

## Subclinical Iron Deficiency, Part 4: Testing and Treating

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When a patient's hemoglobin (Hb) and hematocrit (Hct) are not out of range, it is sometimes difficult for them to convince a gatekeeper that they need additional tests to rule out an iron problem. When I suspect an iron deficiency in this type of patient, I'll recommend an iron trial. The test is positive if supplemental iron makes the patient feel better. *Please note:* I do not recommend iron just because a patient is tired. They must have other signs and symptoms [see [Part 3 \(Feb. 12 issue\)](#) for details], and they must have a supportive history including regular iron losses with inadequate iron replacement.

Because too much iron can act as a pro-oxidant, I do not have patients take iron for more than seven days if they do not feel a big difference. Usually, a subtle change is noticed on the third day. By the fourth and fifth days, the change becomes noticeable. When a patient with normal Hb and Hct informs their gatekeeper how much better they feel after a few days of iron, additional tests for iron are almost always approved. When that happens, I tell the patient that even though one week of iron has made them feel better, it is not nearly enough to alter tests that measure iron reserves.

### Testing

Substance	Comments
Hemoglobin	Often within normal ranges until anemia develops.
Hematocrit	Dehydration and high altitude can cause false normal by raising test scores.
Serum iron	Used alone, it isn't an accurate marker because of diurnal variations.
Serum ferritin	The most accurate single test for low iron. Injury, infection and immune problems that promote inflammation can cause a false normal by elevating ferritin. Alcohol can also increase.
TIBC	Total Iron Binding Capacity; the amount of iron that can be bound to serum protein. Positive when high. Oral contraceptives may elevate and cause a false positive.

Transferrin	Concentration is proportional to the amount of iron bound to serum protein; therefore it is another way of expressing TIBC and is high when iron is low.
% transferrin saturation	Serum iron divided by TIBC x 100 = percent of transferrin saturation. Like hemoglobin, this test may not be low until iron deficiency is significant.
<i>Note:</i> Specific numbers were not included because normal ranges vary between labs.	

There is no single test (other than a positive iron trial) that provides gold-standard accuracy for iron deficiency prior to the development of anemia. And since each test measures a different aspect of iron, conflicting results are not uncommon. Table 1 includes the most common tests to evaluate iron levels. Ordering a combination of tests, such as serum iron, ferritin and transferrin, will reduce the chances of a misleading result. These are the three I recommend in cases in which a patient has insurance that allows the DC to order directly and avoid an iron trial. Then, depending on the extent of the deficiency, I will recommend a follow-up test in 8-12 weeks. In those cases in which the second test shows that the problem has been solved, I have males stop taking iron and females take it five days a month beginning on the first day of their period.

Once you start looking for iron problems, you will discover three categories of patients who, with questioning, have diagnosed deficiencies they have not acted on:

1. Patients with low hemoglobin and/or hematocrit on a recent CBC.
2. Patients who were told that they have anemia, but never acted on it.
3. Patients who tried iron and quit because of constipation, nausea or GI upset.

Age Range	Mg / Day
7-12 months	11 mg
1-3 years	7 mg
4-8 years	10 mg
9-13 years	8 mg
14-18 years	11 mg (men); 15 mg (women)
19-50 years	8 mg (men), 18 mg (women)
51+ years	8 mg
Other	
Pregnancy	27 mg
Lactation (under age 19 / over age 19)	10 mg / 9 mg
<i>Source:</i> <a href="https://ods.od.nih.gov/factsheets/iron">ods.od.nih.gov/factsheets/iron</a>	

For patients who fall into the first or second groups, my first question is, "Do you have iron at home?" If they do, I instruct them to take it, preferably in divided doses away from food, with some vitamin C (either supplement or with orange juice). Compared to the RDAs (Table 2), the amount of iron that's recommended to correct a deficiency or a full-blown anemia (30-150 mg/day elemental) seems high. This is because iron is generally not well-absorbed (although there is a wide variance between individuals.) Iron uptake also parallels iron reserves. As the deficiency declines, so does the absorption percentage.

There are many types of iron supplements available over the counter. The amount of elemental (actual) iron in them varies; so does the labeling. Some products list both total and elemental amounts. Others, such as most bis-glycinate (aka, glycinate) will only list elemental levels. For example, a 300 mg iron pill from ferrous gluconate provides a true iron dose of 36 mg. See Table 3.

### Dosing

The dosing guidelines for iron also vary. Treatment for a deficiency can range from 30 to over 150 mg a day of elemental iron. In general, I begin with 50-120 mg a day in divided doses, taken away from food. Iron, unlike most minerals, is absorbed best on an empty stomach. I do not recommend more than 60 mg at one time. I will start with one dose in the morning and one before bed. If taking iron away from food causes nausea or an upset stomach, I have the patient take it with food.

Type	% Elemental Iron
Ferrous sulfate	20%
Ferrous gluconate	12%
Ferrous fumarate	33%
Bis-glycinate chelate	27%
Ferric ammonium citrate	16.5%

Vitamin C helps the body utilize iron, which is why it's advised to take some with iron. This may be a supplement or a glass of orange juice. A mega dose isn't required; 50-100 mg of vitamin C is all that's needed. Some iron products contain vitamin C, which makes things easier for both provider and patient.

For those patients who have had or do have side effects, such as constipation or stomach problems (even when taking with food), I recommend iron glycinate, technically known as bis-glycinate. This form normally comes in elemental doses in the 28-30 mg range. It causes dramatically fewer side effects than other forms.

Iron is tricky enough that this could easily be a 6-8 part series. If you have any questions, feel free to contact me.

### Resources

- Killip S, Bennett JM, Chambers MD. [Iron deficiency anemia](#). *Am Fam Phys*, 2007;75(5):671-8.
- [Center for Disease Control and Prevention. Recommendations to prevent and control iron deficiency in the United States](#). *MMWR*, 1998;47(No. RR-3).
- Centers for Disease Control and Prevention. [Iron deficiency - United States, 1999-2000](#). *MMWR*, 2002;51:897-9.

