

Iron Deficiency Anemia

In adults with iron deficiency anemia, always hunt for the bleeding source — usually the gut in older adults, periods in younger women — then replace the iron.

THE ONE-LINE TRUTH

Iron deficiency anemia happens when the body runs out of iron, so red blood cells become too small and pale to carry enough oxygen.

The chain — how it unfolds

1. Iron leaves the body faster than it comes in — chronic slow bleeding (hidden ulcer, colon polyp or cancer, heavy periods), poor gut absorption (celiac disease, low stomach acid), or inadequate diet. — why: The body loses 2–5 mg of iron per day from bleeding or malabsorption, but can only absorb 1–2 mg per day from food, so iron balance tips negative and stores begin to drain.
2. Ferritin (stored iron in the liver) drops first, often below 15–30 ng/mL, while hemoglobin is still normal — this is the silent phase. — why: The body sacrifices storage iron to keep circulating red cells normal as long as possible; serum ferritin is the earliest lab marker of iron deficiency, dropping months before anemia appears.
3. Once ferritin is empty, serum iron falls, transferrin rises (high TIBC), and transferrin saturation drops below 20% — the marrow is now starved for iron. — why: With no storage iron left, the liver makes extra transferrin (the iron shuttle protein) trying to scavenge any available iron, but there is none to find — so transferrin circulates mostly empty (low saturation).
4. The bone marrow cannot build normal hemoglobin anymore, so new red blood cells come out small (microcytic, $MCV < 80$ fL) and pale (hypochromic, low MCHC) — hemoglobin finally starts to drop. — why: Hemoglobin needs iron at its core to grab oxygen; without iron, red cell precursors divide one extra time trying to keep total hemoglobin per cell adequate, producing smaller, paler cells that carry less oxygen — this is microcytic hypochromic anemia.

5. Tissues and organs do not get enough oxygen, so the patient feels exhausted, weak, short of breath with exertion, dizzy, and has trouble concentrating (brain fog). — why: Every cell in the body depends on oxygen to make energy (ATP); with fewer red cells and less hemoglobin, oxygen delivery falls, so muscles tire quickly and the brain slows down — fatigue is the hallmark symptom.
6. The heart tries to compensate by beating faster (tachycardia) and pumping harder (increased cardiac output) to push what little oxygen is available around the body faster. — why: The heart senses low oxygen delivery (via chemoreceptors and reduced oxygen content in blood) and increases rate and stroke volume to keep oxygen delivery near normal — this works for a while but eventually exhausts the heart if anemia is severe or prolonged.
7. Skin and mucous membranes look pale (pallor), especially the conjunctiva (inside lower eyelid), palms, and nail beds, because blood is shunted to vital organs and hemoglobin is low. — why: Pale skin is a direct result of less hemoglobin (the red pigment in blood) and vasoconstriction in non-essential areas — it is a visible clue that anemia is present.
8. Fingernails become thin, brittle, and spoon-shaped (koilonychia) with the center dipping inward; the tongue may become smooth, red, and sore (atrophic glossitis); and cracks appear at the corners of the mouth (angular cheilitis). — why: Chronic low oxygen and iron deficiency in rapidly dividing cells (nails, tongue lining, mouth corners) cause abnormal growth — koilonychia and glossitis are specific physical exam signs of long-standing severe iron deficiency.

Spot it — what you see, and why

- Feeling very tired and weak all the time: Your red blood cells carry oxygen around your body using iron. When you don't have enough iron, you can't make enough hemoglobin (the oxygen-carrying part of red blood cells), so less oxygen reaches your muscles and brain. It's like trying to run a car on half a tank — everything slows down.
- Pale skin, especially inside the eyelids, under the nails, and on the palms: Hemoglobin gives blood its red color. When you don't have enough hemoglobin because of low iron, your blood looks lighter and your skin loses its usual pink tone — especially in thin-skinned spots where blood vessels show through.
- Shortness of breath, especially when active: Your body isn't getting enough oxygen from your low red blood cell count, so your lungs try to work harder to pull in more air. Even small efforts like climbing stairs can leave you winded because your blood can't deliver enough oxygen to keep up with what your muscles need.
- Fast or pounding heartbeat: Your heart speeds up to pump blood faster, trying to deliver enough oxygen even though each red blood cell is carrying less than normal. It's like your heart is racing to make up for weaker fuel.

- Headaches and trouble concentrating or remembering things: Your brain uses about 20% of your body's oxygen. When iron is low and oxygen delivery drops, the brain doesn't get the fuel it needs to focus, remember, and think clearly — you might feel foggy or get dull, throbbing headaches.
- Cold hands and feet: Your body sends blood to your most important organs first (like your heart and brain) when oxygen is tight. That means less warm blood reaches your fingers and toes, so they feel cold even in a warm room.

Red flags — act now

- Blood in your stool (black, tarry stools or bright red blood) or vomiting blood — can mean bleeding in your stomach or intestines
- Sudden, severe chest pain or trouble breathing — your heart may be struggling because of very low oxygen
- Ongoing heavy menstrual bleeding that soaks through a pad or tampon every hour — can lead to dangerous iron loss
- Unintended weight loss, belly pain, or trouble swallowing — could signal a hidden source of bleeding like cancer or an ulcer
- Signs of severe anemia: confusion, fainting, extreme weakness, or very fast heartbeat at rest — means your organs aren't getting enough oxygen

Treat it — in this order

1. Identify and treat the source: colonoscopy and upper endoscopy in men and postmenopausal women; address heavy menstrual bleeding in premenopausal women; screen for celiac disease if malabsorption suspected → Stops the upstream leak or blockage so the body can rebuild iron stores instead of losing iron faster than you can replace it. Treating a bleeding ulcer, polyp, or menstrual disorder is the only way to truly fix iron deficiency anemia.
2. Oral ferrous sulfate 325 mg (65 mg elemental iron) every other day on an empty stomach, or ferrous gluconate or ferrous fumarate at equivalent elemental iron dose → Delivers iron to the duodenum (first part of the small intestine), where the body absorbs it and shuttles it to the bone marrow to make hemoglobin. Every-other-day dosing improves absorption and cuts side effects like nausea and constipation.

3. Intravenous iron: ferric carboxymaltose 750–1000 mg, iron sucrose 200 mg, or low-molecular-weight iron dextran, if oral fails, malabsorption present, severe anemia (hemoglobin < 10 g/dL), inflammatory bowel disease, chronic kidney disease, or pregnancy → Bypasses the intestine and delivers iron directly into the bloodstream, filling the body's iron tank even when the gut cannot absorb pills. IV iron works faster and replenishes stores in days to weeks instead of months.
4. Recheck hemoglobin at 4 weeks, then every 8 weeks until normal; recheck ferritin at 3 months to confirm iron stores are replenished (goal ferritin > 50–100 ng/mL) → Confirms the iron is being absorbed and used to make new red blood cells. Hemoglobin should rise 1–2 g/dL per month. Ferritin tells you whether the body's iron tank is refilling or still empty.
5. Vitamin C 200 mg with oral iron to boost absorption (optional, not required) → Vitamin C (ascorbic acid) keeps iron in the ferrous (Fe^{2+}) form, which is absorbed better in the duodenum. May speed iron repletion slightly.

Your top priorities at the bedside

1. Check hemoglobin, blood pressure, and heart rate before and after position changes to assess severity and hemodynamic stability — why: Hemoglobin below 7 g/dL or orthostatic low blood pressure (hypotension) (drop in blood pressure when standing) means tissues are not getting enough oxygen and may require urgent transfusion before waiting for iron to work
2. Verify ferritin, serum iron, TIBC, and transferrin saturation labs are drawn before giving any iron supplementation — why: Iron therapy falsely raises these lab values within 24 hours, preventing accurate diagnosis of the type of anemia and potentially masking coexisting conditions like anemia of chronic disease
3. Educate patient to take oral iron (ferrous sulfate 325 mg) every other day on an empty stomach, one hour before breakfast — why: Every-other-day dosing allows hepcidin (a hormone blocking iron absorption) to drop between doses, improving absorption by 30 percent and reducing constipation and nausea compared to daily dosing