

Stress Testing: A Value Based Approach

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Background

- Achieving high value care in a complex senior population requires use of accurate testing modalities that can limit complications related to invasive procedures and improve outcomes and quality of life at the lowest total cost.
- Stress echocardiography is comparable to, and less costly than, other imaging modalities.^{1,2}
- However, most community practices still preferentially use nuclear stress testing for detecting ischemic heart disease.²
- The quality of results with stress echocardiogram are directly proportional to the technical expertise of the operator.³
- Technology is improving, with less operator dependency on accuracy.³

Objective

To assess the predictive value of stress echocardiography in a community setting in a population age 65 and above.

Methods

Study design: Retrospective, observational

Data source: Medical claims, electronic medical records, and death records

Timeframe: Data was collected between 8/1/2015 and 6/1/2017.

Study design:

- 382 consecutive stress echocardiograms were performed at two suburban community cardiology centers between 8/1/2015 and 3/31/2017
- Exercise or dobutamine stress echo were performed in an accredited lab
- Followed a minimum of 3 months post-echo
- Included patients ≥65 years of age
- Excluded patients with known cardiomyopathy and referred for other testing

Outcomes:

- Stress echos were characterized as positive, negative or indeterminate
 - Patients with indeterminate results were excluded from subsequent analysis and went on to receive further testing
 - Cardiac catheterization reports were used to confirm all positive stress echos
 - Data were evaluated for presence of the following clinical endpoints:
 - Coronary artery bypass graft (CABG)
 - Percutaneous coronary interventions (PCI)

Results

Table 1. Patient Characteristics

Characteristic	Total
N	382 (100%)
Age ± SD	72.23 ± 10.6
Gender, n (%)	
Male	131 (34%)
Female	251 (66%)
Follow-up time in months, mean ± SD	19.5 ± 0.7
Previous intervention, n (%)	
Percutaneous coronary intervention	43 (11.6%)
Coronary artery bypass graft	27 (7.1%)
Comorbidities, n (%)	
History of stroke	32 (8.4%)
Atrial fibrillation	37 (9.7%)
Prediabetes (5.6-6.4)	77 (20.2%)
Diabetes	162 (42.4%)
Hypertension	316 (82.7%)
Active smoking	28 (7.3%)
Chronic kidney disease	232 (60.7%)
Body mass index, mean ± SD	29.6 ± 6.12
Gastroesophageal reflux disease	90 (23.6%)
Pulmonary hypertension	37 (9.7%)
Aortic stenosis	24 (6.3%)
Sick sinus syndrome with pacemaker	14 (3.7%)
Connective tissue diseases	10 (2.6%)

Figure 1. Stress Echocardiography Results

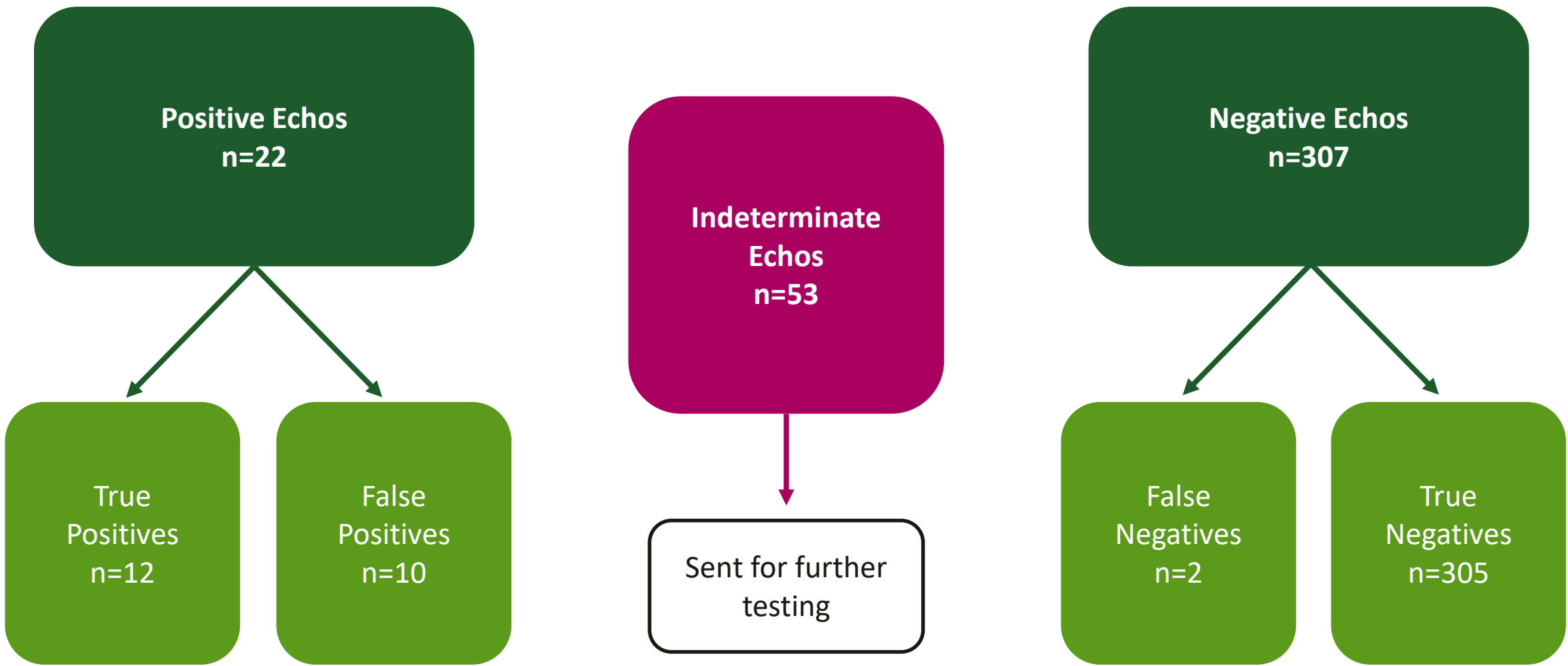


Figure 2. Test Accuracy and Predictive Value of Quality Diagnostic Images

Sensitivity = 86% <i>Calculated as: TP/(TP + FN)</i>	Specificity = 97% <i>Calculated as: TN/(TN + FP)</i>
Positive Predictive Value = 55% <i>Calculated as: TP/(TP + FP)</i>	Negative Predictive Value = 99% <i>Calculated as: TN/(TN + FN)</i>

*TP true positives, FN false negatives, TN true negatives, FP false positives

Stress echocardiography in this study was highly sensitive and specific, with very high negative predictive value, indicating that patients with a negative test truly do not have the disease.

Conclusions

- The negative predictive value and specificity of stress echo may be significantly higher than previously reported due to improved technologies
- Stress echo may better fit within a value-based care model than alternative stress testing modalities
- Re-examining typical community practices regarding stress testing may be warranted

Limitations

- Limitations common to claims data apply to this study (e.g., coding errors, missing data, fixed variables)
- Diagnoses were identified to the extent such information was available from administrative medical claims and medical records
- This study included patients from select clinics and one health plan; and therefore may not be generalizable to all populations

References

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