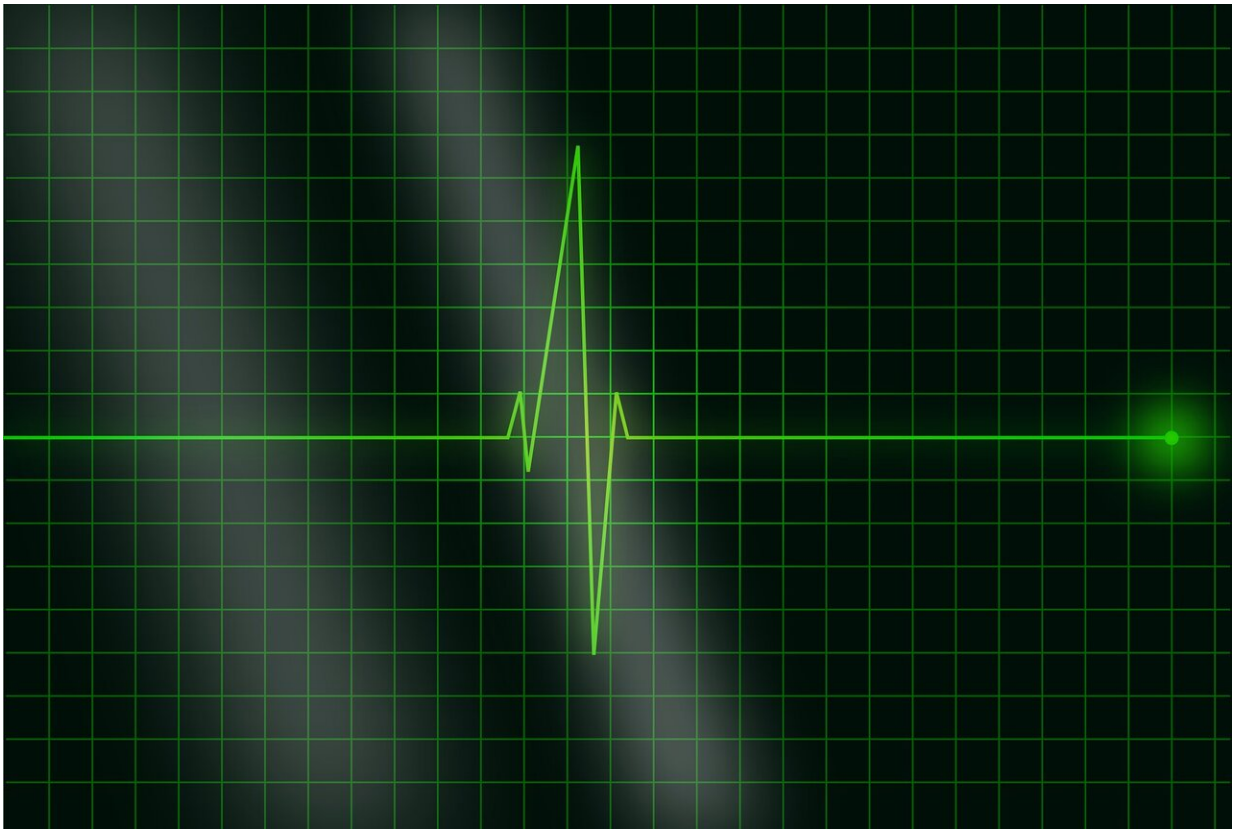


New artificial intelligence tool detects often overlooked heart diseases

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Physician-scientists in the Smidt Heart Institute at Cedars-Sinai have created an artificial intelligence (AI) tool that can effectively identify and distinguish between two life-threatening heart conditions that are

often easy to miss: hypertrophic cardiomyopathy and cardiac amyloidosis. The new findings were published in *JAMA Cardiology*.

"These two [heart](#) conditions are challenging for even expert cardiologists to accurately identify, and so patients often go on for years to decades before receiving a correct diagnosis," said David Ouyang, MD, a cardiologist in the Smidt Heart Institute and senior author of the study. "Our AI algorithm can pinpoint disease patterns that can't be seen by the naked eye, and then use these patterns to predict the right diagnosis."

The two-step, novel algorithm was used on over 34,000 cardiac ultrasound videos from Cedars-Sinai and Stanford Healthcare's echocardiography laboratories. When applied to these clinical images, the algorithm identified specific features—related to the thickness of heart walls and the size of heart chambers—to efficiently flag certain patients as suspicious for having the potentially unrecognized cardiac diseases.

"The algorithm identified high-risk patients with more accuracy than the well-trained eye of a clinical expert," said Ouyang. "This is because the algorithm picks up subtle cues on ultrasound videos that distinguish between [heart conditions](#) that can often look very similar to more benign conditions, as well as to each other, on initial review."

Without comprehensive testing, cardiologists find it challenging to distinguish between similar appearing diseases and changes in heart shape and size that can sometimes be thought of as a part of normal aging. This algorithm accurately distinguishes not only abnormal from normal, but also between which underlying potentially life-threatening cardiac conditions may be present—with warning signals that are now detectable well before the disease clinically progresses to the point where it can impact health outcomes. Getting an earlier diagnosis enables patients to begin effective treatments sooner, prevent adverse clinical

events, and improve their quality of life.

Cardiac amyloidosis, often called "stiff heart syndrome," is a disorder caused by deposits of an abnormal protein (amyloid) in the heart tissue. As amyloid builds up, it takes the place of healthy heart muscle, making it difficult for the heart to work properly. Cardiac amyloidosis often goes undetected because patients might not have any symptoms, or they might experience symptoms only sporadically.

The disease tends to affect older, Black men or patients with cancer or diseases that cause inflammation. Many patients belong to underserved communities, making the study results an important tool in improving healthcare equity, Ouyang said.

Hypertrophic cardiomyopathy is a disease that causes the heart muscle to thicken and stiffen. As a result, it's less able to relax and fill with blood, resulting in damage to heart valves, fluid buildup in the lungs, and abnormal heart rhythms.

Although separate and distinct conditions, cardiac amyloidosis and hypertrophic cardiomyopathy often look very similar to each other on an echocardiogram, the most commonly used cardiac imaging diagnostic.

Importantly, in the very early stages of disease, each of these cardiac conditions can also mimic the appearance of a non-diseased heart that has progressively changed in size and shape with aging.

"One of the most important aspects of this AI technology is not only the ability to distinguish abnormal from normal, but also to distinguish between these abnormal conditions, because the treatment and management of each cardiac disease is very different," said Ouyang.

The hope, Ouyang said, is that this technology can be used to identify

patients from very early on in their disease course. That's because clinicians know that earlier is always better for getting the most benefit from therapies that are available today and that can be very effective for preventing the worst possible outcomes, such as heart failure, hospitalizations, and sudden death.

Researchers plan to soon launch [clinical trials](#) for patients flagged by the AI algorithm for suspected cardiac amyloidosis. Patients enrolled in the trial will be seen by experts in the cardiac amyloidosis program at the Smidt Heart Institute, one of only a handful of programs on the West Coast dedicated to the disease.

A clinical trial for patients flagged by the [algorithm](#) for suspected [hypertrophic cardiomyopathy](#) just started at Cedars-Sinai.

"The use of [artificial intelligence](#) in cardiology has evolved rapidly and dramatically in a relatively short period of time," said Susan Cheng, MD, MPH, director of the Institute for Research on Healthy Aging in the Department of Cardiology at the Smidt Heart Institute and co-senior author of the study. "These remarkable strides—which span research and clinical care—can make a tremendous impact in the lives of our patients."

More information: Grant Duffy et al, High-Throughput Precision Phenotyping of Left Ventricular Hypertrophy With Cardiovascular Deep Learning, *JAMA Cardiol.* (2022). [DOI: 10.1001/jamacardio.2021.6059](https://doi.org/10.1001/jamacardio.2021.6059)

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