



Research Article

Personalized Preventive Care for Patients at Risk of Heart Attack or Stroke

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Abstract

Objectives: This study examines the impact of MDVIP enrollment on incidence of acute myocardial infarction (AMI) or stroke/transient ischemic attack (TIA) for an at-risk population of Medicare fee-for-service (FFS) beneficiaries.

Study Design: We obtained participating physician and beneficiary enrollment lists from MDVIP and used Medicare FFS claims from 2005 to 2015 to identify those at risk of AMI or stroke/TIA based on at least two instances of the following: hypertension, hyperlipidemia, and/or diabetes.

Methods: Propensity score weights achieved and maintained balance in baseline characteristics across MDVIP enrollees and comparisons throughout the study period. Linear probability models measured differences in the change in AMI and stroke/TIA incidence rates over time, along with two falsification outcomes, hip fracture and colorectal cancer.

Results: The estimates indicate a 0.8 percentage point drop in the occurrence of either AMI or stroke after MDVIP enrollment (p -value $< .0001$). For each condition separately, the model estimates reductions in the probability of occurrence, 0.12 percentage points (p -value = 0.0588) for AMI and 0.67 percentage points for stroke/TIA (p -value $< .0001$). Relative to rates in the comparison population, the point estimates represent relative reductions of 12% and 11% for AMI and stroke/TIA, respectively.

Conclusion: Our analysis utilizes Medicare FFS claims to provide initial evidence that an alternative primary care arrangement, MDVIP,

is associated with reduced incidence of vascular events in an at-risk population. The evidence adds to prior literature by indicating an effect on measures of health, to accompany prior evidence of changes in utilization and expenditures.

Objectives/Introduction

MD-Value in Prevention (MDVIP) is a national program in which physicians and patients participate in a personalized primary care arrangement, sometimes referred to as retainer medicine. MDVIP patient members pay an annual fee (average of \$1,800) and, in return, receive a personalized wellness plan, including screenings and diagnostic tests, diet and exercise coaching and resources, and other ancillary benefits, such as 24/7 availability and same-day appointments [1]. To provide such care, MDVIP-affiliated physicians agree to serve a smaller panel, maximum of 600 patients. Prior studies of MDVIP participation have shown overall cost savings, decreased ED utilization, decreased hospital admissions and readmissions, and increased evaluation and management utilization [2-5]. This study expands focus beyond the costs and utilization to examine the impact of MDVIP enrollment on the incidence of acute myocardial infarction (AMI) or stroke/TIA for a population of Medicare fee-for-service (FFS) beneficiaries who are at higher risk of these events.

Methods

Study populations

Common predictors of vascular risks include age, blood pressure, diabetes, and cholesterol levels, as noted in the Framingham and Omnibus risk estimators. We defined the at-risk population for our observational study as 65 and older Medicare FFS beneficiaries with at least two of three risk-related chronic conditions—hypertension, hyperlipidemia, and diabetes—identified in the chronic conditions segment of CMS's Master Beneficiary Summary File [6]. Among at-risk beneficiaries, we used Medicare FFS claims to identify MDVIP enrollees receiving at least one Part B service from an MDVIP-affiliated physician in the 15 months prior to the physician's, and beneficiary's subsequent, MDVIP enrollment, between 2005 and 2014. We also identified non-enrollees receiving care from non-MDVIP physicians in the same primary care service area during the same 15-month period ("non-MDVIP comparisons"). We excluded any beneficiaries without coverage under Medicare Parts A and B for the 12 months prior to and following the local MDVIP physicians' enrollment dates. Finally, for both enrollees and non-MDVIP comparisons, we created beneficiary-year observations for the three years prior and up to five years following the local MDVIP enrollment date.

Statistical analysis

We balanced the MDVIP and non-MDVIP comparison populations over observed pre-enrollment characteristics using propensity score overlap weights, where each observation is weighted by the predicted probability of being in the opposite group. Overlap weights minimize

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the influence of extreme propensity scores and create exact balance over characteristics included in the propensity score model [7]. To obtain propensity scores, logistic regressions modeled MDVIP enrollment as a function of age at enrollment, sex, and race, as well as characteristics measured for each of the three pre-enrollment years including: incidence of AMI; history of prior AMI; incidence of stroke/TIA; history of prior stroke/TIA; obesity; history of prior obesity; total Medicare expenditures; number of inpatient admissions; number of readmissions; whether the beneficiary had one, two to three, four to five, or six or more additional chronic conditions in the year; and whether the beneficiary was FFS in the entire year. For the logistic regressions, we weighted comparison observations to proportionally represent the zip codes from which MDVIP enrollees reside.

Due to attrition and censoring in both the treatment and comparison populations, we estimated the propensity model and created weights for each year separately. By balancing in each year, the analysis can utilize all available observations and maintain balance in pre-enrollment characteristics for enrollees and non-MDVIP comparisons throughout the study period. Linear probability models estimated the impact of MDVIP enrollment, the differential change from pre- to post-enrollment for weighted MDVIP enrollees relative to weighted non-MDVIP comparisons. Additional controls in the model included age, age squared, sex, race indicators, and year fixed effects. Analyses were conducted in 2018 and 2019.

Results

Descriptive statistics

The populations consist of 15,409 MDVIP enrollees, contributing

44,304 pre-enrollment and 52,066 post-enrollment person-year observations, and 1,012,349 non-MDVIP comparisons, contributing 2,868,555 pre-enrollment and 2,961,212 post-enrollment person-year observations. Table 1 demonstrates the balance as the weighted populations achieve equality on all beneficiary characteristics prior to enrollment, as pre-enrollment measures were included in the propensity score model. In the post-enrollment period, time-consistent demographic variables remain equal between the populations, but contemporaneous chronic condition indicators begin to differ. Importantly, though the post-enrollment means may differ, the populations remain balanced on their pre-enrollment measures.

Outcomes of Interest

The outcomes of interest include the incidence of AMI or stroke/TIA during the year. As the propensity score model included pre-enrollment occurrences of AMI and stroke/TIA, the weighted averages are balanced during the pre-enrollment period but differ in the post-enrollment period (Table 1). Additionally, we examine two falsification measures, the incidence of hip fracture or colorectal cancer during the year, which are unlikely to be influenced by MDVIP enrollment in the short term, either through changes of care or diagnosis coding. As the falsification outcomes were not included in balancing, pre-enrollment rates differ by 0.1 to 0.2 percentage points. Coefficient estimates from the weighted regressions, presented in Table 2, demonstrate MDVIP enrollment is associated with decreases in the incidences of AMI and stroke, relative to expectation. The estimates indicate a 0.8 percentage point decrease in the probability of either AMI or stroke for MDVIP enrollees (p-value < .0001).

Beneficiary Characteristics	Pre-enrollment		Post-enrollment	
	MDVIP N = 44,304	Comparison N = 2,868,555	MDVIP N = 52,066	Comparison N = 2,961,212
	Person Years	Person Years	Person Years	Person Years
Age	78.1	78.1	81	81
Male	43.50%	43.50%	43.20%	43.20%
Black	3.70%	3.70%	4.00%	4.00%
Hispanic	0.20%	0.20%	0.20%	0.20%
Other race	1.60%	1.60%	1.70%	1.70%
Hyperlipidemia in year	64.40%	64.40%	61.40%	67.90%
Hypertension in year	70.30%	70.30%	73.80%	78.90%
Diabetes in year	27.10%	27.10%	31.90%	31.70%
No additional Chronic Conditions	5.40%	5.40%	4.10%	4.30%
1 additional Chronic Condition	17.60%	17.30%	15.80%	14.60%
2 to 3 additional chronic conditions	39.30%	39.30%	38.00%	37.00%
4 to 5 additional chronic conditions	21.30%	21.30%	24.10%	24.70%
6+ additional chronic conditions	10.10%	10.10%	15.80%	17.60%
Outcomes of Interest				
AMI in year	0.60%	0.60%	0.90%	1.00%
Stroke/TIA in year	4.20%	4.20%	5.10%	5.90%
Hip fracture in year	0.70%	0.90%	1.20%	1.30%
Colorectal cancer in year	1.50%	1.60%	1.80%	1.80%

Table 1: Mean Characteristics of MDVIP and Comparison Populations.

Note: Weighted means presented for observed Medicare fee-for-service beneficiary years. Overlap propensity score weights equals (1-p) for MDVIP observations and p for comparison observations, where p equals the conditional probability of receiving treatment. AMI = Acute Myocardial Infarction; MDVIP = MD – Value in Prevention; TIA = Transient Ischemic Attack.

Estimated separately, the probability of AMI is 0.12 percentage points (p-value = 0.0588) lower for MDVIP enrollees and the probability of stroke/TIA is 0.67 percentage points lower (p-value < .0001). Relative to the post-enrollment averages for non-enrollee comparisons, these represent reductions of 12% and 11% for AMI and stroke/TIA, respectively.

Dependent Variable	Estimated Effect (SE)	P-value
AMI or Stroke/TIA	-0.0080***	<.0001
	0.0018	
AMI	-0.0012*	0.0588
	0.0006	
Stroke/TIA	-0.0067***	<.0001
	0.0017	
Hip Fracture	0.0007	0.3082
	0.0007	
Colorectal Cancer	0.0008	0.3258
	0.0009	

Table 2: Estimated Effects of MDVIP Enrollment on Outcomes of Interest.

Note: Linear probability coefficient estimates on interaction between MDVIP participant and post-enrollment indicators. Boldface indicates statistical significance (*p<0.1, ***p<0.01).

AMI = Acute Myocardial Infarction; SE = Standard error; TIA = Transient Ischemic Attack.

Contrary to the targeted outcomes, we do not find statistically significant differential changes from baseline in either falsification outcome for MDVIP enrollees relative to the non-MDVIP comparisons. The point estimates indicate statistically insignificant increases for both the hip fracture (p-value = 0.3082) and colorectal cancer outcomes (p-value = 0.3258). These findings represent smaller changes, both 5%, relative to the post-enrollment comparisons than those found for the target outcomes.

Discussion

This study adds to prior literature demonstrating the effects of one personalized primary care arrangement, MDVIP, on utilization and expenditures by examining the incidence of two vascular events, AMI and stroke/TIA, for at-risk Medicare FFS beneficiaries. The results provide evidence that personalized primary care arrangements can improve patient outcomes, in addition to changed costs and utilization, with estimated reductions of 12% and 11% for AMI and stroke/TIA, respectively. Though we find changes in the incidence rates for vascular events, we do not identify similar statistically significant changes in the incidence of two falsification outcomes not expected to change during the period of time of our study, hip fracture and colorectal cancer, providing support for the estimation strategy. However, the study is observational. Though we selected a comparison population residing in similar geographic areas and, through weighting, achieved balance on observed characteristics and the pre-enrollment incidence rates of the target outcomes, beneficiaries who enroll in MDVIP may differ in unobserved ways. The evidence adds to prior studies of MDVIP enrollment by indicating an effect on measures of health, reduced incidence of two vascular events for an at-risk population, to accompany prior evidence of changes in utilization and expenditures [2-5]. Future research should include clinical data to better document changes in vascular health.

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