EDUCATIONAL OBJECTIVES

After completing this activity, participants will be better able to:

1. Review prevalences and clinical implications of anemia and iron deficiency in patients with heart failure (HF)
2. Compare data for anemia and iron deficiency management approaches in HF patient populations
3. Describe dosage and administration guidelines for intravenous iron to prevent and treat anemia and iron deficiency
4. Determine pharmacists’ roles and responsibilities in the multidisciplinary management of HF and comorbidities such as anemia and iron deficiency

Post-test/Rationale

1. What percentage of the heart failure population has anemia?
   A. 20%
   B. 35%***
   C. 50%
   D. 65%

Correct answer: B

Rationale: Anemia is a common finding in patients with chronic heart failure (HF) and the prevalence of anemia among patients with HF increases with HF severity. Between 25% and 40% of patients with HF have anemia, which is defined as a hemoglobin concentration less than 13 g/dL in men and less than 12 g/dL in women.

2. What percentage of the heart failure population without anemia has iron deficiency?
   A. 10%
   B. 20%
   C. 30%
   D. 40%***

Correct answer: D

Rationale: Iron deficiency can be defined as having either a serum ferritin of less than 100 µg/L or a serum ferritin of 100 to 300 µg/L along with a transferrin saturation of less than 20%. According to this definition, approximately 60% of patients with anemia and 40% of patients without anemia have iron deficiency.
3. In observational studies, which of the following consequences were experienced by both heart failure (HF) patients with anemia and HF patients with iron deficiency?

   A. Increased mortality and reduced quality of life (QOL)***
   B. Reduced QOL and reduced renal function
   C. Reduced renal function and mortality
   D. There are no adverse consequences of anemia or iron deficiency that are shared

   Correct answer: A

   Rationale: In observational studies, patients with HF and anemia have been shown to have worse QOL and functional capacity and more frequent hospitalizations than patients with HF but without anemia. In a large observational study of 150,000 patients, the mortality risk was approximately doubled in HF patients with anemia compared to those without anemia, and this risk persisted after controlling for other confounders, including renal dysfunction and HF severity. In a pooled observational analysis of 1,506 patients with HF, iron deficiency was significantly related to mortality and impaired health-related QOL.

4. What does the literature suggest about the use of erythropoietin-stimulating agents in heart failure patients to increase hemoglobin concentrations above 13 g/dL?

   A. It enhances quality of life but may have negative effects on embolic and thrombotic events***
   B. It increases overall mortality
   C. It reduces the occurrence of embolic and thrombotic events and reduces quality of life
   D. It decreases overall mortality

   Correct answer: A

   Rationale: In a study of the use of an erythropoietin-stimulating agents to increase hemoglobin concentration to 13 g/dL, the risk of embolic and thrombotic events was significantly higher in a groups of patients receiving darbepoetin-alfa than in patients receiving placebo, including a significant increase in ischemic strokes and 3 concerning trends in the risks of unstable angina, any stroke, and pulmonary embolism.

5. Which of the following 2 iron products evaluated in a meta-analysis of clinical trials improved New York Heart Association functional class, 6-minute walk distances, and quality of life and reduced hospitalizations?

   A. Iron sucrose, iron gluconate
   B. Iron gluconate, ferric carboxymaltose
   C. Ferric carboxymaltose, iron sucrose***
   D. Ferrous sulfate, ferric carboxymaltose
Correct answer: C
Rationale: In a meta-analysis of iron supplementation, intravenous (IV) iron preparations, including iron sucrose and ferric carboxymaltose, were used, with total iron doses between 1000 and 2000 mg. There were fewer hospitalizations and greater improvements in the 6-minute walking distance test and New York Heart Association classification in the IV iron-treated patients than in those given control therapy.

6. When iron and erythropoietin-stimulating agents (ESAs) are used together in heart failure patients with iron deficiency but without severe anemia, what are the effects on hemoglobin (Hb) concentrations?

A. Iron and ESAs together achieve significantly better improvements in Hb concentrations than either agent alone
B. Iron and ESAs together achieve Hb improvements that are similar to either agent alone***
C. Iron and ESAs together achieve Hb improvements that are worse than either agent alone
D. Iron and ESAs have not been evaluated together in any studies

Correct answer B
Rationale: In an observational study, the impact of intravenous (IV) iron alone in improving anemia in patients with heart failure and renal dysfunction was explored. The Hb level increased in the group of patients receiving only iron and in the group of patients receiving combination therapy; the net ferritin increase from baseline was significantly greater in patients receiving IV iron alone. This suggests that iron is cleared faster with concomitant ESA use without dramatically different results in Hb improvements.

7. Which of the following iron supplementation regimens have NOT been shown to improve heart failure outcomes?

A. Ferric carboxymaltose 200 mg weekly for 5 weeks
B. Iron sucrose 200 mg weekly for 5 weeks
C. Ferric carboxymaltose 500 to 1000 mg every 6 weeks for 2 doses
D. Iron sucrose 500 to 1000 mg every 6 weeks for 2 doses***

Correct answer: D
Rationale: Several IV iron regimens have evidence-based benefits, and each has advantages and disadvantages: ferric carboxymaltose 200 mg weekly, ferric carboxymaltose 500 to 1000 mg every 6 weeks, and iron sucrose 200 mg weekly for 5 weeks.

8. Which of the following adverse events can rarely occur in patients within 30 minutes of administration of intravenous iron, necessitating at least 30 minutes of clinician monitoring after administration?

A. Hypotension, unconsciousness, and shock***
B. Hypertension, stroke, and death
C. Bradycardia, angioedema, and deep venous thrombosis
D. Tachycardia, pulmonary embolism, and diplopia

Correct answer: A

Rationale: Intravenous (IV) iron supplementation can predispose some patients to acute adverse events, but this can be minimized by monitoring patients for at least 30 minutes after the drug is administered, checking the iron indices at the appropriate times to see if repletion has occurred, not over-diluting the product and administering it by slow IV push or infusion using normal saline, and by assessing and treating chronic adverse events that arise. Possible adverse events vary according to the IV product administered but can include: nausea, diarrhea, vomiting, dizziness, hypertension or hypotension, injection site discoloration, headache, skin flushing, pruritis, blood phosphorous decrease, nasopharyngitis, sinusitis, upper respiratory tract infections, cough, chest pain, shock, collapse, and unconsciousness.

9. Which one of the following is NOT a commonly reported chronic adverse effect of intravenous iron?
   A. Vomiting
   B. Dizziness
   C. Nystagmus***
   D. Headache

Correct answer: C

Rationale: Possible adverse events vary according to the IV product administered but can include: nausea, diarrhea, vomiting, dizziness, hypertension or hypotension, injection site discoloration, headache, skin flushing, pruritis, blood phosphorous decrease, nasopharyngitis, sinusitis, upper respiratory tract infections, cough, chest pain, shock, collapse, and unconsciousness.

10. Pharmacists play important roles in detecting iron deficiency and counseling about appropriate supplementation. Which of the following is NOT an example of an activity in which pharmacists should engage to enhance patient care?
   A. Pharmacists in the community can discuss the impact of iron deficiency and anemia with their patients who have heart failure (HF), which improves patients’ chances of being screened and treated
   B. Pharmacists in the hospital can design protocols to guide when iron supplementation should be given and how it should be administered
   C. Pharmacists in the hospital can perform drug use evaluations to ensure that the iron deficiency in HF protocol is being followed for quality assurance
   D. Pharmacists should be the primary clinicians diagnosing iron deficiency and injecting intravenous iron products***
Correct answer: D

Rationale: There are many ways that pharmacists can provide value in the area of iron supplementation and enhance patient care. Health system pharmacists can assess intravenous iron products for formulary review, design protocols for their safe use, and conduct drug use evaluations to ensure that important treatment and safety principles are being followed. Clinical pharmacists in hospitals and HF clinics can screen patients to see if iron therapy is appropriate and ensure that therapy is initiated, administered, and monitored correctly. Pharmacists in all practice settings can counsel patients about the risks and consequences of iron deficiency and anemia, the rationale for screening and treatment, the need for proper compliance in order to derive those benefits, and possible adverse events.