Iron-Deficiency Anemia and Heart Failure

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Objectives

1. Describe the impact of iron deficiency anemia on the heart failure patient

2. Identify treatment options for heart failure patients with iron deficiency anemia

3. Describe ordering/coverage for IV iron
Conflict of Interest

- None to disclose
■ 75 y/o, 70-kg man with a 2 year history of HFrEF (EF 25%), NYHA class III, and a history of one hospitalization in the past 6 months presents for a regular f/u visit

■ Current meds: carvedilol, furosemide, potassium chloride, losartan, aspirin, spironolactone, citalopram, acetaminophen, zolpidem, and vit D

■ Routine labs are checked
  ✓ SCr 1.4 mg/dL, calculated CrCl = 45 mL/min
  ✓ K+ 4.5 mmol/L
  ✓ Hb 10.5 g/dL
  ✓ Low MCV
  ✓ Ferritin 150 ng/mL
  ✓ Tsat 14%
Iron: an Important Micronutrient

Figure 2. Jankowska EA, et al. Eur Heart J. 2013 Mar 14; 34(11): 816–829
Iron-Deficiency: Epidemiology in HF

- Iron deficiency occurs in > 1/3 of patients with HF
  - Common cause of anemia
  - More likely to occur in women vs men
  - Prevalence increases with HF disease severity

- 2 types of iron deficiency
  - Absolute: depleted iron stores, with intact iron homoeostasis mechanisms
    - Common causes: low-dietary intake, impaired GI absorption, GI blood loss, menorrhagia
  - Functional: normal or high iron body stores, but iron is trapped inside cells of the reticuloendothelial system and is unavailable for cellular metabolism

Iron-Deficiency: Pathophysiology in HF

Renal dysfunction, neurohormonal and proinflammatory cytokine activation

Inappropriate erythropoietin production and defective iron utilization, leading to ↓ intestinal iron absorption and accumulation within the reticuloendothelial stores

Hemodynamic responses to hypoxia: vasodilation-mediated high-output state with neurohormonal activation—to increase oxygen transport

Effects of Iron-Deficiency in HF: Adverse Outcomes

Figure 1. Jankowska EA et al. Eur Heart J. 2013 Mar;34(11):816-29
Mortality with Iron-Deficiency (ID) in HF

Figure 5. Jankowska EA, et al. Eur Heart J. 2013 Mar;34(11):816-29
Iron-Deficiency Anemia: Symptoms

- Fatigue
- Exercise intolerance
- Exertional dyspnea
- Chest pain
- Weakness
- Headache
- Irritability
- Vertigo
Iron-Deficiency Anemia: Diagnosis

✓ CBC
  ▪ Low Hemoglobin (Hb) <13 g/dL (men) or <12 g/dL (women)
  ▪ May have low mean corpuscular volume (MCV) or mean corpuscular hemoglobin (MCH)

✓ Serum ferritin
  ▪ May be low (<100 ng/mL = absolute iron deficiency)
  ▪ May be normal (100-300 ng/mL = functional iron deficiency)

✓ Iron binding panel = transferrin, % transferrin saturation (Tsat), total iron binding capacity (TIBC), unsaturated iron binding capacity (UIBC)
  ▪ Tsat <20% accompanied by normal ferritin = functional iron deficiency

✓ May also want to consider ordering serum vitamin B12

Iron Absorption

- Iron is absorbed in the upper GI tract
  - Duodenum is the site of maximal absorption

- Mucosal cells are responsible for iron absorption, and older adults with certain conditions may ↓ absorption
  - Celiac disease, atrophic gastritis, *H. pylori* infection, and previous bariatric surgery
## Clinical Investigation of Iron Replacement

<table>
<thead>
<tr>
<th>TRIAL</th>
<th>INCLUSION CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>JACC&lt;sup&gt;1&lt;/sup&gt; 2006</td>
<td>Hb ≤12 g/dL, NYHA II-III</td>
</tr>
<tr>
<td>FERRIC-HF&lt;sup&gt;2&lt;/sup&gt; 2008</td>
<td>Ferritin &lt;100 ng/mL or 100-300ng/mL w/ TSat &lt;20%; Hb ≤ 14.5 g/dL; NYHA II-III; LVEF ≤45%</td>
</tr>
<tr>
<td>J NEPHROL&lt;sup&gt;3&lt;/sup&gt; 2008</td>
<td>Hb &lt;11 g/dL, NYHA III-IV</td>
</tr>
<tr>
<td>FAIR-HF&lt;sup&gt;4&lt;/sup&gt; 2009</td>
<td>Ferritin &lt;100 ng/mL or 101-299ng/mL w/ TSat &lt;20%; Hb 9.5-13.5g/dL NYHA II-III, HFrEF with LVEF≤40-45%</td>
</tr>
<tr>
<td>IRON-HF&lt;sup&gt;5&lt;/sup&gt; 2013</td>
<td>Ferritin &lt;500 ng/mL and TSat &lt;20%; Hb 9-12 g/dL; Hb 9-15 g/dL; NYHA II-III, III), LVEF&lt;40%</td>
</tr>
<tr>
<td>CONFIRM-HF&lt;sup&gt;6&lt;/sup&gt; 2015</td>
<td>Ferritin &lt;100 ng/mL or 100-300ng/mL w/ TSat &lt;20%; Hb &lt;15 g/dL; Symptomatic HFrEF with LVEF≤45%, NYHA II-III, and high BNP</td>
</tr>
<tr>
<td>IRONOUT-HF&lt;sup&gt;7&lt;/sup&gt; 2017</td>
<td>Ferritin &lt;100 ng/mL or 101-299ng/mL w/ TSat &lt;20%; NYHA II-III, LVEF ≤40%</td>
</tr>
<tr>
<td>EFFECT-HF&lt;sup&gt;8&lt;/sup&gt; 2017</td>
<td>Ferritin &lt;100 ng/mL or 100-300ng/mL w/TSat &lt;20%; Hb &lt;15 g/dL; NYHA II-III, HFrEF with LVEF≤45%; VO_{2} max 10-20 mL/kg/min</td>
</tr>
</tbody>
</table>

# Clinical Investigation of Iron Replacement

<table>
<thead>
<tr>
<th>TRIAL</th>
<th>N</th>
<th>DRUG REGIMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>JACC¹ 2006</td>
<td>16</td>
<td>IV IS 200mg x 3-5 doses over 17 days</td>
</tr>
<tr>
<td>FERRIC-HF² 2008</td>
<td>35</td>
<td>IV IS 200 mg/wk until ferritin &gt;500, then Qmo; or no treatment</td>
</tr>
<tr>
<td>J NEPHROL³ 2008</td>
<td>32</td>
<td>IV IS 100mg TIW x 3wks, then weekly x 23wks</td>
</tr>
<tr>
<td>FAIR-HF⁴ 2009</td>
<td>459</td>
<td>IV FCM 200mg weekly, then Qmo starting at wk 8 or 12; or placebo Used Ganzoni formula⁹</td>
</tr>
<tr>
<td>IRON-HF⁵ 2013</td>
<td>23</td>
<td>IV IS 200 mg/wk x 5 wks or FeSO₄ 200mg TID X 8wks or placebo</td>
</tr>
<tr>
<td>CONFIRM-HF⁶ 2015</td>
<td>304</td>
<td>IV FCM 500-1000 mg based on weight/Hb at weeks 0, 6; 500mg at wks 12, 24, and 36 depending upon Tsat and ferritin or placebo</td>
</tr>
<tr>
<td>IRONOUT-HF⁷ 2017</td>
<td>225</td>
<td>Oral iron polysaccharide 150mg BID or placebo</td>
</tr>
<tr>
<td>EFFECT-HF⁸ 2017</td>
<td>174</td>
<td>IV FCM 500-1000 mg based on weight/Hb at weeks 0, 6 and 12; or placebo ± oral iron</td>
</tr>
</tbody>
</table>

IV IS = IV Iron sucrose = Venofer®; IV FCM = Ferric carboxymaltose = Injectafer®

<table>
<thead>
<tr>
<th>TRIAL</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>JACC&lt;sup&gt;1&lt;/sup&gt; 2006</td>
<td>• ↑ Hb (11.2 to 12.6), ↑ ferritin (87 to 217), ↑ Tsat (16 to 25%)</td>
</tr>
<tr>
<td>• 12-wk f/u</td>
<td>• Improved functional class, improved 6MW distance, no effect on EF</td>
</tr>
<tr>
<td>FERRIC-HF&lt;sup&gt;2&lt;/sup&gt; 2008</td>
<td>• ↑ Hb (by 0.1), ↑ ferritin (by 273), ↑ Tsat (by 11)</td>
</tr>
<tr>
<td>• 16-wk f/u</td>
<td>• Improved exercise capacity, improved symptoms; effects ↑ if anemic</td>
</tr>
<tr>
<td>• Mean dose: 1433mg</td>
<td></td>
</tr>
<tr>
<td>J NEPHROL&lt;sup&gt;3&lt;/sup&gt; 2008</td>
<td>• ↑ Hb (by 3), ↑ ferritin (by 40), ↑ Tsat (by 13-18)</td>
</tr>
<tr>
<td>• 26 wk f/u</td>
<td>• Improved functional class from III to II and improved cardiac defects</td>
</tr>
<tr>
<td>• Mean dose: 3200mg</td>
<td>and LVEF in class III patients; less robust response in class IV patients</td>
</tr>
<tr>
<td>FAIR-HF&lt;sup&gt;4&lt;/sup&gt; 2009</td>
<td>• Significant improvement in patient global assessment (50%</td>
</tr>
<tr>
<td>• 24 wk f/u</td>
<td>much/moderately improved vs 28%, OR 2.51)</td>
</tr>
<tr>
<td>• Median dose ≈ 2000 mg</td>
<td>• Significant improvement in functional class (47% class I or II vs 30%</td>
</tr>
<tr>
<td></td>
<td>at wk-24, OR 2.40) and significant improvement in 6MW test and QOL</td>
</tr>
<tr>
<td></td>
<td>• Results similar in patients with anemia/no anemia</td>
</tr>
<tr>
<td></td>
<td>• No difference in death or adverse events</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRIAL</th>
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</tr>
</thead>
</table>
| **IRON-HF\(^5\) 2013** | • No diff in Hb between oral/IV iron, ↑ ferritin in oral & IV iron (only significant w/oral iron), Tsat ↑ significantly in IV compared to placebo  
                          • VO\(_2\)max increased in IV iron group but not oral iron group                                                                                                                                             |
| **CONFIRM-HF\(^6\) 2015** | • Significant improvement in 6MW, NYHA class, PGA, QOL & fatigue starting at week 24—consistent amongst all subgroups through wk52  
                          • Significant reduction in hospitalization for worsening HF (HR 0.39) and trend for reduction in hosp due to any CV reason (HR 0.63)  
                          • No difference in deaths or adverse event                                                                                                                                                               |
| **IRONOUT-HF\(^7\) 2017** | • Significant ↑ Tsat (2 pts); Nonsig ↑ ferritin (18 pts)  
                          • No difference in change in VO\(_2\) max  
                          • No difference in 6MW distance, NT-proBNP levels or KCCQ QOL score                                                                                                                                 |
| **EFFECT-HF\(^8\) 2017** | • ↑ Hb (by 0.74), ↑ ferritin (by 189), ↑ Tsat (by 5)  
                          • Significant improvement in VO\(_2\)max with or without anemia  
                          • Significantly improved functional class & patient global assessment                                                                                                                                 |

Meta-Analysis: IV Iron for Patients with HFrEF and Iron Deficiency

Meta-Analysis: IV Iron for Patients with HFrEF and Iron Deficiency

Cardiovascular death or hospitalization for worsening HF

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental Events</th>
<th>Control Events</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anker et al. 2009</td>
<td>11</td>
<td>13</td>
<td>0.41 [0.18; 0.93]</td>
<td>34.3%</td>
<td></td>
</tr>
<tr>
<td>Ponikowski et al. 2015</td>
<td>19</td>
<td>42</td>
<td>0.38 [0.21; 0.68]</td>
<td>65.7%</td>
<td></td>
</tr>
</tbody>
</table>

Random effects model: 455 (Q = 0.02)

Z = -3.8443, P = 0.0001

HF hospitalization

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental Events</th>
<th>Control Events</th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toblli et al. 2007</td>
<td>0</td>
<td>5</td>
<td>0.07 [0.00; 1.34]</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td>Okonko et al. 2008</td>
<td>1</td>
<td>2</td>
<td>0.20 [0.02; 2.43]</td>
<td>5.2%</td>
<td></td>
</tr>
<tr>
<td>Anker et al. 2009</td>
<td>7</td>
<td>9</td>
<td>0.38 [0.14; 1.04]</td>
<td>32.5%</td>
<td></td>
</tr>
<tr>
<td>Ponikowski et al. 2015</td>
<td>10</td>
<td>32</td>
<td>0.27 [0.13; 0.56]</td>
<td>58.5%</td>
<td></td>
</tr>
</tbody>
</table>

Random effects model: 499 (Q = 1.3)

Z = -4.3563, P < 0.0001

Effects of intravenous iron therapy on outcomes in patients with systolic heart failure (HF) and iron deficiency. CI, confidence interval.
Meta-Analysis: IV Iron for Patients with HFrEF and Iron Deficiency

6MWT distance

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental Total Mean</th>
<th>Control Total Mean</th>
<th>Mean difference</th>
<th>MD</th>
<th>95% CI W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Anker et al. 2009</td>
<td>268 38.6 75.38</td>
<td>134 10.2 66.67</td>
<td>134 10.2 66.67</td>
<td>28.40</td>
<td>[13.95; 42.85]</td>
</tr>
<tr>
<td>5. Ponikowski et al. 2015</td>
<td>126 16.6 98.04</td>
<td>121 -21.8 106.50</td>
<td>121 -21.8 106.50</td>
<td>38.40</td>
<td>[12.80; 64.00]</td>
</tr>
</tbody>
</table>

Random effects model: Q = 0.44

NYHA class

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental Total Mean</th>
<th>Control Total Mean</th>
<th>Mean difference</th>
<th>MD</th>
<th>95% CI W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Toblli et al. 2007</td>
<td>20 -0.900 0.7000</td>
<td>20 0.400 0.0000</td>
<td>20 0.400 0.0000</td>
<td>-1.30</td>
<td>[-1.77; -0.83]</td>
</tr>
<tr>
<td>2. Okonko et al. 2008</td>
<td>20 -0.400 0.6000</td>
<td>10 0.200 0.4000</td>
<td>10 0.200 0.4000</td>
<td>-0.60</td>
<td>[-0.96; -0.24]</td>
</tr>
<tr>
<td>3. Anker et al. 2009</td>
<td>294 -0.306 0.6672</td>
<td>150 -0.053 0.5661</td>
<td>150 -0.053 0.5661</td>
<td>-0.25</td>
<td>[-0.37; -0.13]</td>
</tr>
<tr>
<td>5. Ponikowski et al. 2015</td>
<td>127 0.047 0.8996</td>
<td>121 0.322 0.8861</td>
<td>121 0.322 0.8861</td>
<td>-0.29</td>
<td>[-0.49; -0.09]</td>
</tr>
</tbody>
</table>

Random effects model: Q = 0.44

LVEF

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental Total Mean</th>
<th>Control Total Mean</th>
<th>Mean difference</th>
<th>MD</th>
<th>95% CI W(random)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Toblli et al. 2007</td>
<td>20 -4.4 16</td>
<td>20 2.9 10</td>
<td>20 2.9 10</td>
<td>-6.4</td>
<td>[-9.32; -3.48]</td>
</tr>
<tr>
<td>2. Okonko et al. 2008</td>
<td>20 2.0 5</td>
<td>10 1.5 10</td>
<td>10 1.5 10</td>
<td>1.0</td>
<td>[-2.80; 4.80]</td>
</tr>
</tbody>
</table>

Random effects model: Q = 9.17

Meta-Analysis: IV Iron for Patients with HFrEF and Iron Deficiency

EQ-5D score

3. Anker et al. 2009
5. Ponikowski et al. 2015

KCCQ score

3. Anker et al. 2009
5. Ponikowski et al. 2015

Meta-Analysis: IV Iron for Patients with HFrEF and Iron Deficiency

**PGA**

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental</th>
<th>Control</th>
<th>Mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Mean</td>
<td>SD Total Mean</td>
<td>95%-CI W(random)</td>
</tr>
<tr>
<td>2. Okonko et al. 2008</td>
<td>20 1.50 1.20</td>
<td>10 -0.20 1.60</td>
<td>1.70 [0.58; 2.82]</td>
</tr>
<tr>
<td>3. Anker et al. 2009</td>
<td>292 1.31 1.32</td>
<td>149 0.68 1.48</td>
<td>0.63 [0.35; 0.91]</td>
</tr>
<tr>
<td>5. Ponikowski et al. 2015</td>
<td>127 0.46 1.85</td>
<td>119 -0.06 1.80</td>
<td>0.52 [0.06; 0.98]</td>
</tr>
</tbody>
</table>

Random effects model: 439 vs. 278
Heterogeneity: I-squared=45.8%, tau-squared=0.0539, p=0.01579
Q = 3.69

**MLHFQ score**

<table>
<thead>
<tr>
<th>Study</th>
<th>Experimental</th>
<th>Control</th>
<th>Mean difference</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Total Mean</td>
<td>SD Total Mean</td>
<td>95%-CI W(random)</td>
</tr>
<tr>
<td>1. Toblli et al. 2007</td>
<td>20 -19 6</td>
<td>20 1 7</td>
<td>-20.00 [-24.04; -15.96]</td>
</tr>
<tr>
<td>2. Okonko et al. 2008</td>
<td>20 -10 18</td>
<td>10 3 19</td>
<td>-13.00 [-15.17; 1.17]</td>
</tr>
</tbody>
</table>

Random effects model: 40 vs. 30
Heterogeneity: I-squared=0%, tau-squared=0, p=0.3519
Q = 0.87

z = 3.5223 P=0.0004

z = -9.8253 P<0.0001

2016 European Society of Cardiology Guidelines

- Based upon FAIR-HF and CONFIRM-HF
- Intravenous ferrous carboxymaltose (FCM)
  - Improve self-reported global assessment
  - Improve QOL
  - Improve NYHA class
  - Improve exercise capacity
  - Reduce HF hospitalizations

Recommendations for the treatment of other co-morbidities in patients with heart failure

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron deficiency</td>
<td>IIa</td>
<td>A</td>
<td>469, 470</td>
</tr>
</tbody>
</table>

FCM = ferric carboxymaltose; HF = heart failure; HFrEF = heart failure with reduced ejection fraction.

Class: a
Level: b
Ref: c

Treatments not recommended for other co-morbidities in patients with heart failure.

Eur Heart J (2016) 37 (27): 2129-2200
### Routine evaluation of HF patients should include evaluation for anemia

- In patients with HF and anemia, erythropoietin-stimulating agents should not be used to improve morbidity/mortality

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**2017 AHA/ACC Guideline Recommendations**

<table>
<thead>
<tr>
<th>Recommendations for Anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COR</strong></td>
</tr>
<tr>
<td>IIb</td>
</tr>
</tbody>
</table>

See Online Data Supplement D.

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[http://circ.ahajournals.org/content/early/2017/04/26/CIR.0000000000000509](http://circ.ahajournals.org/content/early/2017/04/26/CIR.0000000000000509)
Future Directions

- **FAIR-HF2**: Germany, Hungary and Spain
  - IV ferric carboxymaltose vs placebo in patients with HFrEF and iron deficiency
  - Major outcomes at 12 months: HF hosp, CV hosp and CV death
  - Funded by German University

- **AFFIRM-AHF**: Italy, Netherlands, Poland, UK
  - IV ferric carboxymaltose vs placebo in patients with acute HF and iron deficiency
  - Major outcomes at 12 months: HF hosp, CV death, CV hosp, all-cause mortality, functional outcomes
  - Funded by manufacturer, Vifor Inc.

- Long term safety with IV iron in patients with heart failure unknown
- Effects of IV iron in patients with HFpEF unknown

Patient Case

- 75 y/o, 70-kg man with a 2 year history of HFrEF (EF 25%), NYHA class III, and a history of one hospitalization in the past 6 months presents for a regular f/u visit

- Current meds: carvedilol, furosemide, potassium chloride, losartan, aspirin, spironolactone, citalopram, acetaminophen, zolpidem, and vit D

- Routine labs are checked
  - SCr 1.4 mg/dL, calculated CrCl = 45 mL/min
  - K+ 4.5 mmol/L
  - Hb 10.5 g/dL
  - Low MCV
  - Ferritin 150 ng/mL
  - Tsat 14%

- Should this patient be treated with oral iron?
- Should this patient be treated with IV iron?
Patient Case: IV Ferric Carboxymaltose

- FDA approved for iron-deficiency anemia in adults with NDD-CKD or those who have intolerance to oral iron or have had an unsatisfactory response to oral iron
  - Dose: FDA approved 750mg weekly X 2 doses if >50 kg
  - ? re-dosing like in clinical studies to maintain ferritin/Tsat
  - IV infusion over at least 15 min or slow IV push over at least 7.5 min
    - Some clinical trials gave over 1 min
  - Monitor for hypersensitivity and increases in BP for 30 min after administration
  - Adverse effects: nausea (7%, all others <5%), HTN, HA, dizziness, vomiting
  - Cost: ≈$1200 per 750 mg/15 mL single-use vial
  - Insurance coverage: likely covered by Medicare Part B and commercial plans, possibly with PA, Medicaid may/may not cover
**Ganzoni Formula**

- Ganzoni Formula: Total body iron deficit/cumulative iron dose (mg) = body weight* (kg) x (target Hb – actual Hb in g/L) x 0.24** + iron depot (mg)***

  * Use ideal body weight in overweight patients. If underweight, use actual body weight.

  ** The factor 0.24 = 0.0034 x 0.07 x 1,000
  For this calculation the iron content of hemoglobin = 0.34%, blood volume = 7% of the bodyweight, and 1,000 is the conversion from g to mg.

  ***Iron depot: <35 kg body weight: iron depot = 15 mg/kg body weight; ≥35 kg body weight: iron depot = 500 mg

For example a 70 kg female with Hb 80 g/L has an iron deficit of: 70 x (150 – 80) x 0.24 + 500 = 1676 mg i.e. approx. 1700 mg

Example order for IV Iron—in EPIC

1. Select the ambulatory referral order set

2. Fill out the following referral order for Injectafer. Be sure to pick the dose that matches your patient's body weight as there are two options for dosing.

3. Select how frequently you would like lab testing. The referral order will only allow you to select one time-frame per lab order. The **CBC, ferritin, transferrin, and hemoglobin/hematocrit** should be checked one month after receiving Injectafer. Once the 2 doses of Injectafer have been given, all lab tests associated with the order set will also be discontinued. Further or additional lab monitoring will need to be ordered separately.

4. Keep the auto-checked boxes as is (e.g. Yes is checked for nurse monitoring for infusion reactions, etc).

5. Make sure to **add the diagnosis code (D50.9 iron deficiency anemia)** by clicking on the order-entry link. There also needs to be documentation in your clinical notes related to the order of why the patient needs IV versus oral iron therapy.
Example order for IV Iron—in EPIC

Ambulatory Referral for Injectafer
Example order for IV Iron—in EPIC

<table>
<thead>
<tr>
<th>LAB TEST - CBC w/AUTO DIFF:</th>
<th>Once - 1st Visit</th>
<th>Every Visit</th>
<th>Every Other Visit</th>
<th>Weekly</th>
<th>Every 2 Weeks</th>
<th>Monthly</th>
<th>Other</th>
<th>Please specify in COMMENTS</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAB TEST - FERRITIN:</td>
<td>Once - 1st Visit</td>
<td>Every Visit</td>
<td>Every Other Visit</td>
<td>Weekly</td>
<td>Every 2 Weeks</td>
<td>Monthly</td>
<td>Other</td>
<td>Please specify in COMMENTS</td>
<td>NA</td>
</tr>
<tr>
<td>LAB TEST - TRANSFERRIN:</td>
<td>Once - 1st Visit</td>
<td>Every Visit</td>
<td>Every Other Visit</td>
<td>Weekly</td>
<td>Every 2 Weeks</td>
<td>Monthly</td>
<td>Other</td>
<td>Please specify in COMMENTS</td>
<td>NA</td>
</tr>
<tr>
<td>LAB TEST - HEMOGLOBIN / HEMATOCRIT:</td>
<td>Once - 1st Visit</td>
<td>Every Visit</td>
<td>Every Other Visit</td>
<td>Weekly</td>
<td>Every 2 Weeks</td>
<td>Monthly</td>
<td>Other</td>
<td>Please specify in COMMENTS</td>
<td>NA</td>
</tr>
</tbody>
</table>

Dose based upon body weight <>/>
50 kg

Labs to order
Example order for IV Iron—in EPIC

- If infusion reaction, give diphenhydramine IV
- Monitoring of VS
- Monitor s/s hypersensitivity
- IV access/maintenance
Iron-deficiency is common in adults with heart failure, increasing with HF severity

- Independently leads to adverse outcomes

Data and national guidelines support evaluating patients with NYHA class II-III HFrEF for iron deficiency

IV iron replacement is recommended if patient is iron-deficient, regardless if anemic

- Ferric carboxymaltose—recommended by guidelines, less frequent dosing, well tolerated
Questions?
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