The Efficacy Of An Adjusted Timi Risk Score In The Evalauation Of Patients With Chest Pain Presenting To A Public Hospital

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Citation

T Webb. *The Efficacy Of An Adjusted Timi Risk Score In The Evalauation Of Patients With Chest Pain Presenting To A Public Hospital*. The Internet Journal of Academic Physician Assistants. 2006 Volume 5 Number 2.

Abstract

Risk stratification has been proven to be effective in some populations to evaulate chest pain, but does it apply to a population from a lower socioeconomic status, specifically in the south? This study is designed to test an adjusted version of the Thrombolysis in Myocardial Infarction risk score while evaluating chest pain.

Methods: Patients, ≥65, diagnosed with diabetes, cocaine positive drug screen, or evidence of an acute myocardial infarction, were excluded. All participants received stress testing and calculation of the risk score.

Results: There was no statistical difference between low and intermediate risk and prediction of a positive stress test. However, men were more likely to have a positive stress test versus women in this particular population. This was of statistical significance.

Discussion: The results suggest that risk stratification may be helpful in the evaluation of women with chest pain, but not with men in this particular population.

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of death of Americans with an estimated 650,000 a year experiencing a myocardial infarction (MI)[1]. Because of the high prevalence of the disease, public awareness has resulted in an increasing number of people who present to the emergency department for evaluation of chest pain. The medicine wards at the study site, a public hospital, have noted a rise in patient census, due in part to this increase. It is estimated that $13 billion is spent annually in the US on hospitalizing patients with chest pain who turn out not to have a MI [2]. The current treatment practice at the study site involves admission for provocative testing (Stress Testing with Nuclear Imaging most often) after an acute coronary syndrome (ACS) is ruled out. However, these tests are only done during the “work week” causing delays during hospital admission. It is feasible, if these patients are evaluated with risk stratification that some of them could be discharged with outpatient testing. Therefore, patients would not have extended hospitalizations waiting on a stress test. The benefits from this risk stratification are multiple, including time involved, resources utilized, and money spent.

It is the standard of care in the United States to utilize risk factor stratification to help determine the type of cardiac work-up a patient needs when presenting with chest pain. In many facilities a scale is used to determine the risk of an acute coronary syndrome based on risk factors. One example is the Thrombolysis in Myocardial Infarction (TIMI) risk score. The TIMI score is based on risk factors for CAD and clinical presentation during a possible ACS[3].

For many years it was felt that approximately 50% of coronary events occurred in patients with no risk factors. However, in reality, the presence of one or more risk factors in the young (18-59) is highly sensitive for future coronary events[4]. The traditional risk factors for CAD are advanced age, sex, family history, dyslipidemia, cigarette smoking, hypertension, diabetes, obesity, and sedentary lifestyle. Multiple studies have been conducted to show potentiation effects of risk factors on a person's risk for having CAD.

The TIMI score was developed by the TIMI trials that began in 1984. They examined thrombolytic and antithrombotic regimens in acute MI and unstable angina (UA). Currently there have been 23 TIMI trials that have provided insights into the pathophysiology, and clinical course and have provided information that is useful in the treatment of acute MI and UA[5]. In the TIMI-11B trial, a score was developed based on risk factors and clinical presentation that distinguished those patients with UA or non-ST elevation myocardial infarction (NSTEMI) into risk categories of low (0-2), intermediate (3-4) and high (5-7). These risks were associated with the chance of having an acute coronary event in the following 14 days after presenting with chest pain[3].

A retrospective study was published in April 2004 that looked at the correlation of the TIMI risk score with the extent of native vessel disease in patients diagnosed with NSTEMI and who underwent angiography. The results indicated that the TIMI score did correlate with the extent of coronary disease confirmed by coronary angiography and 57% of the low risk patients had nonsignificant CAD or normal angiogram. This study showed that the TIMI risk score has a broader usefulness and can be used at the bedside when deciding on diagnostic and therapeutic interventions[6].

The American College of Cardiology (ACC) and the AHA have published together in their practice guidelines, an algorithm for the "Evaluation and Management of Patients Suspected of Having an ACS" [7]. If the cardiac enzymes remain negative and the patient has no further episodes of chest pain, then a stress test is recommended. Stress test is defined as an Exercise Treadmill Testing (ETT), with or without imaging modality, or Dobutamine/Adenosine Myocardial Perfusion Imaging (MPI). The guidelines indicate that admission is not necessary for those at low risk based on risk factor stratification and stress testing may be done prior to discharge or as an outpatient.

However, there is some concern that risk stratification may not be safe for those people who are in lower socioeconomic circles, as defined by lower income and educational levels. There has been documentation over the past ten years that seems to indicate there is an inverse relationship between SES and cardiovascular risk[8]. All risk factors do not have the same association. However, hypertension, smoking, BMI, and physical inactivity do seem to correlate. Of note, elevated cholesterol and lipids are not associated[9].

Environmental factors also play a role in increasing the risk for CAD. When comparisons were made between individuals from New York and their areas of birth, the south was shown to have higher incidence of CAD, which supports the impact of early life influences[9].

The purpose of this study is to determine if the A-TIMI scoring system can differentiate a low risk patient from an intermediate risk patient for safe discharge with outpatient provocative testing at a public hospital. Specifically, an inner city hospital located in the south, that mainly provides medical care to a lower socioeconomic class known to have more adverse cardiac outcomes.

METHODS

PARTICIPANTS

Participants will be selected based on criterion sampling method[10]. Criterion for this study will be patients seen at a public hospital, who, based on interview by the physician (either in clinic or the emergency department) could be experiencing an ACS. ACS is defined by symptoms consistent with UA, acute MI, or equivalent symptoms[a]. All races, genders, and patients less than 65 years of age and greater than 18, will be included.

Patients with a diagnosis of diabetes will be excluded because of their known microvascular disease, atypical presentations for coronary events, and because MPIs are frequently abnormal in asymptomatic diabetics[11]. Those patients with a prior diagnosis of heart disease (i.e. Congestive Heart Failure, Myocardial Infarction, arrhythmia, valvular disease), previous workup (i.e. stress test, echo), or evidence of acute MI (ST elevation > 1 mm or troponin >0.3[b]) will be excluded as well.

PROCEDURE

This is a prospective study over 12 months. The association between the participant number and the medical record number assigned by the study site will be kept on a master list to avoid duplication of data. The master list will be destroyed at the completion of the study to preserve patient confidentiality.

Study participants will receive the routine care provided at the study site for ACS. Routine care consists of a stress test with nuclear images, serial ECGs, and serial cardiac enzymes. The stress test will consist of an ETT with images or Adenosine/Dobutamine MPI. Based on the results of the stress tests, the participants will be placed into two groups. Those with no reversible ischemia will be placed in Group A

and termed “negatives”. Those with either significant or nonsignificant ischemia will be placed in Group B and termed “positives”. Fixed defects due to attenuation artifact will be considered “negatives” and fixed defects due to scar will be considered “positives”. Results will be followed for those “positives” taken to left heart catheterization, to determine if the stress was truly positive.

A participant's financial class will be determined as funded or non-funded. The funded group will consist of private insurances, Medicaid, and Medicare recipients. The non-funded group will be comprised of all self-pay patients, free care patients, and prisoners.

Information will be gathered by chart review during hospital course. Participant's data will be collected and entered onto a data sheet. The information on the data sheet is coded with individual identification numbers that will be keyed into the database. The A-TIMI risk score will be determined for each participant by the investigator.

INSTRUMENT

The TIMI score was developed by the Thrombolysis in Myocardial Infarction (TIMI) trials[5]. A TIMI score of 0-2 is low risk, 3-4 is intermediate risk, and 5-7 is high risk. Low risk patients are discharged with outpatient cardiac work-up and the intermediate and high-risk patients are admitted.

The TIMI score originally involved the risk factors of hypertension, family history, diabetes, dyslipidemia, and history of smoking. The A-TIMI score includes obesity when calculating the risk score. Obesity is defined by a body mass index (BMI) greater than or equal to 30. Diabetics and high-risk patients (prior CAD and/or age greater than or equal to 65) are excluded by study design. Since “sedentary lifestyle” is not regularly documented, nor does it have a documentation standard at the study facility, it will not be included in the A-TIMI.

DATA ANALYSES

The data will be evaluated quantitatively to generate results. The A-TIMI score and the stress test results of Groups A and B will be compared. Financial class will be evaluated to determine percentage of participants with no funding, who represents the lower socioeconomic classes. Analyses, specifically, means and percentages, will determine if the A-TIMI risk score can safely determine low risk patients for future cardiac events in patients of LSES in a public hospital. Significance determined by chi-square.

RESULTS

This study was conducted over a twelve-month period where 145 participants met the entry parameters. The demographic findings are reported in Table 1 and the study results are noted in Table 2.

Figure 1

Table 1: Demographic Findings

AGE			
	Average		49.34 +/- 8.68
	Less than 40 yrs		13.10%
	40-49		31.03%
	50-59		44.83%
	60-64		11.03%
BMI			
	Average		29.34 +/-7.65
	Less than 30 [normal]		59.31%
	30-34		22.07%
	35-39		6.9%
	≥ 40		11.72%
RACE			
	African-Amer.	n. 66	45.52%
	Caucasian	n.78	53.79%
	Hispanic	n. 1	0.69%
GENDER			
	Male	n. 67	46.21%
	Female	n. 78	53.79%

Figure 2

Table 2: Study Findings

RISK SCORE			
	Low	n. 132	91.03%
		Male (n. 59)	Female (n. 73)
	Intermediate	n. 13	8.97%
		Male (n. 8)	Female (n. 5)
STRESS TEST			
	Negative	n. 87	60.0%
	Male	n. 28	41.79%
	Female	n. 59	75.64%
	Positive	n. 58	40.0%
	Male	n. 39	58.21%
	Female	n. 19	24.36%

Females comprised 78 (or 53.79%) and males comprised 67 (or 46.21%) of this population. Average overall age was 49, with African-Americans, Caucasians, and Hispanics composing 45.52%, 53.79%, and 0.69%, respectively. Participants spent an average of 2.3 hospital days with 36

(24.83%) of the hospital admissions greater than or equal to four days due to complications or delays in procedures. Ninety-one percent of this population was calculated as low-risk patients, and of these 132 participants, 77 had negative stress tests and 55 had positive stress tests. Thirteen were calculated as intermediate-risk with only three positive stress tests vs. ten negative. Of the 58 total positive stress tests (both low and intermediate risk), only 26 (17.93%) were taken for left heart catheterization (LHC) as deemed by the Cardiology Service at the study site or because of refusal of procedure (2). Eleven of the 26 LHCs did not have findings consistent with the stress tests, therefore the stress tests were termed false positives. The remaining 15 had findings as indicated on the stress tests, and were termed true positives. Only two patients were referred for coronary bypass surgery. And interventions, via percutaneous angioplasty or stent placements, were performed on 6 of the 15. Thirteen received medical management or ischemia was so minimal that Cardiology felt the chest pain experienced by the patient was not cardiac in origin. Eight had fixed defects and no evidence of ischemia, but indicating previous infarct. Statistics of this population regarding positive risk factors are seen in Table 2 and 3.

Figure 3

Table 3: Risk Factor Prevalence in Study Population

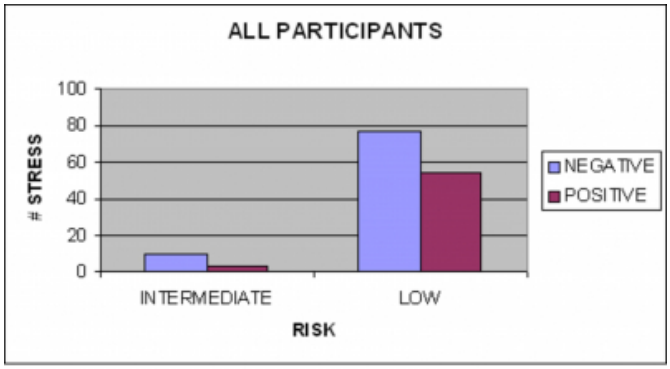
EKG Changes	11.72%
Family History	33.79%
Diagnosis of Dyslipidemia	19.31%
History of Hypertension	46.90%
≥ Risk Factors	30.34%
History of Tobacco Use	60.00%

Only 28 (19.31%) of this study population had funding for medical care as provided by Medicaid, Medicare, or private insurance.

None of the above findings were statistically significant [see Graph 1, 2, & 3].

Figure 4

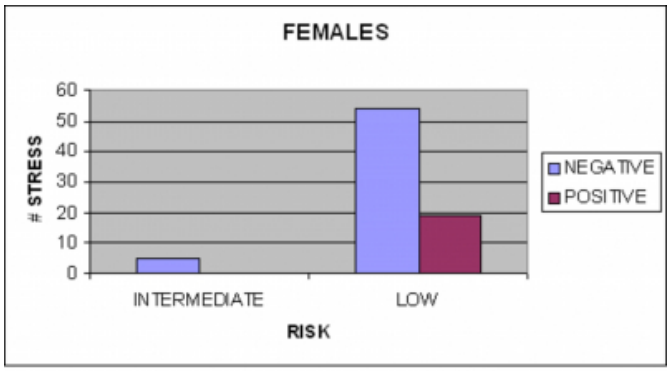
Graph 1: Comparison of positive and negative stress tests, between low and intermediate risk categories.



$P \leq 0.20$

Figure 5

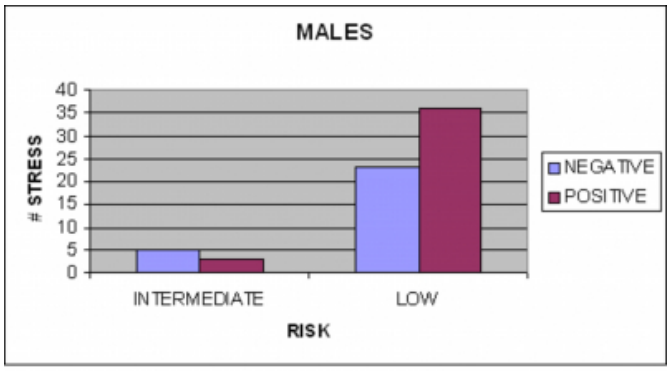
Graph 2: Comparison of positive and negative stress tests, between low and intermediate risk categories in the female study population.



$P \leq 0.20$

Figure 6

Graph 3: Comparison of positive and negative stress tests, between low and intermediate risk categories in the male study population



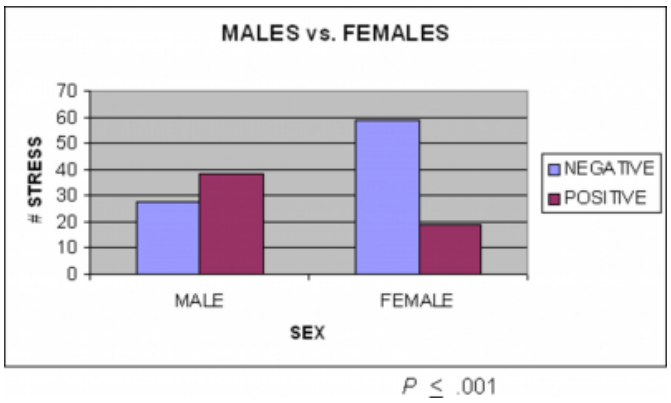
$P \leq 1$

The only significant finding was noted when comparing males to females [see Graph 4]. It was noted that 19 of the

58 positive stress tests were women (33%), while 39 were men (67%). When comparing positive and negative stress tests against gender, there was a statistical significance with a P value of less than or equal to .001.

Figure 7

Graph 4: Comparison of positive and negative stress tests, between males and females.



DISCUSSION

At this study site that serves the lower socioeconomic population, a fairly equal number of men and women presented to the emergency department or clinic for evaluation of chest pain. There was no correlation between intermediate or low risk patients and whether or not they had a positive stress test, but when evaluated as a whole, there was a correlation, however, it was statistically insignificant.

A notable finding was the difference between men and women and the chance of having a positive stress test. One in four women (24.36%) were likely to have a positive stress test, indicating that risk stratification may be acceptable in the female segment of this population. However, the men had a one in 1.72 chance of having a positive stress test (58.21%), and therefore, risk stratification may not be acceptable in the male segment of this population

PROBLEMS

There was only one finding that was of statistical significance in this study, due in part to the sample size. Bias also played a big part in this study.

First, the interpretation of the nuclear images from the stress tests was dependent on one individual, the nuclear radiologist. Two individuals, at six months intervals, were responsible for reading the stress test results during the course of this study.

Second, the Cardiology staff physician determines if a LHC is necessary when a positive stress test occurs. Four of the 13 classified as “medical management”, were actually the cardiologist's opinion that chest pain was not from CAD despite a positive stress test, therefore a LHC was not performed. Since all positive stress tests were not taken for LHC, the false positive stress tests cannot be included in the “negative” tests, possibly effecting percentages and thus statistical significance.

Other problems noted concerned information gathering from the participant. Risk factor scoring was determined by taking a history from the participant. Some denied a history, such as dyslipidemia, when a previous lipid panel was documented in the computer. The family history of CAD posed a problem because many people would associate chest pain as having a MI. Ages regarding CAD history were not consistently documented by the admitting physician, therefore making it hard to determine if a primary relative actually had a history of CAD (i.e. MI <55).

ACKNOWLEDGEMENTS

Jian Huang, MD, Chief, Section of Internal Medicine, Department of Medicine, Louisiana Health Sciences Center, Shreveport, Louisiana.
Roy Parish, PharmD
Silvia Peters, DHSc, Nova Southeastern University, Ft. Lauderdale, Florida.

FOOTNOTES

[a] Symptoms of Unstable Angina, Acute MI, or ACS: Chest discomfort, described as heaviness, pressure, squeezing, smothering; pain localized to the sternum, indicated sometimes with a clenched fist; this symptom is usually crescendo-decrescendo lasting 1 to 5 minutes; can radiate to left shoulder, both arms or to the ulnar surfaces of the forearm and hand; and it can arise in or radiate to the back, neck, jaw, teeth, and epigastrum[12].

[b]The minimum level of Troponin necessary to diagnose AMI used at the study site hospital.

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