Point-of-Care Screening Echocardiography to Improve Cardiac Diagnostic Access Among American Indians

Alan F. Riley, FAAP, FASE

Pediatric Cardiology

Congenital Heart

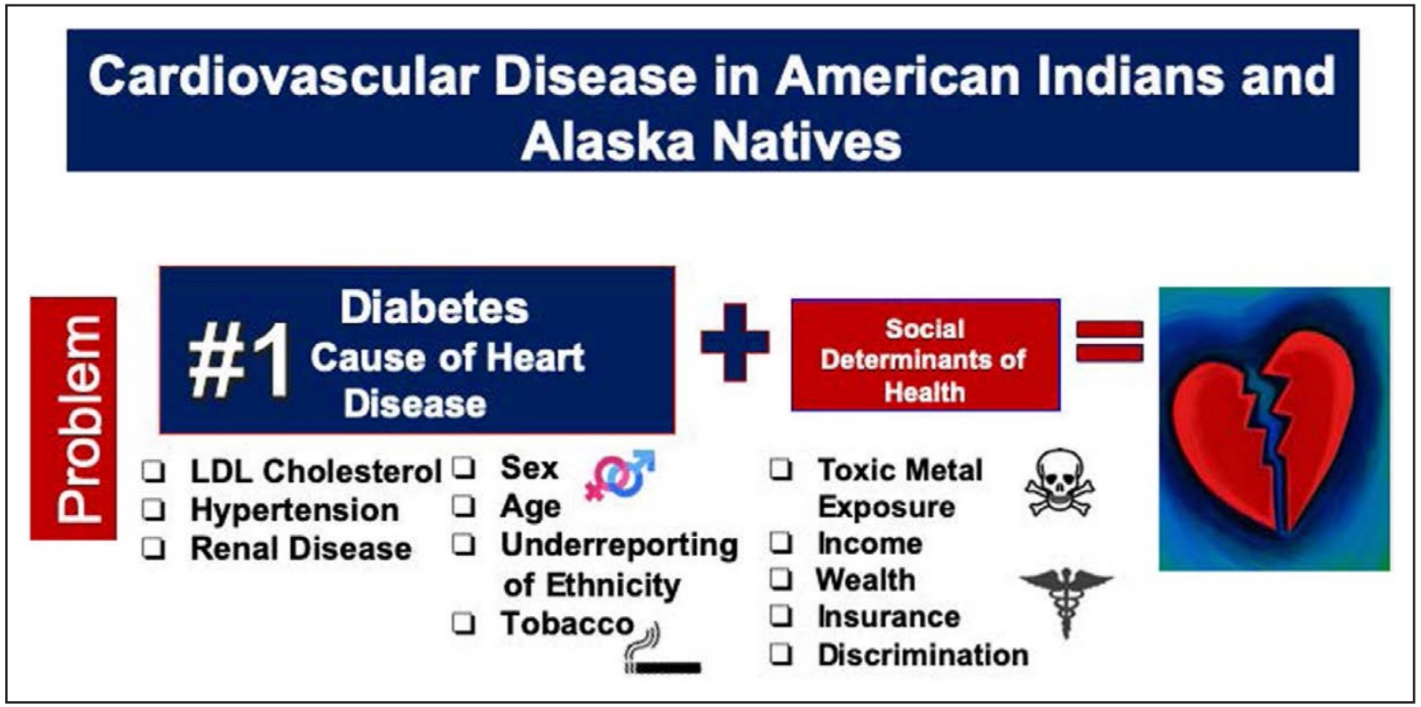
Disclosures

- American Heart Association’s Health Equity Research Network
  - Rural PRO-CARE
  - 10% salary support (Educational Lead, INSTEP)

RURAL-PROCARE
Health Equity Research Network

American Indian Structural Heart Disease Partnership (IN-STEP)

Native American Lands



Circulation

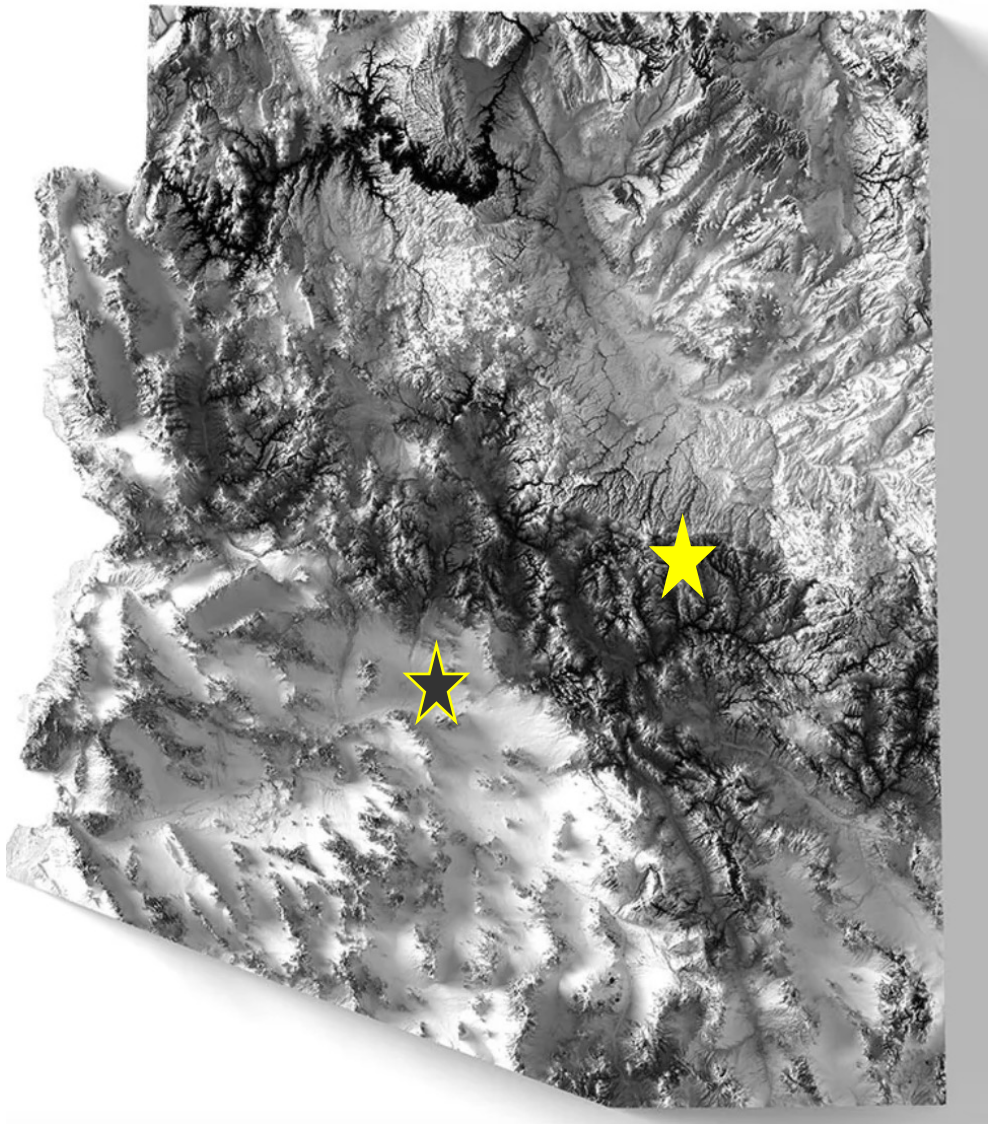
AHA SCIENTIFIC STATEMENT

Cardiovascular Health in American Indians and Alaska Natives

A Scientific Statement From the American Heart Association

White Mountain Apache Tribe

Population: ~17,000



ORIGINAL RESEARCH

Deployment of Point-of-Care Echocardiography to Improve Cardiac Diagnostic Access Among American Indians

INSTEP 1.0

Task Shifting

- Training local staff to perform screening hand-held echocardiography

- Indian Health Service (IHS) Employees
  - 3 Physicians
  - 2 Nurse Practitioners
  - 3 Medical Assistants
  - 1 Clinical Pharmacist

What We Learned...

IT WORKS

12 Providers Trained in Obtaining and Interpreting Basic Echo

THERE'S DISEASE

14% Had Heart Disease, with ~6% of People Scanned Having Newly Diagnosed Heart Disease

IT'S UNSUSTAINABLE

Providers are Busy and Integrating Into Clinic Was Not Sustainable

ORIGINAL RESEARCH

Engaging American Indian Tribal Members Using Group-Level Assessment to Identify Needs and Priorities of a Local Heart Disease Program to Improve Cardiac Care

- Community-engaged participatory research approach
- Co-develop approach to improve cardiology care access
- Inform scalable models for improved diagnosis, care, and outcomes
- Improve cardiac care in a culturally informed and sustainable way

INSTEP 2.0

What is a C.H.R.?

The Community Health Representative Program (C.H.R.) provides healthcare, Health education and wellness activities in a group setting or individual counseling to all communities on the Fort Apache Indian Reservation.

C.H.R. Program is staffed by well-trained paraprofessionals to deliver healthcare services in various settings, i.e., home, office, hospitals, and community health fairs.

Community Health Representatives

CHR Specialization Within The Program

EDUCATION

Explain CVD risks and potential symptoms

CVD SCREENING

Screening for hypertension, diabetes, and hypercholesterolemia

ECHO SCREENING

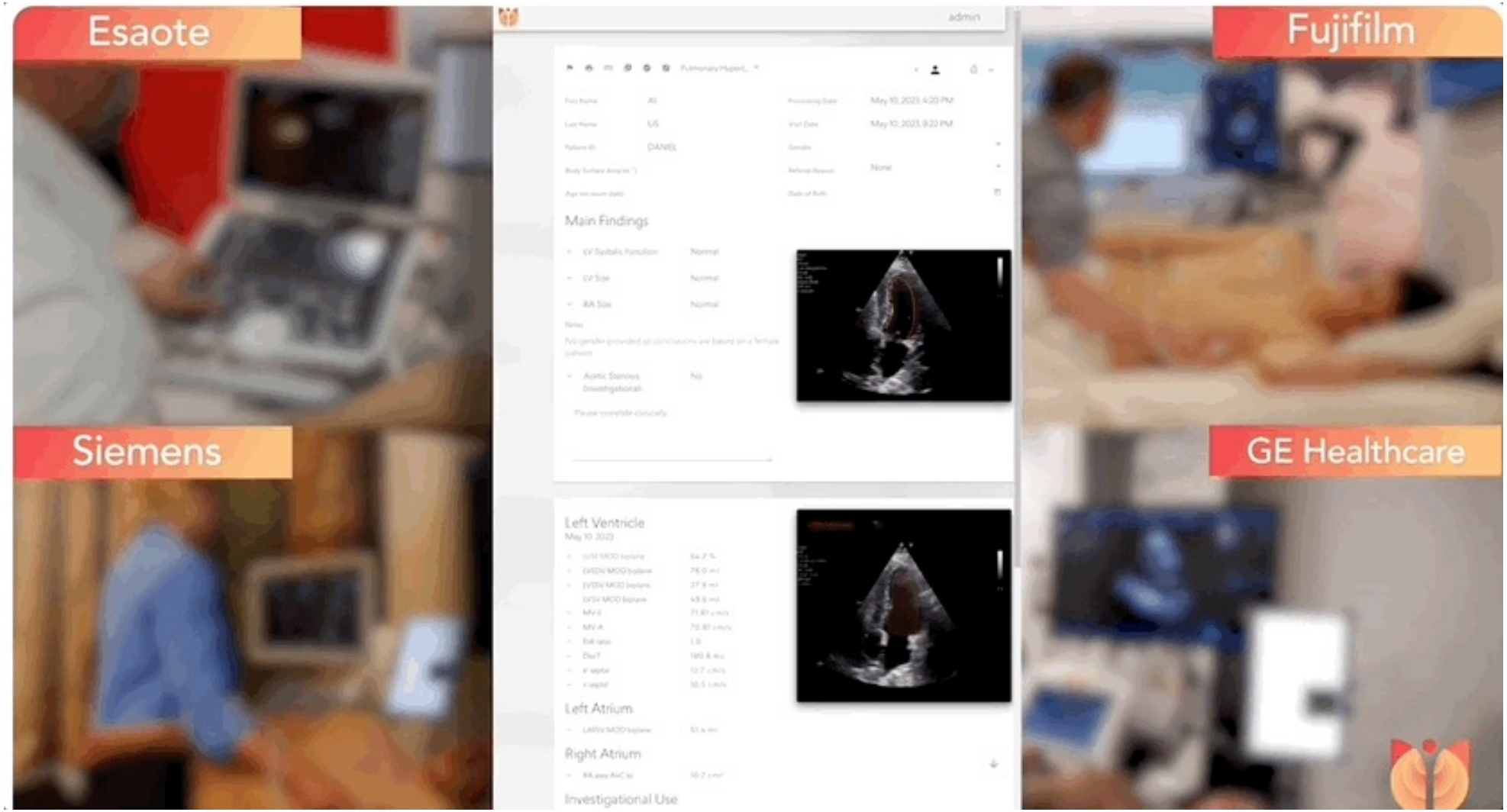
Screening echocardiograms and explanation of screening test results

POCSE-AI

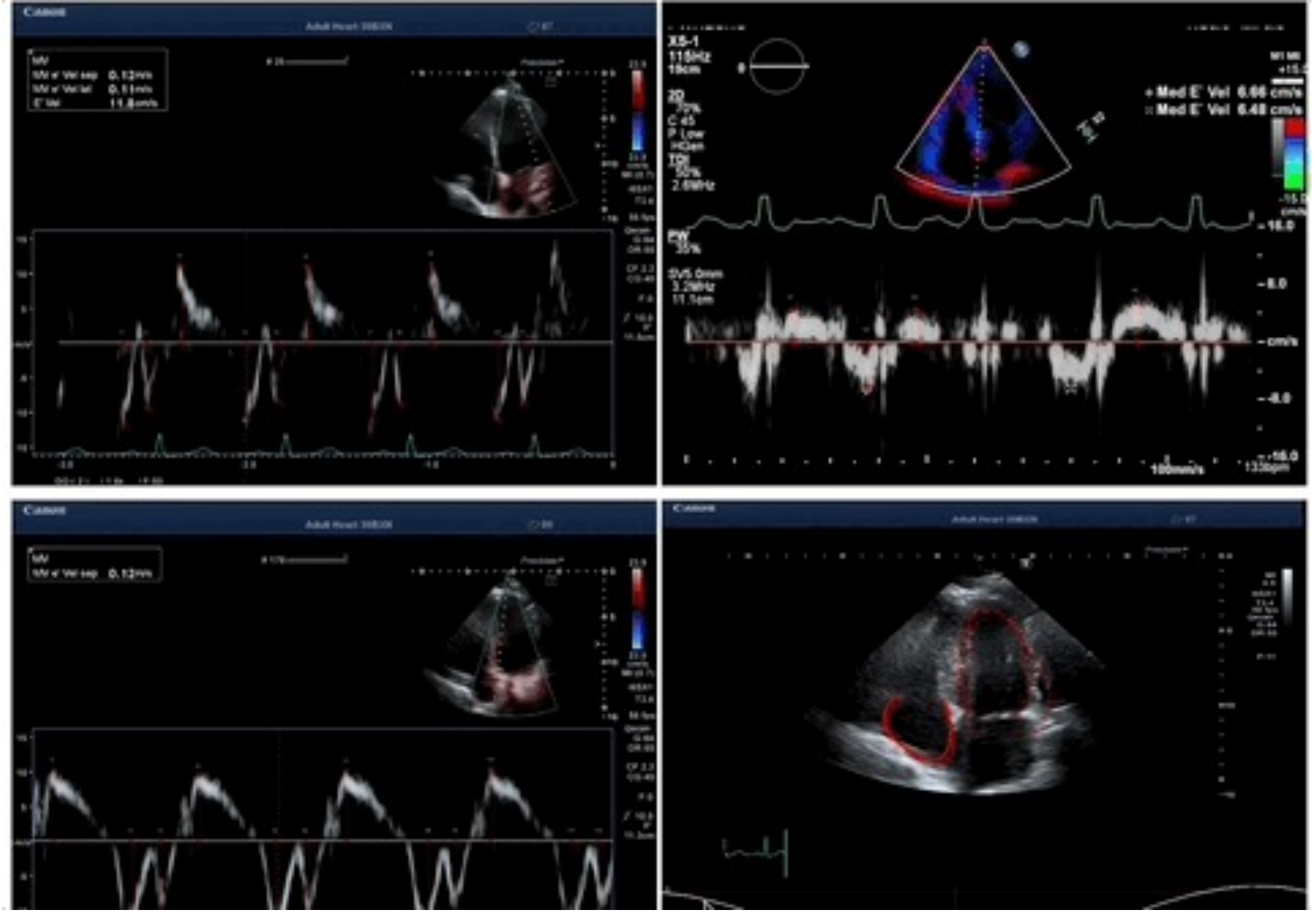
Point-of-Care Screening Echocardiography with Artificial Intelligence-assisted interpretation

Artificial Intelligence-Enabled Point-of-Care Echocardiography: Bringing Precision Imaging to the Bedside

Sasha-ann East[1] · Yanting Wang[1] · Naveena Yanamala[1] · Kameswari Maganti[1] · Partho P. Sengupta[1]


Esaote
Siemens
Main Findings
Left Ventricle
Left Atrium
Right Atrium
Investigational Use
Fujifilm
GE Healthcare

US2.AI


Canon
Adult Heart
MV
MV e' Vel sep 0.12m/s
MV e' Vel lat 0.11m/s
E' Vel 11.8cm/s
X5-1
115Hz
19cm
2D
70%
C 45
P Low
THI
50%
2.6MHz
PW
35%
SV5.0mm
3.2MHz
11.1cm
+ Med E' Vel 6.66 cm/s
Med E' Vel 6.48 cm/s
-16.0
-8.0
cm/s
-8.0
100mm/s
1338bpm

US2.AI

Conclusions

- The left ventricular (LV) systolic function is classified as normal
- The left ventricle (LV) diastolic function is normal
- The left ventricular (LV) size is normal
- The right ventricle (RV) global systolic function is normal. Tricuspid annular plane systolic excursion (TAPSE) measuring 19.5 mm.
- The right ventricle (RV) size is normal
- The left atrial (LA) cavity size is normal

Main Findings

LV Systolic Function

The left ventricular (LV) systolic function is classified as normal, with a calculated left ventricle ejection fraction (LVEF) of 54.5 % by modified biplane Simpson's method.

LV Diastolic Function

The left ventricle (LV) diastolic function is normal. The E/A ratio is 0.6. The mitral valve E velocity (MV-E) measures at 56.79 cm/s. The septal E' velocity is 5.5 cm/s. The left atrial end-systolic volume indexed to body surface area (LAESVi) measures 16.1 ml/m^2 by modified biplane Simpson's method.

LV Size

The left ventricular (LV) size is normal. When indexed to body surface area, the LV end-diastolic volume index (LVEDVi) is 21.6 ml/m^2, and the LV end-systolic volume index (LVESVi) is 9.8 ml/m^2, both of which are within normal limits.

RV Function

The right ventricle (RV) global systolic function is normal. Tricuspid annular plane systolic excursion (TAPSE) measuring 19.5 mm.

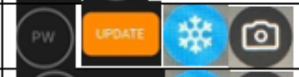
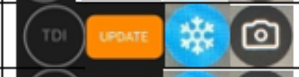
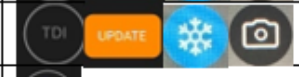
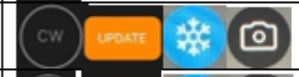
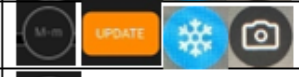
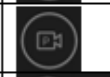
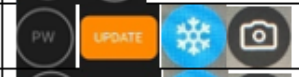
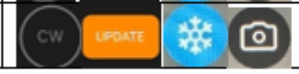
RV Size

The right ventricle (RV) size is normal, with right ventricular internal diameter in diastole (RVIDd) at the basal level measuring 29.5 mm.

INSTEP Imaging Protocol

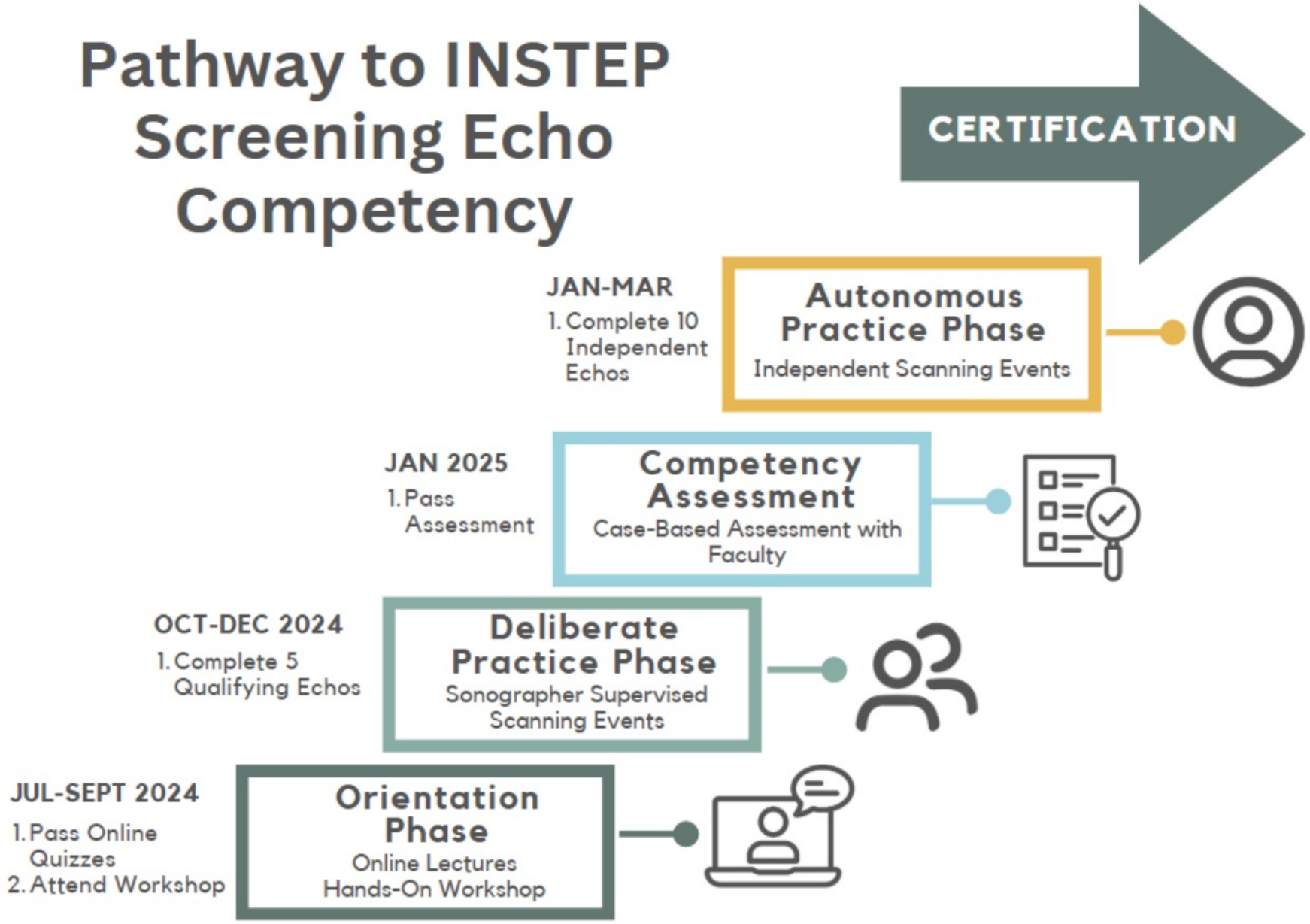
Targeted structural heart disease:

- Previously identified within community during prior screening
- Within limits of US2.AI diagnostic capabilities

View	Clips & Images Captures	Button!
Parasternal Long Axis (PLAX)	Full 2D view PLAX (LA, MV, LV, AV)	
A4C Apical **Four** Chamber	Full 2D view A4C (LA, LV, RA, RV)	
	Color over **MV**	
	PW through **MV**	
	TDI septal	
	TDI lateral	
	Color over **TV**	
	CW through **TV**	
	M-mode over lateral **TV** annulus	
A2C Apical **Two** Chamber	Full 2D view A2C (LA, LV)	
	Color over **MV**	
A3C Apical **Three** Chamber	Full 2D view A3C (LA, LV, LVOT)	
A5C Apical **Five** Chamber	Full 2D view of A5C (RA, RV, LA, LV, LVOT, AV)	
	Color over AV	
	PW LVOT	
	CW AV	

AV: aortic valve; **CW**: continuous wave; **LA**: left atrium; **LV**: left ventricle; **LVOT**: Left ventricular outflow tract; **MV**: mitral valve; **RA**: right atrium; **RV**: right ventricle; **TV**: tricuspid valve

Pathway to INSTEP Screening Echo Competency



IN•STEP
AMERICAN INDIAN STRUCTURAL HEART DISEASE PARTNERSHIP

INSTEP Workshop: September 2024

1:35

IN-STEP Formative Assessment

AAA

Please complete the survey below.

Thank you!

1) Date of Assessment

* must provide value

Now M-D-Y H:M

2) Expert Name:

* must provide value

3) Learner's Name:

* must provide value

Formative Assessment INSTEP US2AI Limited Echocardiographic Protocol

4) Completed universal precautions (clean probe/hands)

- Yes
- No

redcap.research.cchmc.org

1:35

reset

9) Parasternal Long Axis View

- They needed manual assistance
- They needed my verbal assistance
- They can obtain this view independently

reset

10) Apical Four Chamber View

- They needed manual assistance
- They needed my verbal assistance
- They can obtain this view independently

reset

11) Pulsed Wave Doppler of the Mitral Valve Inflow

- They needed manual assistance
- They needed my verbal assistance
- They can obtain this view independently

reset

12) Tissue Doppler Imaging at Mitral Annulus: Septal side

- They needed manual assistance
- They needed my verbal assistance
- They can obtain this view

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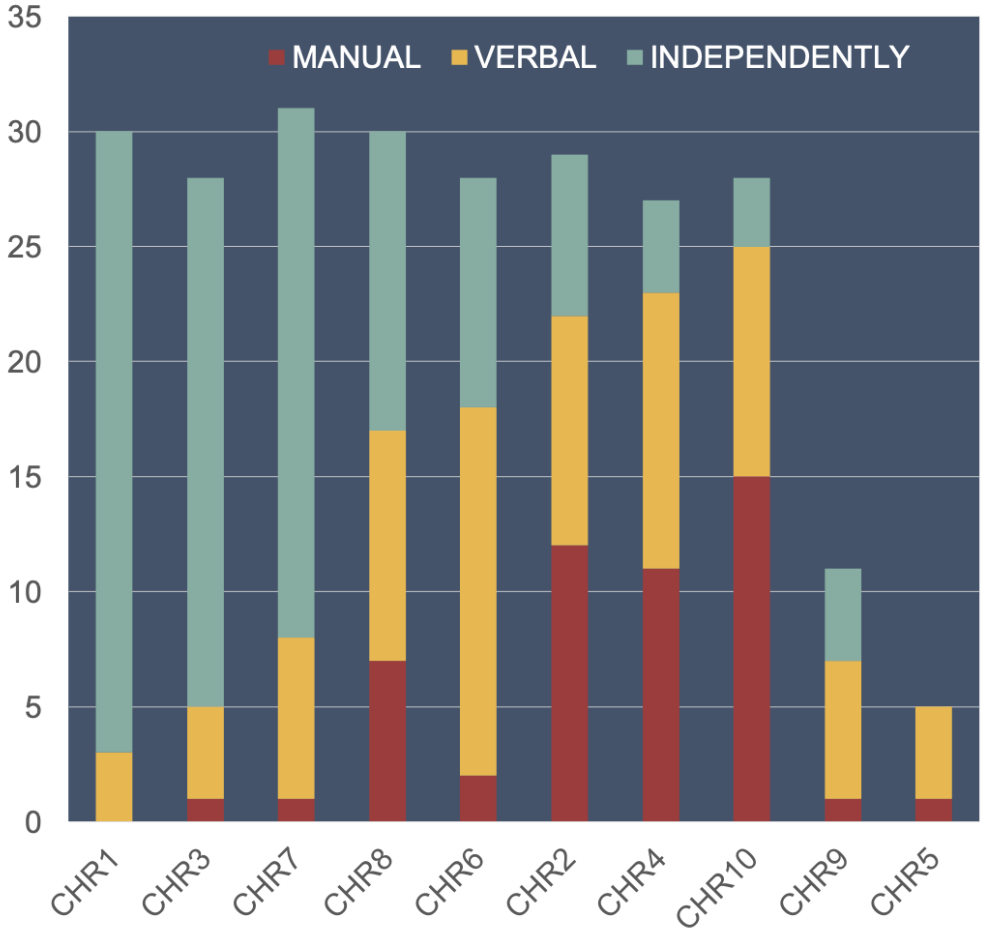
INSTEP Workshop: September 2024

CHRs Obtaining Echo Views During Workshop



INSTEP Workshop: September 2024

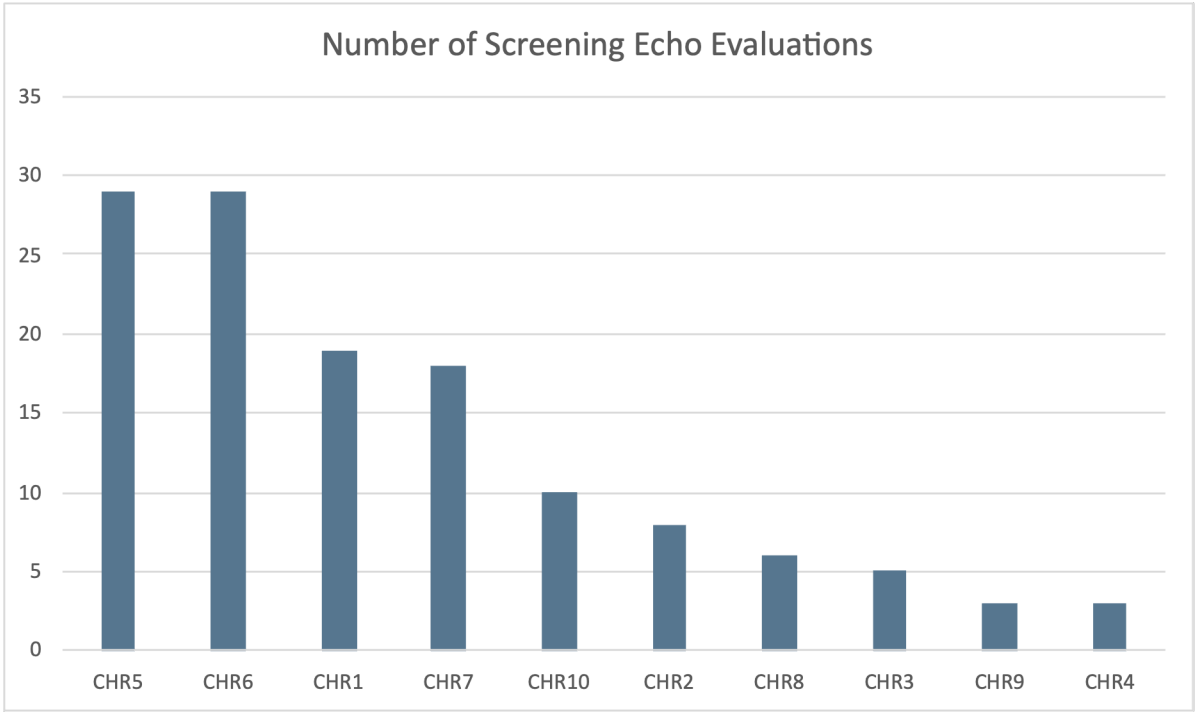
- 3 CHRs performed protocol WITHOUT Assistance by End of Workshop

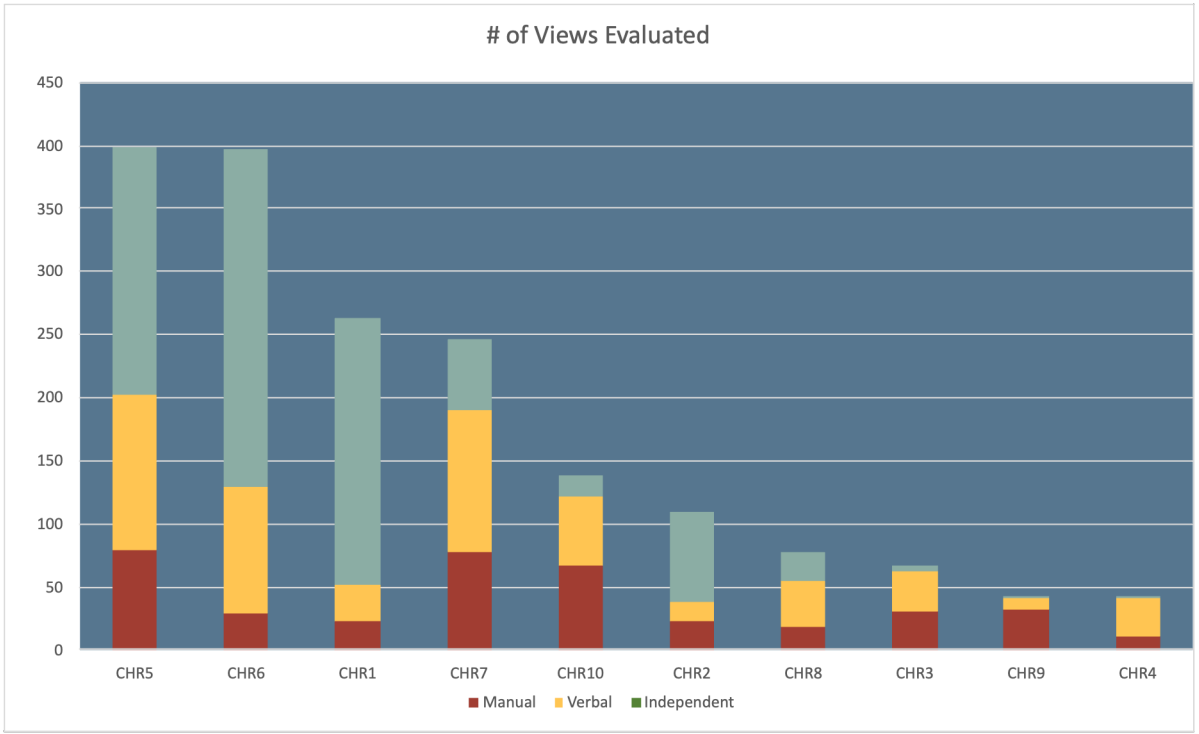
- **None** had image quality sufficient for successful AI interpretation of core echo parameters
  - LVSF/DF
  - LV size/walls
  - LA size
  - RV size/SF
  - AoV velocity

INSTEP Deliberate Practice Screening Events

- **September:**
  - *3 MDs, 6 sonographers*
- **October:**
  - *6 sonographers*
- **November:**
  - *2 sonographers*
- **December:**
  - *1 sonographer*
- **January:**
  - *1 MD, 1 sonographer*

INSTEP Deliberate Practice Screening Events



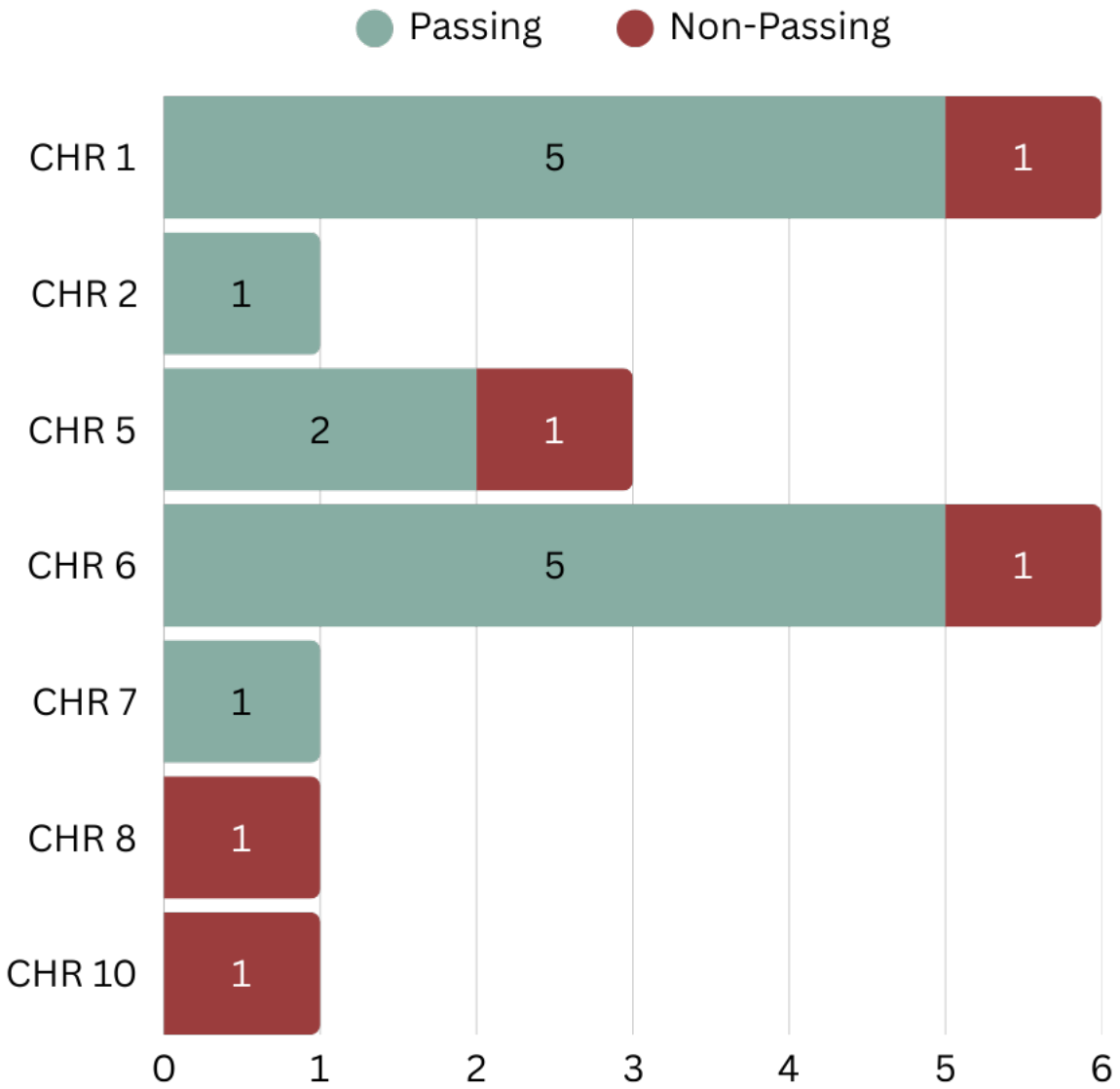


Echo Certification

Qualifying Exam

1. Obtained autonomously in supervised setting
2. Images interpreted by US2AI
3.
   - All Core Findings*
   - 3 of 4 Additional Findings**

** Core Findings: LV systolic function, LV size, and LV walls
** Secondary Findings: LV diastolic function, RV systolic function, LA size, and Aortic valve velocity



CHR Qualifying Exam Progress

Professional Skills Certification

CHR Name: Attempt No:	Evaluator Name:	Date:
	Point Deduction	Score (Start with 100)
Demographic Entry Error	-30	
Suboptimal Professionalism		
Universal Precautions	-5	
Patient Respect	-5	
Patient Privacy	-5	
Patient Comfort	-5	
Suboptimal Ergonomics	-5	
Image Stored Incorrectly	-10	
Image Omitted	-10	
Unable to Upload Images	-20	
Failure to Recognize Abnormal Report Findings	-30	
	Total Score:	

Objective Structured Clinical Examination (OSCE)

- Final Assessment Grading Rubric
- Completed with volunteer standardized patient
- Passing Score: 75

10 CHRS

Completed Online Modules and 2-day Workshop

10 CHRS

Started Deliberate Practice Scanning through Organized Events

7 CHRS

Started Working Toward Obtaining Qualifying Exams

2 CHRS

Passed Competency Assessments

3 CHRS

Expected to Obtain Echo Certification

Echo Training and Certification


IN STEP

POCSE-AI Case

75-year-old male presented to CHR screening event

How can we help today?

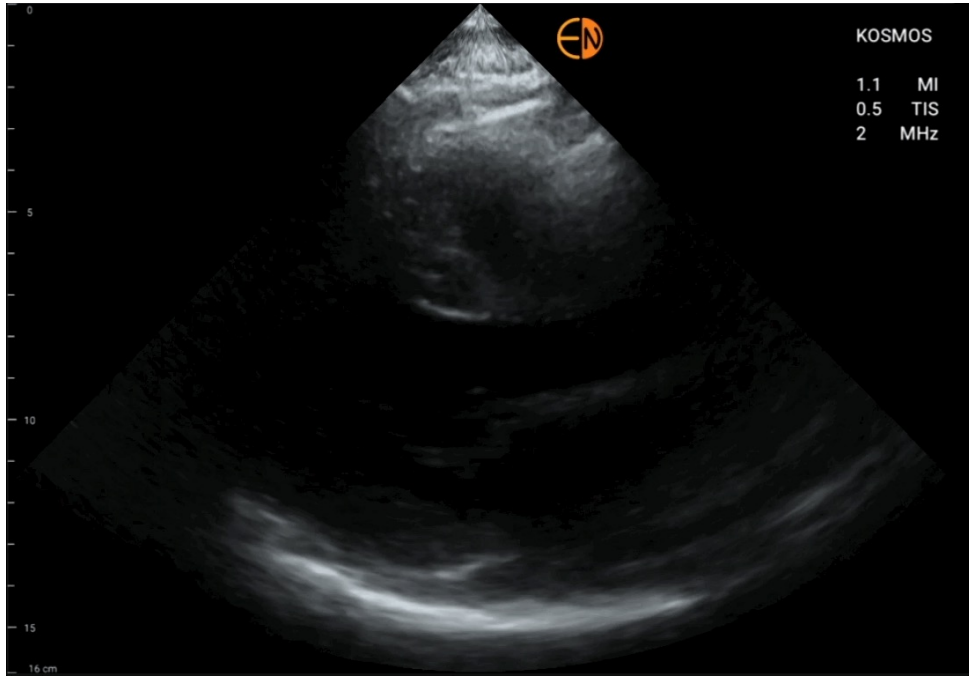
"I have wanted to get my heart checked for awhile"

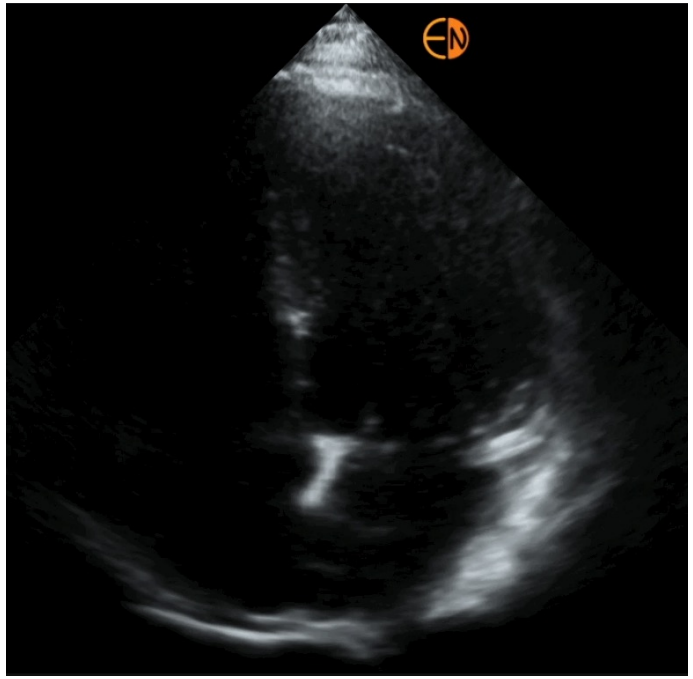
Any prior diagnoses

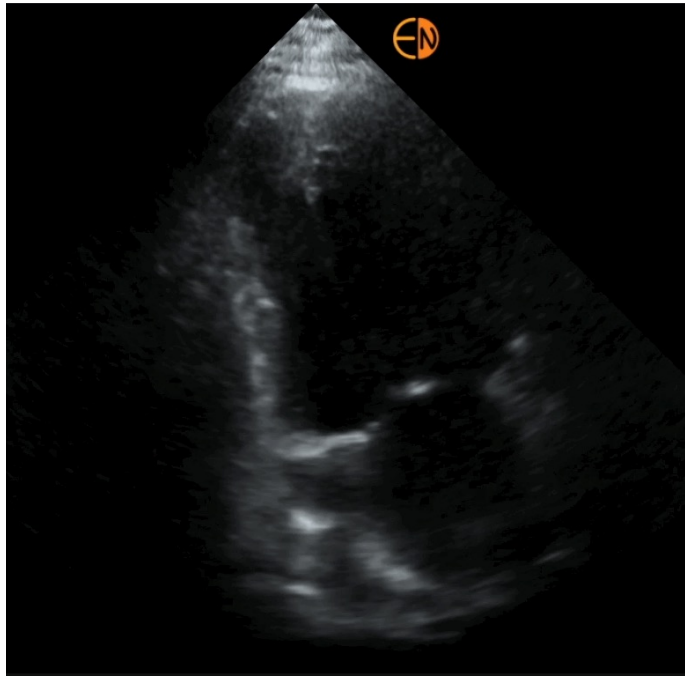
"No"

POCSE-AI Case

75-year-old male with no known cardiac disease and who is asymptomatic and presented to CHR screening event

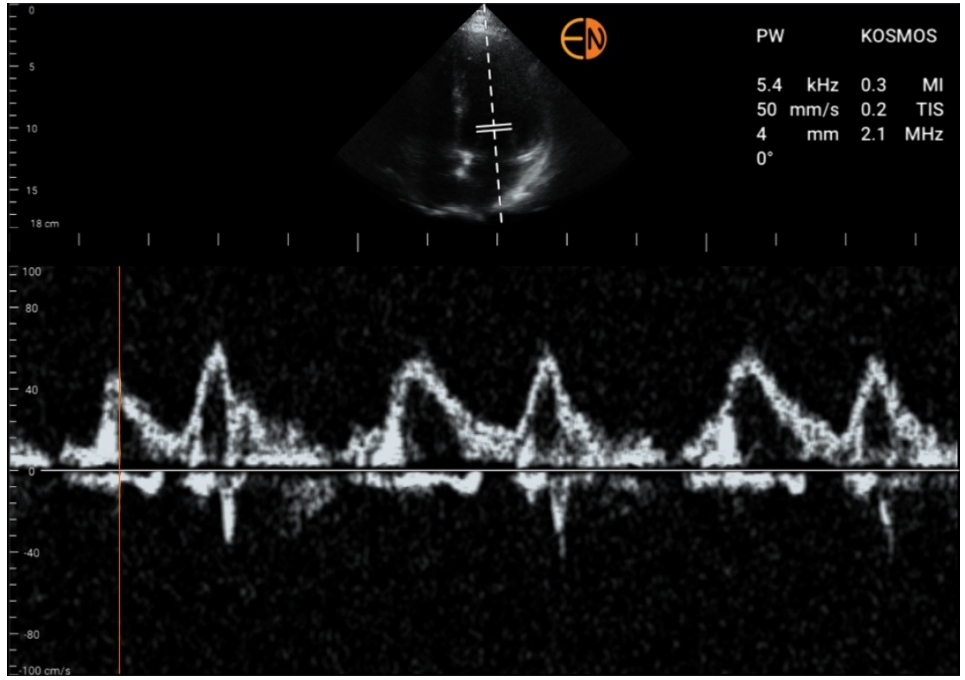


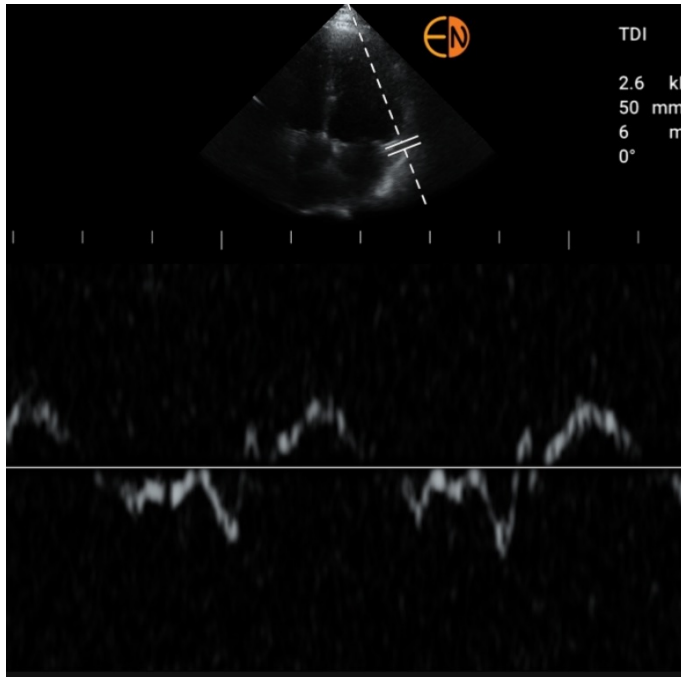


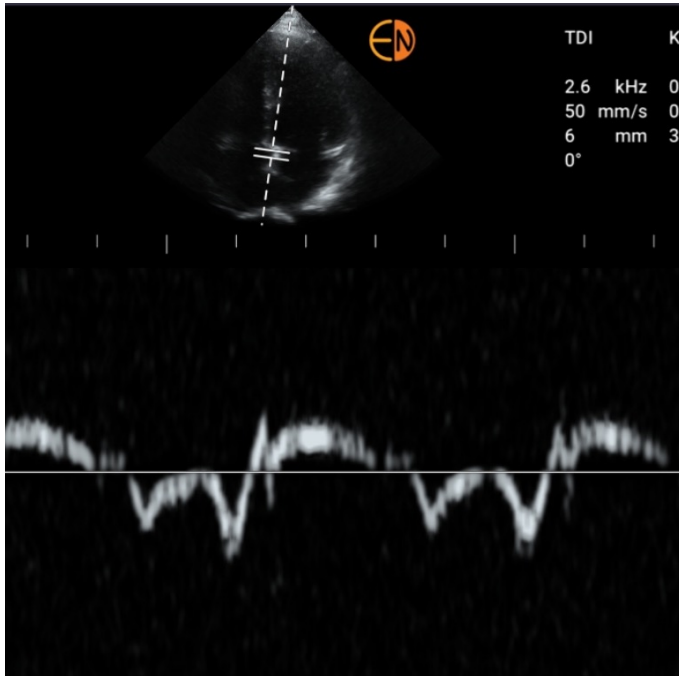


POCSE-AI Case

75-year-old male with no known cardiac disease and who is asymptomatic and presented to CHR screening event







POCSE-AI Case

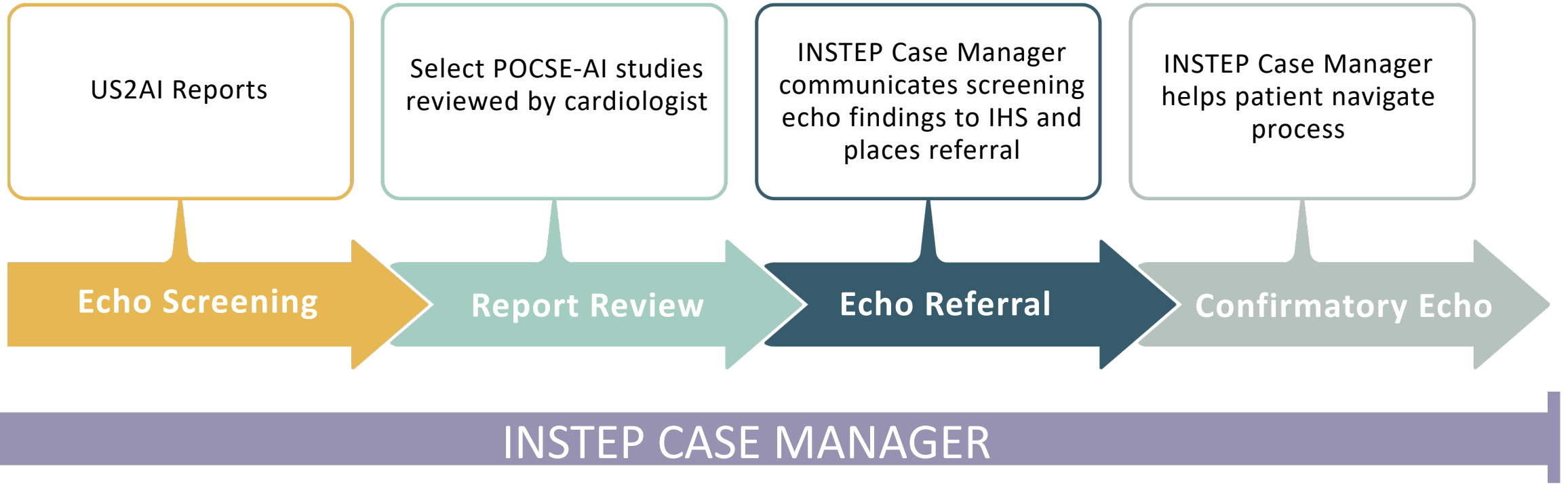
75-year-old male with no known cardiac disease and who is asymptomatic and presented to CHR screening event

Conclusions

- The left ventricular (LV) systolic function is classified as abnormal.
- The left ventricle (LV) diastolic function is abnormal.
- The left ventricular (LV) size is normal.
- LV wall thickness is abnormal.
- The right ventricle (RV) global systolic function is normal.
- The left atrial (LA) cavity size shows borderline measurements.
- The right atrial (RA) cavity size is abnormal.

INSTEP Screening Referral Pipeline

- Negative/inconclusive report → counseling and IHS referral as needed
- Abnormal report → IHS and Confirmatory Echo referral
- Borderline report → Images sent for cardiologist review prior to referral



Update of INSTEP SHD Screening

187

People screened between Sep 2024-Mar 2025

SCREENED

58 (31%)

Borderline Screening Echo's Requiring Expert Overread

EXPERT OVERREAD

29 (16%)

Concerning Screening Echo's Referred for Formal Echocardiogram

REFERRED

9 (5%)

Formal Echo's Have Been Completed

CONFIRMED

Competency Based Curriculum & On-going Review

01

ORIENTATION

Familiarize with Topic

02

DELIBERATE PRACTICE

Build Skills

03

COMPETENCY ASSESSMENT

Demonstrate Skills

04

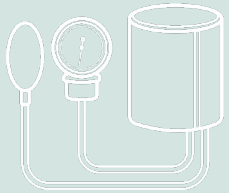
CERTIFICATION

Show Independence

05

ONGOING REVIEW

Maintain Skills



IN•STEP
AMERICAN INDIAN STRUCTURAL HEART DISEASE PARTNERSHIP

POCSE-AI

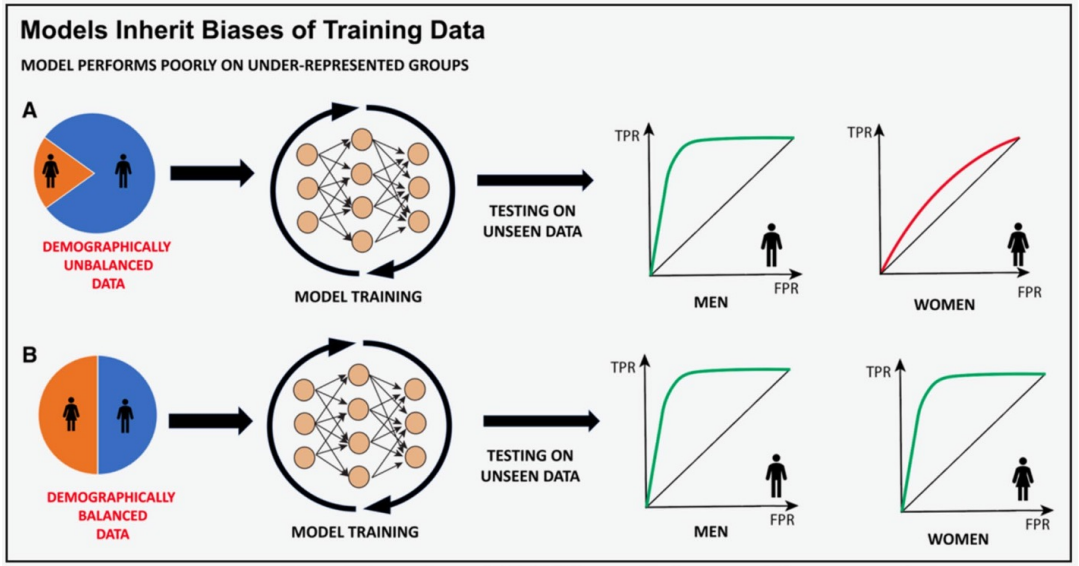
- Implications of the AI-training data
- Minimize false reassurances and false positives
- Quality Assurance

Artificial Intelligence-Enabled Point-of-Care Echocardiography: Bringing Precision Imaging to the Bedside

Sasha-ann East[1] · Yanting Wang[1] · Naveena Yanamala[1] · Kameswari Maganti[1] · Partho P. Sengupta[1]

Point-of-care AI-enhanced novice echocardiography for screening heart failure (PANES-HF)

Weiting Huang[1,2]✉, Tracy Koh[1,2], Jasper Tromp[2,3], Chanchal Chandramouli[1,2], See Hooi Ewe[1,2], Choon Ta Ng[1,2], Audry Shan Yin Lee[1,2], Louis Loon Yee Teo[1,2], Yoran Hummel[4], Feiqiong Huang[4] & Carolyn Su Ping Lam[1,2,4]




Reach More People At Risk
Explore Ways to Address CVD Risk
Scope Settings to Scale

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Cincinnati Children's
Co Primary Investigator

Alan Riley
MaineHealth
Co-Investigator, Education

Nicole Sloan
WMAT CHR Program
Co-investigator

Andrea Beaton
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Co Primary Investigator

Samantha Buonfiglio
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Ryan Close
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