Preliminary Results: Diagnostic Yield of Stress Testing in Patients with High Sensitivity Troponin T Less than the Limit of Quantitation

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Introduction

- Efficient evaluation of ED patients with suspected acute coronary syndrome (ACS) is crucial due to increasing ED crowding and resource limitations.
- Cardiovascular disease (CVD) is the leading cause of mortality in the U.S., with coronary artery disease (CAD) being the most common subtype.[1]
- Many ED patients presents with symptoms concerning for ACS (e.g., chest pain, shortness of breath), but only ~5% of these result in an ACS diagnosis.[2]
- High-sensitivity cardiac troponin (hs-cTn) assays enable faster, more accurate rule out of acute myocardial infarction (MI) compared to older serial troponin protocols, especially when initial values are below defined thresholds (e.g., <5 ng/L or <6 ng/L in the U.S.).[3-5]
- Despite low-risk findings, many patients still undergo additional in-hospital testing (e.g., stress tests) due to institutional protocols, increasing cost and resource utilization.
- Clinical decision tools like the HEART pathway help identify patients at higher risk of major adverse cardiac events (MACE).[6,7]
- Research using hs-cTn with well-known clinical decision tools is needed to develop strategies to identify patients who could safely defer in-hospital testing to help reduce unnecessary use of hospital resources.

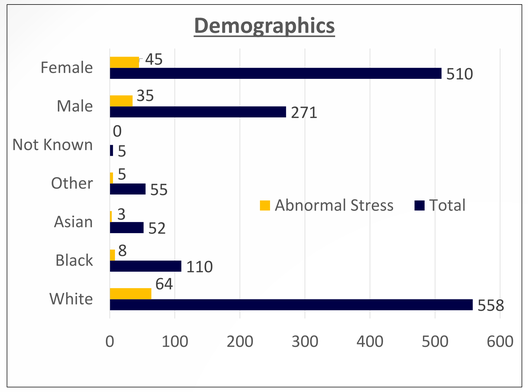
Methods

- **Study Design:** Retrospective cohort study of patients presenting to the ED at Michigan Medicine (Feb 2, 2018 – Dec 29, 2022).
- **Inclusion Criteria:**
  - Age ≥18
  - ED presentation with suspected ACS
  - Two hs-cTnT values <6 ng/L (0 and 2 hours)
  - In-hospital cardiac stress testing before discharge
- **Exclusion Criteria:**
  - Age <18
  - Fewer than two hs-cTnT tests
  - hs-cTnT ≥6 ng/L
  - No cardiac stress testing
- **Data Collection:**
  - Patient charts identified via EMR query, reviewed by a trained advanced practice provider (APP)
  - Data abstracted using REDCap
  - Variables collected: demographics, cardiovascular risk factors and other medical history, ED presentation details (symptoms, vitals, labs, ECG), HEART scores, stress test results, cardiac catheterizations
  - Outcomes assessed within 30 days (MACE, rehospitalizations, additional ED visits, including at other hospitals via CareEverywhere and GLHC)

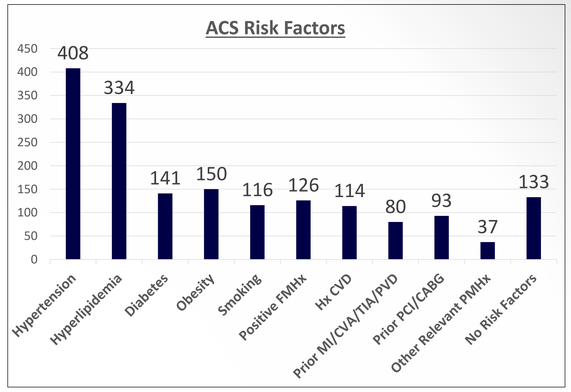
Outcomes:

- **Primary:** Rate of clinically significant coronary stenosis on catheterization (≥70% in non-left main vessels, ≥50% in left main artery, intermediate stenosis with FFR ≤80%, or PCI).
- **Secondary:**
  - Abnormal stress test rates
  - 30-day MACE (MI, PCI, CABG, death)
  - Other adverse cardiovascular events
  - 30-day rehospitalizations

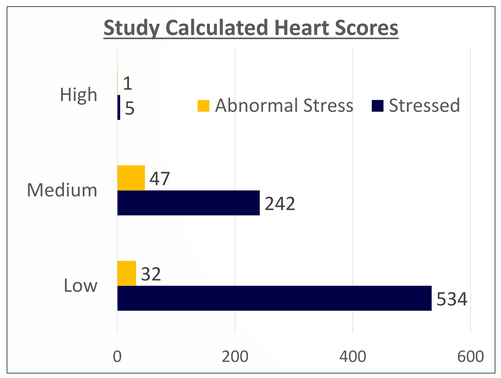
Results



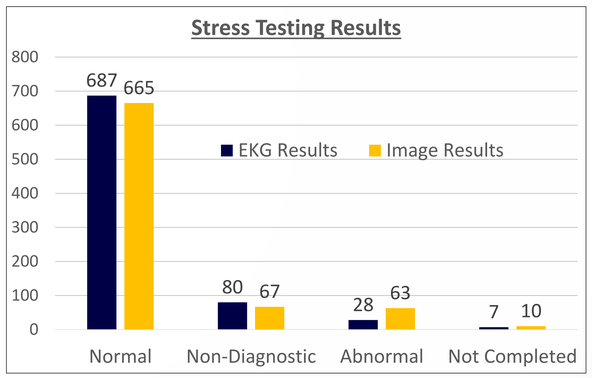
Graph 1. Demographics: Race and Sex



Graph 2. Documented ACS Risk Factors



Graph 3. Retrospectively Calculated HEART Scores



Graph 4. EKG and Imaging Results for Diagnostic Stress Testing

Cardiac Catheterization		
	Severe Stenosis	Without Severe Stenosis
Total LHC	8	33
Abnormal Stress	8	29
Normal Stress	0	4

Chart 1. Results of Left Heart Catheterization

ED Visits and Rehospitalizations		
	With Abnormal Stress	Without Abnormal Stress
ED for ACS Concern Without Admission	2	14
ED for ACS Concern With Admission	4	3
No 30 Day Adverse Events	73	715

Chart 2. Rates of ED Visits and Rehospitalization for ACS

30 Day Significant Outcomes Occurrences	
Nonfatal MI	0
Nonfatal Ischemic Stroke	0
Urgent Revascularization	2
Cardiovascular Death	0
Non-Cardiovascular Death	0
Major Adverse Event Due to Stress Test	0
Major Adverse Event Due to LHC	0

Chart 3. Adverse Events within 30 days of Initial ED Visit

Conclusion

- 1323 patients screened, **788 met inclusion criteria**
- The diagnostic yield of stress testing in patients with two negative hs-cTn values (<6 ng/L) is low—only ~10% had abnormal results.
- Among patients with **low-risk HEART scores**, the rate of abnormal stress tests was even lower (~6%), and the rate of **clinically significant coronary disease requiring intervention** was ~0.5%.
- Less than half the patients with abnormal stress testing underwent LHC (37).
- Most patients with abnormal stress tests did **not** require PCI or CABG (29/37)
- Only **two patients** in the cohort had experienced a MACE – both patients underwent urgent PCI after discharge.
- Of these patients, one had an abnormal stress test **AND** had undergone LHC during the initial hospitalization.
- **No patients** experienced death for any cause within 30 days.
- Findings suggest that a substantial number of low-risk patients **may not benefit** from routine in-hospital stress testing.
- Relying on both hs-cTn levels and HEART scores could improve the ability to safely risk stratify select patients, potentially avoiding unnecessary hospital admissions, stress tests, and resource use.
- This could improve ED throughput, reduce costs, and minimize patient burden.
- Future protocols might safely defer stress testing in select low-risk patients to outpatient settings without compromising care quality.

Limitations

- Preliminary results
- Single center study
- Retrospective study
- Single interpreter
- Selection bias towards less sick patients
- Using study calculated heart score versus documented
- Limited by CareEverywhere and GLHC

References

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