AI-Automated Opportunistic Screening for Cardiomegaly on CT

Asser Abou Elkassem, Steven Rothenberg, Rafah Mresh, Yujan Shrestha, Adam Sturdivant, Efstathia Andrikopoulou, Kevin Junck, Ryan Godwin, Srini Tridandapani, Andrew Smith

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

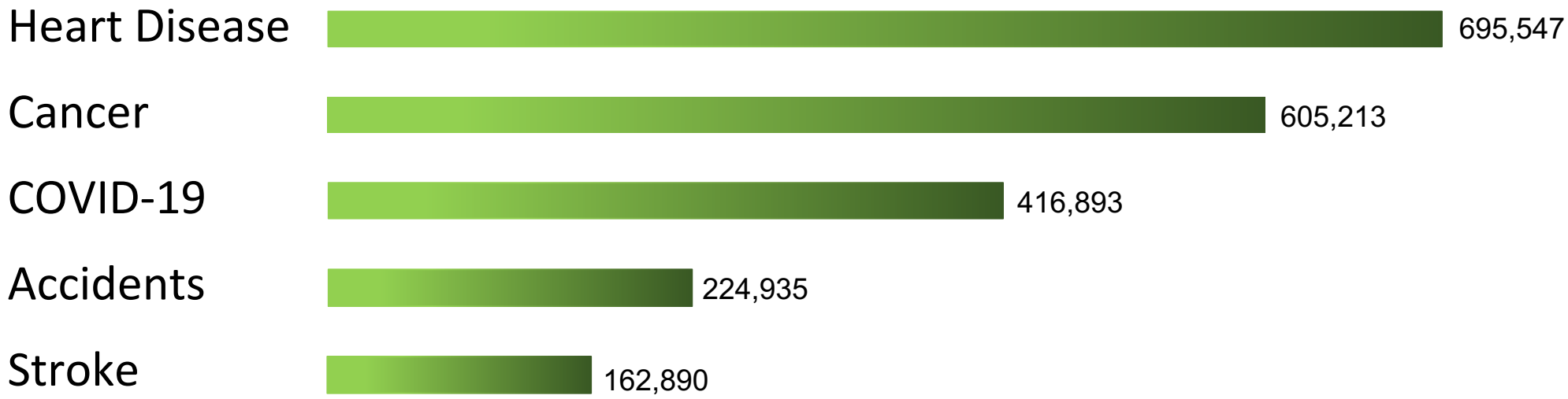
Disclosures

Andrew Smith MD PhD:

- AI Metrics – Cofounder, Chair of Board, CMO, and Owner
- Radiostics – CEO and Owner
- Body Check – Advisor and Owner
- Multiple patents issued and pending on AI medical imaging solutions

Background

- Heart Disease is the #1 cause of death in the U.S.

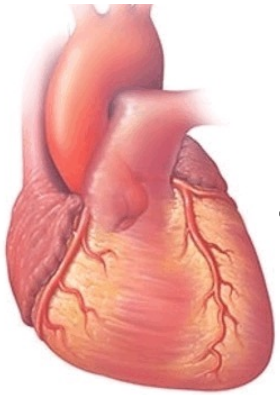


- Current screening methods for heart disease have been ineffective in reducing mortality rates.

Xu JQ, et. al. Mortality in the United States, 2021. NCHS Data Brief, no 456. Hyattsville, MD: National Center for Health Statistics. 2022.

Cardiomegaly

- Cardiomegaly (Abnormal Heart Enlargement) is asymptomatic and can lead to major heart problems.

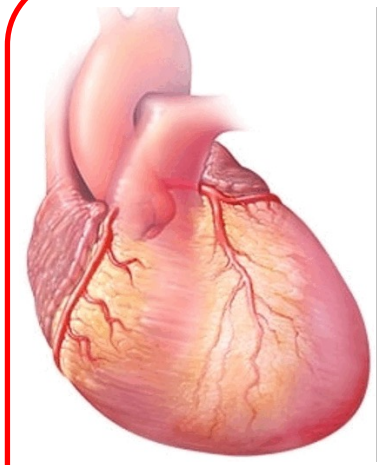


Normal Heart

+

Chronic conditions:

- Elevated Blood pressure
- Decreased blood flow to heart
- Valvular disease
- Congenital



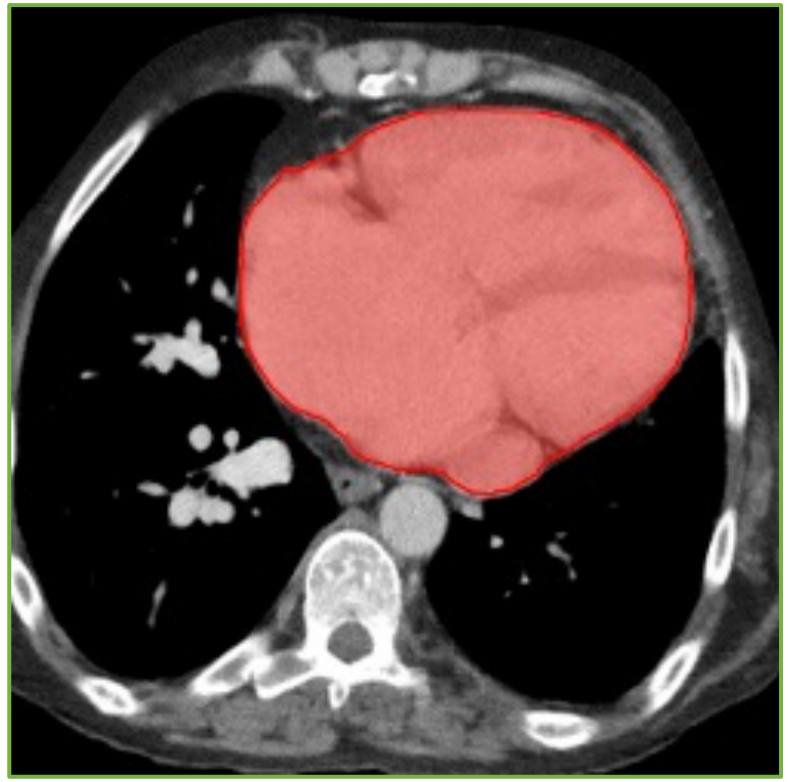
Cardiomegaly

Major Heart events:

- Myocardial Infarction
- Heart failure
- Stroke
- Arrhythmias
- Death

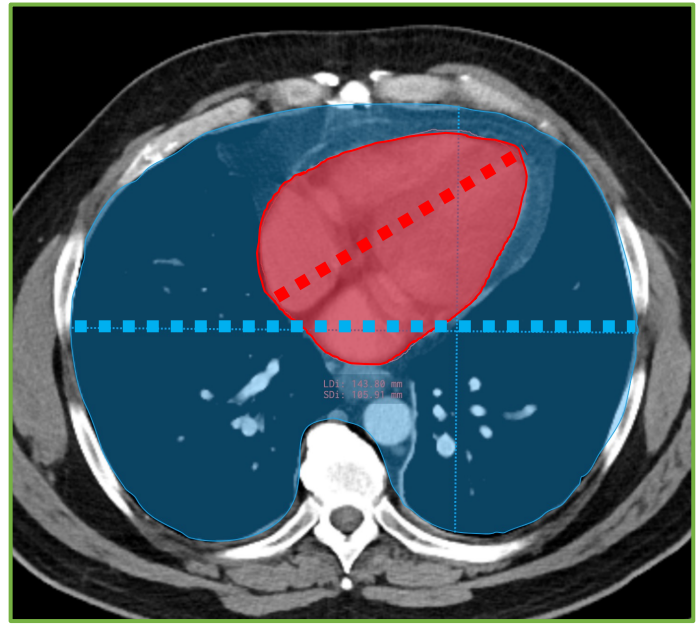
Opportunistic Screening

- There are 50 million chest and abdominal CTs per year in the U.S.
- Opportunistic screening for cardiomegaly on routine chest or abdominal CT could help reduce major CVD events and.
- This adds no patient cost or radiation.



AI Cardiomegaly: Algorithm Training & Validation

- The heart and inner chest were segmented on a multi-institutional set of CT exams (N=1500) to train the AI Cardiomegaly algorithm.
- The AI Cardiomegaly algorithm extracts the cardiothoracic ratio (CTR) and was validated in a large single center study (N=14,299).
- The fully-automated AI algorithm was installed on a local server to process all chest and abdominal CTs.

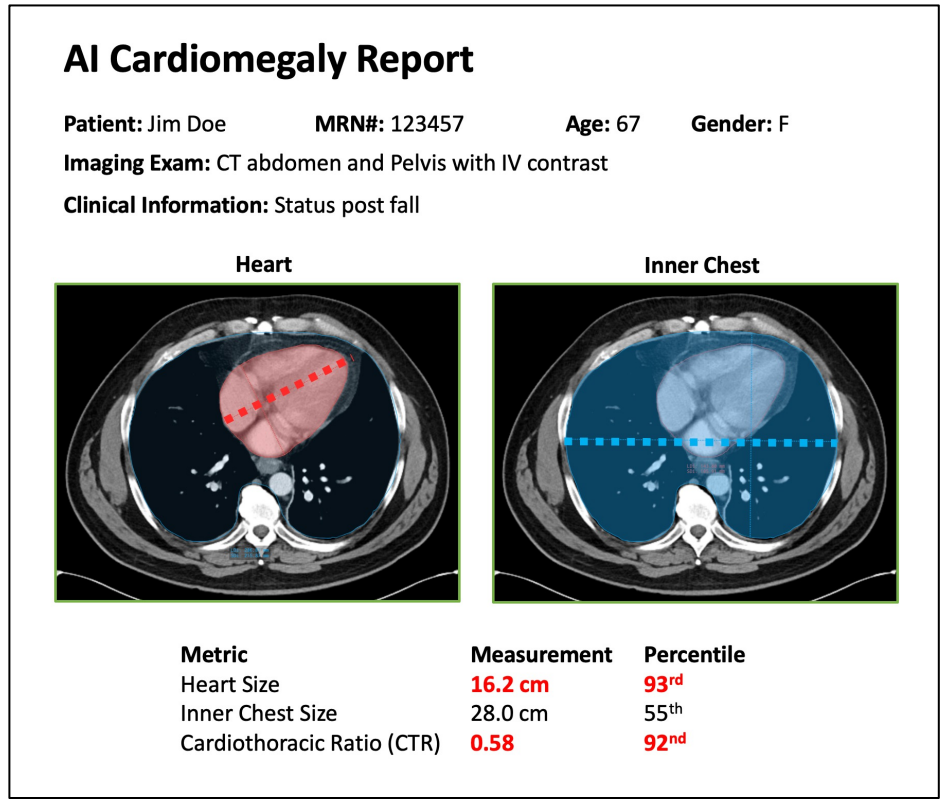


CardioThoracic Ratio (CTR)

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Results

- AI Cardiomegaly output includes a PDF report with patient and exam data, segmentation images, and measurements.
- CT exams processed = 220/day or 80k/year.
- Severe cardiomegaly (CTR >0.56) is found in 10.3% = 22/day or 8,000/year.
- Severe cardiomegaly is unmanaged in >50% = 11/day or 4,000/year.



AI Cardiomegaly Report

Patient: Jim Doe **MRN#:** 123457 **Age:** 67 **Gender:** F

Imaging Exam: CT abdomen and Pelvis with IV contrast

Clinical Information: Status post fall

Heart **Inner Chest**

Metric	Measurement	Percentile
Heart Size	16.2 cm	93rd
Inner Chest Size	28.0 cm	55th
Cardiothoracic Ratio (CTR)	0.58	92nd

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Cardiomegaly: Care Coordination

- Patients with severe cardiomegaly are directed to cardiology for an echocardiogram and complete workup.
- Effective management of cardiomegaly is expected to saves lives and markedly reduces the public health burden of cardiovascular disease.

Clinical Value:

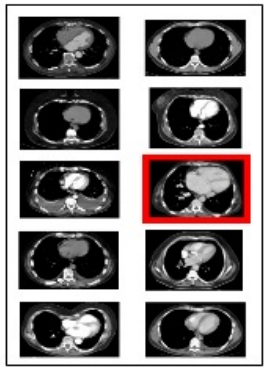
- Detects reversible heart diseases
- Improve quality of life & survival

Return On Investment (ROI):

- Echocardiogram
- New clinical visits
- Reimbursable procedures

Conclusion

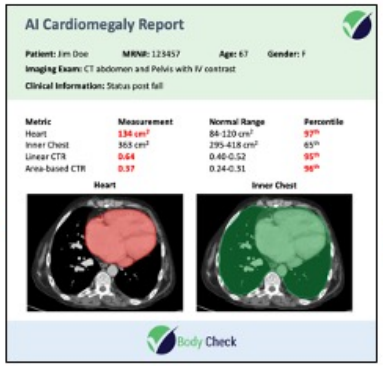
A fully-automated AI algorithm to opportunistically screen for cardiomegaly has the potential to significantly improve the identification and management of patients at risk for preventable cardiovascular disease events.



***220 patients/day**
(80,000 patients/year)

***UAB data**

AI

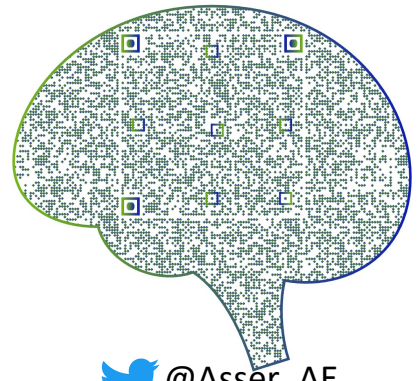


22 patients/day with Cardiomegaly
(8,000 patients/year)

11 patients/day with Unmanaged Cardiomegaly
(4,000 patients/year or 5% of all CT exams)

Management:
- Echocardiogram
- Lifestyle modification
- Medications
- Coronary interventions
- Valve replacement
- Pacemaker
- Defibrillator

Improved Health & Financial ROI



@Asser_AE