Retrospective evaluation of physician decision making with acute chest pain in the emergency department and inpatient setting

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INTRODUCTION

Annually, there are Approximately 6 million people present to U.S. Emergency Departments (ED) with the complaint of acute chest pain. About 15% of these patients result in the diagnosis of acute coronary syndrome (ACS).[1] Many patients without ACS are admitted to the hospital for further evaluation that is sometimes unnecessary and can result in increased personal stress, and medical costs. The Goal of our project is to evaluate the decision making process of physicians when treating patients with acute chest pain, and to evaluate the use of evidence based tools, such as the TIMI, Diamond and Forrester or Duke score, in this decision making process. [2,3,4] Our hypothesis is that in practice, physicians in the emergency department and the inpatient setting do not use the above mentioned tools, or any other evidenced based guideline for making decisions in the evaluation and treatment in those with non-ACS related chest pain. We believe that the lack of an evidenced based, algorhythmic system leads to unnecessary admissions and overutilization of stress testing in the hospital in patients safe to be discharged home with evaluation and follow up with their primary care physician.

METHODS

We performed a retrospective chart review of 363 patients admitted to the hospital from the emergency department (ED) with a diagnosis of chest pain without evidence of ACS from 2012-2013. Data to calculate TIMI score, Diamond and Forrester score, and Duke score were collected if available.
We reviewed chart for documentation of use of evidenced based chest pain evaluation methods in the ED, as well as use of evidenced based methods for calculation of pre-test probability of Coronary artery disease (CAD) prior to stress testing on the inpatient floor. We also collected information of discussion of risk factors without use of evidenced based scoring in both the ED and in the inpatient setting.

Results

- 322/363 charts reviewed were found to be eligible for the study.
- 165/322 patients had Duke scores calculated due to age, and having all labs available.
- No risk stratification score (TIMI, HEART, GRACE) was documented by ED physician on any of 322 charts.
- Pretest probability of CAD was mentioned in 4/322 reviewed charts by the inpatient team, but no reference to a particular assessment tool was made. 318/322 had no pre-test probability documented prior to stress testing.
- In the ED and the inpatient floor, the majority of charts had a discussion of risk factors for CAD/ACS, but in a non-systematic way.
- Mean TIMI risk score of the 322 charts reviewed from the ED was 1.78
- Mean Duke Clinical Score was 22.3%. (Intermediate risk)
- Only 1/68 patients with Low or Very low risk Duke score had a coronary artery catheterization performed. This patient was diagnosed with ACS after admission to the inpatient floor leading to the procedure.

Demographics and Medical History

Characteristic	Result
Mean Age (years)	57.1 (14.4)
Gender	
% Female	54.3 (175/322)
% Male	45.7 (147/322)
% Smoking	25.8% (83/322)
% Diabetes Mellitus	23.0% (74/322)
% Prior MI	25.5% (75/322)
% > 3 Risk Factors for CAD	43.5% (140/322)
% Atypical Chest Pain	93.2% (300/322)
% Positive Troponin	11.5% (36/313)
Mean TIMI Risk Score	1.78 (1.43)
Mean Duke Clinical Score	22.3 (22.9)

High Risk vs Low Risk TIMI Score

TIMI Score	Count (n/N)	Percentile
TIMI 0/1	154/322	47.8
TIMI ≥2	71/322	52.2

Testing Results based on Duke Score

Duke Score	Stress Test	No Stress Test	Cath
Participants negative troponins (N=142)	102/142 71.8%	40/142 28.2%	7/142 4.93%
< 5% Very low risk (N=34)	29/34 85.3%	5/34 13.7%	0/34 0.0%
5-10% Low risk (N=34)	22/34 64.7%	12/34 35.3%	1/34 2.94%
11-90% Intermediate risk (N=74)	51/74 68.9%	23/74 31.1%	6/74 8.11%
>90% High risk (N=0)	0/0 0.0%	0/0 0.0%	0/0 0.0%

Coronary Catheterization Results by Diagnosis

	Cath Positive	Cath Normal or Unchanged
ACS or Unstable Angina	16/17 94.1%	1/17 5.9%
Known CAD	6/7 85.7%	1/7 14.3%
Abnormal Stress w/no known CAD	3/7 42.9%	4/7 57.1%
Recurrent chest pain w/ negative stress, no known CAD	0/4 0.0%	4/4 100.0%
Other	0/2 0.0%	2/2 100.0%

DISCUSSION

As we suspected, there was little documentation by either the ED or the inpatient team that any evidenced based methodology was used in decision making with patients admitted with low risk chest pain. There was frequently a discussion of risk factors in the chart, but this was done in a non-systematic way.
In our post-hoc calculation, 47.8% of patients admitted from the ED had a TIMI score of 0-1. This indicates a 5% risk of 14 days all cause mortality, new or recurrent MI, or severe recurrent ischemia requiring immediate revascularization, and therefore, represent a subclass who may have been safe for discharge from the ED for outpatient follow up.[2] When we applied the Duke Clinical Score to those with negative troponins, we found the majority in the very low to low risk range (85.3%) still had stress tests.[3,4] This did not lead to unnecessary catheterizations however, as the only person in the low and very low risk categories had a catheterization did so due to having ACS. However, 68.9% in the intermediate risk range with negative troponins were appropriately stress tested.[3,4] We believe it is possible that the high rate of stress testing those in a very low risk category could lead to unnecessary stress testing, in a larger sample size, though it is encouraging here that no unnecessary catheterization seems to have occurred in this group.
We did find that the 37 individuals who received heart catheterizations were largely appropriate per the 2012 ACCF guidelines with 21/30 showing obstructive CAD.[5] However, if we eliminate the 17 who had unstable angina or NSTEMIs, only 6/20 demonstrated new or worsening CAD. While this is a small sample, this could raise questions about decision making for coronary catheterizations.

CONCLUSION

- Physicians commonly take into consideration risk factors for ACS and CAD but do not use evidenced based risk stratification tools to help with decisions in testing and management.

- While not demonstrated in this data set, it raises the possibility of unnecessary hospital admissions, advanced testing, and invasive procedures.

- Future direction of this project could include prospective data gathering and trials requiring use of evidenced based tools in decision making, to evaluate whether this simple step could lead to changes in physician behavior.

REFERENCES

1. Marcoon S, Chang AM, Lee B, et al. HEART score to further risk stratify patients with low TIMI scores. *Critical Pathways in Cardiology.* 2013;12(1): 1-5.
2. Antman E, Cohen M, Bernink PJL, et al. The TIMI risk score for unstable angina/non-ST elevation MI. *JAMA.* 2000;284(7): 835-842.
3. Diamond GA, Forrester JS. Analysis of probability as an aid in the clinical diagnosis of coronary-artery disease. *New England Journal of Medicine.* 1979;300(24):1350-1358.
4. Pryor DB, Harrell Jr FE, Lee KL, et al. Estimating the likelihood of significant coronary artery disease. *American Journal of Medicine.* 1983;75:771-780.
5. Patel MR, Bailey SR, Bonow RO, Chambers CE, Chan PS, Dehmer, GJ,et al. ACCF/SCA/AATS/AHA/ASE/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 Appropriate Use Criteria for Diagnostic Catheterization. *J Am Coll Cardiol.* 2012; 59(22), 1995-2027.