Does an elevated troponin ultimately matter? An assessment of outcomes in patients presenting to the emergency department with non-cardiac complaints

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ABSTRACT

Background: Acute coronary syndrome (ACS) is one of the most time-sensitive diagnoses made in the emergency department (ED). Troponin (TNI) measurement is an invaluable tool; however, its utility depends on the clinical context and is highest where there is a strong pre-test probability. Studies show that most TNI elevations are due to non-cardiovascular causes; however, elevated TNI has been associated with increased morbidity and mortality, often prompting additional investigations.

Objective: The purpose of our study was to evaluate patients who presented to the ED with non-cardiac complaints but elevated TNI and to investigate if there was any difference in one-year outcomes (unstable angina, ST-elevation myocardial infarction [STEMI], non-STEMI, stroke or transient ischemic attack [TIA], revascularization, hospitalization for cardiac cause or death) between those who underwent further cardiac evaluation (consultation and/or testing) and those who did not.

Methods: We conducted a retrospective chart review of patients ≥18 assessed in the ED for non-cardiac complaints with a high TNI from January 1- June 30, 2016. In total, 1499 patients were analyzed and stratified into three groups: Group 1-patients with no further evaluation for ischemia or cardiology consultation (n=1131); Group 2-patients where only cardiology consultation was requested (n=81) and Group 3-patients who underwent further cardiac diagnostic testing and/or cardiology consultation (n=297). Data was collected on major adverse cardiac events within one-year of ED presentation. Pearson's chi-squared analysis assessed for a difference in proportions of outcomes between the three groups.

Results: Between the three groups, there was no statistically significant difference in the proportion of patients who developed unstable angina (p=0.775), STEMI (p=0.332), non-STEMI (p=0.699), stroke/TIA (p=0.560), revascularization (p=0.171), cardiac hospitalization (p=0.478) or death (p=0.157), within one-year of their ED presentation.

Conclusions: In patients with isolated elevated TNI and non-cardiac complaints, our data showed no difference in mortality or cardiac event rates between those who had further testing and/or cardiac consultations and those who did not. Therefore, we suggest that TNI ordering be cautiously limited to only presenting complaints and preliminary diagnoses likely to have cardiac etiology or sequelae or to those in whom further testing would impact management or outcomes. Quality of care may be improved by reducing length of stay in the ED and potential risks of unnecessary tests. Future studies are needed to assess cost implications of further cardiac evaluation and to classify what degree of TNI elevation in non-ACS patients may predict a future cardiac outcome.

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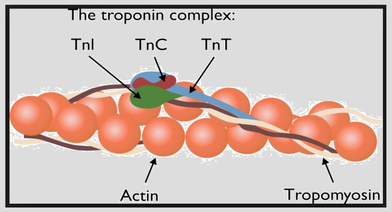
INTRODUCTION

- Acute myocardial infarction is one of the most time-sensitive diagnoses made in the emergency department (ED), where delays have significant clinical implications
- Cardiac troponin is used in myocardial infarction (MI) diagnosis because of its high myocardial tissue specificity and clinical sensitivity [1].
- Troponin measurement is also an invaluable tool in decision-making about referral of patients, further cardiac diagnostic testing, or discharge [2-5].
- However, the utility of cardiac troponin depends on the clinical context and is highest where there is a strong pre-test likelihood [5].
- It's well known that troponin elevation is also seen in a multitude of conditions unrelated to MI [5-7].

- Widespread availability and indiscriminate ordering of troponins for undifferentiated patients within EDs has increased the detection of elevated troponins even in the absence of acute coronary syndromes (ACS), presenting a clinical conundrum for physicians.
- Studies have demonstrated that majority of troponin elevations are due to non-cardiovascular causes [6-8], yet elevated cardiac troponin has been associated with increased morbidity and mortality [8], which tends to prompt additional investigations.
- This results in lengthened stays in the ED, increased cardiology referrals, increased cardiac diagnostic imaging (invasive and non-invasive), admissions, and increased length of hospital stay
- These are sources of additional costs to the health care system as well as anxiety and unnecessary exposure to the risks of testing for the patient.



OBJECTIVE

- To assess the outcomes of patients with non-cardiac presentations who have elevated troponin levels in the ED

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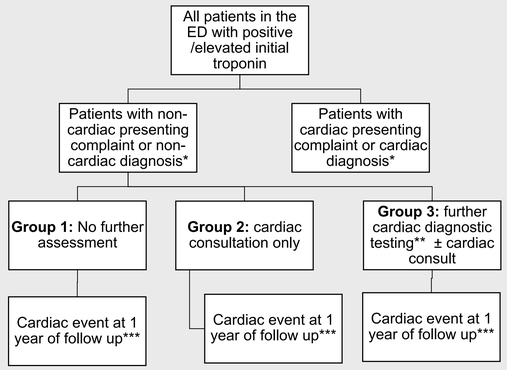
HYPOTHESES

1. Unrestricted or indiscriminate ordering of cardiac troponin levels in the ED for non-cardiac presenting complaints leads to further unnecessary investigation.

2. Restricting the ordering of troponin for non-cardiac complaints to physicians in the ED rather than automatically at triage would reduce further unnecessary investigation

Figure 1. Algorithm for algorithm for analysis of patients with elevated troponin in the ED



*Based on diagnosis documented on ED Record of Transfer
**Exercise stress ECG, holter monitor, coronary CT angiography, stress echocardiogram, regular echocardiogram, myocardial perfusion imaging (SPECT or PET) or cardiac catheterization
***1 year from date of initial presentation to the ED

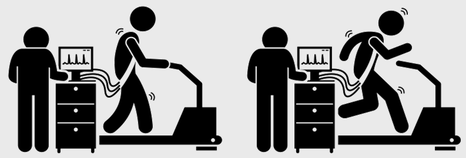


Image 1. Exercise Stress Test

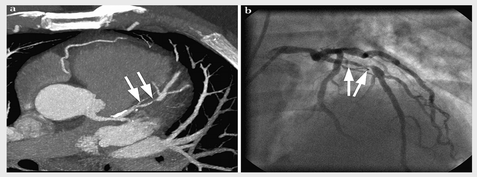


Image 2. Coronary CTA

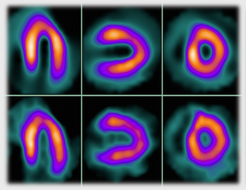


Image 3. Myocardial Perfusion Imaging

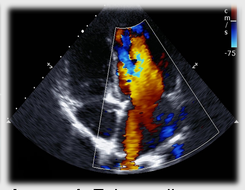


Image 4. Echocardiogram

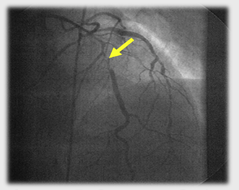


Image 5. Coronary Cath

Image 6. Holter Monitor

METHODS

- Methodology is summarized in Figure 1 to the left.
- We conducted a retrospective chart review for patients ≥ 18 seen in the ED with an elevated initial troponin from January 1 - June 30, 2016.
- Elevated or positive troponin was defined as Troponin I of >0.045ug/L.
- Patients presenting with cardiac complaints including chest pain, palpitations, syncope shortness of breath or cardiac arrest were excluded.

- **Patients without cardiac complaints were stratified into 3 groups:**
  - 1) patients who had no further work-up for their elevated troponin and
  - 2)patient who underwent cardiology consultation only (inpatient or outpatient)
  - 3) patients who underwent further cardiac diagnostic testing cardiac diagnostic testing for ischemia ± cardiac consult:
    - Exercise Stress ECG Test
    - Holter Monitor
    - Coronary CT Angiogram (CTA)
    - Stress Echo
    - Regular Echo
    - SPECT
    - PET or
    - Coronary Cath

- Data was collected on major adverse cardiac events within 1 year of initial presentation to the ED, defined as:
  - Unstable Angina
  - ST Elevation Myocardial Infarction (STEMI)
  - Non-STEMI
  - Cerebrovascular accident (Stroke/TIA)
  - Need for revascularization
  - Hospitalization for a cardiac cause (ischemia or heart failure)
  - Death

RESULTS

- 1,499 patients were included in our analysis.
- 1,131 had no further investigations, 81 underwent cardiac consultation only and 297 underwent diagnostic testing for ischemia ± cardiac consult.
- There was no statistically significant difference in the proportions of patients who developed cardiac outcomes within 1-year of their ED presentation.

Cardiac Outcomes	No further investigation (N=1,131)	Cardiac consult only (N=81)	Diagnostic testing ± cardiac consult (N=297)	P-value of proportions
Unstable Angina	2 (0.2%)	0 (0.0%)	1 (0.3%)	0.775
STEMI	11 (1.0%)	0 (0.0%)	5 (1.7%)	0.332
NSTEMI	15 (1.3%)	2 (2.5%)	4 (1.4%)	0.669
Stroke/TIA	16 (1.4%)	0 (0.0%)	4 (1.4%)	0.560
Revasc-ularization	11 (1.0%)	0 (0.0%)	6 (2.1%)	0.171
Cardiac Hospitalization	20 (1.8%)	1 (2.2%)	8 (2.8%)	0.478
Death	241 (21.3%)	10 (12.3%)	59 (20.6%)	0.157

DISCUSSION

- Overall, in patients with isolated elevated TNI and non-cardiac complaints, our data showed no difference in mortality or cardiac event rates between those who had further testing and/or cardiac consultations and those who did not.
- TNI ordering could be cautiously limited to presenting complaints/preliminary diagnoses likely to have cardiovascular etiology or sequelae.
- Triage protocol should be re-evaluated to limit TNI ordering in the setting of non-cardiac complaints and potential risks of unnecessary tests.

FUTURE DIRECTIONS

- Determining whether these recommendations are truly cost-saving and classifying what level of TNI elevation is more likely to predict a future cardiac outcome.
- Ultimately, these findings will inform changes that will improve quality of patient care by reducing length of stay in hospital.

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