White Paper

Nonadherence To Oral Antidiabetic Treatment Among Patients With Type 2 Diabetes

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Diabetes is one of the most common and costly chronic conditions in the United States. While the prevalence of diabetes varies by age, race, and socioeconomic status, it nonetheless impacts employers in terms of direct medical costs and productivity. As with other chronic conditions, medication noncompliance is common among patients with diabetes and results in negative outcomes. Suboptimal adherence with diabetes treatment is associated with increased use of medical services, including increased risk of hospitalization.1,2,3

This report summarizes an analysis that characterizes type 2 diabetes patients who did and did not adhere to oral antidiabetic medication. Statistically significant differences were found, even after controlling for diabetes-related complications in the demographics, comorbidities, and healthcare utilization and costs (overall and diabetes-related) of patients who adhered and patients who did not adhere to treatment.
Background

Medication noncompliance (or nonadherence) reduces the effectiveness of pharmaceutical treatment. In the U.S., approximately 33 to 50 percent of patients are medication noncompliant,4 at an estimated cost of $290 billion annually.5 This excess cost translates to about $1 million in additional spending for every $10 million in claims for an employer.6 Barriers to compliance may arise from characteristics of the drugs (e.g., side effects and complex regimens) or of the patients (e.g., forgetfulness, poor health literacy, cultural beliefs, and a reduced sense of urgency during periods where no symptoms are being experienced).7

Approximately 8.3 percent of individuals in the U.S. have diabetes.8 It is one of the most common and costly chronic conditions that employees face. Diabetes is an independent risk factor for a number of macrovascular diseases, including coronary artery disease (and congestive heart failure resulting from diabetic-induced coronary artery disease), stroke, and peripheral vascular disease, as well as microvascular diseases, including retinopathy, neuropathy, and kidney failure. Adults with diabetes have rates of mortality from heart disease two to four times as high as people without diabetes.9

For most patients with diabetes, improving glycemic control to prevent or delay complications is the highest treatment priority.10 A substantial proportion of patients with type 2 diabetes fail to achieve optimal glycemic control and are therefore at increased risk for developing complications of the disease. Failure to achieve glycemic control is in part attributable to suboptimal adherence to glucose-lowering treatment regimens. Suboptimal adherence with diabetes treatment is associated with increased use of medical services, including increased risk of hospitalization.11, 12, 13

The analysis described herein compared the characteristics of type 2 diabetes patients who were adherent or nonadherent to oral antidiabetic treatment within a large, commercially insured population (MarketScan® data). Specifically, this study examined whether significant differences existed in demographic factors, comorbidities, and healthcare utilization and costs between adherent and nonadherent patients in a national, commercially insured population.

**KEY FINDINGS**

- Adherent patients were slightly older than nonadherent patients.
- The prevalence of various comorbidities and complications of diabetes was similar for the adherent and nonadherent cohorts.
- Differences in healthcare expenses among adherent and nonadherent patients depend on the presence of diabetes-related complications.
- Among patients with diabetes-related complications, both total (all-cause) and diabetes-related medical costs are higher among the nonadherent than the adherent.
- Among patients without evidence of diabetes-related complications, total (all-cause) and diabetes-related costs are lower among the nonadherent than the adherent.

“In the U.S., approximately 33 to 50 percent of patients are medication noncompliant,4 at an estimated cost of $290 billion annually.”

NONADHERENCE TO ORAL ANTIDIABETIC TREATMENT AMONG PATIENTS WITH TYPE 2 DIABETES
Methods
The Healthcare business of Truven Health Analytics conducted a retrospective database analysis to evaluate adherence to oral antidiabetic therapy within a national database of individuals with private health insurance (MarketScan Commercial Claims and Encounters Database). The most recent years of complete data available at the time of analysis (2009-2010) were used. The study population consisted of all individuals aged 18 years and older with type 2 diabetes, at least one outpatient prescription claim for an oral antidiabetic drug (OAD) within a 12-month period, a minimum of six months of continuous health plan enrollment prior to the first observed OAD prescription claim, and 12 months of continuous health plan enrollment following the first observed OAD prescription claim. Patients with medical claims carrying a diagnosis of either gestational diabetes or type I diabetes were excluded from the study population. The period of observation to determine adherence and assess patient characteristics was the 12 months following the first OAD prescription claim.

Adherence, as measured by the proportion of days covered (PDC) over a 12-month period, to OAD therapy was evaluated. Patients were characterized according to their level of adherence during the observation period. The PDC is defined as the proportion of days during the observation period (i.e., 365 days) that patients had a supply of one or more OADs. Patients with a PDC ≥ 80 percent were considered adherent; those with a PDC < 80 percent were considered nonadherent.

Patient demographics, clinical characteristics, HEDIS indicators of comprehensive diabetes care, and healthcare utilization and expenditures were evaluated for the observation period and reported according to level of adherence. Diabetes-related complications examined were diabetic retinopathy and macular edema, diabetic neuropathy, amputation or ulceration, renal disease, peripheral vascular disease, congestive heart failure, myocardial infarction, coronary/ischemic heart disease, and cerebrovascular disease. Both all-cause and diabetes-related healthcare utilization and expenditures were summarized and stratified by type of service (i.e., inpatient, outpatient, and pharmaceutical).

Medical claims carrying a diagnosis of type 2 diabetes and pharmacy claims for an OAD, insulin, or other diabetes treatment were considered diabetes-related. Medical expenditures were based on paid amounts of adjudicated claims, including insurer and health plan payments as well as patient cost-sharing in the form of copayment, deductible, and coinsurance. Costs for services provided under capitated arrangements were estimated using payment proxies based on paid claims with matching procedure codes.

All analyses were stratified by level of adherence during the observation period, with statistical comparisons made of patients who were adherent (PDC ≥ 80 percent) to those who were nonadherent to their treatment. Healthcare utilization and costs were further stratified by the presence of diabetes-related complications. Chi-square tests were used to assess the statistical significance of differences between categorical measures; t-tests or Wilcoxon rank tests were used for continuous variables. A p-value of 0.05 was set as the maximum for which differences were considered statistically significant.

“Among patients with diabetes-related complications, total (all-cause) medical and drug costs are 22 percent higher ($22,491 vs. $18,875) among the nonadherent than the adherent.”
Observations and Conclusions

Overall, 531,824 patients met the study criteria. Of those patients, 303,685 (57 percent) were adherent and 228,139 (43 percent) were nonadherent. Results of the analyses are presented in a series of figures below. The statistical significance of differences between the adherent and nonadherent is indicated as follows: * p < 0.05; ** p < 0.01; *** p < 0.001.

Patient Characteristics and Comorbidities

A higher proportion (56 percent) of adherent patients was male compared to nonadherent (50 percent) (Figure 1). Adherent patients were slightly older (3.4 years) than nonadherent patients (Figure 2).

The prevalence of various comorbidities and complications of diabetes was similar for the adherent and nonadherent cohorts. Over half of the diabetic patients in our study population, whether adherent or nonadherent, had evidence of hypertension and almost half also had high cholesterol (dyslipidemia). Five percent of both adherent and nonadherent patients suffered from depression (Figure 3).
Almost 29 percent of nonadherent and 25 percent of adherent diabetics showed evidence of diabetes-related complications such as cerebrovascular disease, coronary heart disease, and congestive heart failure (Figure 4).

Compliance With HEDIS Comprehensive Diabetes Care Measures
In general, adherent diabetics had higher rates of compliance for HEDIS quality measures when compared to nonadherent diabetics (Figure 5):

- At least one HbA1c screen in 12-month post-index period (82 percent vs. 74 percent)
- At least one lipid screen in 12-month post-index period (74 percent vs. 67 percent)
- At least one retinal eye exam in 12-month post-index period (96 percent vs. 95 percent)
- At least one nephropathy screen or evidence of nephropathy in 12-month post-index period (44 percent vs. 37 percent)
Inpatient and ER Utilization
Patients who were nonadherent, regardless of the presence of complications, were more likely to have an inpatient stay for any cause. Similarly, nonadherent patients were more likely to have visited the emergency room for any cause. Figures 6 and 7 summarize these data.

**Figure 6: Percent of Diabetics With Hospital Admissions — All Causes**

![Figure 6](chart6.png)

**Figure 7: Percent of Diabetes With Emergency Room Visits — All Causes**

![Figure 7](chart7.png)

Similar to overall hospitalization and ER visit rates, nonadherent patients had higher rates of diabetes-related hospitalization and ER visits compared to those adherent to their treatment. Figures 8 and 9 summarize these data.

**Figure 8: Percent of Diabetes With Hospital Admissions — Diabetes Related**

![Figure 8](chart8.png)
Total Medical Costs
Among patients with diabetes-related complications, total (all-cause) medical and drug costs are 22 percent higher ($22,491 vs. $18,875) among the nonadherent than the adherent. However, among diabetes patients without complications, mean costs over the 12-month period among adherent patients were significantly higher than among nonadherent patients (Figure 10). Further analysis was conducted to determine the drivers of higher costs (Figures 11 and 12).

The largest driver of costs among patients with complications was inpatient care. Total annual inpatient costs for nonadherent patients with diabetes-related complications exceeded costs for adherent patients by 75 percent. Outpatient prescription drug costs for nonadherent patients with complications were 34 percent less than outpatient prescription drug costs for adherent patients. The most common services in the Other category included outpatient hospital services, physical therapy, supplies, and outpatient mental health care (Figure 11).
Among patients without complications, nonadherent patients cost $433 less, on average, than adherent patients. The largest difference was found among prescription drugs, as adherent patients had more drug costs than nonadherent patients (Figure 12).

Diabetes-related Medical Costs
Diabetes-related costs, as defined by this analysis, represented approximately 50 percent of total costs among patients with complications and 25 percent of total costs among patients without complications. This trend was similar between adherent and nonadherent patients.

Among patients with diabetes-related complications, diabetes-related medical costs were 31 percent higher among the nonadherent than the adherent. However, among patients without complications, the mean covered diabetes-related healthcare expenses incurred over a 12-month period for a nonadherent patient were lower than for similar adherent patients (Figure 13).
Diabetes-related annual inpatient costs for nonadherent patients with diabetes-related complications of $7,288 (SD $31,979) exceeded costs for adherent patients of $4,283 (SD $18,695) by 70 percent or $3,005. Outpatient prescription drug costs for nonadherent patients with complications were $854 (SD $1,343), which is 52 percent less than similar costs for adherent patients (Figure 14).

Diabetes-related annual Inpatient costs for nonadherent patients without diabetes-related complications of $734 (SD $5,763) exceeded costs for adherent patients of $547 (SD $4,759) by 34 percent, or $187. Outpatient prescription drug costs for adherent patients without complications $1,399 (SD $1,579) compared to $563 (SD $949) for nonadherent patients; this difference accounted for the entire additional cost of the adherent group compared to nonadherent patients (Figure 15).
Conclusion
Type 2 diabetes patients who were not adherent on their oral antidiabetic drugs were significantly different from those who were adherent. Nonadherent patients were younger and less likely to have had the appropriate screenings based on the HEDIS diabetes management measure. Lower proportions of nonadherent patients had significantly lower rates of diabetes complications and comorbidities, though the magnitude of difference was small. Overall, nonadherent patients had higher rates of utilization (particularly hospitalizations and ER visits) and costs. Where adherent patients were costlier, the cost differences were driven by the additional costs of prescription drugs. While this study did not evaluate the long-term costs associated with nonadherence, patients who do not comply with evidence-based therapies appropriate to their disease stage may eventually develop diabetic complications that become substantially more expensive to treat.\textsuperscript{14, 15}

Limitations
A few key limitations to these analyses merit brief discussion. First, because the analyses were limited to individuals with employer-sponsored health insurance, results may not be generalizable to individuals with other insurance or without health insurance coverage. Second, the potential for misclassification of diabetes status or other conditions is possible due to the fact that patients were identified through administrative claims data as opposed to medical records. As with any claims databases, the MarketScan Research Databases rely on administrative claims data for clinical detail. These data are subject to data coding limitations and data entry error. Third, duration and stage of disease were not included in the analysis. Duration of disease is likely to be associated with both medication adherence and healthcare utilization and costs. Finally, while patients who were insulin-dependent at the onset of the study were excluded, patients may switch to insulin. Given the difficulties in measuring days of insulin therapy in administrative data and that $< 3$ percent of patients in this analysis switched to insulin, insulin therapy was not considered in calculating days of therapy. Despite these limitations, this study provides useful estimates of the costs associated with adherence to OAD treatment within a large employed, commercially insured population in the U.S.
References


6 Ibid.

7 Ibid.


FOR MORE INFORMATION

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