Researchers develop new method for detecting heart failure with a smartphone

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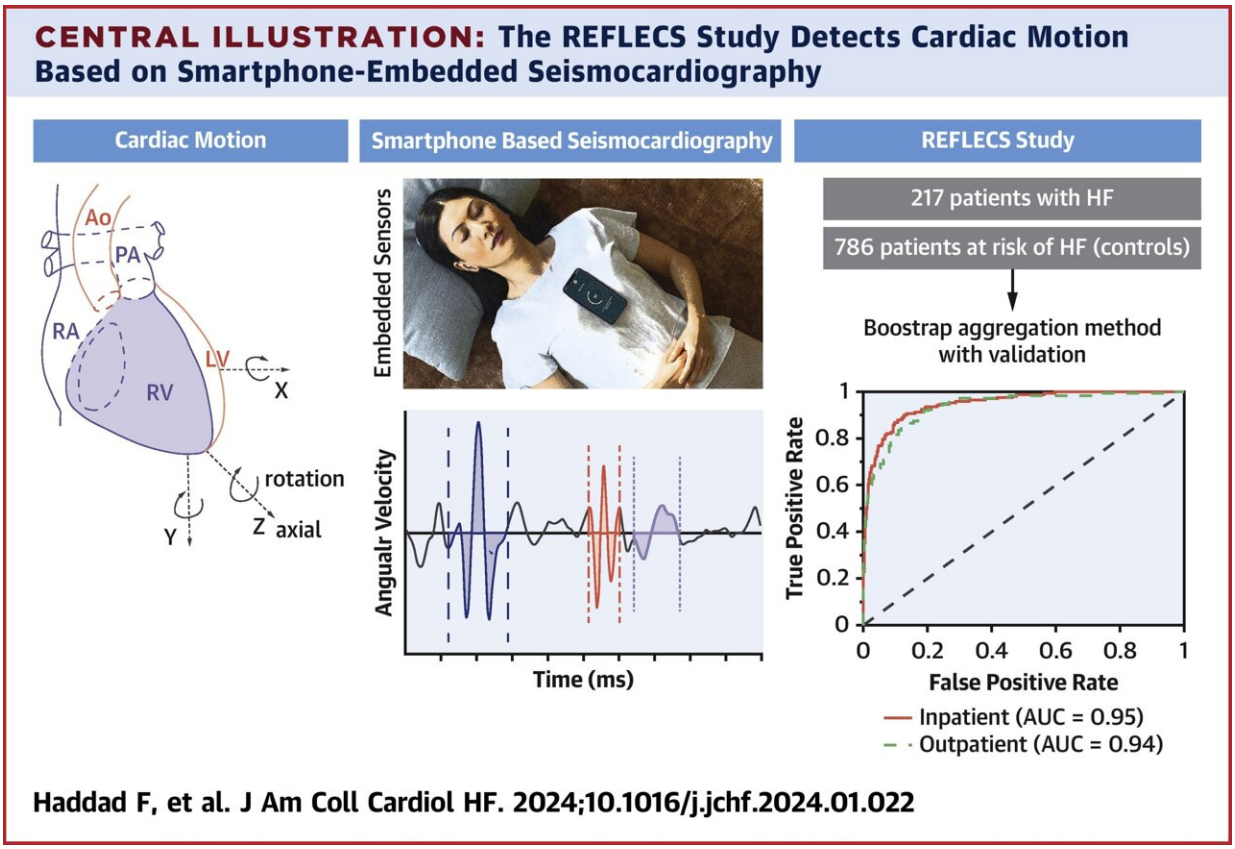

Credit: *JACC: Heart Failure* (2024). DOI: 10.1016/j.jchf.2024.01.022

A new technology using a smartphone to analyze heart movement and detect heart failure was created at the University of Turku and developed by the company CardioSignal. The study involved five organizations from Finland and the United States and is now published in *JACC: Heart Failure*.

Heart failure is a condition affecting tens of millions of people worldwide in which the heart is unable to perform its normal function of pumping blood to the body. It is a serious condition that develops as a result of a number of cardiovascular diseases and its symptoms may require repeated hospitalization.

Heart failure is challenging to diagnose because its symptoms, such as shortness of breath, abnormal fatigue on exertion, and swelling, can be caused by a number of conditions. There is no simple test available to detect it and diagnostics relies on an examination by a doctor, blood tests, and sophisticated imaging, such as an ultrasound scan of the heart.

Gyrocardiography is a new non-invasive technique for measuring cardiac vibrations on the chest. The smartphone's built-in motion sensors can detect and record these vibrations, including those that doctors cannot hear with a stethoscope. The method has been developed over the last 10 years by researchers at the University of Turku and CardioSignal.

The researchers' latest study on using smartphone motion sensors to detect heart failure was carried out at the Turku and Helsinki University Hospitals in Finland and Stanford University Hospital in the U.S. Approximately 1,000 people took part in the study, of whom about 200 were patients suffering from heart failure. The study compared the data provided by the motion sensors in the heart failure patients and patients without heart disease.

"The results we obtained with this new method are promising and may in the future make it easier to detect heart failure," says Cardiologist Antti Saraste, one of the two main authors of the research article and the Professor of Cardiovascular Medicine at the University of Turku, Finland.

Precise detection uncovers heart failure

The researchers found that heart failure is associated with typical changes in the motion sensor data collected by a smartphone. On the basis of this data, the researchers were able to identify the majority of patients with heart failure.

The analysis of the movements detected by the gyroscope and accelerometer is so accurate that in the future it could provide health care professionals with a quick and easy way to detect heart failure.

"Primary health care has very limited tools for detecting heart failure. We can create completely new treatment options for remote monitoring of at-risk groups and for monitoring already diagnosed patients after hospitalization," says CardioSignal's founding member and CEO, Cardiologist Juuso Blomster.

Consistent with several European countries, heart failure affects about 1%–2% of the population in Finland, but it is much more common in older adults, affecting around 1 in 10 people aged 70. Detecting heart failure is important as effective treatment can help to alleviate its symptoms. Accurate diagnosis and timely access to treatment can also reduce health care costs, which are driven up by emergency room visits and hospital stays, especially during exacerbations.

The joint research projects between CardioSignal and the University of Turku aim to promote people's health and reduce health care costs

through innovation, improved disease diagnostics, and prevention of serious complications.

More information: Francois Haddad et al, Smartphone-Based Recognition of Heart Failure by Means of Microelectromechanical Sensors, *JACC: Heart Failure* (2024). DOI: 10.1016/j.jchf.2024.01.022

Provided by University of Turku

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