Payer Effects of Personalized Preventive Care for Patients With Diabetes

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ABSTRACT

OBJECTIVES: To examine the effects of MD–Value in Prevention (MDVIP) enrollment on Medicare expenditures and utilization among fee-for-service (FFS) beneficiaries with diabetes over a 5-year period.

STUDY DESIGN: We obtained participating physician and beneficiary enrollment lists from MDVIP and Medicare FFS claims data through the Virtual Research Data Center to compare changes in outcomes, before and after enrollment dates, with those of nonenrolled beneficiaries receiving primary care in the same local market.

METHODS: We employed propensity score matching to identify comparison beneficiaries similar in observed characteristics and preenrollment trends. Individual fixed effects were used to control for time-consistent differences between treatment and comparison populations.

RESULTS: We found that enrollment is statistically associated with reductions in outpatient expenditures, Medicare expenditures in year 5, emergency department (ED) utilization, and unplanned inpatient admissions, accompanied by significant increases in evaluation and management visits and expenditures. Total Medicare expenditures over the 5-year period, as well as all inpatient admissions, were not statistically different between the MDVIP and comparison groups.

CONCLUSIONS: Our finding of reduced unplanned inpatient admissions and ED utilization supports the previous findings regarding MDVIP enrollees. We did not find significant changes in overall third-party expenditures, although savings were estimated in year 5, the last year of observation, and may occur later. Our approach, however, strengthens controls for baseline characteristics of the population and uses a comparison population drawn from the same markets who do not experience the loss of their primary care physician at the time of enrollment.

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Numerous primary care physicians and patients voluntarily participate in personalized primary care arrangements, sometimes referred to as concierge medicine or retainer medicine. MD–Value in Prevention (MDVIP) is a large, geographically diverse example of such a model. MDVIP members pay an annual fee (average of $1800 in 2020) and, in return, receive a personalized wellness plan, including screenings and diagnostic tests, diet and exercise planning, and other services, such as same-day appointments and a physician who is reachable 24/7.[1] To provide such care, MDVIP-affiliated physicians agree to serve a panel of 600 or fewer patients[1] compared with a national average panel size of 2300 patients for internal medicine and family practice physicians.[2] We examined patients enrolled in MDVIP and matched comparisons to investigate whether the MDVIP model affects healthcare utilization and third-party payer expenditures for a population with a diagnosis of diabetes.

Prior research suggests that enrollment in MDVIP reduces utilization of inpatient or emergency department (ED) services. Musich et al analyzed medical utilization of MDVIP members in comparison with a sample of Medicare Advantage beneficiaries who did not join the model and showed that participation in MDVIP led to savings in medical expenditures for 2 years after joining, resulting from reduced hospitalizations and ED visits.[3] Similar reductions in healthcare utilization related to MDVIP membership were found by Klemes et al[4] and Musich et al,[5] who used patient-level data from 5 states within the Intellimed data set and a sample of patients with a UnitedHealthcare employer-sponsored health plan, respectively. Our study continues this evidence base by examining the role of the MDVIP model on third-party Medicare fee-for-service (FFS) expenditures and healthcare utilization for the older Medicare FFS population. Further, we chose to focus on a population with diabetes, a common and costly chronic condition, because patients with chronic conditions may experience differential effects of personalized primary care arrangements from those presented in prior research.

As physician and patient participation is voluntary and involves enrollment fees for patients, we expect that MDVIP physicians

and patients may differ from others who are part of the Medicare FFS population. A review of the work of Klemes et al[4] by the American College of Physicians raised questions regarding identification of an MDVIP effect without further adjustment for baseline health and socioeconomic factors.[6] We addressed such factors in this study by matching comparison beneficiaries on observed characteristics, including baseline health, and controlling for time-consistent unobserved characteristics using fixed effects.

TAKEAWAY POINTS

We used claims data to examine how healthcare utilization and third-party Medicare expenditures change after individuals with diabetes enroll in the MD–Value in Prevention (MDVIP) model.

- Changes from before to after enrollment were compared with changes among selected similar individuals in the same healthcare market.
- After MDVIP enrollment, outpatient expenditures, emergency department utilization, and unplanned admissions were lower than expected.
- After enrollment, individuals received more evaluation and management visits and, relatedly, had higher Part B expenditures than expected.
- We did not find significant changes in overall third-party expenditures, although savings were estimated in year 5, the last year of observation, and may occur later.

METHODS

We obtained lists of MDVIP-participating physicians and MDVIP-enrolled beneficiaries 65 years or older, as well as their associated program enrollment dates, from MDVIP, and 2000-2015 Medicare claims (parts A and B) and Master Beneficiary Summary File Chronic Conditions segment data from the Virtual Research Data Center. The Chronic Conditions segment applies algorithms to identify the incidence of chronic conditions based on diagnosis and service codes in beneficiaries' claims histories. We used these chronic condition flags to identify beneficiaries meeting the diabetic criteria at the time of MDVIP enrollment or potential enrollment.

Study Populations

We first identified all Medicare FFS beneficiaries receiving at least 1 Part B service from an MDVIP-affiliated physician in a 15-month period ending when the physician joined MDVIP, including both beneficiaries who did and did not join the MDVIP model. Among beneficiaries receiving care from future MDVIP-affiliated physicians, we cross-referenced sex, date of birth, and zip code in Medicare records with MDVIP enrollment files. Using this approach, we uniquely identified 90% of FFS beneficiaries listed by MDVIP.

We also identified unaffiliated primary care physicians operating in the same primary care service area (PCSA) and the population of patients receiving care from these non-MDVIP physicians in the 15 months prior to when the MDVIP physicians joined. As such, we selected a population of potential comparison beneficiaries who received primary care in the same market at the same time as beneficiaries who enroll in MDVIP, where markets are defined as PCSAs.[7]

Because more than 90% of beneficiaries enrolled in MDVIP within 30 days of their providers' enrollment, and 95% within 90 days, we used the providers' enrollment dates as the start of MDVIP for the enrolled population. For beneficiaries seeing non-MDVIP providers, the intervention start date was defined as the enrollment date of the linked local MDVIP provider.

From the providers' enrollment dates, we extracted beneficiaries' Medicare FFS claims 3 years prior to and up to 5 years post enrollment. We only included years in which the beneficiary was enrolled in Medicare Part A and Part B and not enrolled in Medicare managed care.

The beneficiaries of interest with diabetes included 3 populations: (1) beneficiaries who joined MDVIP (MDVIP enrollees), (2) those who did not join MDVIP once their provider joined the model (MDVIP nonenrollees), and (3) those who did not join the MDVIP model and received services from physicians who also did not join MDVIP but are located in the same PCSA as MDVIP-affiliated physicians (non-MDVIP comparisons).

MDVIP enrollees are the population for whom we measured changes after MDVIP enrollment. Because MDVIP nonenrollees do not join MDVIP and are no longer patients of the same physicians, they also experience a change at the time of nonenrollment that may alter future outcomes. As such, we do not make postenrollment comparisons with this population but do utilize their preenrollment information to describe the characteristics of nonjoiners and include in modeling the tendency to join MDVIP.

More specifically, we used propensity score model estimates generated over MDVIP enrollees and nonenrollees to match non-MDVIP comparisons, who are patients of non-MDVIP providers in the same market, at the same time, to use as our primary comparison population.

Propensity Score Matching

For the 3 years prior to providers' MDVIP enrollments, future MDVIP enrollees and nonenrollees were similar in average age. Future MDVIP enrollees, however, were more likely to be men and averaged fewer hospitalizations or ED visits, but more evaluation and management (E&M) services, perhaps suggesting a stronger relationship with a primary care provider. In addition, MDVIP enrollees were 29% less costly to Medicare than nonenrollees ($8964 vs $12,558), on average. As such, the selection of beneficiaries into MDVIP does not appear random, which we addressed by matching comparison beneficiaries and controlling for time-consistent unobserved differences.

Further examining the subset of MDVIP enrollees with diabetes, we observed changes in Medicare expenditures related to the timing of enrollment. Specifically, we regressed annual Medicare expenditures in the 3 years prior to MDVIP enrollment on a variable indicating the number of years to enrollment, indicator variables for each year of age, and year fixed effects. We estimated the

regression over MDVIP enrollees only and, after conditioning on beneficiaries' ages, coefficients on the variable indicating years to enrollment suggest that expenditures were higher closer to enrollment, averaging $1003 more than expected with each additional year nearing MDVIP enrollment. Other dependent variables, including inpatient admissions and ED utilization, also suggested higher utilization nearer to MDVIP enrollment.

To balance observed characteristics between treatment and comparison populations, including increased expenditures prior to enrollment, we used propensity scores to match a comparison population of non-MDVIP beneficiaries who have a similar propensity to join, given their observed baseline characteristics.

The propensity score model includes regressors correlated with participation and expected to be related to outcomes of interest: age in the third baseline year; age squared; sex; number of E&M visits in each baseline year (3 variables); presence of any inpatient admissions and number of inpatient admissions in each baseline year (6 variables); number of unplanned inpatient admissions in each baseline year, as outlined for Medicare's Hospital-Wide All-Cause Unplanned Readmission Measure (3 variables); presence of any observed ED visits and the number of ED visits in each baseline year (6 variables); total Medicare expenditures and Medicare expenditures squared in each baseline year (6 variables); and whether the beneficiary was a Medicare FFS beneficiary enrolled in parts A and B and not enrolled in a Medicare managed care plan for any part of each baseline year (6 variables).

From logistic regressions, we estimated the propensity score for the 3 populations of interest: MDVIP enrollees with diabetes, MDVIP nonenrollees with diabetes, and non-MDVIP comparisons with diabetes. The 3 populations had similar mean propensity scores, not shown, although enrollees had the highest average propensity. Meaningful variance and overlap in the distribution of propensity scores suggest that the populations are drawn from a common support.

The matched comparison was selected as the non-MDVIP beneficiary nearest in propensity score, within 0.2 SD.[8] Using this approach, we matched 81% of MDVIP enrollees to a non-MDVIP comparison in the same PCSA and year.

Because few beneficiaries enrolled prior to 2005, we restricted the population for analysis to beneficiaries observed in at least 1 year of pre- and postenrollment status between 2005 and 2014. The final analytic sample includes 157,210 beneficiary-year observations from 30,727 beneficiaries.

Statistical Analysis

Along with propensity score matching, we used a difference-in-differences (DID) structure to control for unobserved factors generating time-consistent differences in outcomes. The estimator measures the difference in change for the conditional outcome over time between the treatment and comparison populations. A key assumption of the estimator posits that in the absence of joining MDVIP, the conditional mean outcome for MDVIP enrollees would have changed in a manner parallel to that of the comparison population.

Left and right censoring of beneficiary observations changes the observed population in each year. If the subsets of beneficiaries included in each year are not equally representative, and attrition is correlated with outcomes, then changes in outcomes may not be representative of the broader population over time. To control for the varying population and potentially nonrandom attrition when estimating MDVIP effects, we used individual, beneficiary fixed effects, rather than a traditional DID model controlling for the average population-level preexisting difference. Fixed-effects regression measures the difference in the change in outcome (eg, Medicare expenditures) for each MDVIP enrollee from the baseline period, prior to enrollment, to postenrollment years, relative to the change in outcome for the population of matched comparisons. Additional time-varying covariates include indicators for age grouping (65-69, 70-74, 75-79, 80-84, and ≥85 years), an indicator for death during the year, year fixed effects, and indicators for the number of chronic conditions (1-2, 3-4, or ≥5) in addition to diabetes. Beneficiary fixed effects control for time-consistent characteristics of beneficiaries included in claims data, such as sex or race/ethnicity, and characteristics that are not available, such as socioeconomic status.

RESULTS

Table 1 displays average age, sex, acute inpatient and ED utilization, and total Medicare expenditures over 3 baseline years for 3 populations. The first 2 columns compare information for the 3-year baseline period for MDVIP enrollees with diabetes and their matched non-MDVIP comparisons in years when both are observed in the data. The third column displays averages of all potential non-MDVIP comparison matches. MDVIP enrollees are closer, on average, to their matched comparison beneficiaries than to the population of all potential comparisons, although a few differences remain. Relative to matched non-MDVIP comparisons, MDVIP enrollees, on average, were more likely to receive an E&M service, were less likely to visit the ED, and had average annual Medicare expenditures that were $713 lower over the 3 years.

Figure 1 displays the mean Medicare expenditures for MDVIP enrollees with diabetes and matched non-MDVIP comparisons in years prior to the MDVIP enrollment time period (years –3 to –1) and after enrollment (years 1-5). The unconditional means show similar expenditure growth over the baseline period and into the first year after enrollment. Over the 3 baseline years, the differences in average Medicare expenditures between the 2 populations are $610, $773, and $737. The baseline differences demonstrate relatively stable parallel paths, suggesting that a DID framework is appropriate. After the first postenrollment year, however, the unconditional means continue to rise for the comparison population, while flattening for the treatment beneficiaries.

Figure 2 presents estimated effects of MDVIP enrollment on total Part A and Part B Medicare expenditures in the first 5 years of enrollment for patients with diabetes. Changes in expenditures are not statistically significant in the first 4 years post enrollment.

TABLE 1. Descriptive Characteristics of Beneficiaries in Baseline Period[a]

Characteristic	MDVIP Enrollees n = 39,919 Beneficiary-Years	Matched Non-MDVIP Comparisons n = 39,919 Beneficiary-Years	Non-MDVIP Comparisons, Prematch n = 141,967 Beneficiary-Years
	Mean (SD)	Mean (SD)	Mean (SD)
Year	2010 (2.3)	2010 (2.3)	2010 (2.4)
Age in years	74.87 (6.270)	74.02 (6.174)	75.10 (6.606)
Female	0.51 (0.500)	0.52 (0.500)	0.53 (0.499)
With 1 or more E&M services	0.96 (0.194)	0.90 (0.294)	0.94 (0.244)
With 1 or more acute hospitalizations	0.18 (0.384)	0.18 (0.386)	0.26 (0.440)
With 1 or more ED visits	0.20 (0.398)	0.24 (0.430)	0.23 (0.420)
Number of E&M visits, if 1 or more	5.35 (3.855)	5.68 (4.233)	5.51 (4.145)
Number of ED visits, if 1 or more	1.37 (0.838)	1.44 (0.913)	1.59 (1.525)
Number of acute hospitalizations, if 1 or more	1.40 (0.811)	1.41 (0.813)	1.73 (1.281)
Acute hospital days, if 1 or more	6.20 (7.682)	6.33 (7.706)	9.04 (11.353)
Total Medicare expenditures	$8473 ($15,162)	$9186 ($16,222)	$13,310 ($25,920)

ED indicates emergency department; E&M, evaluation and management; MDVIP, MD–Value in Prevention.

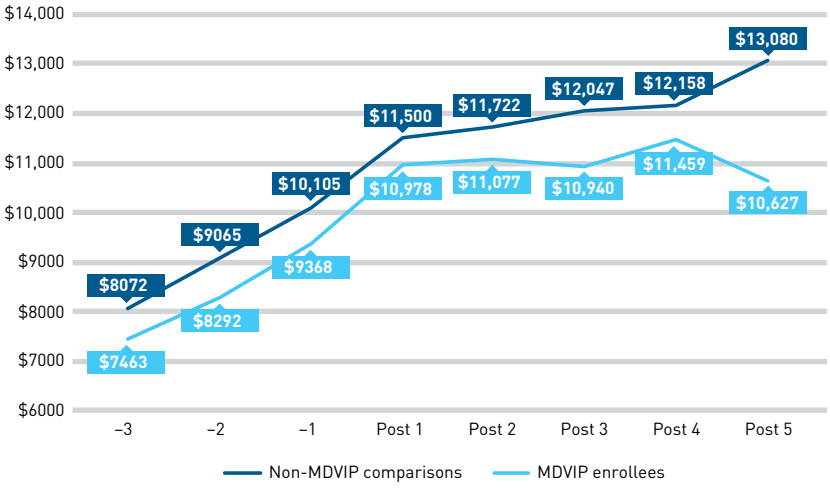
[a]Data were taken from the 2005 to 2014 Medicare fee-for-service claims data and Master Beneficiary Summary File. MDVIP enrollees include beneficiaries aged 65 to 90 years, identified as patients with diabetes, who received at least 1 Medicare Part B service from an MDVIP provider in the 15-month period ending when the MDVIP provider joined the model. Non-MDVIP comparisons include beneficiaries aged 65 to 90 years, identified as patients with diabetes, receiving at least 1 Part B service from a non-MDVIP provider in the same primary care service area and same 15-month period ending when a local MDVIP provider joined the model.

However, those who are enrolled for 5 years have lower-than-expected Medicare expenditures, with estimated savings near $1000. Although only 1 year is statistically significant, multiple years may be necessary to generate expenditure reductions in the population with diabetes, corresponding to reductions at the end of the observation period.

Additionally, we tested the effects of MDVIP enrollment jointly over all postintervention years to eliminate increased incidence of type I errors associated with presenting multiple estimates over years. The average effect of MDVIP enrollment on total Part A and Part B expenditures was not statistically significant, as shown in the top panel of Table 2.

Table 2 also presents estimated effects for other expenditure categories, including total acute inpatient, outpatient, and Part B physician expenditures. Similar to total Part A and Part B expenditures, we did not find statistically identifiable changes in acute inpatient expenditures. However, we estimate that MDVIP enrollment is associated with a reduction in outpatient expenditures (–$92) and an increase in Part B physician expenditures ($181).

FIGURE 1. Unconditional Mean Medicare Expenditures, Pre- and Postintervention Periods[a]

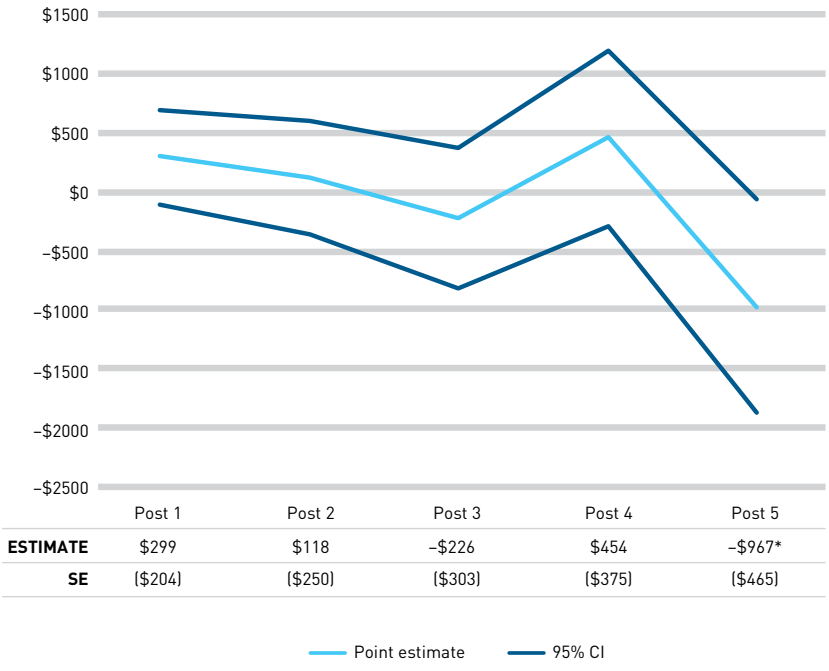


MDVIP indicates MD–Value in Prevention.

[a]Data were taken from the 2005 to 2014 Medicare fee-for-service claims data and Master Beneficiary Summary File. MDVIP enrollees include beneficiaries aged 65 to 90 years, identified as patients with diabetes, who received at least 1 Medicare Part B service from an MDVIP provider in the 15-month period ending when the MDVIP provider joined the model. Non-MDVIP comparisons include beneficiaries aged 65 to 90 years, identified as patients with diabetes, receiving at least 1 Part B service from a non-MDVIP provider in the same primary care service area and same 15-month period ending when a local MDVIP provider joined the model.

Results in the bottom panel of Table 2 show that MDVIP enrollment was associated with changes in several types of utilization that may drive expenditure changes. First, although changes in the occurrence of any inpatient admission and the number of total acute admissions were not statistically significant, the number of unplanned acute admissions, as outlined by Medicare's Hospital-Wide All-Cause Unplanned Readmission Measure, was estimated to decline by 0.022 admissions per year. On average, beneficiaries experienced 0.29 acute admissions per year, 0.22 of which were unplanned admissions. As such, the estimated effect was a 10% reduction in unplanned admissions.

FIGURE 2. Estimated Effects of MDVIP on Medicare Expenditures by Year of Enrollment[a]



	Post 1	Post 2	Post 3	Post 4	Post 5
ESTIMATE	$299	$118	–$226	$454	–$967*
SE	($204)	($250)	($303)	($375)	($465)

MDVIP indicates MD–Value in Prevention; SE, standard error.

*P <.05.

[a]Data are from 2005 to 2014 Medicare fee-for-service claims. SEs in parentheses are clustered at the beneficiary level. Additional covariates include age, age squared, indicator for death during the year, year fixed effects, beneficiary fixed effects, and controls indicating whether diabetes was identified in the future (preenrollment years only), in the current or previous year of observation, 2 to 3 years prior to the year of observation, or 4 or more years prior to the year of observation (omitted from regression).

Second, the likelihood of an ED visit and the number of ED visits were estimated to decline after MDVIP enrollment. The probability of 1 or more ED visits was estimated to drop by 1.3 percentage points, with 0.03 fewer ED visits per year.

Finally, with a focus on primary care, MDVIP enrollment was associated with an increase in the utilization of E&M visits, 0.245 more visits per year, which is likely related to the observed increase in Part B physician expenditures.

DISCUSSION

As MDVIP reduces the transaction costs of primary care through easier appointment scheduling, reduced waiting times, and more direct availability of the physician, we hypothesize that MDVIP participants will increase care received from primary care physicians and shift care away from higher-cost hospital outpatient settings.[9] Reductions in outpatient expenditures may stem from changes in common outpatient services for patients with diabetes, including more frequent ED utilization with poor disease management or more fragmented care.[10,11] Such changes are consistent with our findings of increased E&M utilization and physician expenditures along with decreased ED utilization and outpatient expenditures.

TABLE 2. Estimated Effects of MDVIP on Select Expenditure and Service Types[a]

Dependent Variable	Estimate (SE)
Expenditures	
Total parts A and B	$130 ($161.7)
Acute inpatient	$44 ($102.0)
Outpatient	–$92* ($40.9)
Part B physician	$181** ($49.4)
Services	
Any acute inpatient admissions	–0.004 (0.0039)
Count of acute inpatient admissions	–0.010 (0.0069)
Count of unplanned inpatient admissions	–0.022** (0.0060)
Any emergency department visits	–0.013** (0.0041)
Count of emergency department visits	–0.030** (0.0047)
Count of evaluation and management visits	0.245** (0.0327)

MDVIP indicates MD–Value in Prevention; SE, standard error.

*P <.05; **P <.01.

[a]Data are from 2005 to 2014 Medicare fee-for-service claims. SEs in parentheses are clustered at the beneficiary level. Additional covariates include age, age squared, indicator for death during the year, year fixed effects, beneficiary fixed effects, and controls indicating whether diabetes was identified in the future (preenrollment years only), in the current or previous year of observation, 2 to 3 years prior to the year of observation, or 4 or more years prior to the year of observation (omitted from regression).

Our other findings for the effects of MDVIP on a population with diabetes differ somewhat from those of prior literature on the broader population that evaluated expenditures, ED utilization, and inpatient admissions for up to 3 years.[3-5] Although we do identify evidence of reduced unplanned inpatient admissions and ED utilization, we do not identify statistically significant changes in total expenditures in the first 4 years or overall inpatient utilization in this population with diabetes. Further research is needed to determine whether changes occur over a longer period of observation, due to the complexities of a diabetic population.

Limitations

Although our quasi-experimental approach utilizes propensity score matching and individual fixed effects to estimate effects of MDVIP enrollment, it remains susceptible to time-varying unobserved influences that could confound our estimated effects of enrollment. The model, therefore, will net out consistent effects of unobserved characteristics but remains susceptible to time-varying effects of unobserved characteristics. For instance, if differences in wealth exist between the treatment and comparison populations, our model will control for the consistent difference in ability to pay for supplemental insurance or healthier foods but

will not control for time-varying differences if MDVIP enrollees were more likely to enroll in or change Medicare Part D status during the observation period.

CONCLUSIONS

One in 5 healthcare dollars is estimated to be spent on patients with diabetes, 59% of whom are 65 years or older.[12] Given the importance of this population in health expenditures, we used Medicare claims data to identify whether a personalized preventive care model like MDVIP can reduce those costs within the Medicare FFS population with diabetes.

Prior studies of the broader MDVIP population have shown cost savings, decreased ED utilization, and decreased inpatient admissions. This study of MDVIP enrollees with diabetes matched to comparison Medicare beneficiaries was undertaken to broaden the literature in this costly-to-treat population. We observed statistically significantly fewer ED visits and unplanned admissions in this population with diabetes, along with higher E&M visits and Part B expenditures. We did not observe statistically significant changes in total Medicare expenditures among these patients with diabetes until year 5. More studies are needed to determine longer-term expenditure changes in this population. ■

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Authorship Information: Concept and design (BM, LT, VS, AK); acquisition of data (BM, VS); analysis and interpretation of data (BM, LT, VS, AK); drafting of the manuscript (BM, LT, AK); critical revision of the manuscript for important intellectual content (BM, VS, AK); statistical analysis (BM); provision of patients or study materials (AK); obtaining funding (BM, AK); administrative, technical, or logistic support (BM, VS, AK); and supervision (BM, AK).

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