

Patient Engagement Following Acute Myocardial Infarction and Its Influence on Outcomes



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The Patient Activation Measure (PAM) is a validated assessment tool that evaluates how engaged patients are in their own health care. The more engaged or “activated” patients are, the higher the score and the more likely they are to adhere to medical therapy and make healthy lifestyle choices. Little is known regarding patient activation in patients after an acute myocardial infarction. From March 2016 to December 2016, we administered PAM surveys to patients after myocardial infarction at the time of a clinic visit scheduled within 10 days of hospital discharge. Demographic and outcome data were collected. The primary outcome was defined as a composite end point of major medication errors, emergency department visits, and/or unplanned readmission. The secondary outcome was continued tobacco use after discharge. A total of 93 patients were enrolled and 39 (42%) were positive for the primary outcome. PAM scores ranged from 40.9 to 100 (median 62.6, interquartile range 56.0 to 72.1). In multivariable analysis, adjusting for age, gender, and burden of comorbidities, patients with lower PAM scores were more likely to have the primary outcome (odds ratio 1.063, 95% confidence interval 1.020 to 1.109, $p = 0.0041$). Patients with lower PAM scores also were more likely to continue to use tobacco after discharge (odds ratio 1.060, 95% confidence interval 1.005 to 1.118, $p = 0.0325$). In conclusion, we found an association between lower PAM scores and subsequent adverse clinical outcomes, including unplanned readmissions. Further investigation into the potential effect of education and coaching interventions in patients with low PAM scores after acute myocardial infarction is warranted. © 2017 Elsevier Inc. All rights reserved. (Am J Cardiol 2017;120:1467–1471)

The principle of patient activation reflects patients' understanding of what their role is in the overall care plan; how engaged they are in their own health care. Patient activation incorporates a combination of knowledge regarding their illness, skill, and self-confidence in the management of their medical conditions.¹ It has been shown to be associated with health behaviors, metrics of chronic disease, morbidity, and hospitalizations.^{2–6} Lower patient activation scores have been associated with higher health-care costs.⁷ The Patient Activation Measure (PAM) is an effective survey tool that quantifies a patient's activation level. It has been validated in diabetes,⁸ chronic obstructive pulmonary disease,⁹ multiple sclerosis,¹⁰ and congestive heart failure.^{11–13} Several studies have found an association between PAM scores and cancer screening, smoking, obesity, emergency room visits, and readmissions.^{2–5} The principle of patient activation has not been rigorously studied in the population after acute myocardial infarction (AMI) to date. The goal of this study was to evaluate the impact of PAM on clinical outcomes including unplanned readmissions in patients after AMI.

Methods

Patients were enrolled from March 2016 to December 2016 in the University of Virginia post-MI clinic, a multidisciplinary clinic where patients with AMI (ST elevation and non-ST elevation) are seen within 10 days of hospital discharge. Investigational review board approval was obtained to administer a 10-question survey (PAM-10) after obtaining written consent. Answers were converted to numerical scores through a validated algorithm. PAM scores range from 1 to 100 and are separated into the following levels: level 1 (≤ 47.0) reflects patients who are passive, lack confidence, and are nonadherent; level 2 (47.1 to 55.1) reflects patients who have gained some knowledge of their condition and can set simple goals, but they still believe that their health is largely out of their control; level 3 (55.2 to 67.0) reflects patients who are taking action and building self-management skills; and level 4 (≥ 67.1) reflects patients who have adopted healthier behaviors and are trying to maintain a healthy lifestyle.¹⁴

Baseline demographics, length of hospital stay, medical co-morbidities, and adherence to discharge medication regimen was collected during the clinic visit and through retrospective chart review. Overall burden of co-morbidities was defined as the total number of co-morbidities per patient. During the clinic visit, patients were assessed for symptoms, medication adherence, current tobacco use, and emergency room visits and readmissions since hospital discharge. The medication regimen of each patient was reviewed, and discrepancies from discharge regimen were noted. Information of emergency department visits and unplanned readmissions over the subsequent 3 months were collected through chart review using an electronic medical record by Epic Systems Corporation

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(EPIC) and the Care Everywhere platform, allowing us to obtain data on patients who were evaluated and/or readmitted to outside hospitals. Smoking status at follow-up was documented by the pharmacist who provided smoking cessation coaching.

Patient demographics, co-morbidities, and discharge medication regimens were compared with the Wilcoxon rank sum test or Kruskal-Wallis test (continuous variables) and chi-square test (categorical variables). The Fisher's exact test was used for categorical variables with small (<5) expected values. The primary outcome was defined as major medication errors identified at clinic visit after MI, emergency department visits, and/or unscheduled readmission. Major medication error was defined as a medication error that threatened the efficacy of standard of care for patients with AMI and, if left unresolved, would lead to adverse outcomes. The secondary outcome was continued tobacco use after discharge. Univariable logistic regression was used to analyze continued tobacco use after discharge. Multivariable logistic regression was used to compare scores with regard to outcomes, adjusted for age, gender, and burden of co-morbidities. Receiver operating characteristic curve analysis was performed to evaluate the performance of the model as a predictor of the primary outcome. Performance was compared with established predictive scores: the Thrombolysis in Myocardial Infarction score,^{15,16} the Global Registry of Acute Coronary Events score,¹⁷ and the Primary Angioplasty in Myocardial Infarction score.¹⁸ Analyses were performed with Statistical Analysis System software, version 9.4 (SAS Institute, Cary, NC). A p value of <0.05 was considered statistically significant.

Results

A total of 93 patients who attended the clinic appointment were enrolled, with PAM scores ranging from 40.9 to 100 (median 62.6, interquartile range 56.0 to 72.1). Baseline patient demographics and co-morbidities were not

significantly different in patients with different PAM levels (Table 1). Patients who experienced the primary outcome were more likely to be female and had a higher burden of co-morbidities (Table 2). All patients completed the 3-month follow-up. A total of 39 (42%) patients had the primary end point, including 19 major medication errors, 17 emergency department visits, and 18 unplanned readmissions for a total of 47 events; several of these events occurred in the same patients and were counted as a single "positive" outcome. Median number of days from discharge to readmission was 17 (interquartile range 6 to 45) for the entire cohort. Major medication errors included duplicate or incorrect dosing of antiplatelet agents (n = 4), and errors in hypertension medications (n = 8), hyperlipidemia medications (n = 3), diabetes medications (n = 3), and anticoagulation (n = 1).

In a multivariable model adjusting for age, gender, and burden of co-morbidities, lower PAM scores were significantly associated with the primary outcome (odds ratio [OR] 1.063, 95% confidence interval [CI] 1.020 to 1.109, p = 0.0041). Other predictors of the primary outcome were younger age (0.953, 95% CI 0.914 to 0.994, p = 0.0244), female gender (OR 13.676 CI 3.211 to 58.251, p = 0.0004), and increased burden of co-morbidities (OR 2.738 CI 1.675 to 4.475, p <0.0001) (Table 3). For comparison with established scores, continuous variables were categorized based on the strength of their association with the primary outcome as follows: age <65, 1 point; female sex, 3 points; co-morbidity burden, 0 to 6 points; and inverse of PAM level, 0 to 3 points. This score compared favorably with the Thrombolysis in Myocardial Infarction and Global Registry of Acute Coronary Events scores (Figure 1). The Primary Angioplasty in Myocardial Infarction score produced a c-statistic of 0.5227 for MI patients with ST-elevation (n = 29). The primary end point was driven largely by unplanned readmissions and major medication errors, whereas emergency department visits alone played a less significant role (Figure 2). PAM scores also were significantly associated with continued tobacco use at post-MI clinic follow-up (OR 1.060, 95% CI 1.005 to 1.118, p = 0.0325).

Table 1
Patient characteristics stratified by Patient Activation Measure level

Variable	Level 1–2 (n = 23)	Level 3 (n = 48)	Level 4 (n = 22)	p-Value
Age	69 (58–76)	59.5 (48.5–73)	64.5 (46–75)	0.1979
Male	19 (83%)	37 (77%)	14 (64%)	0.3089
Race				
Caucasian	19 (83%)	41 (85%)	15 (68%)	0.1965
African-American	3 (13%)	5 (11%)	7 (32%)	
Other	1 (4%)	2 (4%)	0 (0%)	
Current smoker	7 (30%)	16 (33%)	6 (27%)	0.8754
Hypertension	18 (78%)	37 (77%)	14 (64%)	0.4298
Hyperlipidemia	17 (74%)	28 (58%)	15 (68%)	0.4030
Diabetes	14 (61%)	21 (44%)	9 (41%)	0.3163
Chronic kidney disease	5 (22%)	5 (10%)	4 (18%)	0.4025
Chronic obstructive pulmonary disease	2 (9%)	7 (15%)	3 (14%)	0.8474
Known coronary artery disease	10 (43%)	14 (29%)	7 (32%)	0.4812
Comorbidity burden	3 (2–4)	2 (1–3.5)	2.5 (1–4)	0.3575

Values are median (interquartile range) or count (percentage). Hypertension is defined by a previous documentation of blood pressure >140/90 mm Hg or current use of antihypertensive medication. Hyperlipidemia is defined by a previous documentation of total cholesterol >200 mg/dl or low-density lipoprotein >130 mg/dl or high-density lipoprotein <40 mg/dl or current use of lipid-lowering agent. Co-morbidity burden was defined as the sum of co-morbidities (hypertension, hyperlipidemia, diabetes, chronic kidney disease, chronic obstructive pulmonary disease, and known coronary artery disease) for each patient.

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