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Determinants of Medication Use in Diabetes: Results from a Large Database of Pharmacy Complaints

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Abstract: **OBJECTIVE Adults with diabetes typically take multiple medications for hyperglycemia, diabetes-associated conditions, and other comorbidities. For all patients, efforts to reduce out-of-pocket costs and encourage use of mail order pharmacies may result in higher adherence. Medication adherence is associated with improved outcomes, including reduced health care costs, hospitalization, and mortality.**

Keywords: **Diabetes, Pharmacy, medication.**

I. INTRODUCTION

Adults with type 2 diabetes are often prescribed multiple medications to treat hyperglycemia, diabetes-associated conditions, and other comorbidities. Medication adherence is an important determinant of outcomes in patients with chronic diseases. For those with diabetes, adherence to medications is associated with better control of intermediate risk factors, lower odds of hospitalization, lower health care costs, and lower mortality. Estimates of rates of adherence vary widely depending on the population studied and how adherence is defined. Using a large pharmacy claims database, we assessed determinants of adherence to oral antidiabetic medications in.200,000 U.S. adults with type 2 diabetes. We looked at a wide range of variables and categorized those potential determinants into patient factors, prescriber factors, and factors related to the prescribed medication or the prescription system.

II. RESEARCH DESIGN AND METHODS

Data was extracted from the information warehouse of Medco Health Solutions, a large U.S. managed-care company that provided pharmacy management services to a range of clients. The sample includes patients from all 50 states and the larger U.S. territories. Eligibility was based on drug type, benefits, and prescription history. Patients were followed for 12 months from their index diabetes claim date identified during the 6-month targeting period. Predictor variables were defined a priori and grouped into three categories: patient factors (age, sex, education, income, region, past exposure to therapy, and concurrent chronic conditions), prescription factors (retail vs. mail order), total pill burden per day, and out of pocket costs), and prescriber factors (age, sex, and specialty.(

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The ratio captures how often patients refill their medications and is a standard metric that is consistent with the National Quality Forum's measure of adherence to medications for chronic conditions. Patients were considered adherent if their MPR was 0.8 or higher, implying that they had their medication supplies for at least 80% of the days. An MPR of 0.8 or above is a well-recognized index of adherence. Studies have suggested that patients with chronic diabetes need to achieve at least 80% adherence to derive the full benefits of their medications. We used a modified adherence measure to account for changing diabetes drug classes.

Of the 218,384 diabetic patients, 59,035 (27.0%) were taking more than one medication to treat their diabetes and, using this methodology, were considered adherent to their diabetes therapy. Of these patients, 2,706 (4.5% of those on dual therapy considered adherent by our methodology; 1.2% of the total population) had an MPR 0.8 for at least one of their medications; thus, their overall adherence could be overestimated.

We used a logistic regression analysis to examine the independent effects of patient, medication, and prescriber variables on diabetes medication adherence. The C-statistic was 0.73, suggesting reasonable fit. Only patient pill burden was considered in the multivariate analysis.

III. RESULTS

This study analyzed 218,384 patients who met the criteria for inclusion. Sixty-nine percent met the criteria for adherence using the modified definition. Over 51% were Medicare eligible (age $65 years), 53% were female, 35% had a college or postgraduate education, and 26% had estimated annual household income. Sixty-one percent usually filled their prescriptions at retail pharmacies. Forty-one percent resided in the South geographic region and 25% in the Midwest.

Results of the multivariate analysis showed that previous exposure to diabetes therapy had a significant impact on adherence. Patients 25–44 years of age were 49% less likely to be adherent when compared with patients 45–64 years of age. Patients aged 65–74 years were 27% more likely to be adherent, and those aged 75 years and above were 41% more likely to be adherent. Men were significantly more likely to be adherent than women. Education level and household income were both associated with adherence.

The most important details in this text are that the higher the estimated academic achievement, the more likely the patient was to be adherent, and that the largest effect size was observed for patients obtaining their prescription anti-diabetic medications by mail. The largest effect size was observed for patients obtaining their prescription anti-diabetic medications by mail, and total daily pill burden was positively associated with antidiabetic medication adherence. Patient out-of-pocket costs were negatively associated with adherence, and there was no difference in adherence between those with primary care and endocrinologist prescribers. Patients with non endocrinologist specialist prescribers showed slightly but significantly lower adherence than those with primary care prescribers.

IV. CONCLUSIONS

This study found that several patient demographic and clinical factors were associated with higher adherence to noninsulin antidiabetic medications. Older age, male consequences may be an important, but perhaps overlooked, determinant of medication-taking behavior. Use of mail order channels was strongly associated with past adherence, but was still significantly associated with current adherence when controlled for past adherence. Out-of-pocket costs were an important determinant of adherence to statins and a self-reported cause of underuse of medications in one in seven insured patients with diabetes. Most provider factors that could be assessed in the database were not associated with medication adherence.

Patients of endocrinologist prescribers exhibited no higher odds of adherence than patients of primary care prescribers, although the proportion of patients receiving prescriptions from endocrinologists was small. Patients of nonendocrinologist specialist prescribers exhibited lower odds of adherence than patients of primary care prescribers. These results may support other groups' findings that continuity of care (28) is associated with medication adherence and health outcomes in patients with diabetes. There are several strengths to this study, such as This text discusses the methodology used to assess medication adherence. It was found that primary non-adherence (not filling an initial prescription for a medication) was an even greater problem than lack of persistence with ongoing therapy.

Additionally, although MPR is a well-accepted measure of medication adherence, it measures only refill behavior and not actual medication taking. Additionally, there were difficulties imputing adherence to insulin therapy, as insulin doses may vary from day to day, prescribed volumes are fixed, and there may be wastage due to priming of devices and expiration of the medications. Additionally, there were no clinical data such as hemoglobin A1c results. Additionally, the authors did not

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This study used a modified measure of adherence to account for changing classes of antidiabetic medications, which may be common in type 2 diabetes. However, our results were not different when these patients (5% of the total cohort) were instead considered to be nonadherent. Our findings suggest that health care providers should consider many factors beyond common wisdom when addressing the issue of medication adherence. They should not assume that patients who seem uncomplicated are free of barriers to medication adherence, as they may need more support to help them overcome barriers. Even nonmodifiable variables can increase awareness of the common issue of nonadherence and potentially drive adherence-promoting interventions. Providers and payers should work together to address potentially modifiable factors associated with lower likelihood of adherence, such as minimizing out-of-pocket costs and encouraging the use of mail order channels.

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