AI-Powered CT Chamber Volumetry Predicts Heart Failure Risk As Accurately As MRI, New Study Shows

AI-based LV volume from CAC scans predicts heart failure over 15 years as accurately as MRI, enabling early detection from routine CT imaging.
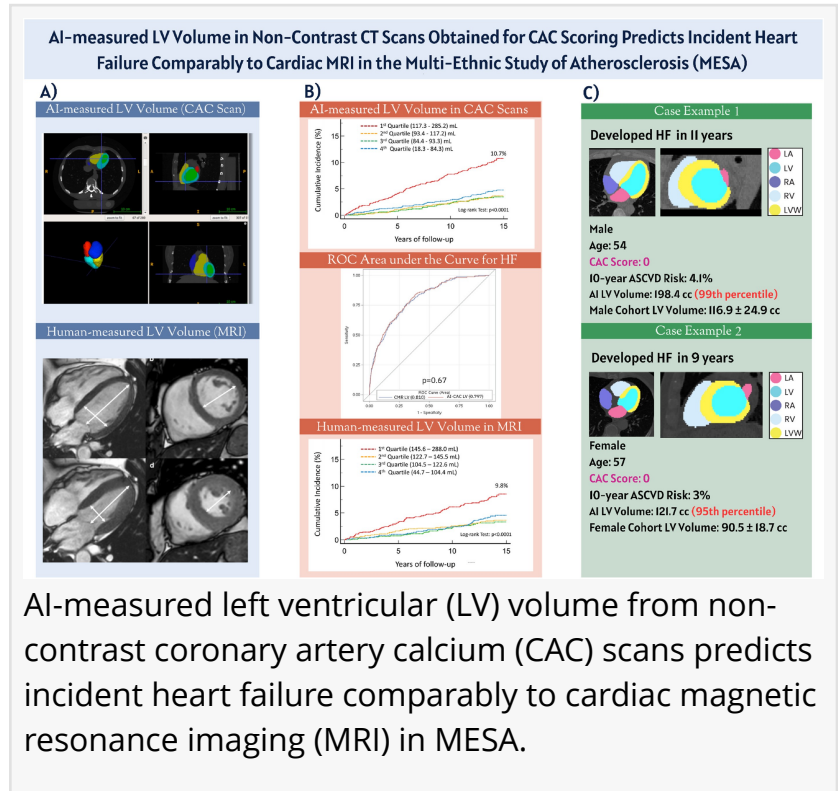
HOUSTON, TX, UNITED STATES, July 24, 2025 /EINPresswire.com/ -- A new peer-reviewed study published in JCCT (Journal of Cardiovascular Computed Tomography) reports that an artificial intelligence (AI) algorithm can opportunistically measure the left ventricular (LV) chamber on routine non-contrast chest CT scans and predict future heart failure as accurately as cardiac MRI. Researchers applied the novel tool, called AutoChamber™ (K240786, FDA designated Breakthrough Medical Device), to standard coronary artery calcium (CAC) screening scans from the Multi-Ethnic Study of Atherosclerosis (MESA) and found that individuals with larger AI-measured LV volumes were significantly more likely to develop heart failure over 15 years of follow-up. The CT-based AI

AI-measured left ventricular (LV) volume from non-contrast coronary artery calcium (CAC) scans predicts incident heart failure comparably to cardiac magnetic resonance imaging (MRI) in MESA.

analysis performed on par with MRI-based measurements – the current gold standard for cardiac volumes – highlighting a new opportunistic use for widely available CT scans in preventive cardiology.

> **"** This work demonstrates the clinical utility of opportunistic cardiac volumetry"
>
> *Dr. Morteza Naghavi*

Key Findings:
• In a cohort of 3,078 asymptomatic adults (52% women, mean age ~62) who underwent both a CAC scan and cardiac MRI at baseline, AI-derived LV chamber volumes from CT scans predicted 15-year heart failure outcomes with high accuracy. A total of 133 participants developed heart failure during
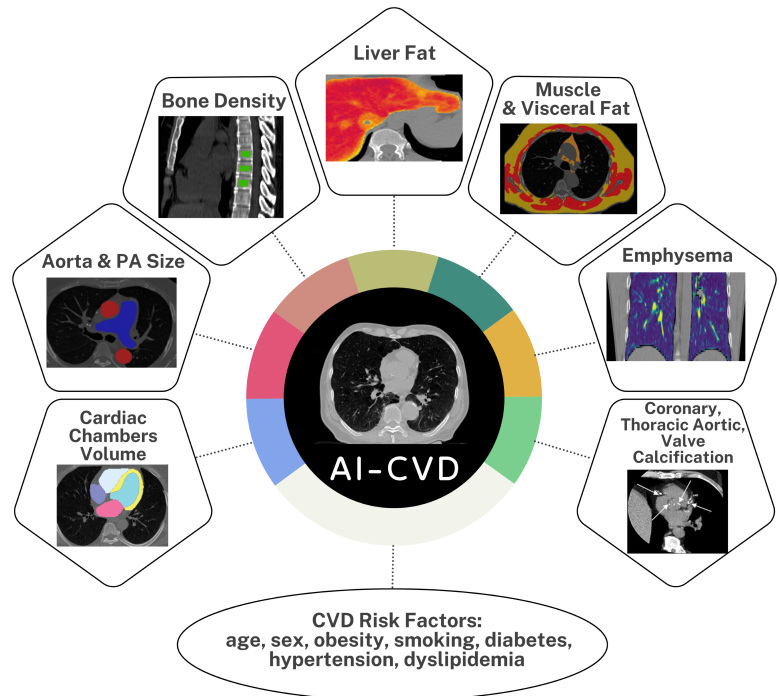
follow-up.

• The AI-enabled CT analysis achieved a time-dependent ROC AUC of ~0.79, virtually identical to the AUC for MRI-derived LV volumes (~0.79 as well; p = 0.67). This indicates no significant difference between the predictive power of the AI CT method and that of cardiac MRI. Both outperformed traditional risk markers such as NT-proBNP (AUC ~0.72) and the CAC score itself (AUC ~0.66).

• Participants with the largest LV volumes (top quartile) on their CAC scans experienced a substantially higher incidence of heart failure over time than those with the smallest hearts (bottom quartile). Kaplan-Meier analyses showed significant separation of heart failure event rates by LV volume category (log-rank p < 0.0001), reinforcing the prognostic value of this AI-based stratification.

The study leverages the fact that coronary calcium scans, commonly used in preventive cardiology, already capture the heart's structure—but typically ignore chamber volumes. By analyzing CAC scans with AI, clinicians can now extract meaningful cardiac data without additional imaging, cost, or radiation.

AI-CVD: CVD RISK FACTORS + AI-GENERATED BIOMARKERS FROM CHEST CT SCANS

Liver Fat
Bone Density
Muscle & Visceral Fat
Aorta & PA Size
Emphysema
Cardiac Chambers Volume
Coronary, Thoracic Aortic, Valve Calcification
AI-CVD
CVD Risk Factors: age, sex, obesity, smoking, diabetes, hypertension, dyslipidemia

AI-CVD components includes AutoChamber, AutoBMD, and several other opportunistic measurements in a CAC scan.

HeartLung.AI

Researchers used AutoChamber (HeartLung.AI, Houston, TX) to analyze CAC scans in MESA participants who were all free of cardiovascular disease at baseline. Over 15 years, 133 developed heart failure. AI-based LV volume measured on CT significantly predicted who would go on to develop heart failure, with nearly identical accuracy to cardiac MRI.

Adding the AI CT metric to models with traditional risk factors improved risk prediction significantly. It outperformed NT-proBNP and CAC score in reclassifying individuals by heart failure risk.

"This work demonstrates the clinical utility of opportunistic cardiac volumetry," said Dr. Morteza Naghavi, Founder and President of HeartLung Technologies. "By applying AI to routine CT scans, we can effectively turn a standard heart scan into a multi-purpose screening tool – evaluating not only a patient's arteries for calcified plaque, but also the size of the heart's chambers for early signs of heart failure risk, and other biomarkers measured by our AI-CVD™ platform. These findings underscore the expanding role of AI in preventive cardiology. The AI-CVD™ toolkit, which includes AutoChamber™, enables us to discover hidden indicators of multiple disorders in scans patients are already getting for other reasons, at no extra cost or radiation."

This study adds to HeartLung's growing body of evidence supporting AI-based chamber analysis. A prior publication in JACC: Advances demonstrated that AI-based left atrial volume from CAC scans could predict new-onset atrial fibrillation and stroke as well as MRI.

Your Cardiac Chambers Volumetry Report

This is an opportunistic report generated by AutoChamber™ AI based on CT scans ordered for other reasons

Patient Name: Doe, Jack
ID: 9008
Date of Exam: 7/16/2024
Date of Birth: 1/1/1953
Gender: Male

Your Clinic's Logo Here

Powered by **HeartLung** Technologies

AutoChamber Volumetry

Chamber	Volume(cc)		Percentile
LA	89.1	**44.3***	96th
LV	121.6	**62.5**	78th
RA	88.7	**45.7**	58th
RV	131.8	**78.8**	65th
LVM	118.5	**63.2**	80th

Cardiothoracic Ratio: 46%
*Adjusted for body surface area (BSA)

Percentile for Males Adjusted by Body Surface Area (BSA)

LA (Left Atrium)
LV (Left Ventricle)
RA (Right Atrium)
RV (Right Ventricle)
LVM (Left Ventricular Mass)

0   50th   75th   100
LA
LV
RA
RV
LVM
PERCENTILE
EXAMPLE

Coronal (Frontal view)
Sagittal (Lateral view)
Axial (Transverse view)

Reference Database
The above percentiles are calculated based on your gender and body surface area (BSA) using reference data from 5830 people who participated in the Multi-Ethnic Study of Atherosclerosis (MESA), sponsored by the National Institute of Health. Using AutoChamber measurements and their clinical evaluation, healthcare providers can investigate asymptomatic patients who are unaware of their risk of heart failure, atrial fibrillation, stroke and other life-threatening conditions associated with enlarged heart, enlarged cardiac chambers, and left ventricular hypertrophy that may warrant additional risk assessment or follow up. The actual level of risk must be evaluated based on your care provider's comprehensive assessment. Colors and cut-offs are based on institutional settings and are not an indication for treatment. This report serves as an AI-enabled quantitative imaging tool to a qualified care provider to make the diagnosis based on comprehensive evaluation.

Physician's Recommendation
Based on the results, your LV, LA, and LVM volume are elevated because they exceed the 75th percentile. We strongly recommend that you consult with your care provider for necessary follow-up and evaluation.

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AutoChamber sample report

AutoChamber has received FDA Breakthrough Device designation and is launching clinically alongside HeartLung's other tools, including AutoBMD for bone density screening.
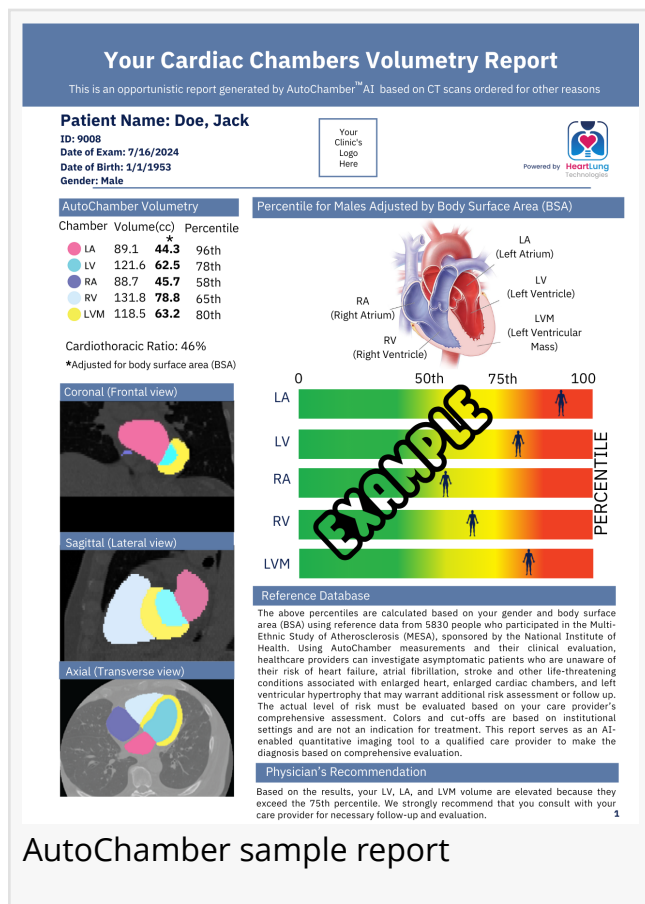
Read the full publication here:
https://www.sciencedirect.com/science/article/pii/S193459252500382X?dgcid=author

About AI-CVD™: Comprehensive AI Solution for Cardiovascular Disease Prevention
HeartLung Technologies' AutoChamber™ and AutoBMD™ are integral components of AI-CVD™, a suite of AI-powered tools designed to detect and prevent cardiovascular disease. AI-CVD™ leverages advanced algorithms to analyze CT scans, identifying hidden heart risks and enabling early intervention. This comprehensive approach underscores HeartLung's commitment to revolutionizing preventive healthcare through innovative AI technologies.

About HeartLung Technologies
HeartLung leverages AI technology for the early detection and prevention of heart disease, lung cancer, emphysema/COPD, osteoporosis, myosteatosis, fatty liver disease, and other life-threatening conditions. HeartLung has received FDA "Breakthrough Designation" for AutoChamber™, an AI tool that identifies enlarged cardiac chambers and left ventricular hypertrophy in non-contrast chest CT scans, which are typically undetectable by the human eye. The AutoChamber™ AI also works on low-dose CT for lung cancer screening as well as contrast-

enhanced coronary CT angiography (CCTA) scans. Additionally, HeartLung has obtained FDA 510(k) clearance for AutoBMD™, the only DEXA-equivalent, CT-based opportunistic osteoporosis screening approved by the FDA, applicable to over 25 million CT scans annually and reimbursed by Medicare. HeartLung is also awaiting FDA approval for AI-CVD™, a suite of AI modules including AI-CAC™ (AI-enabled Coronary Artery Calcium Scoring), aimed at early detection and prevention of cardiovascular disease using widely available CT scans.

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