



ASNC Choosing Wisely Challenge 2016

An outpatient pathway for chest pain visits to the emergency department reduces length of stay, radiation exposure, and is patient-centered, safe and cost-effective.

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- Introduction

Chest pain is a common complaint for Emergency Department (ED) visits and results in considerable health care expense and prolonged length of stay. The American Heart Association suggests that outpatient stress testing after a negative ED visit in low risk patients is an alternative for care if the stress test is completed within 72 hours. Furthermore, stress testing combined with single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) ordered as part of a chest pain risk stratification protocol may lead to unnecessary patient radiation exposure in patients who exercise > 10 METs during stress testing as previous literature suggests that MPI adds little to the prognosis in this population.

- Proposed solution

We therefore suggest a novel testing algorithm for low-risk patients presenting to the ED in which 1) risk stratification testing is shifted from an observation or prolonged ED stay to an outpatient visit within 72 hours of presentation and 2) a provisional radioisotope injection protocol is implemented if adequate exercise is achieved without symptoms and with negative ECG response. Patients qualifying for an outpatient return visit had atypical chest pain, no known coronary artery disease (CAD), at least two sets of negative cardiac enzymes and an overall low traditional risk factor profile.

We hypothesized that this novel protocol would 1) decrease length of stay, 2) lower healthcare cost, and 3) reduce patient radiation exposure while maintaining safe outcomes.

- Research findings

Previously published data from our lab suggests that a provisional injection protocol is associated with very low mortality, few follow-up diagnostic tests, and lower cost compared to standard imaging protocols. In that study, from a total of 965 low-risk patients visiting the ED with chest pain, 192 underwent exercise-only and 773 perfusion imaging stress testing. After 41.6 ± 19.6 months of follow-up, all-cause mortality was similar in the exercise-only versus the exercise plus imaging group (2.6% vs 2.1%, $p = 0.59$). There were no cardiac deaths in the exercise-only group. At 1 year, there was no difference in the number of repeat functional stress tests (1.6% vs 2.1%, $p = 0.43$), fewer angiograms (0% vs 4.0%, $p = 0.002$), and a significantly lower cost ($\$65 \pm \332 vs $\$506 \pm \$1,991$, $p = 0.002$) in the exercise-only group.

For this project, we looked at all patients with ED visits for chest pain between October 2015 and February 2016. Patients were prospectively recorded and retrospectively reviewed. A set of similar patients admitted to the chest pain unit served as a comparison group. Outcomes included length of stay, hospital reimbursement, and radiation exposure. Once patients were deemed “low-risk” and therefore qualified for ED discharge with subsequent outpatient stress testing within 72 hours, they were given a stress lab appointment with detailed follow-up instructions. In case of a no-show, a missed appointment letter was mailed to the patient.

A total of 156 patients (age 51.4 ± 9.9 yrs, 53.8% female and 1.6 ± 1.1 traditional cardiac risk factors) underwent the ED outpatient stress testing pathway with 29.5% not returning for testing. All patients were subject to our provisional injection protocol. Of the 109 (70.5%) patients who returned, 65.1% underwent exercise treadmill testing (ETT) with 26.6% having a stress-only and 8.3% a full rest and stress SPECT MPI study. Ten (9.2%) of the tested patients had an abnormal result (7 MPI's and 3 ETT's) of which 4 (3.6%) underwent catheterization (2 had angiographic CAD and 1 underwent revascularization) (Table 1).

The average length of stay in the ED was 7.68 ± 2.18 hrs for the outpatient stress testing group, with a 72% reduction in stay when compared to a similar patient population admitted to traditional chest pain unit observation (27.37 ± 8.17 hrs, $p < 0.0001$).

Payer mix included Medicare (6.4%), Medicaid (38.2%), private/commercial insurance (50.5%) and self-paying patients (4.5%). Hospital reimbursement for patients undergoing outpatient stress testing averaged US\$ 781 ± 686 . A similar patient population with an

observation stay in the chest pain unit averaged US\$ 3,696 ± 1,795. Financial healthcare burden across the entire spectrum of payers was therefore decreased by 79%.

Radiation exposure for all 109 patients undergoing outpatient stress testing with the provisional injection protocol totaled 193 mSv based on an average 2.9 mSv exposure for stress-only, 12.1 mSv for rest-stress MPI and zero exposure for ETT. Compared to traditional testing protocols with routine rest-stress MPI, total radiation exposure would amount 1,319 mSv. Our provisional injection protocol therefore resulted in an 85% reduction in radiation exposure.

Experiences and Outlook

Most strikingly, the implementation of our novel approach to treating low-risk chest pain patients presenting to the ED has affected important aspects of 1) the provider-patient interaction 2) healthcare cost and hospital administration, and 3) radiation safety for our patients.

Though anecdotal and not formally assessed, patients expressed satisfaction with the ability to return for outpatient testing in a timely fashion and decrease in time spent in the ED. Providers were happier being able to discharge low-risk patients from the ED and following-up in the outpatient setting through a streamlined discharge and follow-up process, reducing the administrative burden of redundant admission and discharge dictations, order writing etc.

In a healthcare environment with ever-increasing cost and scarce resources, a decrease in length of stay and optimized resource utilization achieved through our novel outpatient protocol appears overall positive. A possible reduction in bottom-line hospital reimbursement in these low-risk patients through a shift towards less lucrative outpatient follow-up will have to be carefully assessed and weighed against better availability of beds and other resources for sicker patients in a revenue-oriented hospital environment.

In the current health care environment, the efficient and appropriate use of cardiac diagnostic testing and attention to medical diagnostic imaging radiation exposure have become of paramount importance, and in many situations the mantra of “less is more” has been used to reign in excess. The most obvious application of a provisional protocol in routine clinical practice where up to 60-70% of appropriately indicated myocardial perfusion imaging (MPI) studies demonstrate normal perfusion would be to “downgrade” negative high level exercise MPI studies to an ETT thereby avoiding unnecessary radiation exposure and saving time and resources. Another use would be to facilitate the efficient diagnosis of patients and encourage

adherence to the current guidelines which indicate that ETT alone is a Class 1 recommendation for the evaluation of possible anginal symptoms in intermediate risk patients with good functional capacity and interpretable ECG's. In this case by “upgrading” the study by adding imaging to an ETT when abnormal, a patient’s evaluation can be efficiently completed in a single session as opposed to having the patient return for another stress and imaging session. This approach is similar to that employed in the What is the Optimal Method for Ischemia Evaluation in Women (WOMEN) trial, only more efficiently.

Table 1. Demographics

	ALL PATIENTS N = 156	TESTED PATIENTS N = 109	P VALUE
Age	51.4 ± 9.9	51.1 ± 9.5	0.74
Gender			0.91
Male	72 (46.2%)	50 (45.9%)	
Female	84 (53.8%)	59 (54.1%)	
Height			
Weight			
BMI			
<i>Cardiac Risk Factors</i>			
Diabetes	29 (18.6%)	21 (19.3%)	0.92
Hypertension	85 (54.5%)	55 (50.5%)	0.55
Hyperlipidemia	49 (31.4%)	31 (28.4%)	0.67
Smoking	53 (34.0%)	41 (37.6%)	0.67
Family History	42 (26.9%)	36 (33.0%)	0.37
Mean # of Risk Factors	1.6 ± 1.1	1.6 ± 1.2	1.0
Known CAD	4 (2.6%)	2 (1.8%)	1.0
PCI	0 (0%)	0 (0%)	1.0
CABG	2 (1.3%)	2 (1.8%)	1.0
<i>Stress Test</i>			
Days Bet ED & Stress	N/A	2.1 ± 1.3	-
<i>Test Performed</i>			
No Show	46 (29.5%)	N/A	-
ETT	71 (45.5%)	71 (65.1%)	0.003
Stress-Only MPI	29 (18.6%)	29 (26.6%)	0.17
Rest & Stress MPI	9 (5.8%)	9 (8.3%)	0.47
<i>Test Results</i>			
Normal	N/A	100 (90.8%)	-
Abnormal	10 (6.4%)	10 (9.2%)	0.48
<i>Outcomes</i>			
Returned to ED	4 (2.6%)	4 (3.7%)	0.72
Angiography	4 (2.6%)	4 (3.7%)	0.72
<i>30 Day Return to ED</i>			
All-Cause Visit	17 (10.9%)	9 (8.3%)	0.53
Cardiac Visit	4 (2.6%)	1 (0.9%)	0.65
<i>Insurance</i>			
Commercial	65 (41.7%)	55 (50.5%)	0.20
Medicare	11 (7.1%)	7 (6.4%)	1.0
Medicaid	74 (47.4%)	42 (38.2%)	0.17

None

6 (3.8%)

5 (4.5%)

0.77

BMI = Body Mass Index, CAD = Coronary Artery Disease, PCI = Percutaneous Coronary Intervention, CABG = Coronary Artery Bypass Grafting, ED = Emergency Department, ETT = Exercise Treadmill Test