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Research shows how machine-learning models can interpret echocardiographic images and enable HCM diagnosis

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Computer algorithms can automatically interpret echocardiographic images and distinguish between pathological hypertrophic cardiomyopathy (HCM) and physiological changes in athletes' hearts, according to research from the Icahn School of Medicine at Mount Sinai (ISMMS), published online yesterday in the Journal of the *American College of Cardiology*.

HCM is a disease in which a portion of the myocardium enlarges, creating functional impairment of the heart. It is the leading cause of sudden death in young athletes. Diagnosing HCM is challenging since athletes can present with physiological hypertrophy, in which their hearts appear large, but do not feature the pathological abnormality of HCM. The current standard of care requires precise phenotyping of the two similar conditions by a highly trained cardiologist.

"Our research has demonstrated for the first time that machine-learning algorithms can assist in the discrimination of physiological versus pathological hypertrophic remodeling, thus enabling easier and more accurate diagnoses of HCM," said senior study author Partho P. Sengupta, MD, Director of Cardiac Ultrasound Research and Professor of Medicine in Cardiology at the Icahn School of Medicine at Mount Sinai. "This is a major milestone for echocardiography, and represents a critical step toward the development of a real-time, machine-learning-based system for automated interpretation of echocardiographic images. This could help novice echo readers with limited experience, making the diagnosis rapid and more widely available."

Using data from an existing cohort of 139 male subjects who underwent echocardiographic imaging at ISMMS (77 verified athlete cases and 62 verified HCM cases), the researchers analyzed the images with tissue tracking software and identified variable sets to incorporate in the machine-learning models. They then developed a collective machine-learning model with three different algorithms to differentiate the two conditions. The model demonstrated superior diagnostic ability comparable to conventional 2D echocardiographic

and Doppler-derived parameters used in clinical practice.

"Our approach shows a promising trend in using automated algorithms as precision medicine techniques to augment physician-guided diagnosis," said study author Joel Dudley, PhD, Director of the Institute for Next Generation Healthcare and Director of the Center for Biomedical Informatics at ISMMS. "This demonstrates how machine-learning models and other smart interpretation systems could help to efficiently analyze and process large volumes of cardiac ultrasound data, and with the growth of telemedicine, it could enable cardiac diagnoses even in the most resource-burdened areas."

Source:

Mount Sinai Health System