Anemia Case Study

Patient Profile

D.G., a 72-year-old man whose wife died 6 months ago, is brought to the health care provider by his daughter because he is not eating much and has been lethargic and sleeping a lot. He has a history of hyperlipidemia for which he takes niacin–lovastatin 500/20 mg PO daily at bedtime.

Subjective Data

- Has been unusually tired for the past couple of months
- Is frequently short of breath and sometimes feels like his "heart is pounding"
- Has lost weight because his wife always used to cook for him, and he doesn't cook for himself
- Describes a typical daily meal as coffee and a donut for breakfast, a hot dog and lemonade for lunch, and a jelly sandwich on white bread and coffee for supper

Objective Data

Physical Examination

- Blood pressure 118/72, pulse 98, temperature 98.2°F, respirations 16
- Oxygen saturation 92% on room air
- Height 5'6", weight 135 lb, BMI 21.7 kg/m^2
- S1 and S2 auscultated and regular
- Bilateral radial pulses +3 and regular
- Lungs clear bilaterally

Diagnostic Studies

- RBC 3,300,000/µL
- Hemoglobin 8.3 g/dL
- Hematocrit 24%
- MCV 73 fL
- MCH 23 pg
- WBC 9100/µL
- Platelets 250,000/µL
- Iron 28 mcg/dL
- Ferritin 14 ng/mL
- Cobalamin 600 pg/mL
- Folate 10 ng/mL

Discussion Questions

1. Interpret D.G.'s laboratory results.
   Answer: D.G.'s red blood cell count is low. The RBCs are small in size (low MCV) and pale in color (low MCH). The hemoglobin and hematocrit count is low, as well as the levels of iron and ferritin. The cobalamin and folate levels are within normal parameters for a man.
   Rationale: Laboratory abnormalities characteristic of iron-deficiency anemia are shown in Table 30.6. Morphologic classification is based on RBC size and color (Table 30.1). In moderate anemia (Hgb 6 to 10 g/dL [60 to 100 g/L]), the above cardiopulmonary symptoms are increased. The patient may have them while resting, as well as with activity. Pallor results from reduced amounts of hemoglobin and reduced blood flow to the skin. Normally RBC production (termed *erythropoiesis*) is in equilibrium with RBC destruction and loss. Three problems with erythropoiesis may occur that decrease RBC production: (1) decreased hemoglobin synthesis may lead to iron-deficiency anemia, thalassemia, and sideroblastic anemia; (2) defective

deoxyribonucleic acid (DNA) synthesis in RBCs (e.g., cobalamin deficiency, folic acid deficiency) may lead to megaloblastic anemias; and (3) diminished availability of erythrocyte precursors may result in aplastic anemia and anemia of chronic disease (Table 30.2).

2. Based on the laboratory data and assessment findings, the health care provider diagnoses D.G. with iron-deficiency anemia. What clinical manifestations of iron deficiency anemia does D.G. have?
   Answer: The clinical manifestations of iron-deficiency anemia that D.G. presented with were fatigue, dyspnea, palpitations, and bounding pulses.
   Rationale: In the early course of iron-deficiency anemia, the patient may not have any symptoms. As the disease becomes chronic, any of the general manifestations of anemia may develop (Table 30.3). In addition, specific clinical manifestations may occur related to iron-deficiency anemia. Pallor is the most common finding. *Glossitis* (inflammation of the tongue) is the second most common. Another finding is *cheilitis* (inflammation of the lips). The patient may report headache, paresthesias, and a burning sensation of the tongue, all of which are caused by lack of iron in the tissues.

3. Explain iron-deficiency anemia and identify the probable cause of D.G.'s anemia.
   Answer: In iron-deficiency anemia, or deficiency in the number of red blood cells, the quantity of hemoglobin and/or the hematocrit, is due to an inadequate amount of iron for the production of red blood cells, or erythrocytes. This can be caused by inadequate dietary intake, malabsorption, blood loss, or hemolysis. Based on the data and D.G.'s typical daily meals, the likely cause of his iron-deficiency anemia is inadequate dietary intake.
   Rationale: Iron-deficiency anemia may develop because of inadequate dietary intake, malabsorption, blood loss, or hemolysis. Normal dietary iron intake is usually enough to meet the needs of men and older women. Dietary and lifestyle changes (described in sections on specific types of anemia) can reverse some anemias.

4. How is iron-deficiency anemia treated?
   Answer: The treatment for iron-deficiency anemia is based on the cause. Because in D.G.'s case, inadequate dietary intake appears to be the cause, instruct him to eat foods that are good sources of iron. If needed, he may be directed to take an iron supplement (either oral or parenteral). For iron-deficiency anemia caused by blood loss, a blood transfusion may be required. For iron-deficiency anemia caused by malabsorption or hemolysis, the underlying disease needs to be treated.
   Rationale: Teach the patient which foods are good sources of iron (Table 30.5). If nutrition is already adequate, increasing iron intake by dietary means may not be enough. Then oral or occasionally parenteral iron supplements are used. If the iron deficiency is from acute blood loss, the patient may need a transfusion of packed RBCs. Oral iron should be used whenever possible because it is inexpensive and convenient. Many iron preparations are available.

5. Identify dietary iron sources to include in D.G.'s teaching.
   Answer: Dietary sources that are high in iron include liver and muscle meats, eggs, dried fruits, legumes, dark green leafy vegetables, whole-grain and enriched bread and cereals, and potatoes.
   Rationale: Teach the patient which foods are good sources of iron (Table 30.5).

6. What are important points to include when teaching patients taking oral iron supplements?

Answer: Some important points to teach patients taking oral iron supplements include:

- The typical daily dosage of iron should provide 150 to 200 mg of elemental iron.
- Iron is best absorbed as an enteric-coated or sustained release capsule. Tablets should be swallowed whole. The patient should remain in an upright or sitting position for up to 30 minutes after taking to help minimize esophageal irritation or corrosion.
- Take iron with at least 8 oz of juice or water but not with antacids or milk and preferably not within 1 hour of meals because these decrease all absorption of the drug. Vitamin C (ascorbic acid) enhances iron absorption. Because oral liquid iron can permanently stain tooth enamel, it should be diluted and ingested through a straw.
- Warn patients that using any iron product will turn the stools from brown to a black, tarry color. Other gastrointestinal (GI) side effects are common, including nausea, heartburn, and diarrhea. To combat constipation, they should increase fluids, activity, and bulk foods in the diet; they may need to take a stool softener or laxative.
- Because certain herbal drugs can decrease absorption of iron and other minerals, have the patient ask the health care provider before taking any herb or over-the-counter agent.

Rationale: Oral iron should be used whenever possible because it is inexpensive and convenient. Many iron preparations are available. When giving iron, consider the following factors:

1. Iron is absorbed best from the duodenum and proximal jejunum. So, enteric-coated or sustained-release capsules, which release iron farther down in the GI tract, are counterproductive and expensive.
2. The daily dose should provide 150 to 200 mg of elemental iron. This can be taken in three or four daily doses, with each tablet or capsule of the iron preparation containing between 50 and 100 mg of iron (e.g., a 325-mg tablet of ferrous sulfate contains 65 mg of elemental iron).
3. Iron is best absorbed in an acidic environment. For this reason and to avoid binding the iron with food, iron should be taken about 1 hour before meals, when the duodenal mucosa is most acidic. Taking iron with vitamin C (ascorbic acid) or orange juice, which contains ascorbic acid, enhances iron absorption. Gastric side effects, however, may necessitate taking iron with meals.
4. Undiluted liquid iron may stain the patient's teeth. Therefore, it should be diluted and drank through a straw.
5. GI side effects may occur, including heartburn, constipation, and diarrhea. Have the patient stay upright for 30 minutes after taking oral forms. If side effects develop, the dose and type of supplement may be adjusted. For example, many people who need supplemental iron cannot tolerate ferrous sulfate because of the effects of the sulfate base. However, ferrous gluconate may be a better substitute. Tell patients that iron preparations will cause their stools to become black because the GI tract excretes excess iron. Constipation is common. The patient should start on stool softeners and laxatives, if needed, when started on iron.

7. What evaluative parameters could you use to determine whether D.G.'s anemia is resolving?
   Answer: D.G.'s laboratory values, including RBC, hemoglobin, hematocrit, MCV, MCH, iron, and ferritin levels, will return to the normal range. He will report less fatigue and dyspnea, fewer episodes of palpitations, and the physical exam will show that the pulses are no longer bounding.
   Rationale: Reassess the hemoglobin and RBC count to evaluate the response to therapy. Emphasize adherence with dietary and drug therapy. To replenish the body's iron stores, the patient needs to take iron therapy for 2 to 3 months after the hemoglobin level returns to

normal. Monitor patients who need lifelong iron supplementation for potential liver problems related to the iron storage.