Diabetes disease progression among a Medicare Advantage population: A retrospective analysis

Background
Diabetes is a progressive disease that is increasing in both prevalence and cost. Worldwide, it is estimated that 410 million people will have diabetes by 2030.1 In the US, Medicare spending is projected to account for 50% of direct diabetes health care costs in 2034.2 When poorly managed, diabetes can lead to a wide range of complications, such as cardiovascular disease — including heart disease and stroke, visual impairment, lower extremity conditions — including peripheral arterial disease, ulcer/ulceration/infection, acute hyperglycemic episodes, renal disease, and neuropathy. According to the Centers for Disease Control and Prevention, approximately half of people aged 65 years or older with diabetes have a cardiovascular disease complication; 2 visual impairment is less common — affecting 1 in 5 elderly persons — and has been on a steady decline since 2004. Lower extremity conditions collectively affect 15.6 / 1,000 older persons with diabetes, and can ultimately result in amputation.3 Acute hyperglycemic crises are serious events which can lead to death, and diabetes is the leading cause of end stage renal disease, accounting for 44% of new cases in 2007.4 Accordingly, diabetes-related complications have been shown to negatively impact quality of life.5 Progression from pre-diabetes to diabetes is reported to occur at an annual rate of 5–10%, but the rate of progression from uncomplicated diabetes to diabetes with complications is unknown.1

Objective
To quantify progression of diabetes from uncomplicated diabetes to diabetes with complications and describe the frequency of health care resource utilization.

Methods
Study Design: Retrospective, observational, descriptive study

Data Source: This study was conducted using administrative claims data from Humana Inc., a health care company insuring over 2.8 million Medicare Advantage members, 1.2 million group fully insured members, 1.1 million individual fully insured members, and 3.9 million Medicare Part D members (2nd quarter 2014).

Inclusion and Exclusion Criteria:
– This study was limited to people with Medicare Advantage health insurance through an individual plan. Captivated members were excluded. Members had to be continuously enrolled from January 2010 through December 2012.
– Individuals with either (A) 1 inpatient admission, 1 emergency department visit, or 2 physician visits with a diagnosis of diabetes, or (B) 1 pharmacy claim for a diabetes medication, between January 1 2008 and December 31 2010 were eligible for inclusion. ICD-9 codes 250.xxx, 250.55, 250.72, 250.82, and 250.98 were used to identify diabetes.
– The baseline study cohort was restricted to patients with uncomplicated diabetes based on the Centers for Medicare and Medicaid Services – Hierarchical Condition Categories (HCC). HCC 10 indicates uncomplicated diabetes.

Outcomes:
– The study cohort was followed for three consecutive years. All outcomes were reported for the period of January through December in each year of 2010 (baseline), 2011, and 2012.
– The primary endpoint was the development of a diabetes-related complication identified by ICD-9 codes. Complications were identified using HCC 15-18 for renal, neurologic, peripheral circulation, acute, and ophthalmologic complications.
– Secondary endpoints included the mean annual number of inpatient admissions per 1000 persons, the mean annual number of emergency department visits per 1000 persons, per member per month (PMPM) medical costs (plan + patient paid), mean diabetes complications severity index (DCS) score, and percent of people participating in Humana clinical programs.
– Secondary endpoints were reported for the cohort overall and stratified by complicated and uncomplicated diabetes.

Statistical analyses:
– Descriptive statistics were used in reporting outcomes.

Results

Table 1. Demographics

<table>
<thead>
<tr>
<th>Year</th>
<th>Age Mean</th>
<th>Gender, n (%)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>71.8 years</td>
<td>78,619 (47.9%)</td>
<td>379</td>
<td>378</td>
</tr>
<tr>
<td>2011</td>
<td>71.8 years</td>
<td>351</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>71.8 years</td>
<td>386</td>
<td>385</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Progression to Diabetes with Complications

During the 2 year follow-up period, 24% of the cohort progressed to diabetes with complications.

Figure 2. Mean Annual Health Care Resource Utilization per 1,000 Person by Complication Status

Table 2. Secondary Endpoints by Year and Complication Status

<table>
<thead>
<tr>
<th>Year</th>
<th>PMPM Medical Costs (plan + patient paid)</th>
<th>Mean DCS Score</th>
<th>Humana Clinical Program Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 (Baseline)</td>
<td>$590</td>
<td>1.07</td>
<td>6%</td>
</tr>
<tr>
<td>2011</td>
<td>$654</td>
<td>1.176</td>
<td>uncomplicated $574</td>
</tr>
<tr>
<td>2012</td>
<td>$759</td>
<td>1.176</td>
<td>uncomplicated $627</td>
</tr>
</tbody>
</table>

There was a trend towards increased inpatient admissions (36% increase) and emergency room visits (24% increase).

Conclusions
This Medicare Advantage population, 24% of the cohort population progressed to diabetes with complications over 2 years of follow-up.

– There was an increasing trend in the number of inpatient and emergency room visits which corresponded to the development of diabetes-related complications in the study cohort.
– Costs, disease severity and clinical program participation increased over time and was most pronounced in the sub-set of the population with diabetes-related complications.

Implications
– MA plans are increasingly challenged to manage population health. A deeper understanding of disease progression will lead to more sophisticated population health management strategies and improved health outcomes.
– Interventions which slow the progression of diabetes could significantly improve the health and well-being of people with diabetes, and may lower cost and utilization overall for the healthcare system.

Limitations
– This study only reported trends over time and did not report association or causation.
– This study relied on claims data. Complications which were not coded were not captured and may represent an underestimation of the true incidence.
– Reported plan plus patient PMPM costs did not include pharmacy costs.
– The cohort included individuals insured through Medicare Advantage by a single health plan and may not be generalizable to younger individuals or the general population.

References