RESEARCH

Metformin prescribing in low-income and insured patients with prediabetes

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A B S T R A C T

Objectives: To describe prescribing patterns of metformin in low-income and Medicaid-insured patients with prediabetes and to identify common demographic characteristics and comorbid conditions of low-income and Medicaid-insured patients receiving metformin for treatment of prediabetes.

Design: Retrospective observational study.

Setting and participants: Patients (18-60 years old) who were enrolled in South Carolina Medicaid and diagnosed with prediabetes between January 2009 and December 2013.

Main outcome measures: Metformin prescribing to treat prediabetes identified from pharmacy claims.

Results: Among 7102 patients who met the study criteria, 7.4% (n = 520) were prescribed metformin for prediabetes. Nearly 45% (n = 238) of eligible patients prescribed metformin initiated treatment within 30 days after diagnosis of prediabetes. Twenty-five percent of those prescribed metformin took 280 days or longer to initiate treatment after diagnosis of prediabetes. Older age, black race, managed care plan, comorbid hypertension and obesity, and longer enrollment period significantly increased the likelihood of metformin prescribing to treat prediabetes.

Conclusion: Prevalence of metformin prescription to treat prediabetes is less than 8% in low-income and Medicaid-insured patients. Sociodemographic characteristics and comorbid conditions influenced metformin prescribing in the low-income population.

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Patients with impaired glucose tolerance, impaired fasting glucose, or a glycosylated hemoglobin (A1C) of 5.7%-6.4% are considered to have prediabetes.[1] More than 1 in 3 American adults has prediabetes.[2] However, during 2009-2010, only 11% of persons with prediabetes were aware of their condition.[3] Having prediabetes places patients at a high risk for developing diabetes. Without weight loss and moderate physical activity, 15%-30% of people with prediabetes will progress to type 2 diabetes within 5 years.[2]

Patients with prediabetes are recommended to participate in intensive lifestyle change intervention programs to lose body weight and to prevent diabetes.[1] Studies showed that lifestyle modification was more effective than metformin use.[4,5] However, metformin may provide cost savings over a long period.[6] Evidence from the Diabetes Prevention Program Research group has shown that lifestyle changes and metformin treatment independently prevent or delay development of type 2 diabetes,[4,5] and similar results were found in different countries.[7,8] In addition, during the Diabetes Prevention Program (7-8 years), metformin reduced body weight and waist circumference significantly and showed minimal safety issues.[9] Thus, metformin is recommended as Level A evidence according to the American Diabetes Association (ADA) and is used in the United States as a prediabetes treatment.[1]

Socioeconomic status is associated with prevalence of diabetes and success of diabetes management.[10,11] Compared with people with higher levels of income, education, and occupation, the risk of type 2 diabetes increases by 40%, 31%, and 41%, respectively, in those with lower levels.[10] However, studies on metformin use and associated outcomes outside of clinical trials are limited, particularly in low-income

Key Points

Background:

- Prediabetes is associated with a high risk of developing diabetes. Metformin is recommended by the American Diabetes Association. It is used in the United States as a prediabetes treatment. Prevalence of metformin prescription for prediabetes is low, at less than 4%.
- Assessment of prescribing patterns is an essential step toward identifying disparities in prediabetes treatment and barriers to receiving adequate pharmacologic prediabetes treatment, such as metformin.

Findings:

- The prevalence of metformin prescription to treat prediabetes in a low-income population remains low. Less than 8% of studied patients received metformin to treat prediabetes.
- Patients with older age, black race, comorbid hypertension and obesity, and longer enrollment period with Medicaid were more likely to be prescribed metformin after diagnosis of prediabetes.

populations, which are disproportionately affected by diabetes.[10,11] A recent study by Moin et al.[12] demonstrated low use of metformin, with reported prescribing of only 3.7% of privately insured patients with prediabetes.[12] The reason for metformin underuse in practice is unclear despite the demonstration of its ability to reduce the progression to diabetes effectively with long-term tolerability and safety.[13]

Objective

The risk of developing type 2 diabetes is associated with low socioeconomic status.[10,11,14] The prescribing patterns of metformin for treatment of prediabetes in low-income patients are currently unknown. A better understanding of metformin use or prescribing patterns in this patient population is an essential step toward identifying disparities in prediabetes treatment and barriers to receiving adequate pharmacologic prediabetes treatments for disadvantaged populations. This understanding may allow for the development of interventions to achieve optimal treatment outcomes and cost savings in low-income populations. Study objectives include: (1) describe prescribing patterns of metformin in low-income and Medicaid-insured patients with prediabetes, and (2) identify common demographic characteristics and comorbid conditions of low-income and Medicaid-insured patients receiving metformin for treatment of prediabetes.

Methods

A retrospective database analysis of South Carolina Medicaid claims data was used to identify and follow patients

with prediabetes from 2009 to 2014. South Carolina Medicaid is South Carolina's aid program. In the program, federal and state governments share costs of providing medical care for needy persons who have a low income. More than 1 million South Carolinians enroll in Medicaid each fiscal year. The number of enrollees has increased from 944,835 members in 2008 to 1,207,253 members in 2014.[15] The Medicaid claims data contain inpatient and outpatient service as well as outpatient prescription drug records of beneficiaries. All study data files were de-identified and provided by the South Carolina Revenue and Fiscal Affairs Office. The study was approved by the Institutional Review Board of Presbyterian College.

Patient selection

Patients (18-60 years) diagnosed with prediabetes between January 2009 and December 2013 were identified using ICD-9 diagnosis codes (790.21, 790.22, and 790.29) to reflect impaired fasting glucose, impaired glucose tolerance test, or other abnormal glucose levels. An index date was used to identify the first date of diagnosis of prediabetes. Eligible patients were required to be enrolled in Medicaid continuously for 1 year before and during a follow-up period of at least 1 year after the index date. The follow-up period ended at death, the end of continuous enrollment, or the end of the study window (December 31, 2014), whichever occurred first. All patients had at least 1 year and up to a 6-year follow-up period.

Exclusion criteria included the presence of any of the following characteristics during the 1-year preindex period: diagnosis of diabetes (type 1 or type 2) or prediabetes, use of oral antidiabetic medications or insulin, or diagnosis of polycystic ovary syndrome[16] or chronic kidney disease.[17] In addition, patients with dual eligibility (Medicaid and Medicare) or pregnancy during the study period also were excluded.

Demographic characteristics and comorbidities

Demographic characteristics were measured on the index date and included age at time of diagnosis of prediabetes, sex, race, and type of plan (fee-for-service or managed care). The Charlson comorbidity index served as a measure of comorbid conditions identified by ICD-9 codes from medical claims. Each condition was assigned a weight of 1, 2, 3, or 6, depending on risk of dying.[18] The comorbidity score was calculated for each patient by totaling assigned weights for each of the patient's comorbidities within 1 year before the index date. A higher score suggests greater disease burden and risk for poor outcomes. Total scores were collapsed into 3 categories (0, 1, and ≥2). In addition, existing medical conditions associated with risk of diabetes, including hypertension, obesity, and dyslipidemia were identified using ICD-9 codes during the 1-year period preceding the index date.

Outcome measures

The primary outcome was metformin prescribing identified from Medicaid pharmacy claims. Metformin prescribing was defined as any prescription claim for metformin after the index date and before diagnosis of diabetes to reflect metformin