



Kidney School™

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Module 6

Anemia and Kidney Disease



Module 6 – Anemia and Kidney Disease

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Please Note

Kidney School does not replace the need to talk with your health care team about *your* care and *your* options.

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1. b 2. a 3. d 4. c 5. d 6. a 7. d 8. b 9. a
Congratulations, you've finished the quiz! Here are the correct answers so you can see how you did:

Module 6 – Kidney Quiz Answers





Velma learned a few months ago that she has kidney disease. On her visit to the doctor last week, she said that now she feels tired and worn down all the time.

“My greatest struggle,” she says, “is my lack of energy. I drag myself through each day. I’m barely able to work or even do my chores. It doesn’t matter how much sleep I get, I still feel worn out. This is no way to live!”

A simple blood test found the source of her fatigue: anemia.

Now her problem had a name, but Velma still knew little about anemia. What did it have to do with kidney disease? Could it be treated so she could feel more normal again? She needed to know more.

That’s just what we’ll help you do in this module. You can learn what anemia is and how it relates to kidney disease. Find out how you might know if you have it. And, see what you can do about it.

If you have anemia, this module can help you feel your best. At the end, we will sum up the key points for you in a Personal Plan. You can use your plan to help you recall what you learned.

Have you felt very tired in the last week? If so, tell your doctor—it might help you get better care. You may not think of feeling tired as being a “symptom” you should bother a doctor with. But if your fatigue is due to anemia, your doctor can help! Ask for blood tests to check for anemia. Later in this module, we’ll tell you what those tests are.

If you have anemia, your job is to:

- Pay attention to how you feel and tell your doctor
- Learn about your lab tests for anemia
- Know your treatment options
- Follow your Doctor’s instructions or what your Doctor tells you to do

What Is Anemia?

Blood has many types of cells in it. (See Module 7, Understanding Kidney Lab Tests, to learn more). With anemia, you have too few red blood cells. The job of red blood cells is to bring oxygen from your lungs to the rest of your cells. This job is so vital that when we are healthy, we have 2-3 trillion red blood cells. Lack of red blood cells leads to anemia, which can cause fatigue, weakness, and lack of energy. Children with anemia may grow slowly, since their cells lack oxygen.





In Their Own Words: What Anemia Feels Like

Read what these people with anemia say. Do you have any of these symptoms?

Fatigue:

“We had to wait to do things sometimes because I knew I wasn’t going to have the energy. My son is on the bowling team and had a lot of matches after school. So, on days when I knew he had a match, I wouldn’t do anything else that whole day. I knew if I did, I would be too tired to go see him bowl.”

Feeling cold:

“When I get cold, I have to have a lot of covers on me right away, because I feel like I’m having chills.”

Shortness of breath:

“If I was climbing a hill, I’d have to stop every 20 feet and catch my breath for about 5 minutes or so. My friends would be 5 miles ahead of me, and I’d just have to go slow. I could still do it, I just wouldn’t have the stamina to keep going...”

Trouble concentrating:

“My concentration seems to fall off a little bit. I’m an engineer, so I do a lot of technical work. The length of time I can focus on a problem seems to be reduced.”

If you have any of these symptoms, make a note of them to tell your doctor. They may be due to anemia—or may be caused by something else. If you don’t feel any of these symptoms now, good! Keep them in mind, though. They can come on slowly.

Here is a longer list of symptoms that can be due to anemia. Check the ones you have right now: :

- Fatigue/loss of energy
- I am exhausted
- I feel cold all the time, even when others are warm
- I am short of breath or have chest pain
- My skin, gums, and/or fingernail beds are pale
- My thinking is fuzzy
- I feel dizzy or faint
- I have headaches
- My legs feel weak
- My menstrual cycle has changed (women)
- I have trouble with my erections (men)
- Other symptoms:

Anemia can sap you of the energy to work, run errands, or take the dog for a walk. It can affect your memory and can make you feel dizzy when you stand up. Some people quit their jobs. They don’t know that what makes them too tired to work may be anemia—and it can be treated. One man who had not yet been treated said:

“I’ve had a job since I was 13, and at times I’ve had two or three jobs. Now I can’t hardly get up and go sometimes. I had one unemployment check in my whole life. So I’ve always worked. And now I’m not working.”



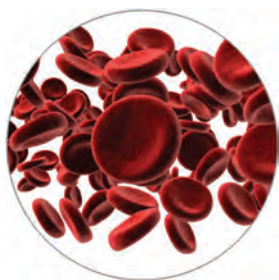


What Causes Anemia?

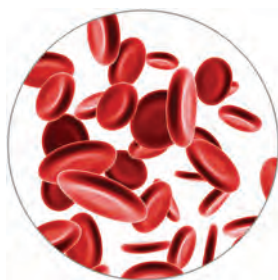
Red blood cells are made by stem cells in your bone marrow. Each red blood cell lives just a few months, so you need new ones all the time. When your red blood cells run low, your bone marrow gets a message to make more. This message is in the form of a hormone, *erythropoietin* (a-rith-ro-po'-uh-tin), or EPO, sent by healthy kidneys.

When your kidney function drops, wastes start to build up in your blood. Some of the wastes are toxic—so your red blood cells don't live as long. At the same time, your kidneys may start to make less EPO. With less (or no) EPO, your bone marrow does not “hear” the call to make more red blood cells. Not enough EPO is one cause of anemia when you have kidney disease.

Most people whose kidneys fail have anemia. (If you have polycystic kidney disease, or PKD, you may not.) And, the problem starts *early*. By the time kidney function is 45% or so of normal, your EPO level starts to drop. As you lose more function, you make less EPO.



Normal red blood cell count



Anemic red blood cell count

The Iron Story

There is a second key cause of anemia: not enough iron. Iron is the building block your bone marrow needs to make red blood cells. The word hemoglobin comes from the root

word heme—which means iron. Iron is part of hemoglobin. You need both EPO and iron to make red blood cells.

Your body treats iron as a precious metal. It tries to reuse as much iron as it can. So, most of the iron to make new red blood cells comes from your old red blood cells once they break down. But, when your kidneys don't work well, your body can't absorb much iron by mouth. And, you can't reuse it as well, either.

When you lose blood through lab tests, dialysis, surgery, or bleeding, it can make anemia worse. With hemodialysis, you lose 2-5 liters of blood a year. In fact, you lose 5-7 mg of iron at each treatment. And, when you are short of red blood cells, each drop of blood counts!

TIP: Ask for a short draw blood tube when you have blood drawn for tests. Studies have found that this saves you blood—and does not change your test results.

If having some iron in your body is good, more must be better. Right? Wrong!

Having too little iron can harm you—but so can having too much iron stored in your body. Extra iron can:

- Raise your risk of infection—or even cancer
- Make heart and blood vessel disease worse
- Harm your liver

As with most other things, you need the right amount of iron.



Fast Facts About Iron

- Some foods have a lot of iron. These include all kinds of liver, iron-fortified cereals, beef, pork, chicken, lima beans, and kidney beans. Some of these may not be good choices for those on dialysis, or on a special diet. Talk to a dietitian before you make a food change.
- If you take iron with coffee or a high-fiber diet, you will absorb less of it.
- *Iron pills or vitamins with iron are the number one cause of poisoning deaths in children under 6.* This is true even when childproof caps are used. They can look like M&Ms, and children think they are candy. **As with all of your drugs, keep iron pills out of the reach of children.**
- One of every 200 to 300 people has *hemochromatosis*. This genetic problem causes too much iron to build up in the blood. The treatment: removing some blood.

QUIZ

Try to rank these events in the order that they occur (1-5):

- ___ Fatigue, shortness of breath, feeling cold
- ___ Less oxygen to the body
- ___ Less EPO is made
- ___ Fewer red blood cells (anemia)
- ___ Kidney disease

How these events occur is not always clear the first time you see this. Here is the right order:

1. Kidney disease
2. Less EPO is made
3. Fewer red blood cells (anemia)
4. Less oxygen to the body
5. Fatigue, shortness of breath, and other symptoms

Testing for Anemia: What Will the Doctor Do?

The first place to look for anemia is in your blood. Blood will be drawn to test for:

- Hemoglobin – the iron-based protein that gives red blood cells their red color and round shape. When levels are low, your red blood cells are pale and uneven. They can't bring as much oxygen to your cells.
- Hematocrit – the percent of your blood that is made up of red cells.
- Reticulocyte count - how fast red blood cells are made (how many of your red blood cells are less than 2 days old).
- Iron levels (we'll talk about these in a bit.)

The second place your doctor may look is in your stool. A test for occult (hidden) blood can see if you are losing blood from your gut. You may be able to do this test at home. There is more than one way to do the test, so follow the steps you are given to get a true result.





Testing for Anemia

Your doctor will order blood tests to see if you have anemia. One panel is called a complete blood count, or CBC. A CBC has two tests that look for anemia:

1. The first is **Hemoglobin** (Hgb or Hb). The normal range is:
 - 14 to 18 g/dL (grams per deciliter) for healthy men
 - 12 to 16 g/dL for healthy women
 - **10 to 12 g/dL for men and women with kidney disease** (except those with PKD, who may have higher counts)
2. The second is **Hematocrit** (Hct or “crit”). The normal range is:
 - 40% to 50% for healthy men
 - 36% to 44% for healthy women
 - **33% to 36% for men and women with kidney disease**

Your doctor can tell that you have anemia when your Hgb and Hct are low. If you have it, these tests help guide your treatment. Know *your* numbers and how they change over time and with treatment. Can you fill in your most recent values?

My hemoglobin is _____ g/dL
My hematocrit is _____ %

Ask for your test results! Tracking your blood tests—and how you feel based on what they are—is a way to take an active role in your health. This knowledge can help you to talk with your care team.

Hemoglobin and Hematocrit in People on Dialysis

Did you see that the range for Hgb and Hct is lower when your kidneys don't work well? Some studies have found more risk of strokes or heart attacks at higher levels due to ESA's. So, Medicare pays for ESAs at a lower target. Talk with your doctor about how well you feel. Read Module 12, Staying Active with Kidney Disease to learn how to boost your energy.

Testing Your Iron Levels

Two blood tests show how much and what type of iron is in your blood:

- Ferritin or Serum Ferritin
- Transferrin Saturation (TSAT)

Let's look at **ferritin** first. Since iron is so vital for red blood cells, your body has a way to save some for a “rainy day.” Iron that you don't need right away is kept in a storage protein (ferritin)—so it won't rust! This blood test shows how much iron is stored in your body. The test also shows how much inflammation you have.

- The normal range is 30 to 300 ng/mL (nanograms per milliliter of blood)
- The dialysis range is greater than 200 ng/mL

Remember, some stored iron is good, but too much is not. Iron can build up in your cells and cause harm or even death. Excess iron can harm your liver or heart. It can lead to infection or cancer. Keep an eye on your ferritin level and be sure it does not go too high.



Think of **transferrin** as a taxi. It transfers iron through your blood to your bone marrow, where you need it. Each transferrin molecule can hold two iron molecules. A TSAT test can tell if your body can move enough iron to keep you well. Like Hct, TSAT is a percent. The normal range for TSAT is greater than 20%. Your doctor will decide on a level that is safe for you.

A Word About Lab Tests

We have given you a reference range for some blood tests. When we can, we use guidelines based on research for these ranges. But, in the real world, each lab will choose its own “normal” range. So, the numbers you see on your test reports may be a bit different than they are here. Please use the range your doctor gives you. This range may be best suited to your age, gender, altitude, or health.

Anemia and Your Heart

With anemia, your muscles are starved for oxygen. It takes more work to do the same things you used to do, which can make you tired. If you are too worn out to walk up steps, you can rest your legs. But, you can't rest your heart. It must beat once a second or so to keep you alive. In fact, your heart has to work *harder* when you have anemia. It pumps your blood faster to try to make up for having less oxygen.

A lack of oxygen can harm muscles. Your body grows fibers (*fibrosis*) as a patch to try to fix the damage. Fibrosis can enlarge your heart's main chamber: the left ventricle. The muscle can become stiff making it hard to pump blood.



This is *left ventricular hypertrophy*, or LVH. (Hypertrophy means enlarged).

LVH tends to start early in kidney disease. By the time the kidneys fail, nearly 75% of people have LVH. LVH is a major reason why heart problems are the leading cause of death in people with kidney failure.

The good news is anemia can be treated with EPO and iron. And that's where we head next.

Anemia Treatment: ESAs

In 1989, the first man-made form of erythropoietin came out to treat anemia for people on dialysis. The drug was called Epogen[®], or EPO. EPO takes a few weeks to work. When it does, your body grows your own red blood cells. Drugs like EPO are ESAs (*erythrocyte*—red blood cell—stimulating agents). The ESAs today are:

- EPOGEN[®] (Epoetin alfa) only for dialysis
- PROCRI[®] (Epoetin alfa) the same as EPOGEN, but for CKD, *not* dialysis
- Aranesp[™] (darbepoetin alfa) for both
- Mircera[®] (methoxy polyethylene glycol-epoetin beta) for both





ESAs help reduce fatigue. They can boost your appetite and energy, and help your memory. Some people prefer to get their ESA by injection. When the drug is given under the skin, it may sting a bit, but it tends to keep red blood cell levels more stable, with fewer ups and downs. Or, on hemodialysis, you can get an ESA in the blood tubing. There is no sting, but it may not work as well. If you take an ESA, know your dose and when and how you should take it.

ESA Black Box Warning

In June, 2011, the U.S. Food and Drug Administration (FDA) revised its 2007 warning about ESAs. The warning says that research found a higher risk of death, heart disease, and stroke in those who took ESAs. Studies found a risk when ESAs were used to raise hemoglobin levels to greater than 11 g/dL.

The FDA asks doctors to start an ESA in those with chronic kidney disease only after hemoglobin drops to less than 10 g/dL. It does not give a target hemoglobin. Instead, the FDA says to use the lowest dose that will avoid blood transfusions. For those on dialysis, the FDA says to stop or change the ESA dose at or above a hemoglobin of 11 g/dL. Blood tests should be done once a week until hemoglobins are stable. Then, blood tests can be done once a month.

Talk to your doctor about the risks and benefits of taking an ESA. The FDA has a Medication Guide that you should get when you get ESAs.

ESA Injections? Me??

If you had a choice, would you want injections of a drug? Maybe not. But what if the drug would give you more energy so you could get your life back—and injections were the only way you could take it? You might just get used to it!

ESAs are such drugs. Like the EPO your kidneys made, ESAs tell your bone marrow to make more red blood cells. Some people inject their own ESAs. Others go to a clinic.

ESAs are costly:

- If you have kidney disease, Medicare Part D (if you have it) can pay for them.
- For those on dialysis, Medicare Part B pays for ESAs. People on dialysis get ESAs during their treatments at home or at a clinic.

Here's what some patients have said about how ESA treatment makes them feel:

"I couldn't walk across the street. I could not walk up a slanted driveway, not even 50 feet. I could not. I took the elevator from the ground floor to the first floor. I could not walk it. With EPO shots—you feel really great. I did the Revlon® walk, 5K. That makes your life worth living."

"Before I started on EPO I had to walk with a stick or cane, because if I'd walk 25 yards or so, I was huffing and puffing. I would have to lean on the cane and rest. After about the 4th injection, I could walk maybe 50 yards and didn't huff and puff. I didn't know what to expect until after I started feeling better, and I said, 'Maybe there is life!'"



An ESA alone cannot help you if your iron levels are too low. As you have learned, ESAs need iron to work well. Eating foods rich in iron, like red meat, leafy greens, and liver is one way to get iron. So is cooking in a cast iron pan. But iron is not absorbed well by mouth. Your doctor may prescribe iron for you.

Anemia Treatment: Iron

Until recently, there were only two ways to take iron supplements. Each has pros and cons listed below. Now, there is a third option (see the box):

1. Iron By Mouth

Iron pills and elixers (liquids) are low cost and easy to find. There are many brands to choose from. Oral iron is not used much in dialysis because it has some drawbacks:

- Iron by mouth can upset your stomach and make you constipated.
- You might forget to take it and not get the iron you need.
- The elixir can stain your teeth (this may go away if you stop needing the drug.)
- Iron can react with other drugs, so it can be hard to find a good time of day to take it. Taking the pills at night may ease stomach upset.
- If you do hemodialysis, you may not be able to absorb enough by mouth to replace the 5–7 mg of iron you lose at each treatment.

2. Intravenous (IV) Iron

Your doctor may prescribe IV iron for you. If you do hemodialysis, guidelines advise doctors to prescribe this form of iron, vs. pills, so you really do get the iron. With an IV drug, you don't have

to take more pills. The iron is injected into your bloodline. A few brands of IV iron are used:

- Ferrlecit[®] (dialysis)
- Venofer[®] (dialysis)
- InFed[®] (dialysis)
- Feraheme[®] (CKD)

Like oral iron, IV iron also has some drawbacks:

- “Free” ferrous iron can harm you. So, each molecule of IV iron has a sugar shell around it (a bit like an M&M) to protect you. But, this shell causes the iron to go to your liver and spleen so the shell can be removed.
- When you do hemodialysis, your liver and spleen may not work well enough to take off the sugar shell. So, most of the iron gets trapped in these organs. Just 2-6% of the IV iron will have a chance to go to your bone marrow to make red blood cells. The rest is stored in your liver.
- Since IV iron is not absorbed well, you will need to get it often. This can lead to iron overload. The extra iron can build up in your liver to toxic levels.
- IV iron can raise your ferritin (stored iron) level a lot. This can cause inflammation
- The use of IV iron has been linked to a higher risk of infections in those on dialysis.
- You may have a metal or aluminum taste in your mouth.

NOTE: IV iron can cause a severe, life-threatening allergic reaction. This reaction can start at any time—even if you have had the iron many times. So, IV iron is not safe for home use. You must get the drug at





A New Hemodialysis Iron Treatment

Triferic[®] is a new form of iron approved by the FDA. It replaces just the 5–7 mg of iron that you lose at each treatment. Since you get the drug in the dialysate, there are no needles or bad taste. The iron binds to transferrin. Your iron “taxi” takes it right to your bone marrow, where it is used (with an ESA) to make new red blood cells.

Since your body uses the iron right away, it does not become trapped in your liver like IV iron does. So, your ferritin level will not rise. In fact, high ferritin levels will drop closer to the normal range. And, this drug does not cause severe allergic reactions. Ask your doctor about it.

One patient said: “With Triferic I felt better. I have more energy and stamina to do things. I feel like I am getting my life back.” www.triferic.com/patient-video-page.htm

NOTE: The FDA has approved Triferic[®] only for use with conventional hemodialysis machines.

Avoid Blood Transfusions

Years ago, the only way for you to get more red blood cells was with a blood transfusion. On the plus side, getting blood can make you feel better right away. It doesn’t take a few weeks to work like an ESA does. But, on the other hand:

- Blood comes from other people—and it can carry diseases. (Blood banks cannot test for every illness.)
- Blood is a fluid—and you may have a fluid limit.
- Blood has a lot of iron in it—which can cause iron overload.
- Getting the wrong blood type by mistake can be dangerous.
- Blood is scarce. Accident victims and people who need surgery must have it. With kidney disease, your need is ongoing—so, it makes sense to grow your own red blood cells all year round.
- Getting blood may be against your religion.

There is *another* reason not to get blood: if you want a kidney transplant. Blood has immune cells from the blood donor. These cells can put your immune system on alert. This is called being “sensitized.” And, the more sensitized your immune cells are, the harder it can be to find a donor who is a match for you.

A test called a panel *reactive antibody* (PRA) checks the percent of other people that your blood would react badly to. A PRA can range from 0% to 100%. A PRA of 100% means your immune system would attack 100% of kidneys. About 1/3 of people with kidney failure have a high PRA. Changes to how organs are matched help those with high PRAs get transplants faster. But, if you want a transplant, it’s best to avoid blood transfusions if you can.



a clinic that has trained staff and a “crash cart” on hand, just in case. A nurse may give you a small test dose each time. In case you wheeze or find it hard to breathe, the nurse will have allergy medicine on hand to help you. Your clinic may ask you to sign a consent form for the treatment.

Talk to your doctor or pharmacist if you have questions about IV iron.

At this point you may wonder: How do I know when my blood and iron levels are too low? Let’s move on to tests that will help you find out what’s going on in your blood.

You Can Help Manage Anemia

You may have anemia as a part of kidney disease. If you do, there is a lot you can do with your care team to feel your best. The chart will give you some tips for what you can do and how it will help you.

It’s time to wrap up this module. Before we do, we want to give you a Personal Plan to help you get a start on some of the key ideas. Put your Plan where it will remind you of the goals you are working toward.

Try This Quick Review...

Match each test with what it measures.

- | | |
|--|--|
| <input type="checkbox"/> Hemoglobin (Hgb/Hb) | 1 – Iron stored in the body |
| <input type="checkbox"/> Hematocrit (Hct) | 2 – Oxygen-carrying protein in red blood cells |
| <input type="checkbox"/> Ferritin | 3 – Percentage of red blood cells |
| <input type="checkbox"/> Transferrin saturation (TSAT) | 4 – Iron building blocks to make red blood cells |

How did you do? Here are the correct answers:
 Hemoglobin (Hgb) – 2
 Ferritin – 1
 Transferrin saturation (TSAT) – 4
 Hematocrit (Hct) – 3





Manage Anemia

How you can manage anemia	How it will help you
<ul style="list-style-type: none"> ■ Ask to see your lab test results, and keep them in a file or notebook. 	<ul style="list-style-type: none"> ■ You can talk with your care team in an informed way. ■ You can know what is going on inside your body. ■ You can track your progress.
<ul style="list-style-type: none"> ■ Ask your doctor what your range should be for each test. 	<ul style="list-style-type: none"> ■ You will know your target and whether you have hit it.
<ul style="list-style-type: none"> ■ Know your blood test results. Ask your doctor if one or more are too high or too low. 	<ul style="list-style-type: none"> ■ You will feel more in control of your health. ■ You can help avoid problems.
<ul style="list-style-type: none"> ■ Get the most hours of dialysis you can, so your blood is as clean as it can be. 	<ul style="list-style-type: none"> ■ With fewer toxins, your red blood cells can live longer. You can take fewer medicines and have more energy. Visit Module 2, Treatment Options for Kidney Failure to learn more.
<ul style="list-style-type: none"> ■ Keep a diary of your symptoms. What are they? When do they occur? What makes them better or worse? You can do this in the same place as your lab results. 	<ul style="list-style-type: none"> ■ The diary can remind you of questions to ask your care team. ■ You can see if your symptoms link to what you do or eat, or to drugs you take. ■ You can see if your symptoms change as your lab tests do.
<ul style="list-style-type: none"> ■ Do you have anemia? If you do and are not on an ESA and iron, ask your doctor why not. 	<ul style="list-style-type: none"> ■ You will help to get yourself the best care.
<ul style="list-style-type: none"> ■ Keep track of your dose of ESAs and iron, if you take them. . 	<ul style="list-style-type: none"> ■ You can avoid a dosing error.
<ul style="list-style-type: none"> ■ Take your medicines in the right dose, at the right time, in the right way. . 	<ul style="list-style-type: none"> ■ Your medicines will work as well as they can. ■ You may avoid some side effects.
<ul style="list-style-type: none"> ■ Tell your care team if your symptoms do not get better 	<ul style="list-style-type: none"> ■ Your drug dose may need a change, or your care team can look for other reasons that you don't feel well.



Personal Plan for _____

Anemia and Kidney Disease

Anemia is a shortage of oxygen-carrying red blood cells.

Anemia and Kidney Disease

Anemia is a shortage of red blood cells. Red blood cells bring oxygen from your lungs to all of your cells. Kidneys make a hormone *erythropoietin* (EPO) that tells your bone marrow to make more red blood cells when you run low. But, failing kidneys can start to make less EPO. You need iron as a building block to make new red blood cells. So, you need both EPO and iron to have enough red blood cells.

Symptoms of Anemia

If I have anemia, I may feel:

- Fatigue or loss of energy
- Cold all the time when others are warm
- Short of breath
- Chest pain
- Pale skin, gums, and fingernail beds
- Mentally fuzzy
- Dizzy or faint
- Headaches
- Weak legs
- Changes in menstrual cycles (women)
- Trouble with erections (men)
- Slow growth (children)

I will tell my doctor about any symptoms I feel at my next visit.

Anemia Treatment

Anemia due to kidney disease may be treated with:

- ESA injections
- Iron – by pill, IV, or in the dialysate

Anemia Blood Tests

Four tests are important for assessing anemia:

- **Hemoglobin** (Hgb/Hb). Shows how much oxygen-carrying protein is in my red blood cells. Normal levels are 14 to 18 g/dL for healthy men and 12 to 16 g/dL for healthy women. The target Hgb/Hb for those on dialysis is 10 to 12 g/dL.
- **Hematocrit** (Hct, “crit”). Shows what percent of my blood is made up of red blood cells. Normal levels are 40-50% for healthy men and 36-44% for healthy women. The target Hct for both men and women on dialysis is 33-36%.
- **Ferritin** shows how much iron is stored in my body. It also reflects how much inflammation I may have. Normal levels in healthy people are from 30 to 300 ng/mL. The dialysis target ferritin range is greater than 200 ng/mL. IV iron is given when you level falls below 200 ng/mL. Too-high iron levels can cause harm. I can learn what my ferritin level is, and take steps to keep it between 200-300 ng/mL.
- **Transferrin Saturation** (TSAT) can show if my body can move enough iron to keep me well. The normal range of TSAT is 20% to 50%. The dialysis range is greater than 20%.





Take the Kidney Quiz!

You'll see how much you're learning if you take our quick kidney quiz. It's just 9 questions. How about it? (*Answers are on page 6-2.*)

1. Anemia is a shortage of:

- a) Fluid loaded blood plasma
- b) Oxygen carrying red blood cells
- c) Infection fighting white blood cells
- d) Blood clotting factors

2. Anemia starts:

- a) Early in kidney disease
- b) Rarely in kidney disease
- c) At the point when dialysis or a kidney transplant is needed
- d) After years of dialysis

3. Anemia is a problem for many with kidney disease because:

- a) They urinate out red blood cells and don't have enough
- b) Their red blood cells explode from kidney toxins
- c) They have enough red blood cells, but their bodies can't use them
- d) Their bodies do not make enough erythropoietin

4. The hormone that triggers the bone marrow to make red blood cells is called:

- a) LEO
- b) HEMO
- c) EPO
- d) PETO

5. Which of the following is NOT a symptom of anemia?

- a) Feeling cold all the time
- b) Fatigue and lack of energy
- c) Shortness of breath and chest pain
- d) A skin rash

6. Treatment for anemia may include:

- a) Injections of an ESA and iron supplements
- b) Injections of an ESA and vitamin D pills
- c) Iron and blood transfusions
- d) Iron and vitamin D pills

7. Which iron based protein gives red blood cells their color and round shape?

- a) Ferritin
- b) Hematocrit
- c) TSAT
- d) Hemoglobin

8. A new way to receive iron is:

- a) Skin patch
- b) Dialysis fluid
- c) Food sprinkles
- d) Enema

9. It is best to avoid blood transfusions if you want a kidney transplant:

- a) True
- b) False



Where to Learn More

The sources below may help you learn more about anemia and kidney disease.

PLEASE NOTE: The non-profit Medical Education Institute does not endorse these sources. We believe you are the best person to choose what will meet your needs. Please check with your library, bookstore, or the Internet to find these items.

Books:

- ***Help, I Need Dialysis!*** by Dori Schatell, MS, and Dr. John Agar (Medical Education Institute, 2012, http://www.lifeoptions.org/help_book, ISBN-13: 978-1937886004) Easy to read, referenced book tells you the lifestyle impact of each type of dialysis. Includes anemia and how to manage it..

Website:

- Visit www.triferic.com to learn more about Triferic, or obtain a patient brochure here: <http://www.triferic.com/patient-brochure/>

Other materials:

- *Anemia in Kidney Disease and Dialysis*, by the National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC). Call (800) 891-5390, email nkudic@info.niddk.nih.gov, or visit their website at www.niddk.nih.gov.
- *Management of Anemia in Chronic Kidney Disease*. The American Association of Kidney Patients (AAKP). <https://aakp.org/videos/management-anemia-chronic-kidney-disease/>

