Intravenous Iron Administration

Iron Corner
sabm.org/iron-corner

SUMMARY

- Iron is critical for normal hemoglobin (Hgb) synthesis to maintain oxygen transport and myoglobin to facilitate oxygen transfer in muscles. Additionally, iron is necessary for cellular metabolism and synthesis of DNA and numerous enzymes.
- The total body iron content of an adult ranges from 2-4 grams. Assuming total body iron of 3,600 mg, a typical distribution would be 2,200 mg as Hgb iron, 1,000 mg as ferritin and hemosiderin iron, 300 mg as myoglobin iron and 100 mg as iron in cytochromes and enzymes.
- For any patient with iron deficiency, intolerant to oral iron or where oral iron is unable or unlikely to work, intravenous (IV) iron is administered.

Sections

IV IRON ADMINISTRATION GENERIC

What Are the Current IV Iron Preparations?

There are six IV iron preparations currently approved by the FDA.

Product*	Brand Name	Elemental Iron
Ferric Carboxymaltose (FCM)	Injectafer®	50 mg/mL
Ferric Derisomaltose (FDI)	Monoferric®	100 mg/mL
Ferric Gluconate	Ferrlecit®	12.5 mg/mL
Ferumoxytol	Feraheme®	30 mg/mL
Iron Dextran	INFeD®	Varies
Iron Sucrose	Venofer®	20 mg/mL

*See Iron Table or Product Monograph for more information.

How Do You Calculate a Patient's Iron Deficit?

A patient's iron deficit can be calculated by using the Ganzoni formula. However, the dose of IV iron to be administered is product-based and PI dosing should be implemented.

- IV iron dosing is based on the patient's body weight in kilograms (kg) and hemoglobin level.
- The cumulative iron dosing can be determined by the **Ganzoni formula** (for precise calculation)
  Total iron deficit (mg) = [Body weight (kg) × (target Hgb − actual Hgb) × 2.4] + depot iron (~500 mg)

How Is IV Iron Administered?

- IV push or IV infusion
- Infusion over 15–90 minutes (depending on preparation)
- Requires monitoring for hypersensitivity and for infusion reactions
- Can be administered in hospital or outpatient settings

When Is IV Iron Indicated?

Intravenous iron can be indicated as a source of iron replacement in iron deficiency or iron deficiency anemia if the patient:

- Cannot tolerate oral iron
- Is considered unreliable to continue oral iron for an extended period
- Has malabsorption syndrome

Intravenous Iron Administration

Iron Corner
sabm.org/iron-corner

- Has an inflammatory process
- Has kidney disease or heart failure
- Is being treated with exogenous Erythropoietin Stimulating Agents (ESA)
- Has a need to rapidly replete iron stores
- Has ongoing bleeding with associated iron losses greater than the patient's capacity to absorb oral iron
- Pregnancy during the 2nd trimester if the Hgb < 10.5g/dL or in the 3rd trimester when oral iron is unlikely to rapidly supply adequate iron to the developing fetus

What Are the Symptoms of Fishbane-Type Reactions to IV Iron?

Fishbane (non-anaphylactic):
Symptoms usually consist of:

- Facial flushing
- Chest/back tightness
- Joint pain
- No hypotension, stridor, or airway compromise

Fishbane reaction is common post-IV iron administration and is typically mild, transient, and resolves within minutes. Fishbane occurs WITHOUT hypotension, tachypnea, tachycardia, wheezing, stridor, or periorbital edema. This mild reaction, which never leaves residual, abates in minutes and does not recur with rechallenge. Should this reaction occur, NO TREATMENT should be administered, the patient should be reassured, observed for a few minutes, and treatment continued cautiously after abatement of all symptoms.

What Are the Symptoms of Hypersensitivity Reactions to IV Iron?

Reaction Classifications:

Type	Symptoms
Mild	Flushing, urticaria, itching, heat sensation, slight chest tightness, joint/back pain, hypertension
Moderate	Above symptoms + transient cough, SOB, tachycardia, hypotension
Severe (Rare)	Wheezing, stridor, periorbital edema, cyanosis, confusion, anaphylaxis
Delayed	Fever, headache, myalgia/arthralgia
Isolated Symptoms	Nausea, diarrhea, metallic taste, abdominal cramps, IV site irritation, mild hypotension/hypertension; tachycardia, pruritus

What Monitoring Is Required?

- Check hemoglobin, ferritin, and transferrin saturation (TSAT) after 4–8 weeks
- Avoid re-dosing too soon unless clinically indicated
- Refer to Product monograph for redosing and post-administration monitoring

When Should Erythropoietin Stimulating Agents (ESA) Be Used?

Iron is an essential component in hemotopoiesis and, as such, should supplement ESA for treatment. ESA treatment alone will rapidly deplete iron stores leading to functional iron deficiency and the production of iron-poor RBCs (iron-deficient erythropoiesis).

In most cases, patients receiving erythropoietin therapy are unable to keep up with oral iron; the demand for iron and intravenous iron is indicated.

Intravenous Iron Administration

Iron Corner
sabm.org/iron-corner

IV IRON TABLE

Parameter	Ferric Carboxymaltose	Ferric Derisomaltose	Ferric Gluconate	Ferumoxytol	Iron Dextran	Iron Sucrose
Trade Name	Injectafer® (US) Ferinject® (CA)	Monoferric Ferric Derisomaltose®	Ferrlecit®	Feraheme®	INFeD® N/A in Canada	Venofer®
Generic Name	Ferric Carboxymaltose	Ferric Derisomaltose / Iron Isomaltoside 1000	Ferric Gluconate	Ferumoxytol	Iron Dextran	Iron Sucrose
FDA Indication	IDA in adults and pediatric patients ≥1 year who cannot tolerate oral iron or have an unsatisfactory response to oral iron IDA in adult patients with NDD-CKD IDA in adults with heart failure (Canada)	IDA in adults intolerant to or failing oral iron IDA in adults with NDD-CKD	IDA in adults and children ≥6 years with CKD on HD who are receiving epoetin therapy	IDA in adults with CKD IDA in adults with intolerance to oral iron or unsatisfactory response to oral iron	IDA in adults and pediatric patients ≥4 months with intolerance or unsatisfactory response to oral iron	IDA in adults with CKD
Black Box Warning	No	No	No	Yes - risk of serious hypersensitivity or anaphylactic reactions	Yes – risk of anaphylaxis	No
Warnings and Precautions	Hypersensitivity, hypertension and hypophosphatemia	Hypersensitivity, iron overload	Hypersensitivity and Fishbane reactions, clinically significant hypotension Contraindicated in neonates and infants due to benzyl alcohol component	Patients should avoid MRIs for 3 months post dose administration	Risk of Fishbane and delayed hypersensitivity reactions, arthralgia and myalgias Requires test dose before therapeutic dosing initiation	Hypersensitivity and Fishbane reactions, clinically significant hypotension
Route of Administration	IV infusion (> 15 min) or slow IV injection (2 mL per min for 500-750 mg, > 15 min for 1000 mg)	IV infusion (> 20 min)	IV infusion (1 hr) or slow IV injection (<12.5 mg/min)	IV injection (> 15 min)	IV (>1 hr), IM (bolus) (IM not recommended)	IV infusion (> 15 min) or injection (2-5 min)
Max FDA Single Dose	1000 mg	1000 mg	125 mg	510 mg	100 mg	400 mg
Dosing Notes	Up to 1000mg/dose based on 15 mg/kg body weight; 2 doses ≥7 days apart (max 2,000mg/ course)	≥50 kg: 1000 mg; <50 kg: 20 mg/kg; dilute in 100–500 mL NS, infuse over ≥20 min	125 mg per dialysis session; dilute in 100 mL NS or slow IV injection	510 mg IV, repeat in 3–8 days (total 1020 mg)	≤300 mg IV push ≤50 mg/min or dilute in 100–250 mL NS; Total dose: dilute in 500 mL NS over ≥1 hr.	CKD-HD: 100 mg IV per dialysis; CKD-ND: 200 mg IV on 5 occasions over 14 days

Intravenous Iron Administration

Iron Corner
sabm.org/iron-corner

IV IRON PRODUCT DESCRIPTIONS

Ferric Carboxymaltose

Background: In 2013, ferric carboxymaltose became available in the US. It has been used in Europe and other countries since 2009. Ferric carboxymaltose is indicated for the treatment of iron deficiency anemia (IDA) in adults who either cannot tolerate or have not responded well to oral iron and in adult patients who have non-dialysis dependent chronic kidney disease. It is also indicated for IDA in pediatric patients 1 year and older who have an intolerance or unsatisfactory response to oral iron.

Dosing and Administration US: Ferric carboxymaltose can be administered as a single dose of up to 750 mg and undiluted as an intravenous push injection at a rate of 100 mg/minute or as an intravenous infusion in up to 250 mL 0.9% sodium chloride injection over the course of at least 15 minutes. Therefore, complete replacement for iron deficient can be achieved in only one to two visits, separated by at least seven days for a cumulative dose of 1,500 mg. It can also be dosed as 15 mg/kg with a 1,000 maximum single dose.

Dosing and Administration CA: A single administration should not exceed 1000 mg or iron or 15 mg iron/kg body weight for adults. The maximum is 750 mg of iron for pediatric patients. The amount of iron needed is determined based on the patient's body weight and Hgb level for both pediatric and adult patients.

Ferric Derisomaltose

Background: In 2020, ferric derisomaltose became available in the US. It has been used in Europe and other countries since 2009 under the drug name iron isomaltoside. Ferric derisomaltose is indicated for the treatment of iron-deficiency anemia (IDA) in adult patients who have intolerance to oral iron or have had unsatisfactory response to oral iron; who have non-hemodialysis dependent chronic kidney disease.

Dosing and Administration US: Ferric derisomaltose can be administered as a single 1,000 mg dose for patients weighing 50 kg or more. For patients weighing less than 50 kg ferric derisomaltose is administered as 20 mg/kg actual body weight as an intravenous infusion. Ferric derisomaltose is diluted in 100 mL to 500 mL of 0.9% Sodium Chloride Injection, USP. The final diluted concentration should be more than 1 mg of iron/mL and administer the prepared solution via intravenous infusion for at least 20 minutes. Ferric derisomaltose treatment can be repeated if iron deficiency anemia occurs.

Dosing and Administration CA: Dosing is determined by Hgb and body weight. Patients under 50 kg with an Hgb >10 g/dL or <10 g/dL need 500 mg of iron. Patients between 50-70 kg with an Hgb >10 g/dL need 1000mg of iron and <10 g/dL need 1500 mg. Patients over 70 kg with an Hgb >10 g/dL need 1500 mg of iron and <10 g/dL need 2000mg.

Ferric Gluconate

Background: Ferric gluconate was first used in Europe in 1977, was approved by the FDA for use in the United States in February 1999. It is also available in Canada. It is currently recommended for the treatment of iron deficiency anemia in adult and pediatric patients undergoing chronic hemodialysis who are receiving supplemental ESA therapy. Ferric gluconate has been used successfully in patients who are intolerant to iron dextran. There is no data available on the use of ferric gluconate in patient's intolerance to iron sucrose, or both iron dextran and iron sucrose.

Dosing and Administration US: For adult hemodialysis patients, a dose of 10 mL is indicated, containing 125 mg of iron administered through IV infusion or slow IV injection. For pediatric patients a dose of 0.12 mL/kg is indicated, containing 1.5 mg/kg of iron administered through IV infusion. Both occur over eight dialysis sessions.

Dosing and Administration CA: Same as US

Intravenous Iron Administration

Iron Corner
sabm.org/iron-corner

Ferumoxytol

Background: In June 2009, ferumoxytol, was approved for administration to iron deficient patients with chronic renal failure. In February 2018, ferumoxytol received approval to broaden its label to include all eligible adult iron deficiency patients who have intolerance to oral iron or have had an unsatisfactory response to oral iron.

Dosing and Administration US: Two doses separated by multiple days are required to reach the recommended dosage. There is no data currently regarding the administration of higher doses. Therefore, complete replacement for iron deficient patients requires at least two visits, at least three days apart. Ferumoxytol may be given as a 510 mg IV Infusion in 50-200 ml. sodium chloride or 5% dextrose over at least 15 minutes.

Dosing and Administration CA: If the patient's baseline Hgb is > 100-120 g/L and they weigh < 50 kg, only one 510 mg iron dose is indicated. For any other weight category and Hgb baseline, the patient follows the US with two separate doses on different days to equal 1020 mg total.

Iron Dextran

Background: In 1991, low-molecular-weight (LMW) iron dextran marketed as INFeD was approved for clinical use in the United States. In 1996, high-molecular-weight iron dextran marketed as Dexferrum was approved and provided an alternative to INFeD. These two products replaced Imferon (Fisons, Rochester, NY), which was no longer manufactured. InFeD is an iron replacement product. The dextran carbohydrate shell found in some early iron dextran products was associated with rare, severe immunologic responses, sometimes resulting in anaphylaxis and death. Iron dextran carries a black box warning because of this risk of severe, sometimes fatal anaphylactic reactions (loss of consciousness, collapse, difficulty breathing associated with the high molecular weight product. High molecular weight iron dextran (Dexferrum) has been removed from the U.S. market. Current information suggests that low-molecular weight iron dextran is associated with a markedly lower risk of serious adverse events than high molecular-weight iron dextran, with a serious adverse event rate of less than 1:250,000.

Dosing and Administration: The total amount of iron dextran required for the treatment of iron deficiency anemia or iron replacement for blood loss is determined from the patient's body weight, current Hgb level, and desired target hemoglobin. Dosage recommendations based on the patient's lean body weight and observed Hgb are included in the iron dextran PI. The total iron replacement dose of INFeD can be diluted in normal saline and administered as a single IV infusion. The drug is diluted in 250 ml of normal saline. The test dose can be administered as a separate IV push or as a slow infusion of the diluted material. If no adverse events are observed after 10-15 minutes, as is the case in 90% of patients, the remainder of the solution is infused over the balance of one hour. For patients with a history of multiple drug allergies, a prior sensitivity to iron dextran or asthma, 125 mg methylprednisolone should be administered prior to the test dose. Otherwise, premedication should be avoided.

Iron Sucrose

Background: Iron sucrose has been used in Europe since 1949 and was approved by the FDA in November 2000. It is indicated for the treatment of iron deficiency anemia in dialysis dependent and non–dialysis-dependent CKD patients. It is approved by both adults and pediatric patients. Iron sucrose has been used successfully in patients who are intolerant to iron dextran. Iron sucrose has also been used successfully in patients who have an intolerance to both iron dextran and ferric gluconate.

Dosing and Administration US: Dosing and administration depend on the patient's comorbidities. Overall, iron sucrose is to be administered intravenously by infusion or slow injection. In adult patients with hemodialysis dependent-chronic kidney disease (HDD-CKD), iron sucrose should be administered as 100 mg in a slow IV injection or infusion. This dosing should be repeated for each dialysis session until the patient has received a total of 1000 mg of iron sucrose. In adult patients with non-dialysis dependent-chronic kidney disease (NDD-CKD), iron sucrose should be administered the same as for HDD-CKD, but the dose should be 200 mg instead of 100 mg and should be administered on 5 different occasions over the course of 14 days to reach a total of 1000 mg. In adult patients with peritoneal dialysis dependent-chronic kidney disease (PDD-CKD), iron sucrose should be administered in three divided doses in a slow IV infusion within 28 days: two infusions of 300 mg over 1.5 hours 14 days apart followed by a single 400 mg infusion over 2.5 hours 14 days after the second 300 mg infusion to equal 1000 mg total.

Dosing and Administration CA: For NDD there is a 500 mg dose maximum per infusion/ injection with there being two doses, 14 days apart or five 200 mg doses over a 14-day period. For HDD a dose of 100 mg is administered in each dialysis session until 1000 mg is reached total. In PDD a 300 mg or 400 mg dose is administered in three divided doses within a 28-day period.

In the pediatric population with HDD-CKD, iron sucrose should be administered as a dose of 0.5 mg/kg (less than 100 mg per dose) every two weeks for 12 weeks. In pediatric patients with NDD-CKD or PDD-CKD on erythropoietin therapy, iron sucrose should be administered as a 0.5 mg/kg dose (less than 100 mg per dose) every four weeks for 12 weeks.

Conclusion

Both Canada and the United States offer a range of IV iron products to address iron deficiency anemia. While some products are available in both countries, others are region-specific. Clinicians should consider the patient's specific medical needs, the available products, and regulatory approvals when selecting an appropriate IV iron therapy.

References

1. Centers for Disease Control and Prevention. Bleeding Disorders in Women. About Heavy Menstrual Bleeding. Published in 2024. Accessed November 6, 2024. https://www.cdc.gov/female-blood-disorders/about/heavy-menstrual-bleeding.html
2. Cho BC, Serini J, Zorrilla-Vaca A, et al. Impact of preoperative erythropoietin on allogeneic blood transfusions in surgical patients: results from a systematic review and meta-analysis. *Anesth Analg.* 2019;128(5):981-992. doi:10.1213/ANE.0000000000004005
3. Kaunitz AM. Abnormal uterine bleeding in reproductive-age women. *JAMA.* 2019;321(21):2126-2127.
4. Kei T, Mistry N, Curley G, et al. Efficacy and safety of erythropoietin and iron therapy to reduce red blood cell transfusion in surgical patients: a systematic review and meta-analysis. *Can J Anesth.* 2019;66(6):716-731. doi:10.1007/s12630-019-01351-6
5. Krule A, Abraham K, Dulce D, Cuellar-Puri S, Salahudeen AA, Chaudhry A. Evaluating anemia-related morbidity in premenopausal female minority and disadvantaged populations. *Blood.* 2022;140(Suppl 1):5114-5115. doi:10.1182/blood-2022-157807
6. Lim W, et al. Canadian expert consensus: management of hypersensitivity reactions to IV iron in adults. Vox Sanguinis 2019. May;114(4):363-373
7. Office of Dietary Supplements. Iron – Health Professional Fact Sheet. Accessed February 10, 2025. https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/
8. Shander A, Corwin HL, Meier J, et al. Recommendations from the International Consensus Conference on Anemia Management in Surgical Patients (ICCAMS). *Ann Surg.* 2023;277(4):581-590. doi:10.1097/SLA.0000000000005721
9. Van Remoortel H, Laermans J, Avau B, et al. Effectiveness of iron supplementation with or without erythropoiesis-stimulating agents on red blood cell utilization in patients with preoperative anaemia undergoing elective surgery: a systematic review and meta-analysis. *Transfus Med Rev.* 2021;35(2):103-124. doi: 10.1016/j.tmrv.2021.03.004
10. World Health Organization. Daily iron and folic acid supplementation during pregnancy. Accessed February 10, 2025. https://www.who.int/tools/elena/interventions/daily-iron-pregnancy
11. CADTH. Environmental Scan- International Policies on Parental Iron. Accessed June 24, 2025. https://www.cda-amc.ca/sites/default/files/es/es0338_international-policies-on-parental-iron-es.pdf
12. NLM Daily Med. INFED- iron dextran injection. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=94b01b1e-794b-4bea-8e24-2e54683fc023
13. NLM Daily Med. VENOFER- IRON SUCROSE Injection, Solution. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=c59cb54c-bee5-96d6-e053-2995a90a767c
14. Pharmascience Inc. pms- IRON SUCROSE Product Monograph. Accessed June 24, 2025. https://www.pharmascience.com/wp-content/uploads/2023/07/pms-IRON-SUCROSE-pm-en-2023-09-12-274654-1.pdf

15. NLM Daily Med. FERRLECIT- Sodium Ferric Gluconate Complex Injection. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=1fe028ff-42ac-4329-b1a5-a9dadfcb79f6
16. Sanofi-Aventis Canada Inc. FERRLECIT Product Monograph. Accessed June 24, 2025. https://pdf.hres.ca/dpd_pm/00054289.PDF
17. NLM Daily Med. FERAHEME- Ferumoxytol Injection. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=32b0e320-a739-11dc-a704-0002a5d5c51b
18. AMAG Pharmaceuticals, Inc. FERAHEME Product Monograph. Accessed June 24, 2025. https://pdf.hres.ca/dpd_pm/00031146.PDF
19. NLM Daily Med. INJECTAFER- Ferric Carboxymaltose Injection. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=517b4a19-45b3-4286-9f6a-ced4e10447de
20. Vifor Inc. FERINJECT Product Monograph. Accessed June 24, 2025. https://pdf.hres.ca/dpd_pm/00074900.PDF
21. NLM Daily Med. MONOFERRIC- Ferric Derisomaltose Injection. Accessed June 24, 2025. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=55859d2d-0456-4fa9-b41f-f535accc97db
22. Pfizer Canada. MONOFERRIC Product Monograph https://www.pfizer.ca/en/our-products/monoferric-iron-isomaltoside
23. Management of Iron Infusion Reactions; JHOP - December 2023 Vol 13, No 6 - Symptom Management Overview; Raluca Laza, PharmD; Meredith Keisler, PharmD, BCOP; Victoria Handy, PharmD, BCOP; Andrea Dickens, PharmD, BCOP

Disclaimer