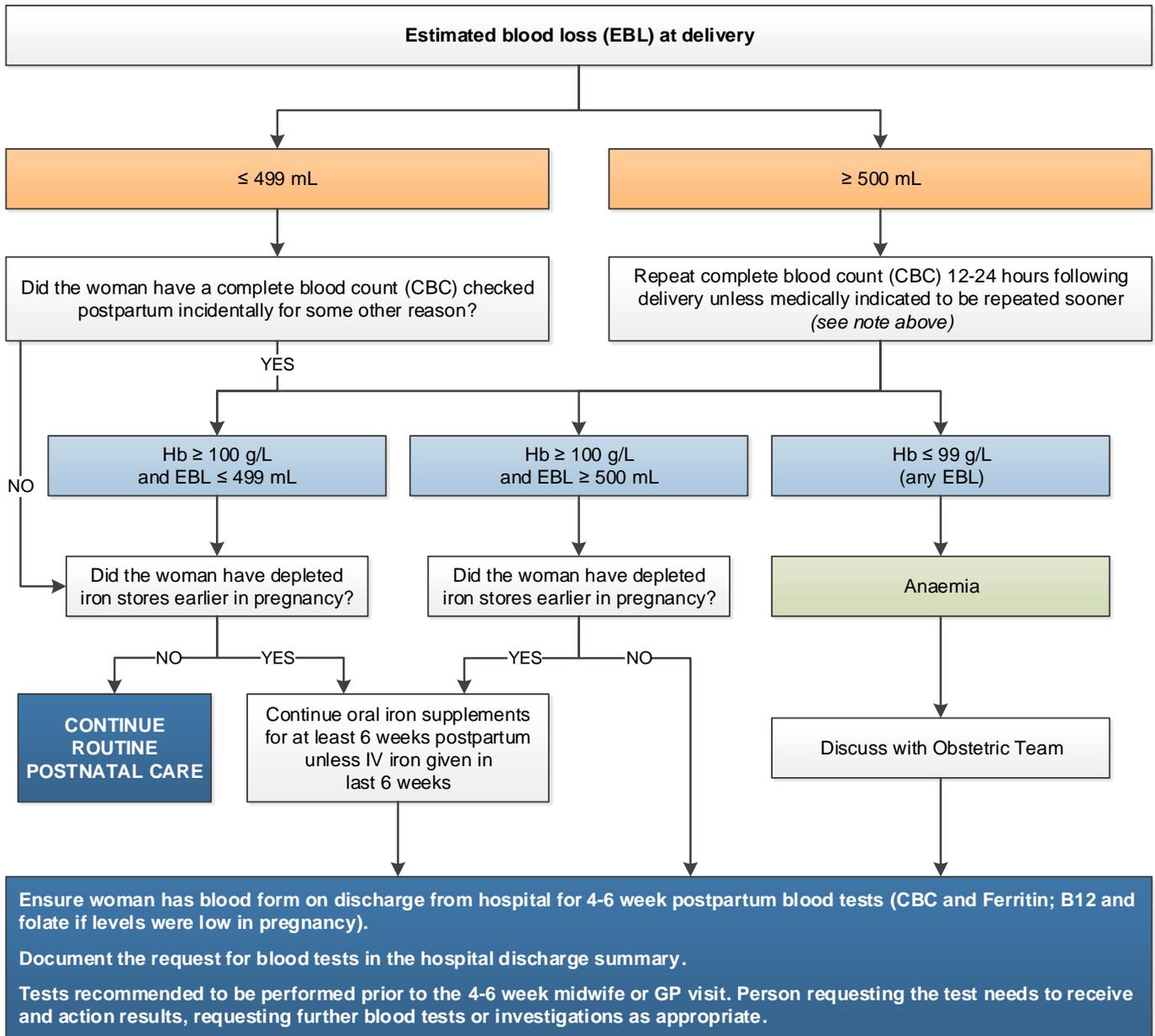
Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 9 of 15	

Inpatient Postpartum

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.



Adapted from Canterbury DHB with permission

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 10 of 15	

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 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 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.

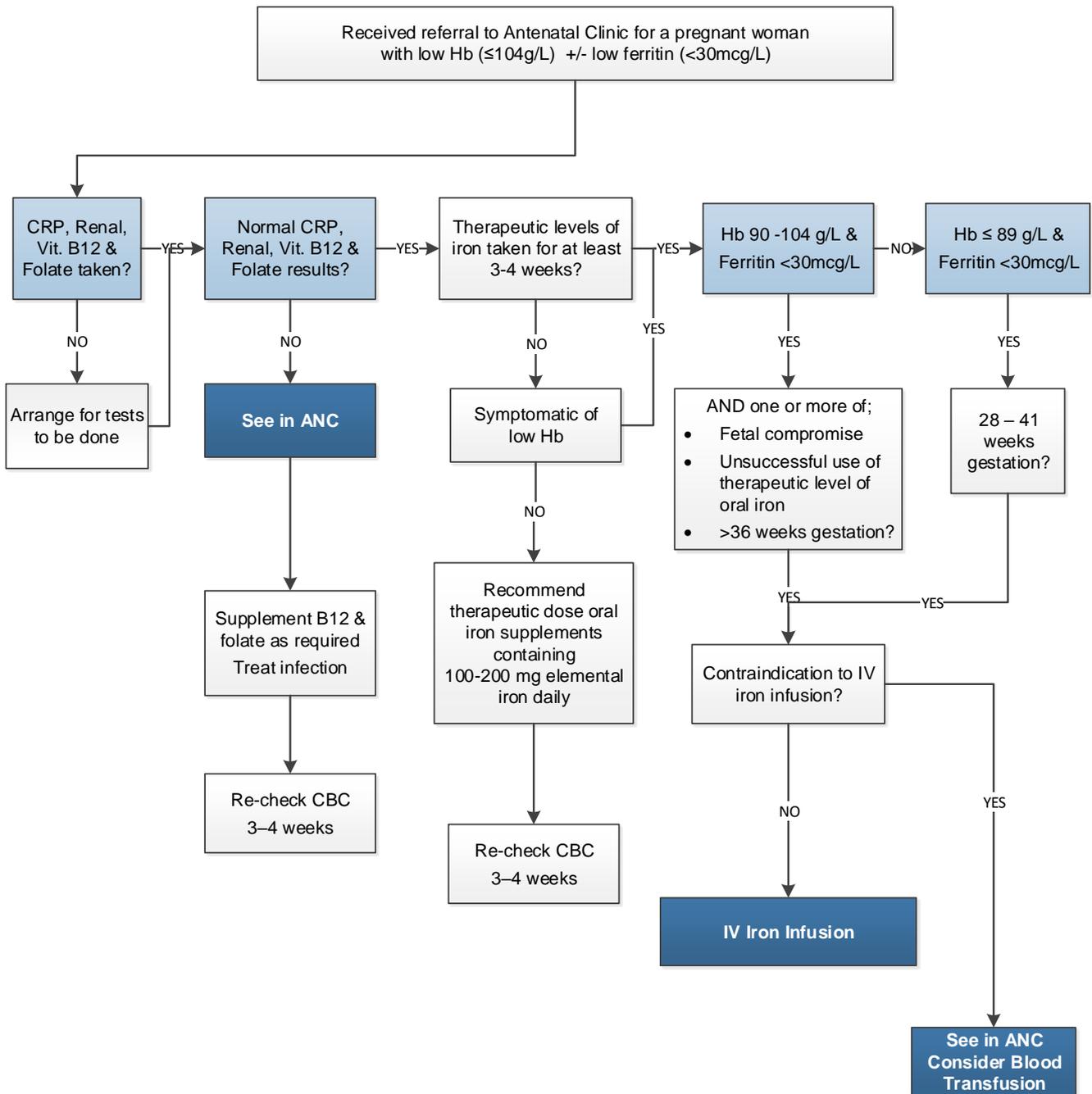
Antenatal: send all requests (Taupo/Turangi & Rotorua) to Day Assessment Unit (DAU)

Postnatal Inpatient: give to ward staff

(See flow diagram on next page for more details)

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 11 of 15	

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 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.
- Ensure women 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
<p>1. Antenatal – one of the following</p> <p>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)</p> <p style="padding-left: 40px;"><u>AND</u> one or more of;</p> <ul style="list-style-type: none"> • 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 <p style="padding-left: 40px;"><u>OR</u></p> <p>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</p>
<p>2. Postnatal</p> <p style="text-align: center;">Postpartum haemorrhage, haemodynamically stable, Hb ≤89g/L +/- blood transfusion</p>

Lakes District Health Board Maternity Services	Key Word(s): Iron deficiency, Iron, Anaemia, Maternal	Document Number: 1401933
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024
	Version: 1.0	Page 13 of 15

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 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;

- LDHB 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](#)

Lakes District Health Board Maternity Services		Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 14 of 15	

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 – 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 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. References

Australian Red Cross Blood Service. Toolkit for Maternity Blood Management.
<https://transfusion.com.au/maternity>

Canterbury DHB, Maternity Blood Optimisation (MBOP) Guideline and Practice Improvement Strategy, April 2020

Canterbury DHB, 'Maternal Blood Optimisation Pathways', April 2020

Flores CJ, Sethna F, Stephens B, et al. Improving patient blood management in obstetrics: snapshots of a practice improvement partnership. BMJ Quality Improvement Reports 2017;6.
<https://bmjopenquality.bmj.com/content/bmjqr/6/1/e000009.full.pdf>

Lakes DHB Clinical Guideline 'Management of Iron Deficiency and Iron Deficiency Anaemia in Pregnancy and Postpartum Period' (April 2020)

Ministry of Health (MOH) (2012). Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines). Wellington: Ministry of Health.

Developed by: Emma Deverall, Obstetrician & Gynaecologist, Lakes DHB
Lisa McKeachie, Maternity Quality & Safety Lead, Lakes DHB
Lisca Hoy, Midwife, Day Assessment Unit, Lakes DHB
Jo Toma, LMC Liaison, Taupo/Turangi, Lakes DHB

Authorised by: Maternity Clinical Quality Improvement (CQI) Meeting

Lakes District Health Board Maternity Services	Key Word(s): Iron deficiency, Iron, Anaemia, Maternal		Document Number: 1401933	
Authorised by: Maternity CQI	Issue Date: 30 th May 2022	Review Date: 30 th May 2024	Version: 1.0	Page 15 of 15