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## Heart Attacks: 7 Heart Tests That Can Save Your Life

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Think a stress test and a simple blood workup are all you need to assess your heart attack risk? Wrong.



Your physician has you come in to his office and run on a treadmill while you're hooked up to an EKG. For the next 8 to 12 minutes, he'll evaluate your heart rate, breathing, and blood pressure as the intensity of the workout increases. When the stress test is over, he'll tell you whether you have coronary artery disease.

Here's news that might make your heart skip a beat: For women, there's a 35% chance the test results will be wrong.

Most often, the test reveals false positives, meaning healthy women are told they have heart disease. Less frequently but obviously far more dangerous is when the test fails to detect clogged arteries that could, in fact, cause a heart attack. Fewer men are misdiagnosed.

Possible reason for the gender gap: Phases of the menstrual cycle and birth control pills have been shown to throw off results, indicating that estrogen's effects on heart cells might be a factor.

For decades, doctors had nothing more sophisticated than a stress test to offer. Not anymore. Cardiologists now use advanced imaging and blood tests that give a much more accurate assessment of heart attack risk. "These tests are the best ways to tell who is in danger, because they can catch cardiovascular disease 20 to 30 years before it gets severe enough to cause a heart attack or stroke," says Arthur Agatston, MD, an early champion of many of them.

Better detection is urgently needed: More than 1 million Americans have heart attacks every year, and almost half die. Men have more than women do, but the gap is closing. From 1988 to 2004, attacks among women ages 35 to 54 spiked 42%.

These tests are available at most major medical centers and hospitals. If your doctor doesn't request them for you, demand the ones that are recommended for women in your age group and risk category.

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### Cardiac Calcium Scoring

**How It Works:** A CT scanner checks for atherosclerotic plaque (made up of calcium, cholesterol, and scar tissue) in your heart's arteries. After electrodes are attached to your chest and to an EKG machine that monitors your heartbeat, you lie on an exam table that slides into a short, doughnut-shaped tunnel and hold your breath for 10 to 20 seconds.

Cost: \$99 to \$399

Duration: 10 minutes

**Why It's Heart Smart:** "Calcium scoring is the number one best predictor of a future heart attack," Dr. Agatston

says. Calcified plaque-- a major warning sign of coronary artery disease, the leading cause of heart attacks-- shows up at least 10 years before a heart attack or stroke hits. By catching the problem early, you can treat it before the buildup narrows arteries so severely that it triggers a heart attack.

**Get It If:** You're 50 or older with risk factors-- or you're younger with a family history and several risk factors. Since the test involves x-rays, women shouldn't have it if there's any chance they might be pregnant.

**What the Results Mean:** You'll get an Agatston Score (developed by Dr. Agatston), which indicates the total amount of hard and soft plaque in your heart's arteries. A score of zero means you have no calcium deposits and a low risk of heart attack in the next 5 years. A score of 400 or more puts you at high risk of a heart attack within 10 years; a score of 1,000+ means you have up to a 25% chance of having a heart attack within a year without medical treatment.

**Next Steps:** If your score is 200 or higher, your doctor may advise lifestyle changes, a statin to lower cholesterol, or a diabetes drug to lower blood sugar--all of which will also reduce plaque.

### Carotid Intimal Medial Thickness Test

**How It Works:** This "ultrasound of the neck" takes a picture of the left and right carotid arteries, which supply blood to your head and brain. After putting a gel on your neck, a technician glides an ultrasound transducer over your carotids to measure the thickness of the arteries' lining.

Cost: \$150 to \$500

Duration: 15 minutes

**Why It's Heart Smart:** Studies show a link between abnormal thickness of the carotid lining and coronary artery disease. "This test can detect even the earliest stages, before blood flow is blocked," says Dr. Agatston. Because it's not an x-ray, it's also helpful for women who are or may be pregnant.

**Get It If:** You're 40 or older--or you're under 40 and a close relative (parents or siblings) had a heart attack or stroke before age 55.

**What the Results Mean:** You'll get two numbers: the thickness of your carotid lining (normal is less than 1.06 mm) and your "arterial age," an estimate of how that thickness compares to that of healthy women your age. If your arteries are more than 8 years "older" than you are, your doctor can tailor treatment to reduce your risk.

**Next Steps:** A diet and exercise plan, stress reduction, and, if necessary, drugs to lower your cholesterol, blood pressure, and blood sugar and reduce your intimal medial thickness.

### High-Sensitivity C-Reactive Protein Test

**How It Works:** A blood test measures CRP, a protein in your blood that's a strong indicator of inflammation throughout your body.

Cost: \$8

Duration: 5 minutes

**Why It's Heart Smart:** Cholesterol plaque injures blood vessels, triggering inflammation and raising CRP levels in your blood. That's dangerous because women with high levels of CRP may be up to 4 times more likely to suffer a heart attack or stroke. A high CRP is most dangerous if you also have another risk factor: a waist circumference of more than 35 inches, indicating the presence of belly fat.

**Get It If:** You're 40 or older.

**What the Results Mean:** If your score is under 1.0 mg per liter, your risk of developing heart disease is low. A score between 1.0 and 3.0 mg/l equals average risk. Above 3.0 mg/l, you're at high risk. It's possible to have high CRP without heart disease, though, because infections and injuries can also trigger a spike in levels.

"We don't consider high CRP to be a warning sign unless we've done the test on three separate occasions with the same results and there's no other reason for the inflammation," says Dr. Agatston. If you get three high scores, you need cardiac calcium scoring and the CIMT test to check your blood vessels.

**Next Steps:** A statin, along with weight loss and exercise, can cut risk of heart problems in women with high CRP.

### Advanced Lipid Profile and Lipoprotein(a) Test

**How They Work:** Unlike the traditional cholesterol blood test, which measures total cholesterol, HDL, LDL, and triglycerides, the advanced test also looks at particle size. This is important because some particles are big and fluffy, so they tend to bounce off artery walls as they travel through the body. Others are small and dense, meaning they can penetrate the artery lining and form clumps of plaque. (Think beach balls versus bullets.) The Lp(a) blood test analyzes a specific type of cholesterol that can triple heart risk.

Cost: \$19 each

Duration: 5 minutes

**Why They're Heart Smart:** Sizing up your particles gives a clearer picture of heart risk than the conventional test: Having a lot of large particles cuts risk, while small ones raise it. The more Lp(a) you have, the worse it is too--it makes LDL particles extra sticky, so they cling to the lining of blood vessels, causing plaque and clots.

**Get Them If:** You have a family history of heart disease.

**What the Results Mean:** "You do not want more than 15% of your particles to be the small, dense type," says Dr. Agatston. For Lp(a), levels above 30 mg/dl put you at increased risk.

**Next Steps:** If you have small particles, your doctor may prescribe a drug to increase their size, most likely a fenofibrate (such as TriCor or Trilipix) or niacin (vitamin B3), along with a healthy diet and exercise. Niacin is also the best treatment for high Lp(a).

### A1C Blood Glucose Test

**How It Works:** A blood test indicates your average level of blood sugar over the prior 3 months. Unlike other glucose tests that require fasting or drinking a sugary beverage, this test requires neither.

Cost: \$50

Duration: 5 minutes

**Why It's Heart Smart:** "This is the simplest way to detect your future risk of diabetes," Dr. Agatston says. This disease puts you at 5 times higher risk of developing heart disease--yet 5.7 million Americans have undiagnosed diabetes (on top of the 17.9 million who are diagnosed) because they haven't had their blood sugar checked.

**Get It If:** You're 45 or older--or earlier if you're overweight and have one or more diabetes risk factors, such as family history, high triglycerides, or low HDL.

**What the Results Mean:** An A1C level between 4.5 and 6% is normal, between 6 and 6.4 indicates prediabetes, and 6.5 or higher on two separate tests means you have diabetes.

**Next Steps:** The disease can often be reversed with weight loss, exercise, and dietary changes. If that's not enough, you may need oral medication or insulin injections.

### Genetic Tests

**How They Work:** A blood sample is tested at a lab for mutations of the KIF6 and APOE genes.

Cost: \$130 each

Duration: 5 minutes

**Why They're Heart Smart:** A common variation in the KIF6 gene and two mutations in the APOE gene raise your heart disease risk. "You have no control over your genes," says Dr. Agatston, "but these tests can help your doctor better tailor your treatment to head off a heart attack."

**Get Them If:** You're 40 or older.

**What the Results Mean:** "The KIF6 gene test predicts how effective statins are likely to be at heading off a future heart attack," says Dr. Agatston. A recent study found that people with a certain variant of KIF6 had a better response to statin treatment, with a 41% drop in heart attack risk, while people without this mutation didn't respond as well, with a 6% drop. "So we'll use a different treatment in these cases," he says-- typically, a fenofibrate or niacin. As for the APOE gene, certain people with those variants have a much greater response to a low-saturated-fat diet. "So they may not need medication if they're diligent about avoiding saturated fat," Dr. Agatston says.

**Next Steps:** A drug to lower cholesterol, changes in diet, or both.

## Stress Echocardiography

**How It Works:** This test is an improvement over the standard stress test because it adds an ultrasound both before and after exercise to evaluate blood flow to your heart's pumping chambers and check for blockages in the arteries that supply the heart.

Cost: \$850 to \$1,600

Duration: 45 minutes

**Why It's Heart Smart:** Adding echocardiography to the standard stress test raises accuracy by as much as 85% for women. "It's an excellent way to tell if your heart disease is severe enough that you could require treatments like a stent or a bypass," he says.

**Get It If:** You have signs of heart disease, regardless of your age. "If you experience shortness of breath, chest pain, neck pain, or any other symptom, you need this test," says Dr. Agatston.

**What the Results Mean:** If the test detects reduced blood flow, one or more of your coronary arteries may be blocked.

**Next Steps:** Your doctor may recommend a cardiac catheterization to check for blockages. If your vessels are clogged, they can be reopened with angioplasty, a stent, or bypass surgery.

## Will Your Insurance Pay?

Compared with the \$760,000 it costs to treat a single heart attack patient, these tests are cheap--but some insurers won't pay for them. "The system rewards doctors who do bypasses but doesn't pay for prevention," says Arthur Agatston, MD. Many companies are coming around: Most will pay for the stress EKG, blood glucose, and advanced cholesterol tests. Some will cover the gene tests and CIMT. Cardiac calcium scoring usually isn't covered. Call your carrier beforehand to find out what it will pay for and what your co-payment will be.

## Prevention Pioneer: Arthur Agatston, MD

A preventive cardiologist and Prevention advisory board member, Dr. Agatston passionately believes that the right combination of diet, exercise, medication, and advanced tests can wipe out heart disease--and he's proving it: Of the 2,500 patients he sees in his Miami clinic each year, only one or two have heart attacks.

"One of the best-kept secrets in cardiology," he says, "is that doctors using cutting-edge prevention have stopped seeing heart attacks in their patients."

It was Dr. Agatston and Warren Janowitz, MD, who developed the first CT scan heart screening--the cardiac calcium scoring test--in the 1980s. "At first, it was a constant battle to educate physicians that the standard of care needed to change," Dr. Agatston says. But now, because of his work, patients everywhere can get this test.

Not content to stop there, he continues to develop treatments to prevent heart attacks. "This disease," he repeats emphatically, "does not need to exist."

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