

# Personalized Preventive Care Leads to Significant Reductions in Hospital Utilization

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**T**he high and growing cost of healthcare is a significant issue in the United States, with hospital care representing the largest component (31.1%) of national healthcare expenditures.<sup>1</sup> In 2008, there were an estimated 39.9 million hospital discharges (131 per 1000 persons) in the United States, with an estimated total aggregate cost of \$364.7 billion.<sup>2</sup> Medicare was the expected primary payer for the largest number of discharges (14.9 million, 46.2%), followed by private insurance (14.1 million, 32.2%).<sup>2,3</sup>

Some hospitalizations for ambulatory care-sensitive conditions, such as diabetes and chronic cardiac and respiratory diseases, can potentially be prevented with timely and effective ambulatory care. Diabetes with complications was in the top 20 most expensive conditions requiring hospitalization for Medicare in 2008.<sup>3</sup> In addition, coronary artery disease and acute cerebrovascular disease (stroke) ranked among the top 10, while congestive heart failure, heart attack, pneumonia, and respiratory failure ranked among the top 20 most expensive conditions for both Medicare and private insurance in 2008.<sup>3</sup> In 2006, hospital costs for potentially preventable (ie, ambulatory care-sensitive) conditions were approximately \$30.8 billion (1 of every 10 dollars of total hospital expenditures), and as many as 4.4 million hospital stays could possibly have been prevented with better ambulatory care, improved access to effective treatment, and/or implementation of healthy behaviors.<sup>4</sup> Therefore, reducing the frequency of potentially preventable hospitalizations would be an effective strategy for lowering costs while improving quality of care and outcomes.<sup>4</sup>

In 2001, the Institute of Medicine issued its vision for reinventing healthcare in the 21st century to foster innovation and improve the delivery of care, which included patient-centered, responsive, and timely approaches to care.<sup>5</sup> One new model that has emerged in the United States that seeks to address this issue is personalized preventive care, which focuses on prevention and wellness while delivering a high quality of care. This model is based upon consumer/patient empowerment, greater focus on preventive services, increased physician availability, and access to other healthcare resources. MDVIP (MD – Value in Prevention) is the first company to establish a network of primary care practices that delivers personalized healthcare in this new way. The MDVIP model of comprehensive management focuses on personalized preventive healthcare by delivering a host of screenings (eg, depression, anxiety, sleep, nutrition, sexual function, vision,

**Objectives:** To assess the impact of the MDVIP model of personalized preventive care on hospital utilization rates over a 5-year period.

**Study Design:** This study was a comparative hospital utilization analysis between MDVIP members and nonmembers using the Intellimed database from 5 mandatory reporting states (New York, Florida, Virginia, Arizona, and Nevada) from 2006 to 2010.

**Methods:** Hospital discharge rates per 1000 persons were calculated and comparisons were made between members and nonmembers by age (Medicare  $\geq 65$  years) vs non-Medicare [35-64 years]) and year.

**Results:** Overall, MDVIP members were approximately 42%, 47%, 54%, 58%, and 62% less likely to be hospitalized relative to nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively. By 2010, MDVIP hospital discharges for the Medicare population were 79% lower than the nonmember Medicare population, and this difference was shown to be trending up since 2006 (70% to 79%). A similar trend was seen in the non-Medicare population (49% to 72%). In addition, elective, non-elective, emergent, urgent, avoidable, and unavoidable admissions were all lower in the MDVIP members compared with nonmembers for each year.

**Conclusions:** The MDVIP model of personalized preventive care allows the physician to take a more proactive, rather than reactive, approach; we believe this increased physician interaction is the reason for the lower hospital utilization and ultimately lower healthcare costs seen here.

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**In this article**

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hensive management focuses on personalized preventive healthcare by delivering a host of screenings (eg, depression, anxiety, sleep, nutrition, sexual function, vision,

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### Take-Away Points

The MDVIP personalized preventive care model which allows for increased physician interaction results in better health outcomes and ultimately lower healthcare costs.

- MDVIP hospital discharges for both the Medicare and Commercial populations were lower than those for the nonmembers over 5 years, and this difference was shown to be trending up from 2006 to 2010.
- MDVIP members were readmitted 97%, 95%, and 91% less frequently for acute myocardial infarction, congestive heart failure, and pneumonia, respectively.
- The estimated cost savings to the system from the 5 states was \$119.4 million for 2010, representing a \$2551 savings per patient.

and hearing) and diagnostics (eg, expanded testing for diabetes, bone disease, and cardiovascular disease) for a membership fee of \$125 to \$150 per month. MDVIP practices limit the number of members in each practice ( $\leq 600$  patients per physician) to be able to logistically deliver the service, thus allowing physicians to provide more personalized attention to manage all relevant health issues including acute concerns, chronic disease, and preventive screening, not just the diagnosis and treatment of illness.<sup>6</sup> Traditional practices have over 2000 patients<sup>7</sup> and do not have the time to provide many preventive services.<sup>8</sup> MDVIP founders calculated the amount of time it would take to deliver a comprehensive preventive wellness program yearly and be able to follow up with chronic issues, thus capping the number of patients at 600 for each physician. As a result of the smaller practice sizes required to be able to provide the services, MDVIP members also receive same-day or next-day appointments for urgent and nonurgent care and the ability to reach their primary care physician (PCP) 24 hours a day. This model is not a third-party payer, and the fee covers only the extended prevention and wellness services provided by the PCP; therefore, members still need traditional health insurance to cover the costs of inpatient and outpatient visits, services provided by specialists, and other medical services (eg, laboratories, X-rays).<sup>6</sup> In this model, MDVIP believes that the focus on prevention and wellness and the additional attention and time (ie, high quality of care) will lead to lower hospital utilization and ultimately lower healthcare costs. In an early effort to assess the impact of the MDVIP model on hospital utilization, we compared the hospital inpatient discharge rates from MDVIP members from 5 mandatory reporting states to nonmembers within the same states over a 5-year period.

## METHODS

### Comparative Utilization Methodology and Definitions

Hospital inpatient utilization data were purchased from Intellimed, an industry provider of hospital data. Intellimed reports utilization by state and payer (ie, for Medicare and

non-Medicare). They also provided population data from the US Census Bureau and Claritas system, which were used to construct the comparator (nonmember) population against which the hospital utilization of MDVIP members was compared. In addition, members were identified by physician provider information since individual patient identifiers are not provided in the database.

Hospital utilization data were classified within the Intellimed database as being elective/non-elective, emergent/urgent, and avoidable/unavoidable admissions. An elective admission was predefined in the IntelliMed database as the condition permitting adequate time to schedule the availability of a suitable accommodation. A non-elective admission was predefined in the IntelliMed database as the condition not permitting adequate time to schedule the availability of a suitable accommodation. Furthermore, non-elective admissions were classified as emergent or urgent. Emergent and urgent admissions were also predefined in the IntelliMed database. Emergent admissions were those that required immediate medical intervention as a result of a severe, life-threatening, or potentially disabling condition, and urgent admissions were those that required attention for the care and treatment of a physical or mental disorder. An avoidable admission was defined and validated by MDVIP physicians as an admission for inpatient care of chronic illnesses that could be averted if the patient had good quality outpatient care (eg, ruptured appendix, asthma, cellulitis, congestive heart failure [CHF], diabetes, gangrene, hypokalemia, immunizable conditions, malignant hypertension, pneumonia, pyelonephritis, perforated or bleeding ulcer) and included the following *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* codes: 032, 033, 037, 045, 055, 072, 250.1, 251.0, 276.8, 401.0, 402.0, 403.0, 404.4, 428, 437.2, 481, 482, 483, 485, 486, 493, 531.0, 532.0, 533.0, 540.0, 590.0, 681, 682, 785.4, inclusive of all sub-codes; whereas, an unavoidable admission could not be averted with good-quality outpatient care.

### Study Population

Of the 40 states and the District of Columbia in which MDVIP does business, only 5 states provide physician-specific data that could be used for this analysis. Therefore, MDVIP members were identified from MDVIP-affiliated physician provider information from those 5 mandatory reporting states: New York, Florida, Virginia, Arizona, and Nevada.

Since there is a lack of patient-level data within the Intellimed data set utilized for this analysis, MDVIP members

## Hospital Utilization Reduced With Personalized Preventive Care

**■ Table.** Number of Hospital Inpatient Discharge Cases and Base Population Used in the Analysis by Health Plan and Year

	Discharge Cases		Base Population	
	MDVIP Members	Non-MDVIP Members	MDVIP Members	Non-MDVIP Members
<b>Commercial Health Plans (35-64 years of age)</b>				
2006	363	1,274,145	7736	13,472,980
2007	426	1,280,310	11,025	13,580,523
2008	542	1,238,091	15,404	13,455,393
2009	563	1,204,501	18,036	12,789,469
2010	459	1,082,569	19,729	13,049,067
<b>Medicare Health Plans (≥65 years of age)</b>				
2006	1770	2,235,433	10,835	4,008,892
2007	2153	2,230,053	13,780	4,201,482
2008	2417	2,188,395	18,321	4,234,172
2009	2768	2,217,677	22,445	4,400,146
2010	2742	2,152,271	27,064	4,468,059

were identified as any admission where an MDVIP physician was the attending physician. We established the comparator population using both inclusion and exclusionary measures. Using Claritas population data and collateral information available from the US Census Bureau, we established a comparison population matched by state of residence, age, and third-party payer coverage. We excluded from the comparator population individuals with attributes not found within the MDVIP cohort (ie, individuals under the age of 35 years were excluded from the commercial payer group, and individuals under the age of 65 years from the Medicare comparison group). We also excluded from the comparison group all payer groups not represented within the MDVIP membership (Medicaid, Medicaid HMO, CHAMPUS, Charity, Kid Care, state/local government, self pay, underinsured, unknown, Veteran's Administration, worker's compensation, and other). In order to further ensure valid comparison, we excluded from the comparison group admission counts any admission types not represented in the population of MDVIP members (ie, newborn/newborn premature, observation, unknown [including "info" and "NA"], semi-urgent, and trauma). MDVIP members were also excluded if their physician had a start date with the MDVIP network within the reporting quarter.

### Data Analysis

Hospital inpatient discharge rates per 1000 persons were used as the measure of comparison, calculated as: (discharges/[days in reporting period/365])/(population/1000). Sensitivity analyses were also performed to assess the robustness of the

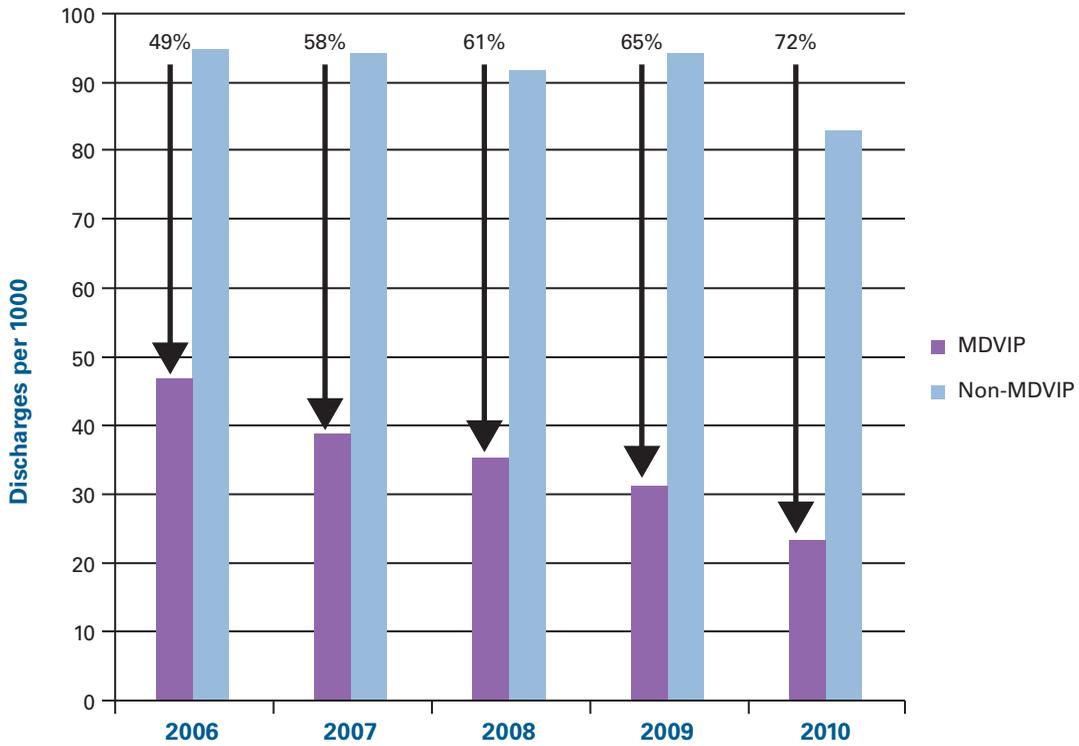
data and to gain better understanding of systematic influences on the utilization differences between MDVIP and nonmember populations.

Additionally, the rate of readmission for MDVIP Medicare members between January 1, 2008, and December 31, 2010, with a primary diagnosis (ICD-9-CM code) of acute myocardial infarction (MI), CHF, or pneumonia was calculated using IntelliMed as the data source. Even though individual patient identifiers are not available in the IntelliMed database, readmissions were defined as another hospital discharge within 30 days of a preceding discharge for the same ICD-9-CM code and the same physician provider for a patient with the same age and sex. Thus, if any patient's date of birth fell in between the first admission and the readmission, then the readmission was not captured, since only age is provided in the IntelliMed database. Also, if a patient was readmitted by another physician provider, then the readmission was not captured. MDVIP Medicare member average readmission rates from 2008 to 2010 for the 3 medical conditions were then compared with readmission rates for non-MDVIP Medicare members within the same 5 states for the same 3 conditions based on the 2009 Medicare readmission rates available from the Dartmouth Atlas Project.<sup>9</sup>

## RESULTS

The **Table** shows the number of hospital inpatient discharge cases and the base population used in the analysis by health plan for each of the 5 years. From 2006 to 2010, the base population of MDVIP members more than doubled due

■ **Figure 1.** Commercial Discharges per 1000 by Member Status for Each Year



to the increase in enrollment in the network over time. Approximately 45% of the MDVIP member base was commercial, and approximately 55% was Medicare per year.

Overall (combining commercial and Medicare), MDVIP members were approximately 42%, 47%, 54%, 58%, and 62% less likely to be hospitalized relative to the nonmember population for the years 2006, 2007, 2008, 2009, and 2010, respectively. **Figures 1** and **2** show the discharges/1000 by member population and year for the commercial and Medicare health plan populations, respectively. By 2010, hospital discharges for the MDVIP Medicare population were 79% lower than the nonmember population in this study, and this difference was shown to be trending up since 2006 (Figure 2). A similar trend was seen in the commercial population (49% in 2006 to 72% in 2010) (Figure 1).

In addition, relative hospital utilization tended to decrease as MDVIP membership increased over time. The estimated utilization savings for just 2010 in these 5 states was calculated to be \$109.2 million for Medicare and approximately \$10.2 million for commercial members, totaling \$119.4 million, which was derived from the 2009 inpatient cost per admission value from the US Department of Health and Human Services (since the 2010 value was not available).<sup>10</sup>

For elective admissions, the overall MDVIP member discharges/1000 was approximately 59% lower than nonmem-

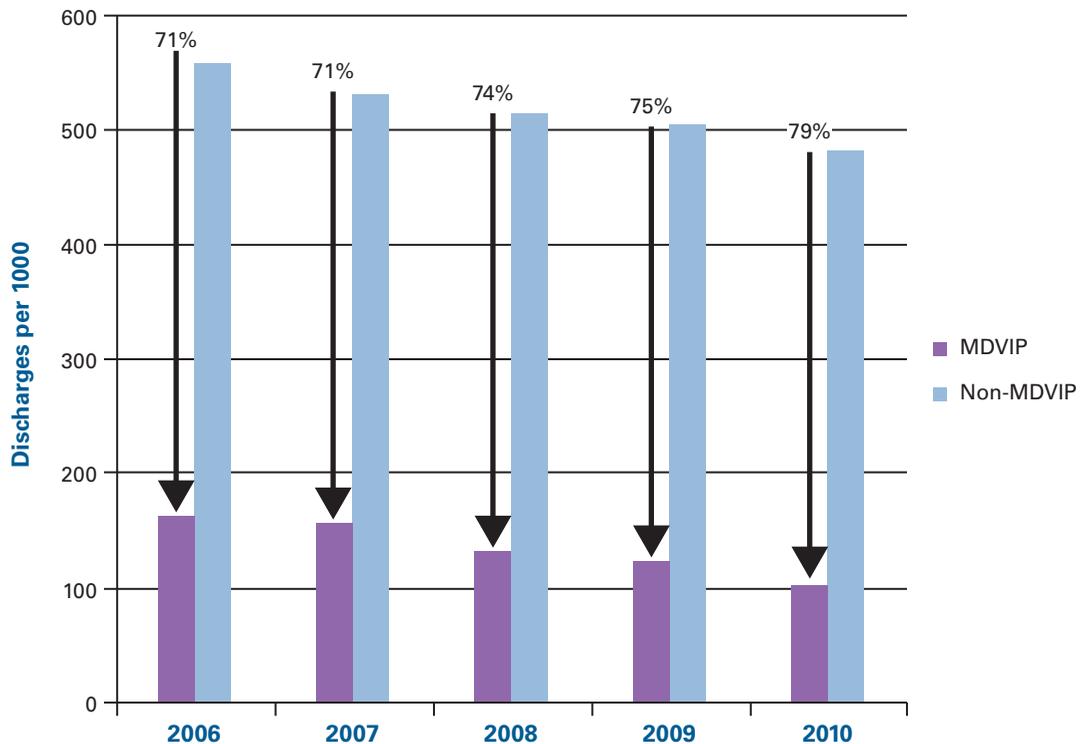
bers for both 2006 and 2007. For 2008, 2009, and 2010, the relative reductions in elective admissions were 71%, 77%, and 83%, respectively. For non-elective admissions, the overall MDVIP member discharges/1000 were approximately 37%, 43%, 49%, 52%, and 56% lower than nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively.

Of the non-elective admissions, the overall MDVIP member discharges/1000 for urgent admissions were approximately 17%, 35%, 42%, 40%, and 42% lower than nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively. For emergent admissions, the overall MDVIP member discharges/1000 for urgent admissions were approximately 41%, 45%, 51%, 54%, and 58% lower than nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively.

MDVIP members experienced approximately 23%, 31%, 38%, 47%, and 49% fewer avoidable admissions than nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively. Furthermore, MDVIP members experienced approximately 45%, 49%, 56%, 59%, and 63% fewer unavoidable admissions than nonmembers for the years 2006, 2007, 2008, 2009, and 2010, respectively.

While the comparative utilization analysis matched MDVIP and nonmember populations on all available measures, we recognize the possible effects of selection bias, ie, MDVIP members may differ from nonmembers on factors such as attitudes toward health, personal health behaviors,

■ **Figure 2.** Medicare Discharges per 1000 by Member Status for Each Year



and baseline health status, none of which are discernible from hospital inpatient utilization data. To better understand systematic influences on the utilization differences between MDVIP and non-MDVIP populations, we performed sensitivity analyses. First, we tested for bias introduced from scaling. The baseline comparative utilization analysis used the comparator group population of the MDVIP physician's state of practice (matched as described previously). This established a comparison population ratio of roughly 425:1 (nonmembers:MDVIP member). We would expect true utilization differences to be robust to a reduction in scaling differential. To test this, we limited the comparator group to the population of matched nonmembers residing in the same zip code as the physician practice, reducing the comparison population ratio to 15:1. Using this scale, across all payers for the 5 reporting states, inpatient utilization was 57% lower for MDVIP members versus nonmembers. From this we can conclude that the utilization difference for MDVIP versus non-MDVIP is robust to population scaling. Second, since year-over-year differences between MDVIP and nonmember populations increased in magnitude for the past several years, we examined the relationship between mean caseload maturity (ie, how long the average person has been an MDVIP member) and the difference in utilization. We found a strong relationship; roughly 86% of the variance in utilization is accounted for by increased

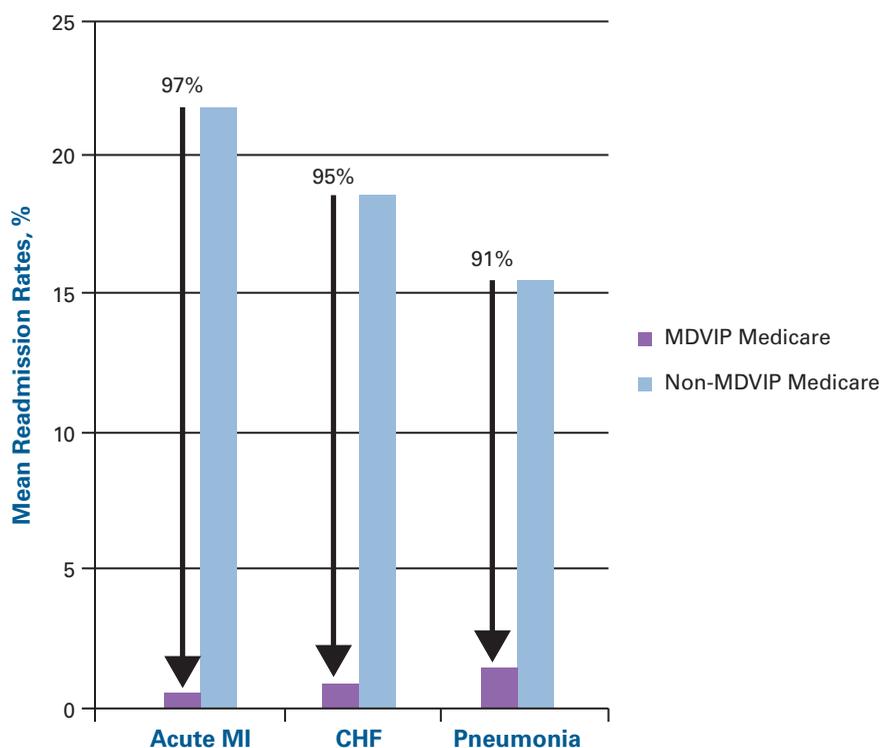
caseload maturity. However, due to a relatively small sample size (4 years of data), analysis of variance did not find significance at the 0.05 level (there is roughly a 7% chance that the relationship would be found by chance).

To further understand the dramatic differences between the hospital utilization of MDVIP Medicare members relative to non-MDVIP Medicare members, readmission rates were evaluated. When compared with the 2009 readmission rates for non-MDVIP Medicare members within the 5 same states,<sup>9</sup> MDVIP members were readmitted 97%, 95%, and 91% less frequently for acute MI, CHF, and pneumonia, respectively (Figure 3).

## DISCUSSION

The hospital utilization rates of MDVIP members were substantially lower than nonmembers for each of the 5 years overall and for the commercial and Medicare populations separately. In addition, elective, non-elective, emergent, urgent, avoidable, and unavoidable admissions were all lower in the MDVIP members compared with nonmembers for each of the 5 years. Greater reductions in hospital discharges were seen in the older, Medicare population ( $\geq 65$  years of age) compared with the commercial population (35-64 years of age).

■ **Figure 3.** Mean Readmission Rates for MDVIP Medicare Members (2008-2010) Versus Non-MDVIP Medicare Members (2009) in the 5 Reporting States



CHF indicates congestive heart failure; MI, myocardial infarction.  
 MDVIP Medicare readmission rates are means based on Intellimed data from 2008 to 2010.  
 Non-MDVIP Medicare readmission rates are means based on 2009 data from the *Dartmouth Atlas of Health Care*.<sup>7</sup>

Studies have shown that better management and a higher quality of ambulatory care can lead to lower hospitalization rates, especially for ambulatory care-sensitive conditions. Scholle et al found that commercial health plans that achieved higher performance on Health Plan Employer Data and Information Set effectiveness-of-care measures of quality tended to have lower hospitalization rates.<sup>11</sup> Wang et al found a decrease in diabetes-related preventable hospitalizations in the United States from 1998 to 2006, which the authors suggested could be due to improvements in the quality of primary care.<sup>12</sup>

In addition, a higher quality of ambulatory care can lead to better patient health outcomes. For example, better glycemic control in persons with diabetes can lead to reductions in healthcare costs and improved outcomes by preventing heart attacks, strokes, amputations, blindness, and end-stage renal disease.<sup>13</sup> In a study of more than 8000 family practices, practices with a higher proportion of diabetic patients with moderate glycemic control were shown to have fewer emergency admissions for short-term complications of diabetes.<sup>14</sup> Readmission rates for the same ambulatory care-sensitive conditions have also been shown to be higher when timely

PCP follow-up was lacking.<sup>15</sup> In a population-based study of the 2006 California State Inpatient Dataset, 26.3% of hospitalized patients (≥50 years) with diabetes were readmitted within 3 months of their index hospitalization, and most readmissions (87%) were unscheduled, suggesting issues in quality and coordination of care.<sup>16</sup> Sharma et al found that patients with chronic obstructive pulmonary disease who had an early post-hospitalization follow-up with their PCP had lower rates of emergency department visits and readmissions.<sup>17</sup> The readmission rates shown in this study suggest that the reduction in hospital utilization for MDVIP versus non-MDVIP Medicare members may be driven by differences in aftercare.

Additionally, the great monetary savings to the system seen in these 5 states alone (\$119.4 million total for 2010) is notable. This savings represents in aggregate a \$2551 savings per patient. The cost savings in hospital utilization alone would more than cover the MDVIP annual membership fee and would ensure that patients get comprehensive, integrated care from their PCP.

There are several limitations to this study. This was an observational study of hospital discharge rates in only 5 states,

whereas MDVIP is a national US company. However, the 5 states chosen represent a large sample of MDVIP membership as well as large non-MDVIP base populations (traditional practice of over 2000 patients). Additionally, we were only able to extract information from the Intellimed database based on physician-provided information; individual patient identifiers and demographic variables were not available in the database. Hospital utilization was measured by discharges, not admissions; therefore, we do not account for patients who were admitted but not discharged (eg, deaths). Readmission rates were also estimates of multiple discharges for the same ICD-9-CM code based on a patient's age and sex and the same physician provider, as individual patient identifiers were not available.

There are also 2 potential sources of selection bias: physicians and members. MDVIP-affiliated physicians may have joined the network because of their interest in the MDVIP primary care model of personalized preventive care and therefore may have better outcomes than non-MDVIP network physicians. Also, there may be differences in demographic attributes for patients electing to become MDVIP members versus those who do not. Since MDVIP members pay an annual fee, they may be more interested in wellness and more likely to comply with the physician's recommendations.<sup>6</sup> As noted earlier, demographics such as education level and socioeconomic status were not available in the Intellimed database to ensure a truly matched cohort for this study. The MDVIP membership was also increasing over time, which did not allow for a clean baseline period without any MDVIP exposure. The average age of members in the entire MDVIP network is 64 years, and 75% of MDVIP members are older than 55 years. The average age of patients in these 5 states pre-transition to MDVIP was 56 years, and post-transition was 65 years. Therefore, this supports that the patients who join MDVIP are older and may have more chronic conditions. As MDVIP is not an insurance company and therefore does not have claims data, the Intellimed database was the best source of these data. Currently, we are in the process of creating a data warehouse of electronic medical records so that we can perform larger and longitudinal studies of all MDVIP members to evaluate healthcare utilization and other health outcome measures.

Despite these limitations, our results have important implications. PCPs are typically the first-contact coordinators of ambulatory care.<sup>18</sup> PCPs have the monumental task of managing all relevant health issues. Acute concerns cannot be deferred and customarily take priority over chronic disease management and prevention; as a result, the time needed for acute, chronic, and preventive care vastly exceeds the total time PCPs have available for ambulatory care.<sup>8</sup> We believe

that the MDVIP personalized preventive care model of smaller practices allows the physician to take a more proactive, rather than reactive, approach. MDVIP-affiliated physicians have the time to focus on all relevant health issues (acute, chronic, and preventive), and we believe that this increased physician interaction has resulted in lower hospital utilization and ultimately lower healthcare costs. Larger and longitudinal studies are necessary to further evaluate whether the findings here are representative and due to the effect of the MDVIP model.

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**Authorship Information:** Concept and design (AK, RES, KW, BK); acquisition of data (RES, KW); analysis and interpretation of data (MAK, KW, BK); drafting of the manuscript (AK, RES, LA, BK); critical revision of the manuscript for important intellectual content (AK, LA, MAK, KW, BK); statistical analysis (MAK, KW); administrative, technical, or logistic support (KW); and supervision (AK, LA).

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