Malaysian Society of Patient Blood Management

MyPBM

Essentials of Iron Deficiency and Intravenous (IV) Iron

QUICK START GUIDE | DIAGNOSING IRON DEFICIENCY & USING INTRAVENOUS IRON

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Quick Start Guide
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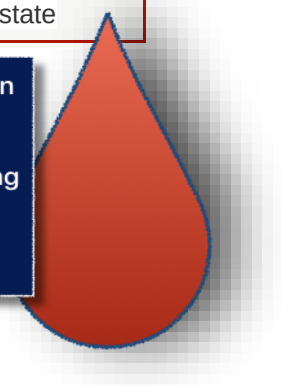
Practice Essentials

Reminders		Reasons
Best time to take iron study	After an overnight fast	Diurnal variation in iron levels dictates iron levels as most accurate after overnight fast [1]
	At least 2 days after last oral iron dosing	Oral iron therapy gives a false high reading of iron saturation
	At least 24 hours after transfusion of allogeneic blood product	Serum iron in severe iron deficiency is transiently increased after transfusion, and returns to baseline 24 hours after [2]

Diagnosing iron deficiency	Formula	Interpretation
Transferrin saturation (TSAT) * depicted in percentage	(Serum iron/ TIBC) x 100%	TSAT of 20% and below indicates iron deficiency and warrants IV iron
Serum ferritin (µg/L)	-	<30 µg/L indicates iron deficiency, > 100µg/L , with TSAT 20% and below may indicate iron deficiency with inflammatory state

- In patients with chronic illness or inflammatory state, ferritin (an acute phase reactant) will be high but this does not exclude iron deficiency, this is functional iron deficiency.
- These patients will not respond to oral iron; instead, IV iron will be needed with erythropoietin.

- In cases of bleeding resulting in anaemia, iron is lost.
- IV iron should be initiated as soon as possible while arresting bleeding. Iron study is not a prerequisite in this instance.



Iron replacement calculation	Formula
Simplified calculation	(Haemoglobin deficit (g/dL) x 200mg) + 500mg for iron stores [3]
Ganzoni formula	(Haemoglobin deficit (g/dL) x 2.4x weight (kg)) + 500mg for iron stores
Ferritin target:100ng/ml (no anaemia)	1ng/ml= 8mg iron (+ 500mg iron for iron stores)

IV iron	Test dose needed?	Administration method	
Iron sucrose (Venofer)	NO	IV Bolus	Maximum IV bolus- 200mg in 2-5mins
	NO	IV Infusion	200mg in 100cc sterile 0.9% sodium chloride (NaCl) over 30 mins every other day (EOD) - maximum 600mg/week
Iron sucrose similar (Sucrofer)	NO	IV infusion	200mg in 100cc sterile 0.9% sodium chloride (NaCl) over 30 mins every other day (EOD) - maximum 600mg/week
Advisable safe maximum single dose for iron sucrose/ iron sucrose similar: 200mg *There is limited experience with administration of a single infusion of 500 mg of Venofer, in a maximum of 250 mL of 0.9% NaCl, over a period of 3.5-4 hours on day 1 and day 14 for non dialysis dependent chronic kidney disease patients (NDD-CKD) ; hypotension occurred in 2 of 30 patients treated. [4] *Local experience in hundreds of administration of Venofer at 400mg in 400cc of 0.9% NaCl, over a period of 4 hours in patients more than 60kg, found no adverse events. [5]			
Low molecular weight iron dextran (Cosmofer)	YES	IV Infusion	1000mg in 250cc sterile 0.9% NaCl over 1-3 hours Slow drops in first 15mins, if no reaction, run the rest for 1-3 hours [6]
Ferric derisomaltose / Iron (III) isomaltose 1000 (Monofer)	NO	IV Bolus	Maximum IV bolus; 500mg Rate up to 250mg iron/minute (undiluted or diluted in maximum 20cc sterile 0.9% NaCl) Administered 1 to 3 times/ week
	NO	IV Infusion	1000mg or less - over 15 mins More than 1000mg - over 30 mins Undiluted or diluted in sterile 0.9% NaCl (maximum dilution 1:1 or 500cc, whichever less) [7] Or 1000mg in 100cc sterile 0.9% NaCl over 30 mins , preceded and followed by 50cc of sterile 0.9% NaCl [8]
Ferric carboxymaltose (Ferrinject)	NO	IV Bolus	500mg to 1000mg undiluted, over 15 mins; 100mg to <500mg undiluted, at rate of 100mg/min **The maximum single bolus dose is 15 mg iron/kg body weight but should not exceed 1,000 mg iron.
	NO	IV infusion	> 500mg to 1000mg in 250cc sterile 0.9% NaCl over 15mins
For total dose infusion- maximum single dose : 20mg/kg ***** maximum 1000mg for Ferric carboxymaltose***			

- Patients SHOULD NOT be premedicated with diphenhydramine as it can cause hypotension, flushing, somnolence and supraventricular tachycardia
- Minor chest and back tightness, usually after test dose, first described by Steve Fishbane (Fishbane Reaction) is NOT a serious AE & resolves after a pause, without treatment: Do NOT intervene with epinephrine or diphenhydramine
- Serious adverse event should consist of hypotension, tachypnea, tachycardia, wheezing, stridor or periorbital edema
- Premedicate with steroids only for allergic diatheses [9]

- For IV infusions, a 5 minute pause at 30 seconds into the infusion reduces incidence of adverse effects or Fishbane reactions [10]

Busting Myths

Myth	Fact
Using IV iron during infection, increase infectious complications	There is **no clinically meaningful increase in infectious complications** when IV iron was adequately dosed according to available guidelines [11] while acute infection is managed.
Using IV iron in cancer, facilitates cancer progression	There is currently **no clinical evidence** for tumour progression [12], when IV iron is used appropriately for the clinical indication of iron deficiency or functional iron deficiency.

- ***IV iron*** has ***significant lower risks*** of causing/ aggravating an infection or causing tumour progression as ***compared to allogeneic blood transfusion (ABT).***

Blood contains Heme iron which bacteria prefers over soluble (commercial) iron.
~ Dr Aryeh Shander

- IV iron (excluding High Molecular Weight Iron Dextran) is associated with an estimated serious adverse events (SAE) incidence of less than 1 in 250,000 administrations. [13]
- Compared to the risk of death and acute SAE resulting from transfusion, the risk with IV iron is almost negligible. [14]

A versatile therapy [15]

Areas of use	Rationale
Cardiology/ cardiac rehabilitation : *heart failure*	Iron deficiency impairs cardiac myocyte contractility, while IV Iron replacement improves cellular energetics. IV iron improves 6min walk test and quality of life (QOL) assessment.
Nephrology : *chronic kidney disease*	IV iron therapy provides better haemoglobin response compared to oral iron, thus reducing morbidity related to anaemia and allogeneic blood transfusion (ABT).
Gastroenterology/ colorectal surgery : *Inflammatory bowel disease*	IV iron is the preferred therapy, as oral iron is poorly absorbed, tolerated and has the tendency of increasing intestinal mucosal inflammation, fostering growth of undesirable bacteria, causing inconvenient effect on microbiome.
Obstetrics/ Maternal foetal medicine : *Pregnancy*	IV iron is superior to oral iron in terms of haemoglobin response, time to target haemoglobin with decreased adverse outcomes. Crucial in correcting iron deficiency in a timely and adequate manner to reduce the morbid side effects of intrapartum iron deficiency on both mother (risk of transfusion when bleeding and post partum depression) and foetus (increased risk of IUGR, autism, attention deficit hyperactivity disorder, and intellectual disability).
Haematology/ oncology : *Chemotherapy induced anemia/ cancer anaemia*	IV iron in combination with erythropoietin, reduces the required dose of erythropoietin and reduces exposure to allogeneic blood transfusion (ABT) (which is known to increase cancer recurrence).
Patient blood management : *Perioperative/ general*	IV iron is an important facet of PBM, the Pillar 1 (optimising haemopoiesis) of PBM, being crucial in management of anaemia and bleeding.

"We are what we repeatedly do. Excellence, then, is not an act, but a habit."
— Will Durant

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