#AHA22

Composite deep learning ECG algorithm trained to identify structural heart disease can identify clinically ascertained hypertrophic cardiomyopathy

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TEMPUS

Geisinger

American Heart Association.

Disclosures

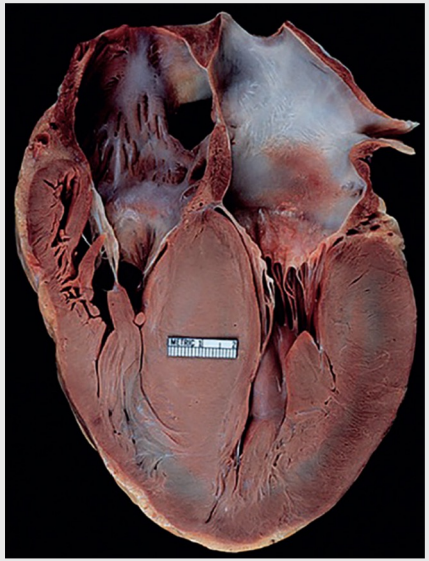
Geisinger receives funding from Tempus for ongoing development of predictive modeling technology and commercialization.

None of the Geisinger authors have ownership interest in any of the intellectual property resulting from the partnership.

Greg, Martin, Arun, David, Brandon, Ruijun and John are Tempus employees.

Hypertrophic Cardiomyopathy (HCM) is **actionable** and **underdiagnosed**

Massive hypertrophy of the myocardium in a patient with HCM[1]



HCM Therapies		
Medications	**Procedures**	**Devices**
Beta Blockers Antiarrhythmics Myosin Inhibitors	Septal Myectomy Alcohol Septal Ablation	ICD

1. Ommen, S. R., et. al. The Lancet. 398, 2102 - 2108 (2021).

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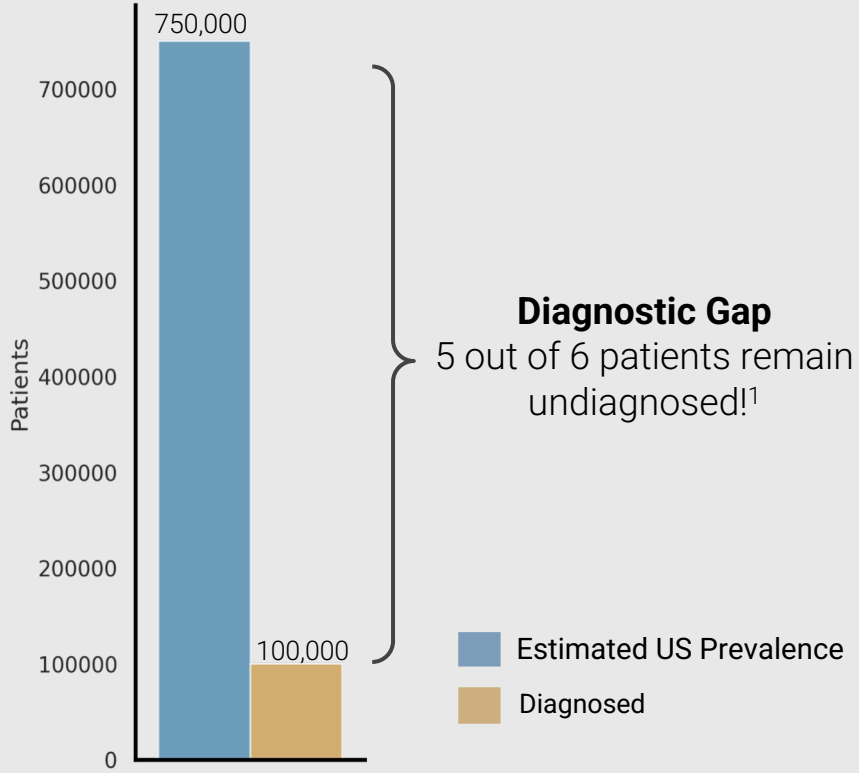

1. Maron, M. S., et. al. Am. J. Cardiol. 117, 1651–1654 (2016).

Two strategies to address the **HCM diagnostic gap**

#1 Single Model

- AUROC: **90%**
- Sensitivity: **90%**
- PPV: **40%** @ 5% prevalence

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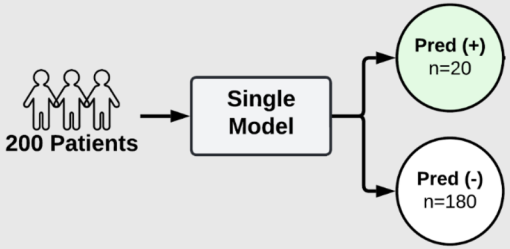

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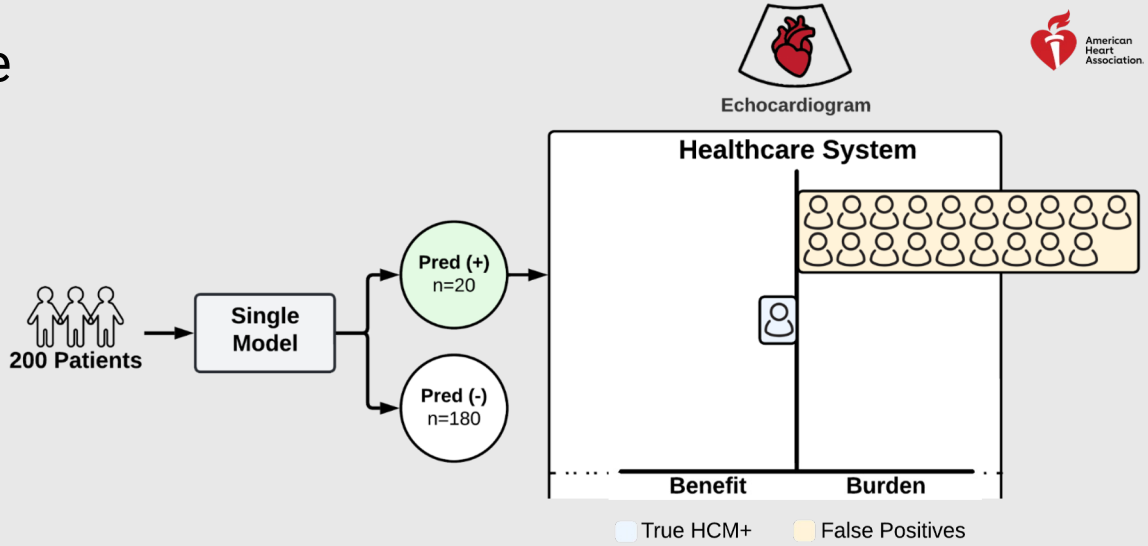

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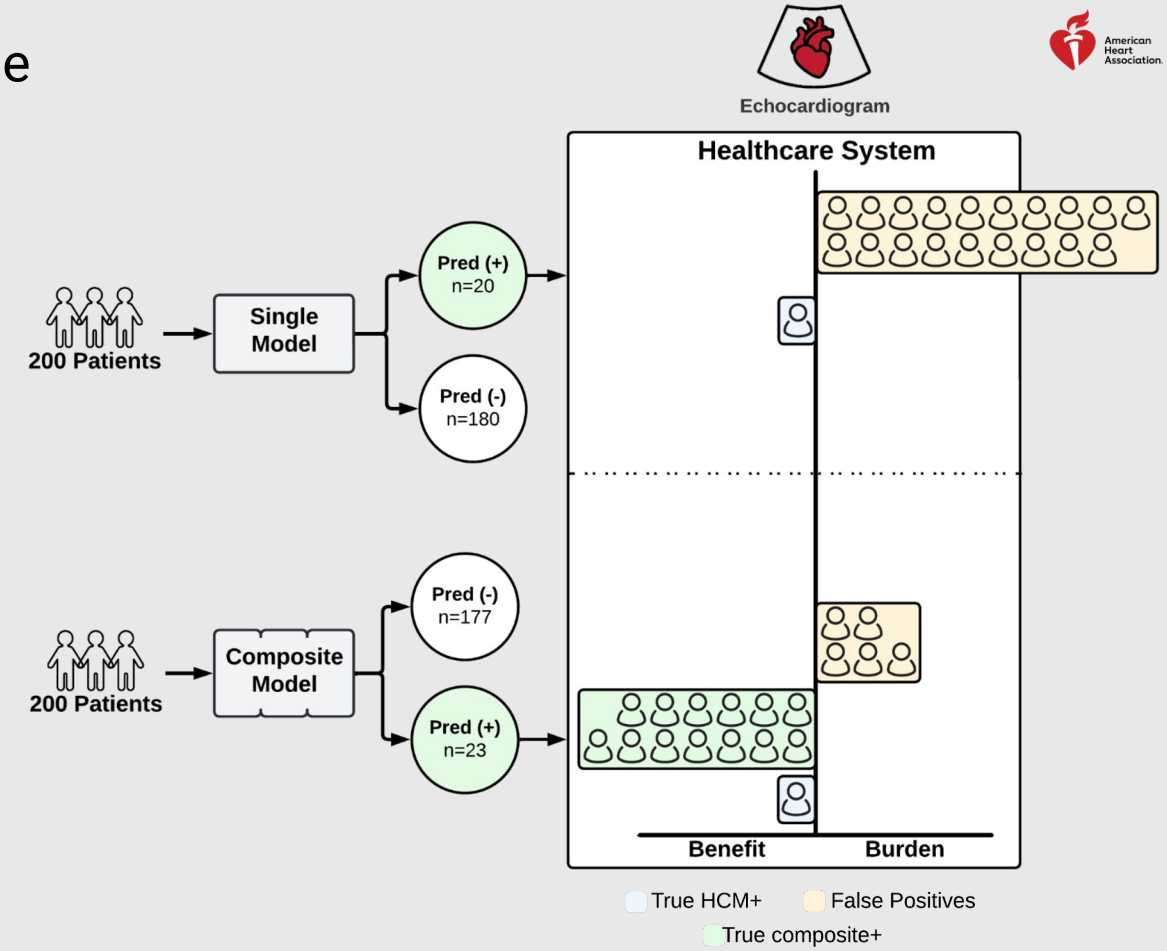
#2 Composite Model

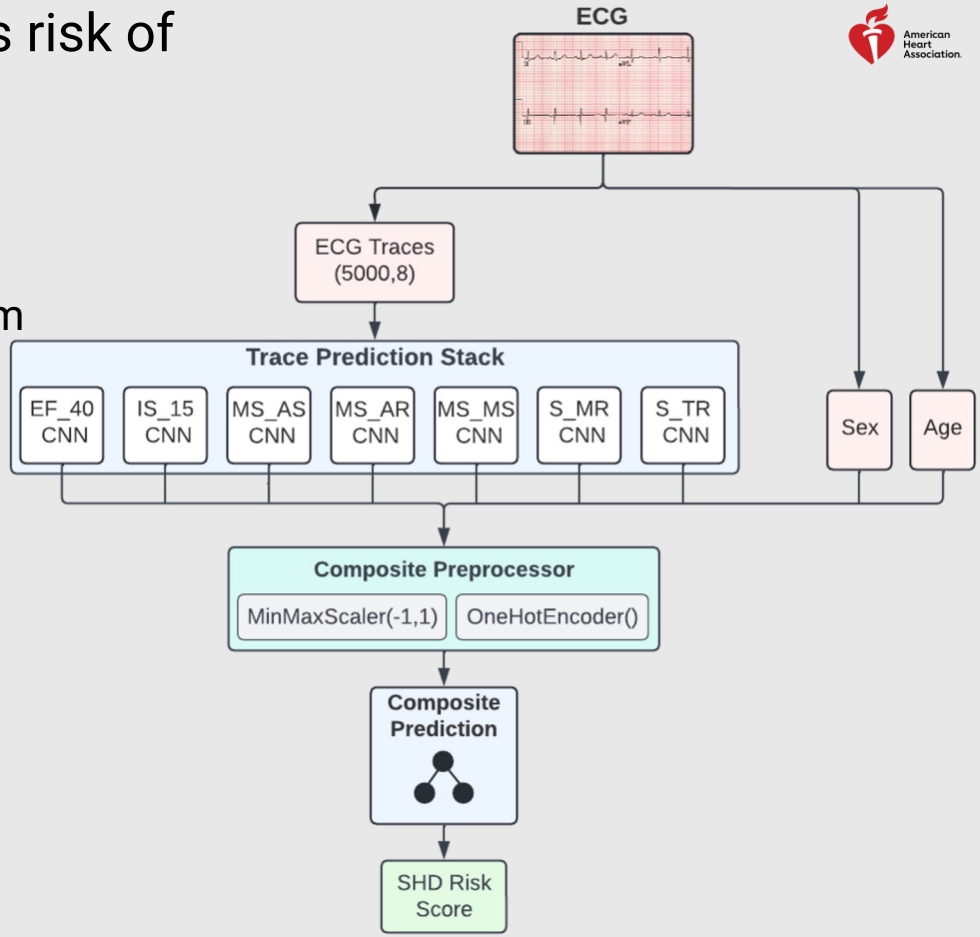
- Triaged diseases based on common diagnostic endpoint **boosts prevalence & PPV**



rECHOmmend: an **ensemble** to assess risk of incident **structural heart disease**

- **Disease Targets:**
  - Ejection Fraction < 40%
  - Interventricular Septal Thickness > 15mm
  - Aortic Stenosis, Regurgitation
  - Mitral Stenosis, Regurgitation
  - Tricuspid Regurgitation

- **Shared Actionability:**
  Triaged disease targets share downstream diagnostic enabling “composite modeling”



1. Ulloa et al. Circulation. 146:36-47 (2022).

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- **Shared Actionability:**
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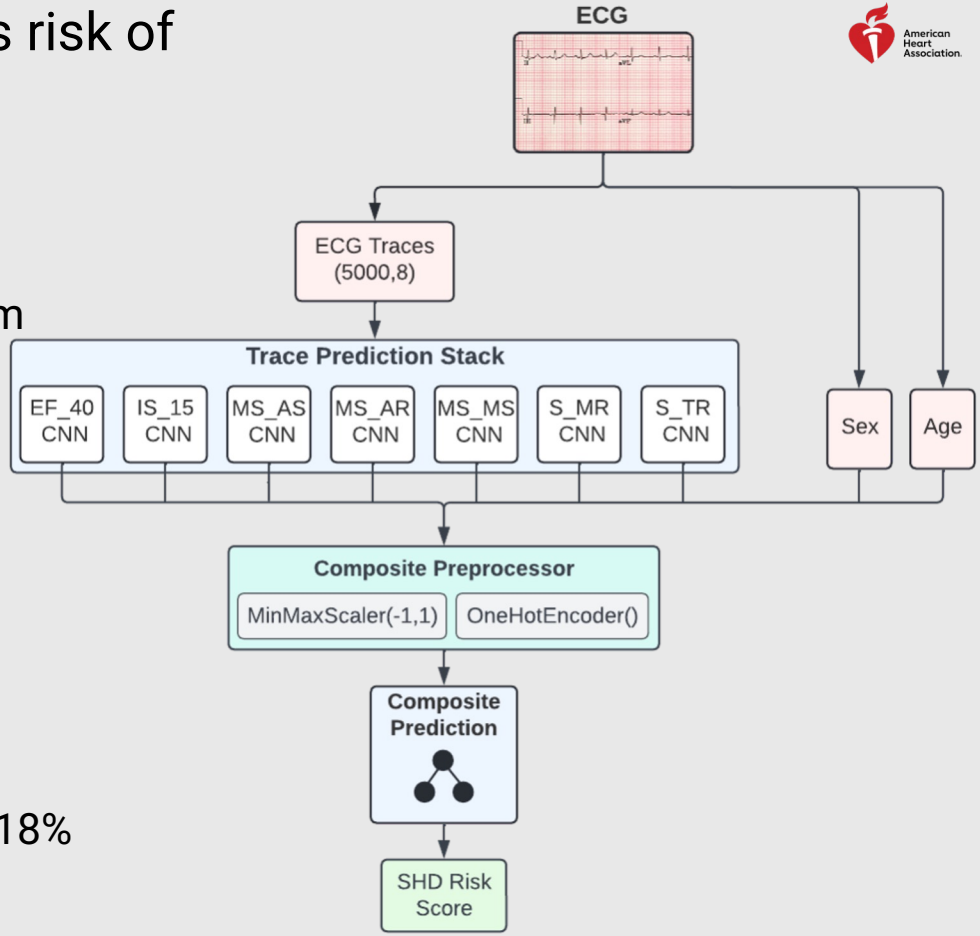
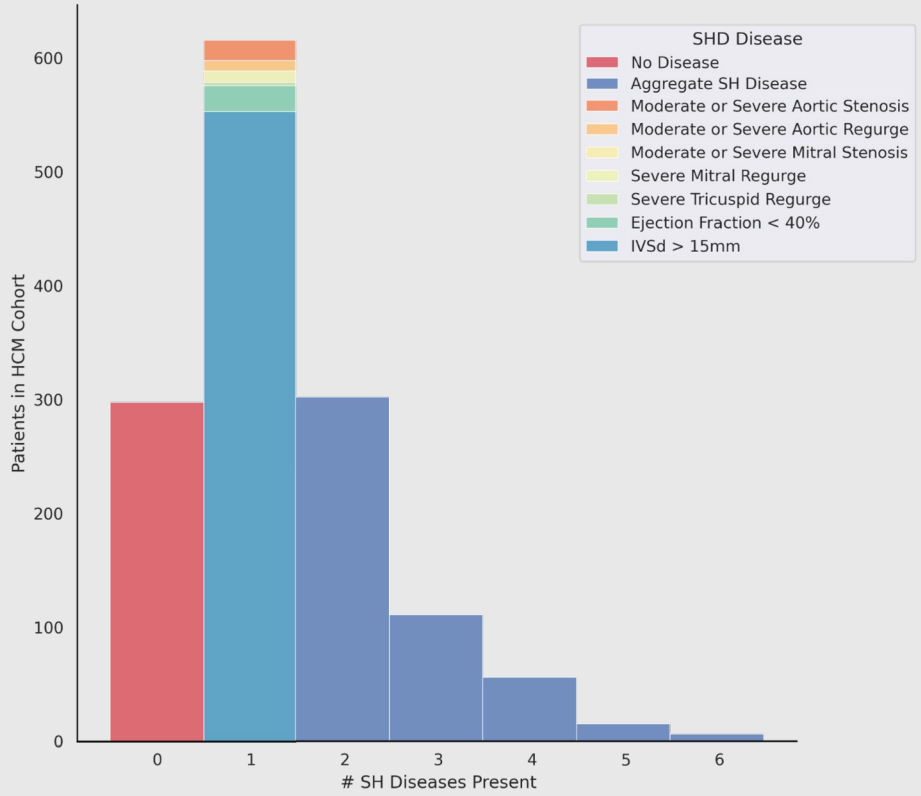
- **AUROC:** 0.90
- **PPV:** 0.77; **Sensitivity:** 0.50 @ prevalence 18%



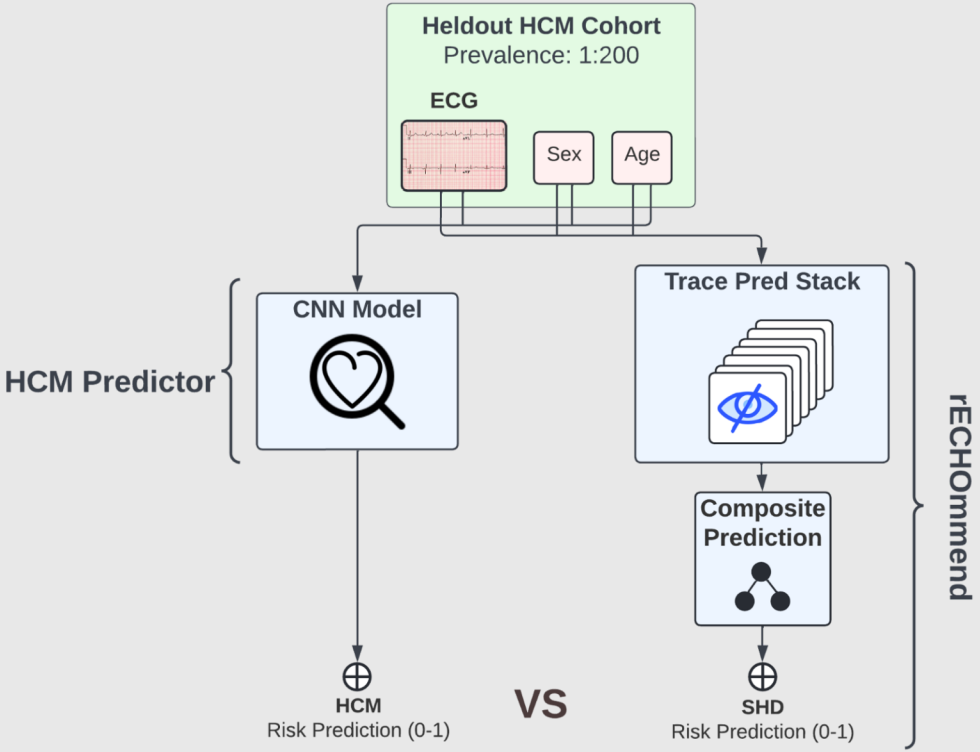
Hypothesis: Despite being trained without HCM-specific labels, rECHOmmend can reliably identify HCM patients

- Septal thickening and mitral regurgitation are often observed in HCM patients[1,2]
- **73%** of patients in the HCM cohort have a “rECHOmmendable” features
- IVSd>15mm, mitral regurgitation and ejection fraction < 40% are commonly observed in our HCM population

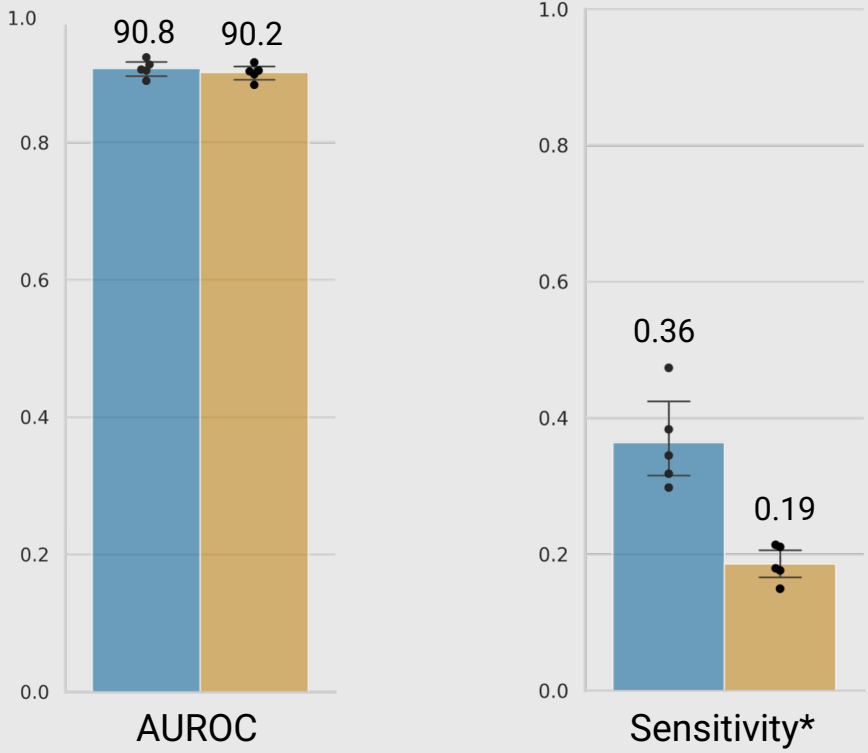


1. Anwar A. Int. J. Cardiol. 10.23937/2378-2951/1410248. (2022).
2. Pantazis A., et al. Echo. Res. Pract. 10.1530/ERP-15-0007. (2015)

We retrospectively evaluated **rECHOmmend's** ability to find incident HCM by testing it against an **HCM-specific CNN** on a heldout set of ECGs



Despite being trained **without HCM labels**, rECHOmmend achieves **comparable AUROC** and **higher sensitivity** to an HCM classifier



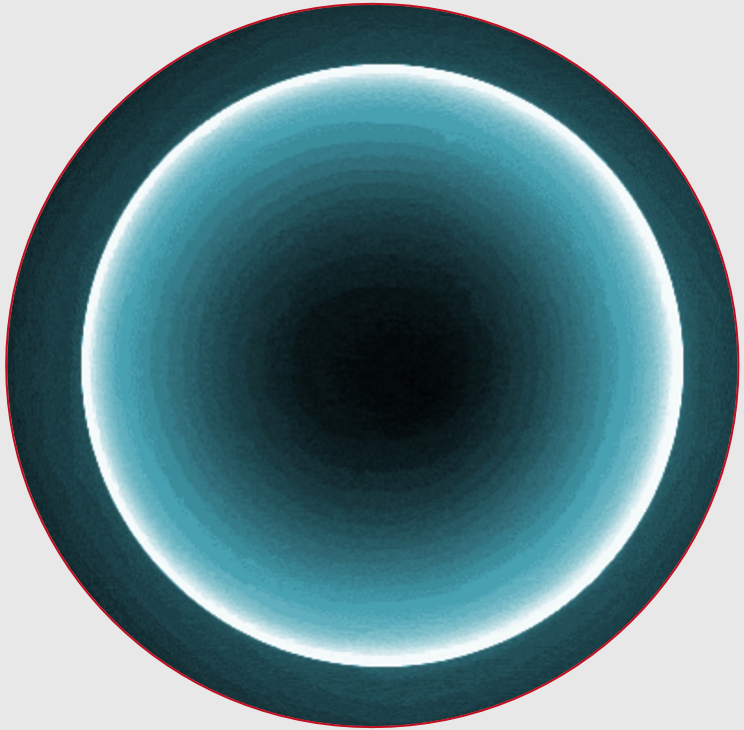
*Sensitivity was calculated on an operating point optimized for an algorithm-specific F1-score

Conclusion & Future Directions

rECHOmmend, a composite deep learning algorithm trained to identify structural heart diseases can identify clinically ascertained HCM with good performance, despite being trained without HCM-specific labels

- We plan to evaluate rECHOmmend on other **disease endpoints** (amyloid, congenital heart disease) to better understand **generalizability**

- We built rECHOmmend under design controls as an investigational medical device and are studying via our **ECG-AID study** (NCT05442203)



Thank you!

- **Geisinger Cardiology Team:**
  Alvaro Ulloa Cerna, Dustin Hartzel, Dan Rocha, Chris Haggerty

- **Tempus Cardiology Team:**
  Martin Kang, Arun Nemani, Brandon Fornwalt, RuiJun Chen, John Pfeifer, David Vidmar

We'd love to chat and showcase our platform @ booth #2606!

American Heart Association.

Scientific Sessions

TEMPUS

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