

# The Relationship Between Adherence and Total Spending Among Medicare Beneficiaries With Type 2 Diabetes

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In 2014, nearly 30 million Americans (9.3%) were living with diabetes, including an estimated 11.2 million who were 65 years or older.<sup>1</sup> In 2012, the total national spending on diabetes was \$245 billion, including \$176 billion in direct medical spending. Patients 65 years or older use more healthcare services than younger patients and incur the majority of costs associated with diabetes. Ultimately, the Medicare program—in which 28% of beneficiaries have diabetes—bears most of this burden.<sup>2</sup> Interventions targeted at individuals using the most resources and who have the greatest expenditures have the potential for a disproportionate impact on spending.

Several studies evaluating the economic burden of diabetes have estimated that antidiabetes agents and supplies account for 12% of total healthcare spending.<sup>2,3</sup> Payers have implemented various cost-sharing schemes to reduce pharmacy spending, including incentive-based formularies, coinsurance or co-payments, and benefit caps.<sup>4</sup> Research consistently shows that higher co-payments or coinsurance reduce pharmaceutical utilization and adherence among patients with chronic diseases like type 2 diabetes (T2D), heart failure, and schizophrenia,<sup>4-12</sup> and that reducing co-payments in employer-sponsored insurance plans can increase adherence.<sup>13,14</sup>

Although cost sharing may reduce overall pharmacy spending, it could also have consequences for patient health and result in unintended increases in nonpharmacy healthcare spending, thereby offsetting the savings on pharmaceuticals. The limited existing research shows that cost sharing increases emergency department visits and hospitalizations, especially among chronically ill patients.<sup>4</sup> The impact of cost sharing on therapeutic adherence is particularly relevant for patients with diabetes, given that improved adherence is associated with a greater likelihood of reaching glycated hemoglobin (A1C) targets—the primary measure of effective disease management<sup>15</sup>—and cost sharing has increased since the introduction of Medicare Part D.<sup>16</sup> By some estimates, a 1% increase in antidiabetes prescription utilization would reduce medical spending for Medicare beneficiaries with T2D by 0.83%.<sup>17</sup>

## ABSTRACT

**OBJECTIVES:** This study examined the relationship between medication adherence, cost sharing measured as out-of-pocket spending, and total annual spending in Medicare beneficiaries with type 2 diabetes (T2D) to evaluate whether pharmacy cost-sharing programs have the potential to decrease adherence. These programs may unintentionally increase the risk of medical complications and may result in higher spending overall.

**STUDY DESIGN:** This retrospective study used 2006 to 2009 Medicare claims data. The sample included patients 65 years or older with T2D (at least 1 claim with *International Classification of Diseases, 9th Revision, Clinical Modification* codes 250.x0 and 250.x2 and at least 1 antidiabetes drug claim).

**METHODS:** Medication adherence was measured as proportion of days covered over the first 12 months of observation. Spending and adherence outcomes were defined in deciles.

**RESULTS:** The sample included 12,305 patient-year observations. Pharmacy spending for patients in the most adherent (10th) decile was 59% higher than that for patients in the least adherent (1st) decile (\$4839 vs \$3046). Yet, patients in the 10th decile had 49% lower total (\$12,531 vs \$24,468) and 64% lower medical spending (\$7692 vs \$21,421) than patients in the 1st decile. Greater out-of-pocket spending was correlated with lower adherence and higher total and medical spending.

**CONCLUSIONS:** This study describes a widespread variation in medication adherence, pharmacy cost sharing, and medical spending in a sample of Medicare beneficiaries with T2D. We found that lower adherence was correlated with higher cost sharing in the Medicare population, perhaps because of unobserved confounding factors. However, the existing literature on patients with employer-sponsored insurance suggests some of this correlation may be indicative of causal relationships.

*Am J Manag Care.* 2017;23(4):248-252

Despite the large overarching financial burden of T2D, few studies have examined the extent to which pharmacy and medical spending contribute to total diabetes-related spending.<sup>18,19</sup> This retrospective claims study of a Medicare population examined the relationship between adherence, cost sharing as measured by out-of-pocket (OOP) spending and total annual spending.

## TAKEAWAY POINTS

- ▶ Increased cost sharing could decrease the likelihood that patients with type 2 diabetes will adhere to their medication and increase diabetes complications and total diabetes spending.
- ▶ Using Medicare claims data (2006–2009), we examined the relationships between medication adherence, cost sharing measured as out-of-pocket spending, and total annual spending to evaluate whether pharmacy cost-sharing programs have the potential to decrease adherence.
- ▶ We found a widespread variation in medication adherence, pharmacy cost sharing, and medical spending, and that lower adherence is correlated with higher cost sharing in the sample of Medicare beneficiaries with type 2 diabetes.

## METHODS

### Study Population and Inclusion Criteria

The study used claims data for a 20% random sample of age-eligible Medicare fee-for-service beneficiaries for the years 2006 to 2009. Data were acquired from the CMS Medicare Research Identifiable Files, which provide medical and pharmacy claims, including diagnoses, procedure codes, and measures of charges and spending. Overall spending in any category (total healthcare, medical, or pharmacy) equaled the sum of the patient OOP component and the payer-covered component.

A sample was created using the following criteria: 1) Medicare beneficiaries 65 years or older; and 2) with at least 1 claim with an *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* code associated with T2D (*ICD-9-CM* codes 250.x0 and 250.x2) and at least 1 claim for an antidiabetes medication in the period following the first observed claim with diabetes diagnosis. The index date for patients in the sample was the date of the first observed claim with a T2D diagnosis. Only patients 65 years or older at the time of the first observed claim with a diabetes diagnosis were included. The sample included patients with a T2D diagnosis or antidiabetes medication use in the year prior to the first observed claim in the database if the patient's index date was less than 1 year after the date of Medicare enrollment. Patients with a follow-up period of less than 1 year after the index date or those who were pregnant or less than 6 months post partum were excluded.

### Adherence Measures

Adherence was measured as the proportion of days covered (PDC), a well-established method that has been used for several decades to evaluate adherence in diabetes and other chronic conditions (eg, cardiovascular disease, dyslipidemia, hypertension).<sup>6,20–24</sup> PDC was calculated as the total number days when a patient had medication on hand during the observation window (ie, date of first claim to exhaustion of last prescription, segmented into calendar years).

### Analysis Methods

This retrospective study used descriptive analysis to evaluate the extent to which patients' health status differed across deciles

of spending. In particular, we calculated the prevalence of diabetic comorbidities, complications, and drug therapy type by decile of total annual spending. To investigate the relationship between medication adherence and spending, average pharmacy, medical, and total spending were calculated within each adherence decile. To examine the relationship between cost sharing—as measured by OOP spending (total, medical, and pharmacy)—and medication adherence, average OOP pharmacy, medical, and total spending were calculated within each decile of adherence.

Dividing the sample into deciles created enough bins to characterize the spending distribution. Using deciles to map the distribution of total, pharmaceutical, and medical spending among Medicare beneficiaries with T2D also enabled the identification and description of the degree of skew in annual spending distribution.

## RESULTS

### Sample Size and Patient Characteristics

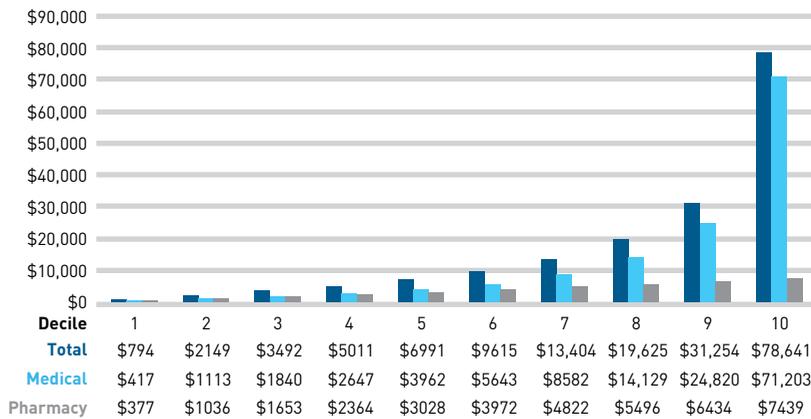
Based on the inclusion and exclusion criteria, the sample included 12,305 patients with a mean follow-up period of 3.2 years and a mean age of 74.4 years. The sample was 64% female and 36% male.

### Distribution of Total, Medical, and Pharmacy Spending

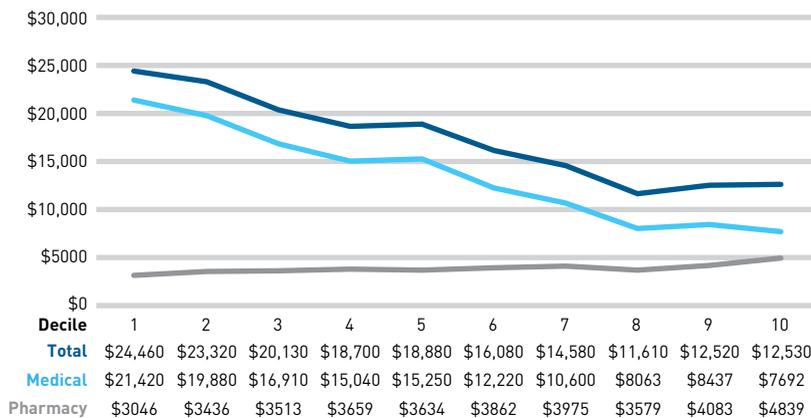
Considerably higher average total and medical spending were observed for patients in the upper deciles of total spending compared with patients in the lower deciles, but the between-decile difference in pharmacy spending for patients was not as substantial (**Figure 1**). The average annual total spend for patients in the lowest spending (1st) decile was \$794; this increased by nearly 100-fold, to \$78,641, for patients in the highest spending (10th) decile. The average annual medical spend for patients in the 1st decile was \$417 and increased more than 170-fold, to \$71,203, for patients in the 10th decile. However, the average annual pharmacy spend for patients in the 1st decile was \$377 compared with \$7439 for patients in the 10th decile, a less than 20-fold increase.

## TRENDS FROM THE FIELD

**FIGURE 1. Average Annual Spending by Category and Decile of Total Spending Among Medicare Beneficiaries With Type 2 Diabetes**



**FIGURE 2. Annual Spending by Category and Decile of Proportion of Days Covered Among Medicare Beneficiaries With Type 2 Diabetes**



### Patient Descriptive Statistics and Health Status by Spending

Patient age and sex were similar across all total annual deciles of spending; however, patients in the upper deciles were substantially more likely to have comorbid conditions, including congestive heart failure (74% in the 10th decile vs 17% in the 1st decile), cardiac arrhythmias (68% vs 24%), complicated hypertension (57% vs 17%), or moderate/severe renal impairment (18% vs 1%), among others. The use of certain antihyperglycemic drug therapies was also more prevalent in the upper deciles of total spending. Compared with patients in the 1st annual spending decile, patients with T2D in the 10th decile had a nearly 5-fold higher probability of using long- or rapid-acting insulin to treat their diabetes (31%-34% vs 3%-7%, respectively). Dipeptidyl peptidase-4 inhibitors, meglitinide, and thiazolidinedione use was also higher for patients in the upper

deciles of total annual spending, whereas metformin (a biguanide) use was less common in the 10th versus 1st decile (31% vs 53%). Use of sulfonylureas and glucagon-like peptide-1 receptor agonists did not vary significantly across the deciles of total annual spending.

### Distribution of Spending by Adherence

Mean PDC was divided into deciles and ranged from 0.20 for patients in the 1st decile to 1.00 for patients in the 10th decile. As shown in **Figure 2**, patients with greater medication adherence, as measured by PDC, had lower average annual medical and total spending and only moderately increased pharmacy spending. For patients in the 1st decile of PDC (lowest adherence) to the 10th decile, average annual total spending decreased 49% (from \$24,468 to \$12,531), and average annual medical spending fell 64% (from \$21,421 to \$7692). By comparison, pharmacy spending between the 1st decile of PDC and the 10th decile increased 59% (from \$3046 to \$4839).

An examination of the relationship between total OOP spending and adherence found analogous results. Average annual pharmacy OOP spending for patients in the 1st to 10th PDC decile increased 67% (from \$441 to \$737), but average annual total OOP spending decreased 36% (from \$2116 to \$1344), and average annual medical OOP spending decreased 64% (from \$1675 to \$607).

## DISCUSSION

Based on the present study's findings, Medicare patients with T2D have highly skewed total annual spending; patients in the upper deciles of total spending account for a disproportionate share of aggregate total spending. As previous studies had similar findings,<sup>18,19</sup> this analysis confirms that medical spending accounts for the vast majority of the skew in total spending on T2D treatment, and that pharmacy spending is a relatively small proportion of total spending.

An analysis of comorbidities and medication use according to total spending showed that patients in the highest deciles were more likely to have comorbid conditions and to use certain anti-diabetes drugs (in particular, long-acting, short-acting, and premix insulins). It is likely that the differences by decile in the prevalence of diabetic comorbidities, complications, and therapy utilization in

patients play a large role in driving healthcare spending variation. This finding is supported by existing studies.<sup>19,25</sup>

This study also examined the distribution of total, medical, and pharmacy spending in Medicare patients with T2D based on their level of medication adherence. More adherent patients had substantially lower total spending and medical spending, but moderately increased pharmacy spending, suggesting that, for Medicare patients with T2D, lower adherence is related to increased spending in general. Increased spending may be the result of poorer outcomes, increased comorbidities, and a need for additional treatment, as medication adherence has been significantly associated with improved health status, fewer complications, and less medical resource utilization in patients with T2D.<sup>15,26-28</sup>

This study corroborates previous research and suggests that increasing adherence among Medicare beneficiaries with T2D could generate significant cost savings.<sup>17</sup> The use of pharmacy cost sharing in Medicare has gone up since the introduction of Medicare Part D, which extended pharmacy benefit coverage and increased pharmaceutical utilization,<sup>29</sup> but the availability of generic drugs has prevented significant increases in OOP spending. If this cost-sharing trend continues, adherence may fall and any savings on pharmacy spending could be offset by increased medical spending.<sup>16</sup> Recent proposals to limit annual OOP spending for Medicare beneficiaries would reduce the financial burden on high-spend Medicare beneficiaries with T2D, potentially improving medication adherence and health outcomes.<sup>30</sup>

## Limitations

This study has certain limitations. The analysis was descriptive, with data randomly drawn from an administrative claims database representing the years 2006 to 2009. Although the levels of pharmacy and medical spending may have changed since 2009, our qualitative results and the correlations between cost sharing, adherence, and medical spending should not be impaired by the age of the data, as many similar studies have found the same relationships in other patient samples and time periods.<sup>4-14</sup> Additionally, because the study drew from the Medicare database, and because only patients 65 years or older at the time of the first observed T2D diagnosis claim were included, the mean age of the sample (74 years) was higher than the average age of T2D diagnosis (54 years) in the United States.<sup>31</sup> Last, only limited medical history is available for patients in claims data research, thereby increasing the potential for confounding, and the date of patients' initial T2D diagnosis could not be determined with certainty.

## CONCLUSIONS

This study has several implications. First, the study results demonstrates the existence of a skew in spending on T2D treatment. Medicare patients in the highest deciles of total spending had dra-

matically higher total and medical spending, clearly indicating that most spending on diabetes-related treatment is from medical—and not pharmacy—spending among a subset of high-cost patients. In addition, the study expands on available studies of patients with employer-sponsored insurance to demonstrate that improved adherence is related to reduced resource use and spending in Medicare beneficiaries with T2D and suggest that interventions aimed at improving adherence among high-cost patients have the greatest potential to reduce health expenditures. Most importantly, the study results confirm the negative connection established in the existing literature between cost sharing and medication adherence, which varied widely among Medicare beneficiaries with T2D.<sup>4-14</sup> If pharmacy cost-sharing programs decrease medication adherence, initiatives that promote pharmacy cost sharing may unintentionally increase the risk of medical complications offsetting some (or in targeting cases, all) of the savings associated with lower pharmaceutical spending. ■

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**Source of Funding:** This study was supported by AstraZeneca.

**Author Disclosures:** Dr MacEwan, Mr Sullivan, and Ms Peneva are employees of Precision Health Economics (PHE), which is a consultant for biotech/pharma companies and was compensated by AstraZeneca to perform the study. Dr Vanderpuy-Orgle was an employee of PHE during the time of the study and is currently employed by Amgen. Dr Yin is a consultant for PHE. Dr Sheehan has been employed by AstraZeneca, and Dr Kalsekar has been employed by and holds stock in AstraZeneca and Johnson & Johnson, which manufacture drugs for the treatment of diabetes. Dr Peters has been a consultant and grant recipient from numerous pharmaceutical companies including AstraZeneca, and receives editorial fees from Medscape.

**Authorship Information:** Concept and design (JPM, JJS, WY, JV-O, JS, IK, ALP); acquisition of data (JS, IK); analysis and interpretation of data (JPM, JJS, WY, JV-O, JS, DP, IK); drafting of the manuscript (JPM, WY, DP); critical revision of the manuscript for important intellectual content (JPM, JJS, WY, JS, ALP); statistical analysis (WY, JS); provision of patients or study materials (ALP); obtaining funding (JJS, IK); administrative, technical, or logistic support (DP, IK); and supervision (JJS, WY, JV-O, IK).

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