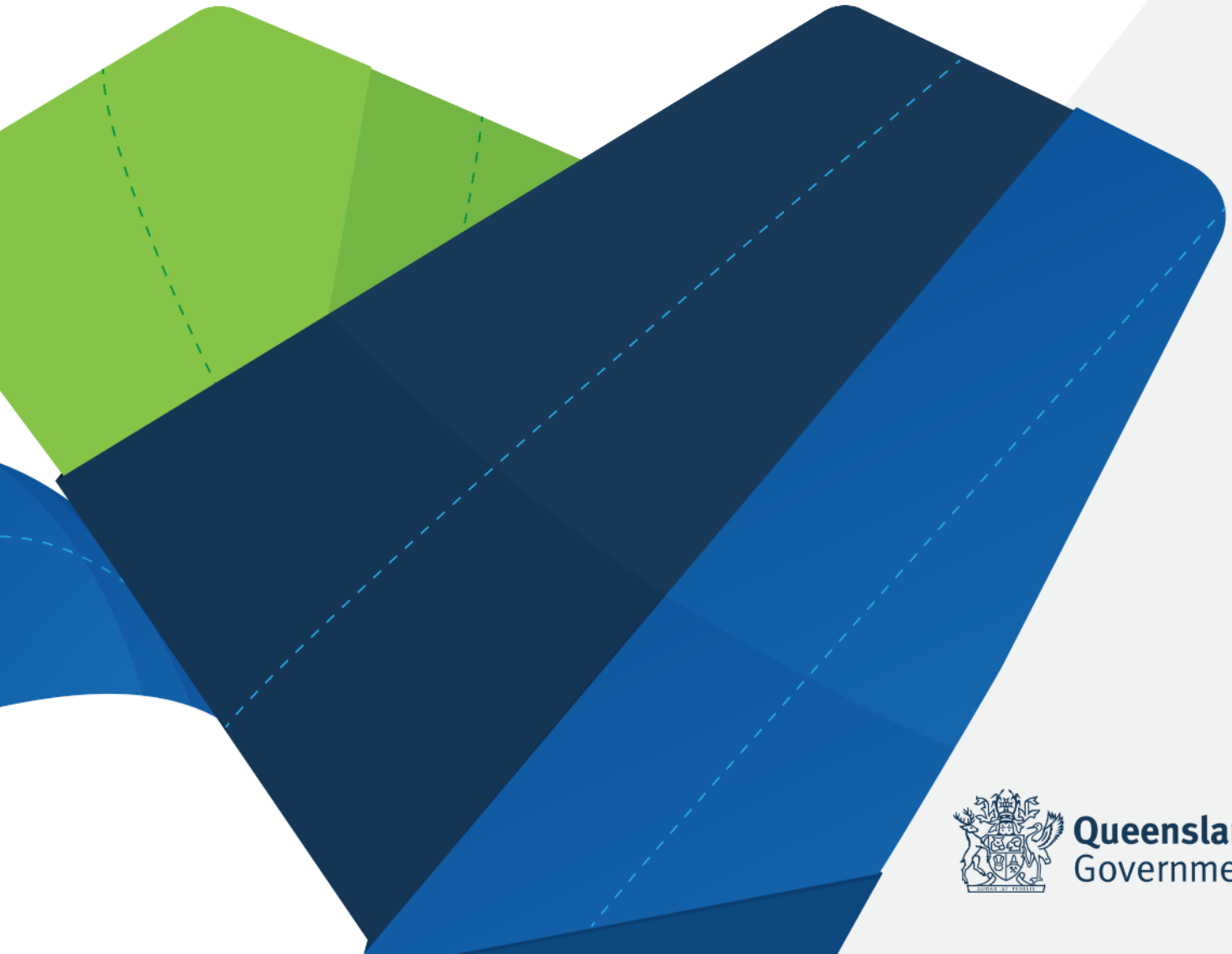
Queensland Health

Iron polymaltose slow intravenous infusion guideline

June 2022



Queensland Government

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An electronic version of this document is available at
https://qheps.health.qld.gov.au/medicines/medication-safety/high-risk-med

1 Purpose

This guideline provides recommendations regarding best practice for the safe prescribing, administration, and monitoring of a **slow intravenous iron polymaltose infusion** for the treatment of iron deficiency anaemia in adult patients when treatment with oral supplementation is either inappropriate or ineffective.

2 Scope

This guideline provides information for all Queensland Health employees (permanent, temporary and casual) and all organisations and individuals acting as its agents (including Visiting Medical Officers and other partners, contractors, consultants and volunteers).

This guideline relates to patients prescribed a total dose* slow intravenous iron polymaltose infusion where a work unit procedure is unavailable. This guideline is not to be used for patients with significant kidney impairment / disease, fluid-restricted patients and patients who receive regular incremental doses of iron (such as renal dialysis patients).

Some units have guidelines which may support a more rapid intravenous iron polymaltose infusion (over 75 to 90 minutes). These rapid infusions are beyond the scope of this guideline.

Other intravenous iron infusion products (e.g. ferric carboxymaltose, iron sucrose, ferric derisomaltose) may be available. These products are beyond the scope of this guideline.

*A total dose iron infusion is designed to provide sufficient iron to allow normalisation of haemoglobin (Hb), and provide iron stores which can be drawn-on in the future. Some practitioners give a smaller initial dose of iron and then repeat this.

3 Related documents

Procedures, Guidelines and Protocols

Queensland Health List of Approved Medicines

4 Guideline

4.1 Background

Intravenous iron may be a suitable option for iron supplementation if the patient is unable to tolerate oral iron or oral iron absorption is unlikely to sufficiently meet the patient's requirements. Intramuscular iron is poorly absorbed, and local reactions (particularly pain) and subcutaneous discolouration occur frequently at the injection site[1]. Similar reactions can occur with intravenous administration if poor insertion technique is used.

Iron polymaltose is one of several intravenous iron formulations listed on the Queensland Health List of Approved Medicines (LAM). All available formulations of iron polymaltose contain 100 mg of elemental iron per 2 mL ampoule.

Further information on the management of iron deficiency anaemia can be found at the Australian Red Cross Blood Service[2] and the National Blood Authority[3]. An online learning module is also available and can be accessed at BloodSafe eLearning[4].

4.2 Potential adverse reactions to iron polymaltose

Although rare, there have been reports of anaphylactic[1] or anaphylactoid[5] reactions associated with intravenous iron polymaltose infusions. Patients most at risk of these types of reactions are those with bronchial asthma, low iron binding capacity, or folic acid deficiency. Caution is also recommended in patients with a history of allergic disorders, hepatic insufficiency, or cardiovascular disease[5]. Reactions occur most frequently within the first few minutes of administration and are generally characterised by sudden onset of respiratory difficulties, tachycardia, and hypotension[5]. Adrenaline and equipment for cardiopulmonary resuscitation must be available for the whole administration time[5].

Hypophosphatemia is a known adverse reaction from the administration of intravenous iron. The duration of this effect may be up to several months depending upon the specific formulation of intravenous iron used[6]. Symptoms of hypophosphatemia include vertigo, nausea, general weakness, tingling in the hands and depression-like symptoms. Pre-existing vitamin D deficiency, low calcium levels, low phosphate levels or raised parathyroid hormone levels may be risk factors. These should be evaluated and corrected before administering intravenous iron.

Extravasation of intravenous iron may result in permanent skin staining (tattooing). The risk of extravasation can be reduced by starting the infusion at a slow rate[1].

4.3 Patient counselling

Prior to administration of iron, ensure the patient understands the importance of notifying staff of unexpected reactions, including systemic reactions such as breathlessness, chest tightness, chest pain, rash, itch, racing heart, nausea, or headache **Signs of extravasation**

including pain, swelling, or tingling at the cannula site should be reported to clinical staff immediately. Discolouration may also occur but could be a delayed symptom. Ensure the patient and carer knows to contact their general practitioner or present to emergency department if any delayed adverse events occur[7].

Counsel the patient/carer again at discharge. A patient information brochure on intravenous iron infusions may be provided to supplement counselling. Provision of patient education should be documented in the progress notes or statewide intravenous iron consent form. Pharmacy staff may document in the pharmaceutical review column next to the iron infusion order on the intravenous and subcutaneous fluid order form.

4.4 Prescribing

Prior to prescribing intravenous iron, ensure there is an appropriate indication. Inform the patient of alternative treatment options and the risks associated with intravenous iron. A statewide IV iron consent form and patient information brochure exists to assist clinicians to inform patients. [8,9]

The dose of iron polymaltose required is based on patient body weight (kg), actual haemoglobin, target haemoglobin, required iron depot, and iron content of haemoglobin (refer to Appendix for the mathematical equation). For overweight patients use ideal body weight. For underweight patients use actual body weight [9].

Iron dose (mg) = body weight (kg) × (target Hb – actual Hb in g/L) × 0.24* + iron depot

Up to 34 kg bodyweight, target Hb = 130 g/L, iron depot = 15 mg/kg bodyweight
Over 34 kg bodyweight, target Hb = 150 g/L, iron depot = 500 mg

* Note: The factor 0.24 = 0.0034 × 0.07 × 1000
Iron content of haemoglobin = 0.34%
Blood volume = 7% of bodyweight
Conversion from g to mg is 1000

Source: Ganzoni AM. Intravenous iron-dextran: therapeutic and experimental possibilities. Schweiz Med Wochenschr. 1970;100: 301-303

Alternatively, the required dose of elemental iron for a patient with a bodyweight greater than or equal to 34 kg can be determined using a reference table with measured (actual) haemoglobin (see Table 1). The table is based on a target haemoglobin of 150 g/L. National guidelines recommend against haemoglobin targets above 130 g/L in chronic kidney disease due to the strong association with increased morbidity and mortality.

Table 1: Total iron polymaltose dose required based on a target haemoglobin of 150 g/l

Body Weight (kg)	Measured (actual) haemoglobin level							
	Hb 60 g/l		Hb 75 g/l		Hb 90 g/l		Hb 105 g/l	
	mL	mg of iron	mL	mg of iron	mL	mg of iron	mL	mg of iron
5	3	150	3	150	3	150	2	100
10	6	300	6	300	5	250	4	200
15	10	500	9	450	7	350	6	300
20	13	650	11	550	10	500	8	400
25	16	800	14	700	12	600	11	550
30	19	950	17	850	15	750	13	650
35	25	1250	23	1150	20	1000	18	900
40	27	1350	24	1200	22	1100	19	950
45	30	1500	26	1300	23	1150	20	1000
50	32	1600	28	1400	24	1200	21	1050
55	34	1700	30	1500	26	1300	22	1100
60	36	1800	32	1600	27	1350	23	1150
65	38	1900	33	1650	29	1450	24	1200
70	40	2000	35	1750	30	1500	25	1250

Body Weight (kg)	Measured (actual) haemoglobin level							
	Hb 60 g/l		Hb 75 g/l		Hb 90 g/l		Hb 105 g/l	
	mL	mg of iron	mL	mg of iron	mL	mg of iron	mL	mg of iron
75	42	2100	37	1850	32	1600	26	1300
80	45	2250	39	1950	33	1650	27	1350
85	47	2350	41	2050	34	1700	28	1400
90	49	2450	43	2150	36	1800	29	1450

Source: Adapted from MIMS Online, Data Version: March 2022. The figures above have been calculated using the formula taken from Ganzoni AM. Intravenous iron-dextran: therapeutic and experimental possibilities. Schweiz Med Wochenschr. 1970;100: 301-303.

Example: A patient weighing 70 kg with measured (actual) haemoglobin of 75 g/L would require 1750 mg of elemental iron. This should be prescribed as 1750 mg of elemental iron (as iron polymaltose) in 500 mL of sodium chloride 0.9%.

4.5 Cannulation

Prevention of extravasation requires the cannula to be appropriately placed, avoiding the hand and sites of flexion. The veins of the distal forearms are optimal sites for insertion. Where there is difficulty with cannulation arrange for technology-assisted insertion. An existing cannula must be site appropriate, checked for patency and assessed for complication. If the cannula is compromised, remove it, and arrange for a new cannula. Frequent site monitoring including visual inspection, palpation and patient perspective is important. Document evidence of monitoring.

4.6 Administration

Iron should be administered during normal business hours and patients should remain on the ward. A medical officer does not need to be present on the ward for the first hour of the infusion.

Adrenaline and equipment for cardiopulmonary resuscitation must be readily available during the entire administration period.[2]

Add the required dose to 500 mL of sodium chloride 0.9% ensuring the maximum concentration does not exceed 5 mg/mL of elemental iron.2 For fluid restricted patients, a smaller volume of fluid may be prescribed, provided the maximum concentration is not exceeded.

No other therapeutic agent should be added to the infusion. If mixed with acidic substances or other substances with a strong reducing effect (e.g. metals such as aluminium), toxic iron compounds may be liberated from the iron solution.[2]

The test dose procedure described in the Product Information can be replaced by administering the first 50 mg of the infusion over at least 60 minutes up to a maximum rate of 40 mL/hr. The initial infusion rate can be determined referring to Table 2. If the infusion is made up in less than 500 mL volume, infusion rates will need to be calculated manually.

Table 2: Initial infusion rates for iron polymaltose in 500 mL volume

Dose	Final Concentration	Initial Infusion Rate (Cap at 40 mL/hr)
500 mg	1 mg/mL	40 mL/hr
750 mg	1.5 mg/mL	33 mL/hr
1000 mg	2 mg/mL	25 mL/hr
1250 mg	2.5 mg/mL	20 mL/hr
1500 mg	3 mg/mL	17 mL/hr
1750 mg	3.5 mg/mL	14 mL/hr
2000 mg	4 mg/mL	12 mL/hr
2250 mg	4.5 mg/mL	11 mL/hr
2500 mg	5 mg/mL	10 mL/hr

Source: Adapted from Cairns and Hinterland Hospital and Health Service Procedure for Iron Polymaltose Infusion (Ferrosig®)[10].

Example: 1750 mg of elemental iron in 500 mL of sodium chloride 0.9%
Initial rate
= (maximum dose in 1st hour) x (volume to be infused) / (total iron dose)
= 50 mg/hr x 500 mL/1750 mg
= 14.29 mL/hr
= 14 mL/hr

If the initial infusion rate is well tolerated, the rate may be increased to 120 mL/hr.2 Nausea and epigastric upset during intravenous administration may indicate an excessive infusion rate [11]. Contact the medical officer and discuss whether to slow the infusion rate or stop the infusion.

4.7 Monitoring

Record baseline observations including blood pressure, heart rate, oxygen saturations, respiratory rate, temperature, and cannula site appearance. Document observations on the Queensland Adult Deterioration Detection System (Q-ADDS) Chart, local early deterioration detection system or integrated electronic Medical Record should be used to document observations.

Table 3: Recommended observations for iron infusions

What?	When?
Blood pressure **Pulse** **Oxygen saturations** **Temperature** **Cannula site appearance**	Every 5 minutes for the initial 15 minutes, then every 15 minutes for the next 45 minutes (i.e. 1 hour post initiation), and then hourly until 1 hour after completion of infusion. Note: Monitoring may be required for up to 6 hours. This is calculated based on a 500 mL infusion with a minimum infusion volume of 10 mL in the first hour leaving the remaining 490 mL to be infused at 120 mL/hr (i.e. 4 hours), plus an additional 1 hr observations after the infusion finishes.

4.8 Managing adverse reactions

- **Stop infusion immediately and notify approved prescriber if there are any adverse reactions**. If pain noticed at infusion site, refer to 'Tissue infiltration (extravasation) with iron' section below.
- Clinical features of an allergic reaction include sweating, tachycardia, wheezing, stridor, dyspnoea, dizziness, hypotension, and cardiac arrest.
- Reactions occur most frequently within the first few minutes of administration and are generally characterised by sudden onset of respiratory difficulties, tachycardia, and hypotension.
- For patients with a history of a mild allergic reaction to iron polymaltose, administer antihistamines prior to subsequent doses [5].
- Delayed adverse reactions include dizziness, muscle or joint stiffness, back pain, fever, chills, rash, and hypophosphataemia.
- Serum phosphate levels may need to be monitored in selected populations such as those with borderline phosphate levels at baseline or those receiving repeated doses of IV Iron at short intervals.
    - For general management of hypophosphataemia see Prescribing Guidelines for HYPO-Electrolyte Disturbances in Adults

4.9 Tissue extravasation with iron

Tissue extravasation with parenteral iron carries a significant risk of permanent skin staining. Patients may experience a bruise-like stain extending from the cannulation site. The stain may or may not fade over an extended period (years). There may be some tissue (surround) swelling, depending on volume infused, and/or depth of vessel. Optimal placement of the cannula will reduce the likelihood of extravasation. The important early indicator of iron extravasation is pain. Consider the suitability of an iron infusion for patients who are sedated, confused, or have cognitive impairment.[7,12]

In the event of extravasation, immediately:

- cease the infusion and disconnect the line **Do not flush the cannula.**
- attempt to aspirate from the cannula. When there is no further aspirate, remove the cannula.
- Contact the medical officer so an assessment can be made
- Do not cover the site with bandages.
- Assess and document the estimated volume of iron that has extravasated.
- Staining may not be evident prior to discharge. If staining is visible, arrange for hospital photographs.
- Clearly document the management in the patient's medical records.
- Document in the incident management system (i.e. RiskMan).

5 Approval

Approving Officer:
Professor Keith McNeil,
Acting Deputy Director-General and Chief Medical Officer, Prevention Division
and Chief Clinical Information Officer,

6 Version control

Version	Amendments	Author/s	Approved
Version 1_0	Original version	Justin Lee	2012
Version 2_0	Revised template	Justin Lee	2013
Version 3_0	Further detail regarding potential side effects and patient counselling	Sarah Mathers	2017
Version 4_0	Further detail regarding potential side effects and patient consent	Fiona McIver	July 2022

7 References and suggested reading

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