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ECG-based AI model can predict undiagnosed structural heart disease

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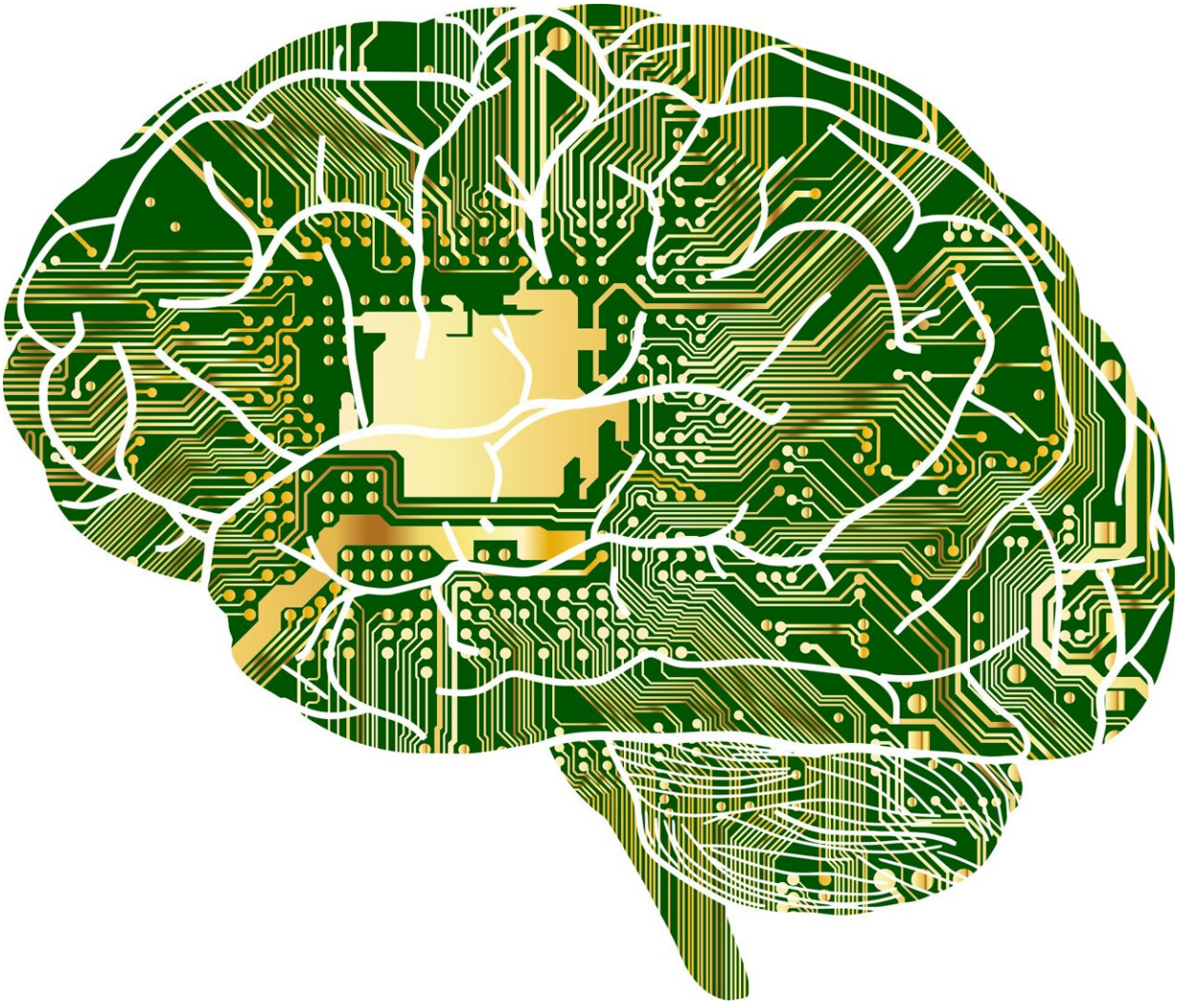

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A team of clinicians and scientists from Tempus and Geisinger have found that a new artificial intelligence model can accurately identify patients at increased risk of undiagnosed structural heart disease.

Structural heart disease (SHD) is a group of conditions that adversely affect the valves, walls, chambers, or muscles of the heart. SHD is typically a progressive disease that causes a variety of debilitating symptoms or death, making it important to diagnose and treat patients early to prevent these poor outcomes. However, many patients with the disease are undiagnosed.

The Tempus and Geisinger study sought to address this diagnostic gap by developing a novel machine learning model that uses data from a 12-lead electrocardiogram (ECG)—an inexpensive and commonly used test measuring the electrical signals of the heart—to identify patients at high risk of undiagnosed SHD. Published in *Circulation*, the rECHOmmend model can predict any one of seven structural heart diseases that are diagnosable by echocardiography (an ultrasound of the heart).

The team of data scientists and medical researchers used 2.2 million ECGs from more than 480,000 patients over 37 years of patient care at Geisinger to train a deep neural network—a specialized type of AI model—to predict who, among patients without a prior history of SHD, would develop clinically significant disease that could benefit from guideline-directed monitoring or treatment. Overall, the study found that the model achieved excellent performance, exceeding the performance of any previously published model predicting any single disease. The findings show that clinicians using this model could find more disease with fewer diagnostic studies.

"Structural heart disease carries a high burden of morbidity and mortality, and this model is both actionable and practical for identifying undiagnosed patients in clinical practice," said Joel Dudley, Ph.D., chief

scientific officer at Tempus. "Our two teams are continuing to find new ways of applying AI to predict heart disease before it reaches a severe stage of irreversible debilitation for patients, and the rECHOmmend study builds on that foundational work."

"Past studies have shown the ability of artificial intelligence to enable single disease screening with echocardiography. The rECHOmmend study builds on those to further improve the feasibility of echocardiography as a screening tool for structural heart disease," said Alvaro Ulloa Cerna, Ph.D., senior data scientist at Geisinger and a lead author of the study. "This could allow for earlier diagnosis and potentially avoid further disease development and its debilitating symptoms."

More information: Alvaro E. Ulloa-Cerna et al, rECHOmmend: An ECG-based Machine-learning Approach for Identifying Patients at High-risk of Undiagnosed Structural Heart Disease Detectable by Echocardiography, *Circulation* (2022). DOI: 10.1161/CIRCULATIONAHA.121.057869

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