



**Laboratory and Other Studies for Sickle Cell Disease**

Test	Notes
Leukocyte count	>10,000/ $\mu$ L in the steady state in most patients, but increases further during painful episodes
Platelet count	>300,000/ $\mu$ L in the steady state in most patients, but usually decreases during painful episodes, infection, and ACS
Reticulocyte count	>10% in the steady state in most patients with sickle cell anemia, but increases further during hyperhemolytic states and decreases during aplastic crises
Solubility test	Carriers of the sickle cell gene will have a positive test result; however, this test does not distinguish between homozygous and heterozygous carriers. A negative test result rules out the presence of the sickle gene; however, it does not rule out other abnormal hemoglobin, e.g., HbC. A positive test result must be followed by hemoglobin electrophoresis to rule out sickle cell anemia vs. sickle cell trait or other combinations
Hemoglobin electrophoresis	When there is no history of blood transfusion during the prior 4 months of testing, hemoglobin electrophoresis in alkaline and acid media is a powerful tool that differentiates the various forms of SCD. Additional more sophisticated techniques to separate hemoglobins include isoelectric focusing and high-pressure liquid chromatography
HbS	>90% in most untransfused patients with sickle cell anemia (exception includes those with HbF >10%). <90% in patients with sickle- $\beta$ -thalassemia. >50% in transfused patients with sickle cell anemia. Approximately 50% in patients with Hb SC disease
Hemoglobin A <sub>2</sub>	>3.5% in patients with sickle- $\beta$ -thalassemia or sickle cell anemia and two $\alpha$ -gene deletion
Hemoglobin F	>2.0% in approximately 50% of patients with sickle cell anemia
Total bilirubin	>2 mg/dL in the steady state in most patients with sickle cell anemia due to chronic hemolysis

Lactate dehydrogenase	Increased in the steady state in most patients with sickle cell anemia due to chronic hemolysis
Serum ferritin	Abnormal in most patients with sickle cell anemia, but increases further during acute painful episodes. May be >1,500 ng/mL in patients with sickle cell anemia who have received multiple transfusions.
Serum iron, total iron binding capacity, and % transferrin saturation	>50% saturation (Fe/total iron binding capacity) suggests iron overload
Urinalysis	Approximately 25% of patients with sickle cell anemia have proteinuria. Microscopic or gross hematuria may be present. Urine specific gravity is typically $\leq 1.01$ due to difficulty in concentrating urine
Serum creatinine	Abnormal level in approximately 5% of adult patients with sickle cell anemia
Alloantibodies to erythrocyte antigens	Alloantibodies have been reported in 18%-36% of transfused patients with SCD
Hepatic enzymes	Mild elevation of alkaline phosphatase and AST in most patients, but increases further during acute painful episodes
Hepatitis B and C serology	Patients who have received multiple transfusions are at risk for developing transfusion-associated infectious diseases, especially hepatitis C for blood transfusions before 1990, when blood donor screening for hepatitis C antibody was not available
Computed tomography scan or MRI of the head	Excludes cerebrovascular accident in patients with neurologic signs
Chest x-ray	Determines the presence or absence of acute and chronic pulmonary changes. Obtain in patients with dyspnea, cough, fever or chest pain.
Electrocardiography	For patients with chest pain, arrhythmia, and a change in murmurs or heart sounds
Echocardiography: standard 2D, M-mode, and Doppler	Determines cardiac function; the presence or absence of cardiomegaly; valvular abnormalities, including mitral valve prolapse and mitral regurgitation; and the presence or absence of pulmonary hypertension due to sickle cell chronic lung disease
Skeletal and long bone radiography and/or MRI of joints	Determines the extent of bone infarcts and avascular necrosis in the steady state to establish baseline findings and if symptomatic
Bone scan or MRI	Determines the presence/absence of osteomyelitis in patients with extensive leg ulcers. Also useful to diagnose acute or chronic bone infarcts and avascular necrosis
Abdominal sonography or	Rules out cholelithiasis if clinically indicated. Estimates liver and spleen

CT	sizes
Pulmonary function tests	Establishes baseline values, especially the baseline arterial blood gas levels. Also useful to diagnose sickle cell chronic lung disease due to repeated attacks of ACS, including reduction in total lung capacity, forced vital capacity, and forced expiratory volume and the need for oxygen therapy

ACS = acute chest syndrome; AST = aspartate aminotransferase; CT = computed tomography; MRI = magnetic resonance imaging; SCD = sickle cell disease.

Table from *Physicians Information and Education Resource (PIER)*, Sickle Cell Anemia module.