

Answers to Frequently Asked Questions About Testing Performed In This Office

Stress Testing

What is a stress test?

A stress test is an evaluation of heart function when the heart is placed under stress or increased workload. It generally involves having a person walk on a treadmill to raise the heart rate to at least 85% of the age-predicted maximum rate; however, there are other ways to proceed if a person is unable to walk to that level on a treadmill.

Why has this test been ordered for me?

Generally speaking, stress testing is performed in order to detect coronary artery disease (CAD), or blockage to one of the arteries supplying the heart muscle with blood. Below are listed the most common reasons why a stress test might be ordered. If none of these seem to apply to you, or if you remain unsure why you are having this test, check with the physician who ordered/recommended the test.

-To evaluate and ensure normal blood flow to the heart muscle because of:

Symptoms, such as discomfort or pain in the chest, back, neck/jaw, or arms, difficulty breathing, decline in energy level or ability to exercise, or palpitations.

Abnormal electrocardiogram (EKG or ECG), with either new EKG changes from a prior EKG, an abnormal heart rhythm such as increased PVCs, or a first ever EKG showing abnormalities

Risk factors for heart disease, including diabetes, high blood pressure, particularly if it has been difficult to control, high cholesterol, smoking history, or a strong family history of heart disease in combination with any other risk factor

History of CAD as a part of a periodic monitoring plan to evaluate the condition of previously placed stents, bypass grafts, or known moderate blockages

Upcoming Surgery in persons with either known heart disease or risks for heart disease, or with pre-operative abnormal EKG of unclear significance

-To clear a person for entrance to cardiac rehabilitation or to exercise on their own following a heart attack, stent placement, or open heart surgery. This type of test would usually be submaximal, or symptom-limited, meaning that achieving the 85% heart rate is not important to the outcome of the test.

-To evaluate blood pressure response to exercise in a person known to have or with suspicion of high blood pressure (hypertension). This can be done repeatedly to evaluate response to treatment as well.

What are the different types of stress testing and why would one be ordered over one of the others?

There are 3 basic types of stress testing which can be performed.

A **Graded Exercise Test** (often abbreviated GXT or called a treadmill test) involves exercise on a treadmill while the EKG and blood pressure are closely monitored by a qualified staff member. This is the cheapest and easiest option but is also the least sensitive to detect abnormalities (about 67% sensitive). It is generally not used if a person has established CAD or a significantly abnormal EKG, as abnormal resting EKGs make interpretation of the EKG with exercise difficult and even less sensitive.

A **Nuclear Stress Test** (often termed Cardiolite or Thallium Stress) is more sensitive than a GXT (about 81% sensitive). It involves injection of a radioactive isotope through an IV placed in an arm vein. This isotope preferentially goes to heart muscle, which then “lights up” under a special camera, allowing us to view the heart muscle’s blood flow pattern. We take images of the heart’s blood flow at rest and again after exercise on a treadmill, to look for areas of heart muscle that do not get adequate blood flow during exercise or “stress”. It can be used in conjunction with Adenosine if one cannot exercise, see information below.

Stress Echocardiography is more sensitive than plain GXT (at least 80% sensitive) but is probably somewhat less sensitive than Nuclear Stress Testing. It involves use of ultrasound in conjunction with treadmill walking. Ultrasound images (echocardiogram) are taken at rest, followed by walking to at least 85% of the age-predicted maximum heart rate on a treadmill. Ultrasound images are then quickly obtained while the heart rate remains elevated.

What happens if I can’t walk on a treadmill or am unable to achieve the heart rate needed for the test?

If a person is unable to walk on a treadmill for whatever reason (symptoms, injury or impending surgery causing disability, prior amputation of a limb, etc), medications can be used to simulate the effects of exercise on the heart. We use a medication called Adenosine in this office. This medication does not cause a fast heartbeat, but works by causing vasodilation, or opening up, of the heart’s blood vessels, similar to that caused by hard exercise. The medication is infused over 4 minutes into the arm vein. It is preferable to other medications which can be used for this purpose because of its short half life (time in the body) and quick elimination, meaning any side effects will be short-lived and will pass within 1-3 minutes of infusion completion.

What side effects are possible with Adenosine?

The most common side effects experienced include flushing and warmth, chest pressure or heaviness, mild breathlessness or an urge to take deep breaths, nausea, and lightheadedness or headache. Low blood pressure and slow heartbeat are possible, and you will be monitored and treated appropriately should these happen. Again because of the short half-life of Adenosine, these side effects are reversible with stopping the medication, and usually go away very quickly once the infusion is terminated.

What are the risks of stress testing in general?

Stress testing is generally quite safe in properly screened individuals. Individuals with unstable cardiac symptoms such as prolonged and ongoing chest pain that has not been properly evaluated should not undergo stress testing. Those with severe aortic stenosis should also generally not undergo stress testing. Stress testing can cause a heart attack in certain individuals, which is why we will ask you numerous questions about your symptoms and history before beginning exercise.

Pharmacologic stress agents, as described above, are generally very safe also. We only use Adenosine in this office. Major risks include low blood pressure and slow heartbeat or heart block. Exacerbation of respiratory symptoms can occur in people with severe COPD with bronchospasm and/or bronchoconstriction; some people with this problem will require a different type of test to minimize the risk. We are prepared to manage side effects should they occur, and again these effects almost always abate as soon as the infusion is terminated.

Risk from radiation exposure during the nuclear stress test is very low. If you have further questions about this or any other risks, please feel free to ask.

What are the limitations to this test?

-The major limitation to stress testing is that it requires high-grade blockage to detect coronary artery disease. This test is not designed to detect non flow-limiting plaque in the arteries, but is intended to detect **flow-limiting** lesions of the major coronary arteries, or those that are at least 60-70% or greater. If there is concern about lesser blockages from a risk reduction standpoint, talk to your provider about other diagnostic options that might help determine if you have early atherosclerosis or plaque.

-This test is not 100% sensitive in detecting even severe blockage. The only test with 100% sensitivity is an invasive study called cardiac catheterization, which, as you might guess, is not performed first-line for most people. If you continue to have worrisome symptoms after this test is completed and shows normal results, further evaluation by your healthcare provider is warranted.

-False positive results are another possible limitation. On occasion, the EKG, echocardiographic images, or nuclear images might look as though there is poor blood flow to the heart muscle, leading to further invasive evaluation, when in fact blood flow is normal. This is an unfortunate possibility with any noninvasive study. The incidence of false positive results is much higher with plain GXT than with the nuclear stress or stress echocardiography. Therefore, if you have a GXT that is positive in appearance without worrisome symptoms, you will likely be asked to return for either a nuclear stress test or stress echocardiography in order to increase sensitivity without subjecting you to an invasive test. If either of these studies appears positive, further discussion with Dr. Doucet will be recommended to decide upon a plan.

What is Echocardiography (Echocardiogram, Echo)?

An echocardiogram is an ultrasound examination of the heart. Sound waves are bounced off of the heart in a precise manner, which allows us to view the heart size and muscle function, heart valves, chambers, and view the outer lining of the heart to evaluate for fluid buildup. The test is noninvasive and involves putting gel on the chest and then moving an ultrasound probe over the left side of the chest to obtain the images. The examination generally takes 30-45 minutes. This can be combined with stress testing, see above.

Why would an echocardiogram be ordered?

Echocardiography might be ordered for the following reasons:

- To evaluate the cause of **symptoms** such as shortness of breath, edema (swelling), palpitations, atypical chest discomfort, unexplained loss of consciousness (syncope), or unexplained fatigue
- To evaluate a detected **heart murmur**, an abnormal heart sound heard with a stethoscope by a health care provider on physical examination
- As a part of ongoing evaluation of **known valvular disease** or poor heart function (**cardiomyopathy**). It is often repeated at regular intervals to follow abnormalities and track changes or response to therapies over time
- As a part of an evaluation for heart **arrhythmias**, or abnormal heart beats
- As part of an evaluation for an **abnormal EKG**, particularly one that shows possible chamber enlargement
- As a part of an evaluation for **pericarditis**, or an inflammation of the sac surrounding the heart

What is a carotid ultrasound?

Carotid ultrasound uses sound wave technology just like echocardiography, but instead looks at the blood flow through the carotid arteries in the neck. These important blood vessels supply the brain with blood flow. They can suffer from plaque buildup just as the heart arteries can, which would increase one's risk for a stroke. Carotid ultrasound is noninvasive and involves placing gel on the neck, followed by moving an ultrasound probe over each side of the neck to get a view of the internal and external branches of each carotid artery. It generally takes about 30-45 minutes to complete.

Why would a carotid ultrasound be ordered?

- To evaluate a **bruit**, or abnormal swishing sound, heard by a health care provider on physical examination
- To check for blockage in people who have blockage elsewhere in the body
- To evaluate carotid blood flow prior to surgery
- To evaluate **symptoms** such as passing out, TIA (mini stroke) symptoms, or other symptoms of concern