



## Anemia

Anemia is a condition where the blood has insufficient red blood cells to carry oxygen from the lungs to the rest of the body or not enough hemoglobin, the iron-rich protein that carries oxygen inside the red blood cells and gives blood its red color. Anemia takes several forms and may vary in severity and duration. It's often caused by an underlying condition, so it's important to get prompt diagnosis and treatment.



Your doctor will likely perform blood tests to diagnose your condition. Additional tests may be used to determine the type of anemia and its cause. Your doctor may recommend chest x-ray, general ultrasound, CT abdomen and pelvis or body MRI to help find underlying conditions. Treatment depends on the specific diagnosis. Anemia due to blood loss may require surgery to stop the source of bleeding. Other treatments range from iron or vitamin supplements to blood transfusions or medication.

## What is anemia?

Anemia is a condition that results from insufficient red blood cells or hemoglobin in the blood. Red blood cells take oxygen from the lungs and release it throughout the body. Hemoglobin is the iron-rich protein that carries oxygen inside the red blood cells and gives blood its red color.

There are many forms of anemia, including:

- iron deficiency anemia from lower than normal amounts of iron in the blood
- vitamin deficiency anemia due to lower than normal amounts of certain vitamins, like B-12, folate or vitamin C
- aplastic anemia, which occurs when the bone marrow doesn't produce enough red blood cells
- hemolytic anemia, a condition in which the body destroys red blood cells prematurely
- sickle cell anemia, an inherited disorder characterized by abnormal, crescent-shaped red blood cells
- thalassemia, an inherited disorder in which the body produces an abnormal form of hemoglobin, leading to the premature destruction of red blood cells

Anemia varies significantly in severity and duration. Because anemia may suggest an underlying illness, prompt diagnosis and treatment is very important.

## How is anemia diagnosed and evaluated?

Common symptoms of anemia include fatigue, irritability, headaches and difficulty concentrating. Your physician may detect a heart murmur or note a significant decrease in your blood pressure when you stand.

A blood sample will provide an overall count of your white blood cells, red blood cells and platelets. If results show anemia, additional tests may be required to determine the type of anemia and whether it is related to a more serious condition. Among these tests are:

- hemoglobin electrophoresis to assess hemoglobin levels in your blood
- a reticulocyte count to determine if your bone marrow is making red blood cells at the normal rate
- serum iron and serum ferritin tests to check the amount of iron in your blood and body
- a peripheral blood smear to see if anemia has caused the shape of your red blood cells to change
- an osmotic fragility test to determine if your red blood cells have become more fragile than usual

Other, more invasive tests may be needed to search for the source of anemia. Your physician may order an endoscopy to visually examine your upper digestive system for signs of bleeding, or a colonoscopy or CT colonography to look for tumors and other problems in the large intestine and surrounding areas. Cell and bone marrow samples can provide clues to anemia-associated abnormalities.

To help find underlying conditions that may be causing anemia, your physician may recommend one of the following imaging exams:

- Chest x-ray: Chest x-rays are often used to rule out infection in anemia patients. See the Safety page for more information about x-rays.
- General ultrasound: Ultrasound can detect internal abnormalities associated with certain kinds of anemia such as an enlarged spleen or may demonstrate the cause of anemia such as uterine fibroids, without the use of ionizing radiation. Doppler ultrasound can also be used to detect circulatory abnormalities suggestive of anemia in fetuses (unborn babies).
- Computed tomography (CT) - Abdomen and Pelvis: CT uses x-rays to provide detailed images of bones, internal organs and lymph nodes. It can help identify an enlarged spleen or lymph node abnormalities associated with certain types of anemia, and is useful for detecting cause of bleeding such as gastrointestinal malignancies that may be causing anemia in patients who cannot undergo colonoscopy or endoscopy. See the Safety page for more information about CT.
- Body magnetic resonance imaging (MRI): MRI is effective at imaging bone and bone marrow disorders noninvasively. It also can help assess iron concentration in various organs such as heart and liver, particularly in patients with multiple blood transfusions and concern for iron overload. See the Safety page for more information about MRI.

## How is anemia treated?

Anemia treatment varies depending on the specific diagnosis. Anemia related to blood loss may require surgery to stop the source of the bleeding. In the case of celiac disease, dietary modifications are necessary to avoid gluten, a protein found in wheat, barley and rye. Treatment options for other types of anemia vary:

- iron deficiency anemia: iron supplements and, if necessary, blood transfusions
- vitamin deficiency anemia: vitamin B-12 injections and folic acid supplements
- anemia associated with chronic disease: blood transfusions or synthetic hormone injections to stimulate red blood cell production
- aplastic anemia: blood transfusions to boost red blood cell levels
- anemia related to autoimmune disorders: drugs that suppress the immune system
- anemia associated with bone marrow disease: medications, chemotherapy or bone marrow transplant
- hemolytic anemia: spleen removal surgery (splenectomy), drugs that suppress the immune system, blood transfusions or plasmapheresis (a blood-filtering procedure)
- sickle cell anemia: oxygen, blood transfusions, folic acid supplements, antibiotics, bone marrow transplant or drugs
- thalassemia: blood transfusions, folic acid supplements, splenectomy, or bone marrow transplant

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