

# 'Healthy' patients at high risk of cardiac death identified

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(PhysOrg.com) -- The way the heart responds to an early beat is predictive of cardiac death, especially for people with no conventional markers of cardiovascular disease, according to new research from Washington University School of Medicine in St. Louis.

The conventional risk factors, such as high [cholesterol](#), smoking, diabetes and high blood pressure, account for many but not all deaths from cardiovascular causes. As a result, doctors are always searching for better ways to identify patients at risk of [cardiac death](#).

The new research indicates that an abnormal response to an early beat in the left ventricle, the heart's main pumping chamber, can identify high-risk patients even when they have no other evidence of cardiovascular disease.

“These are people we do not expect to die of cardiac causes,” says Phyllis K. Stein, PhD, research associate professor of medicine and director of the Heart Rate Variability Laboratory at the School of Medicine. “They appear healthy, but they’re not. We have shown a way they’re not healthy that isn’t showing up using standard tests.”

The work appears Feb. 15 in the *Journal of Cardiovascular Electrophysiology*.

A ventricular premature beat (VPB) occurs when the ventricle gets an inappropriate signal causing it to beat before it should. VPBs are

common, even in healthy people. The question is not whether VPBs occur, but how the body responds to them. The heart's response to a VPB is called heart rate turbulence. It can be measured with a Holter monitor, a device worn for 24 hours that records a person's electrocardiogram, the electrical signals produced by the heart.

When the ventricle beats early, the heart has not finished filling and it pumps less blood to the body than it should. To compensate, the heart rate speeds up to increase blood flow.

But an early beat also empties the heart early, leaving extra filling time afterward. So on the second beat after the VPB, the heart is extra full and pumps more blood to the body than it should. To compensate properly, the heart rate slows down.

A healthy heart will alternately speed up and slow down to compensate for the over- and under-filling that follows a VPB until the amount of blood filling the heart returns to normal.

Abnormal heart rate turbulence occurs when the heart can't compensate in this way.

"It's a clear test of whether the autonomic nervous system, which regulates your heart rate, can adapt to a challenge," Stein says.

Stein and colleagues analyzed Holter monitor recordings for almost 1,300 patients over age 65 recorded between 1989 and 1993.

The patients were divided into three groups based on an assessment of their cardiovascular health. Those in the "clinical" group had a history of cardiovascular disease such as heart attack or surgery to open narrow blood vessels. Those in the "subclinical" group had traditional risk factors for cardiovascular disease such as [high blood pressure](#) or [diabetes](#)

but had never been treated for cardiovascular disease. And those in the “healthy” group had no evidence of clinical or subclinical disease.

In all three groups, abnormal heart rate turbulence was predictive of cardiac death. But the association was especially strong in the healthy group. Of the 357 patients classified as healthy, 21 had abnormal heart rate turbulence. These 21 people were almost eight times more likely to die of cardiac causes than the rest of the healthy group.

“Even though it’s a small group of people, they’re actually at very high risk,” Stein says.

In fact, over the next 12 years, the people in the healthy group with abnormal heart rate turbulence had worse survival than the people with subclinical disease but good heart rate turbulence.

“They’re actually not healthy,” Stein says. “Something is wrong. But the conventional risk factors don’t pick it up.”

Stein and her colleagues also looked at levels of C-reactive protein, a measure of inflammation associated with [cardiovascular disease](#). While C-reactive protein predicted cardiac death in the healthy group, it had no impact in the subclinical and clinical groups. Since heart rate turbulence was predictive in all three groups, it may prove better than C-reactive protein in predicting risk of cardiovascular death.

Though the Holter monitor is a common, noninvasive device, Stein says the software needed to measure heart rate turbulence is only available for clinical use on one commercial Holter monitor. She speculates that this work and other studies showing the value of measuring [heart rate turbulence](#) may make the software more widely available.

**More information:** Stein PK, Barzilay JI. Relationship of abnormal

heart rate turbulence and elevated CRP to cardiac mortality in low, intermediate, and high-risk older adults. *Journal of Cardiovascular Electrophysiology*. Feb. 15, 2011.

Provided by Washington University School of Medicine in St. Louis

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