Lab Values Explained

Common Tests to Help Diagnose Kidney Disease

Lab work, urine samples and other tests may be given as you undergo diagnosis and treatment for renal failure. The test results will be used to assist the healthcare team (your doctor, nurses, and others) in evaluating your kidney function and developing your healthcare plan. Remember, you are in control and you are your own best healthcare provider, so it is essential for you to understand what these tests mean.

Remember, there can be some differences in the results from one lab to another, so make sure you learn the normal values for your lab. Let’s get started.

Blood Urea Nitrogen (BUN)

Blood carries protein to cells throughout the body. After the cells use the protein, the remaining waste product is returned to the blood as urea nitrogen. Healthy kidneys take urea nitrogen out of the blood so it can be excreted in the urine. If your kidneys are not working well, the urea nitrogen will stay in the blood. Normal blood contains 7-20 mg/dL of urea. If your BUN is more than 20 mg/dL, your kidneys may not be working at full strength. Other possible causes of an elevated BUN include dehydration and heart failure.

Serum Creatinine

Creatinine is a waste product in the blood created by the normal use of muscle cells. Healthy kidneys take creatinine out of the blood and it’s excreted in the urine. When the kidneys are not working well, creatinine builds up in the blood. If the kidneys lose their ability to filter blood, more creatinine will accumulate and serum creatinine will rise. As a result, creatinine is an indirect marker of how well the kidneys are working. A creatinine level of greater than 1.2 for women and greater than 1.4 for men may be an early sign that the kidneys are not working properly.

Creatinine Clearance

Creatinine clearance is a measure of how much creatinine is in your urine. It gives an accurate measure of the kidneys’ ability to remove creatinine out of your body. To calculate a creatinine clearance you may be asked to save your urine for 24 hours and bring it to the lab. The lab measures the amount of creatinine in the urine. The normal creatinine clearance is greater than 90 ml/min.
**Blood Tests to Check for Anemia**

**Hematocrit** Hematocrit (Hct) is a blood test that measures the number and the size of red blood cells. It gives a percentage of red blood cells found in whole blood. It is used to check for anemia. Anemia is a shortage of oxygen-carrying red blood cells and often begins at the early stages of kidney disease. Anemia is treatable. A normal hematocrit (Hct) for a healthy adult is 38-45%. For a person with CKD, the desirable Hct is 33-36%.

**Hemoglobin** Hemoglobin (Hb., Hgb) is the part of the red blood cell that carries oxygen to the cells of the body. Both hemoglobin and hematocrit are measured to check for anemia. Three times the hemoglobin level equals the hematocrit. A normal hemoglobin level equals the hematocrit. A normal hemoglobin level for a healthy adult is 12-15 g/dl. For a person with CKD the desirable hemoglobin is 11-12 g/dl.

**Glomerular Filtration Rate (GFR)**

GFR is a measurement of how well the kidneys are processing waste. A sample of your blood is sent to the lab. The blood creatinine level is factored in with your age, gender, height, race, and weight to calculate your glomerular filtration rate (GFR). Normal GFR varies according to age—as you get older it can decrease. The normal value for GFR is 90 ml/min or above. A GFR below 60ml/min is a sign the kidneys are not working properly. A GFR below 15 ml/min indicates that a treatment for kidney failure, such as dialysis or transplant, will be needed.

**Microalbumin Urine** Healthy kidneys remove waste from the blood but leave protein. Impaired kidneys may fail to separate a blood protein called albumin from the waste. At first, only a small amount of protein that is too tiny to be measured with a standard dipstick may leak into the urine. This condition is known as microalbuminuria. This is how the test is read:
- Less than 30 mg/L is normal
- Greater than 30 mg/L but less than 300 mg/L is called microalbuminuria
- Greater than 300 mg/L is called macroalbuminuria

**Urine Protein** As kidney function worsens, the amount of albumin and other proteins in the urine often increases, and the condition is called proteinuria. Your doctor may test for protein using a dipstick in a small sample of your urine taken in the doctor’s office. The color of the dipstick indicates the presence or absence of proteinuria. This test should be negative.
Blood Tests that Measure Diabetes Control

**Glucose (Blood Sugar)** A blood glucose test measures the amount of a type of sugar called glucose in your blood. Glucose is measured to make sure your body is able to digest and utilize sugar and carbohydrates correctly. If your blood sugar is too high, it may mean you have diabetes.

**Normal Fasting (before eating) Glucose levels:**

- No known diabetes: less than 100 mg/dl.
- Above 125 mg/dl can indicate diabetes.
- Diabetics: 70-130 mg/dl is within target range

**Normal Non-fasting (2 hours after you have eaten a meal) Glucose levels:**

- No known diabetes: less than 140 mg/dl.
- Diabetics: less than 180 mg/dl

**Hemoglobin A1C (HbA1c)**

A glycosylated hemoglobin A1C (also called HbA1c, Hemoglobin A1C and A1C) reading reveals your average blood glucose level over the past three months and can be used to monitor your diabetic control and predict your risk for diabetic complications. How does it do that? Your body actually memorizes the trail that sugar leaves in your body. When blood glucose is high, the sugar molecules attach themselves to red blood cells. The red blood cells store the sugar information for about four months. A blood test can then retrieve your average blood glucose results in the form of a percentage. The greater your A1C value, the higher your risk for diabetic complications. For the diabetic with CKD, good control of your blood sugar can slow the worsening of kidney function. Ask your doctor what your percentage should be. For most people, the result should be less than 7%.
Nutritional Blood Tests

**Serum Albumin** Albumin is the protein level in the blood. It is produced in the liver and released into the blood. Albumin helps prevent blood from leaking out of blood vessels. It also carries medications and other substances through the blood, and is important for tissue growth and healing. The normal serum albumin in a healthy adult is 3.5 g/dl. The target for adults with CKD is 4 g/dl.

**Lipid Panel** Lipids are found in your blood and are stored in your tissues. They are an important part of cells, and help keep your body working normally. Lipid disorders such as high cholesterol, may lead to life-threatening illnesses, such as coronary artery disease, heart attack and stroke. There is also growing evidence that hyperlipidemia contributes not only to cardiovascular disease, but also to kidney disease progression.

**Total Cholesterol** People with high levels of cholesterol may feel well, but they are at a higher risk for heart attacks and hardening of the arteries than those with normal levels. Normal range for cholesterol in healthy adults and adults with CKD is less than 200 mg/dl.

**High-Density Lipoprotein (HDL)** This is known as the “good” cholesterol. Higher levels are associated with a lower risk of heart disease. The normal range for HDL for healthy adults and adults with CKD are 40-79 mg/dl.

**Low Density Lipoprotein (LDL)** This is known as the “bad” cholesterol. Higher levels of LDL are associated with a higher risk of heart disease and stroke. The normal range for healthy adults and adults with CKD are less than 100 mg/dl.

**Triglycerides** Triglycerides are the main form of fat in foods and in the human body. The normal range for healthy adults and adults with CKD are less than 150 mg/dl.

**Additional Tests for Kidney Disease**
If blood and urine tests indicate reduced kidney function, your doctor may recommend additional tests to help identify the cause of the problem.

**Renal Imaging** Methods of renal imaging (taking pictures of the kidneys) include ultrasound, computed tomography (CT scan), and magnetic resonance imaging.

Content courtesy of DCI.
Blood Urea Nitrogen  A waste product formed after your body used the protein it needs.  Normal: 7–20 mg/dL.

Serum Creatinine  A waste product in the blood created by the metabolism of muscle cells.  Normal: 1.2 mg/dL for women; 1.4 mg/dL for men.

Creatinine Clearance  A measure of how much of the waste product creatinine is in your urine.  Normal: Greater than 90 ml/min.

Glomerular Filtration Rate (GFR)  A measure of how well the kidneys are processing wastes.  Normal: 90 ml/min. Less than 15 indicates Kidney failure.

Microalbumin Urine Test  A measure of microscopic amounts of protein in the urine may be an early sign of kidney disease.  Normal: Less than 30 mg/L  • 30 mg/L – 300 mg/L is called microalbuminuria.  • Greater than 300 mg/L is called macroalbuminuria.

Urine Protein Test  A measure of protein in the urine.  Normal: Negative.

Renal Biopsy  Your doctor may want to see a close-up of your kidney tissue under a microscope. To obtain this tissue sample, the doctor will perform a kidney biopsy—a hospital procedure in which the doctor inserts a needle through your skin and into the kidney. The needle retrieves a strand of tissue about 1/2 to 3/4 of an inch long. For the procedure, you will lie on your stomach on a table and receive local anesthetic to numb the skin. The sample tissue will help the doctor identify the cause and severity of your kidney disease.
### Blood Tests that Measure Diabetes Control

<table>
<thead>
<tr>
<th>Test</th>
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| Glucose (Blood Sugar)                     | Measures the amount of a type of sugar, called glucose, in your blood. It is measured to make sure your body is able to digest and utilize sugar and carbohydrates correctly. If your blood sugar is too high, it may mean you have diabetes. | Normal: Glucose levels:  
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  - No known diabetes: less than 140 mg/dL.  
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| Hemoglobin A1C (HbA1c)                    | Reveals your average blood glucose level over the past three months.         | Normal: a healthy adult is 12–15 g/dL. A desirable hemoglobin for a person with CKD is 11-12 g/dL. |                                                                                                      |