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Trends in comorbidity burden and treatment patterns in type 2 diabetes: Longitudinal data from a US cohort from 2006 to 2014

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ABSTRACT

Aims: To gather real-world data on treatment characteristics and comorbidity progression in patients with newly-diagnosed type 2 diabetes (T2D) and evaluate differences by patient age.
Methods: Retrospective analysis of a US administrative claims database including 16,950 subjects with newly-diagnosed T2D in 2006 and a baseline Diabetes Complications Severity Index (DCSI) score of 0. Patients were categorized by DCSI score at year 8 (0, 1–2, or ≥3) and comparatively analyzed based on demographic variables, drug usage, and diabetes-related comorbidities.
Results: Year 8 DCSI score distribution was 0 (29.9%), 1–2 (36.2%), and ≥3 (33.9%). The highest DCSI score subgroup (≥3) was characterized by a significantly greater percentage of males, older age at T2D diagnosis, and higher Medicare enrollment. DCSI progressed most rapidly in the oldest age group (≥65). Among all subjects at year 8, insulin use was significantly highest among subjects with DCSI ≥3 compared with those having a lower DCSI. However, for subjects with DCSI ≥3, insulin use was lower among those in the oldest age group (≥65) relative to younger age groups.
Conclusions: These real-world data suggest a relationship between age at T2D diagnosis and disease progression based on comorbidity burden and lower usage of injectable therapies in older patients.

1. Introduction

As of 2017, according to the United States Centers for Disease Control National Diabetes Statistics Report [1], 9.4% of the US population, or 30.3 million people, have diabetes. Diabetes, of which 95% of all cases are type 2 diabetes (T2D), wreaks a costly toll on the healthcare system and on the patients living with it. In 2014, there were 7.2 million hospitalizations for complications of diabetes, 1.5 million of which were related to cardiovascular disease [1]. In 2015, diabetes was associated with 20–40% of all deaths for persons younger than 60 years of age [2]. Unfortunately, improved screening for, and earlier diagnosis of, T2D have been insufficient in affecting the rates of progression of T2D-related comorbidities and subsequent mortality [3–5].

Physiologically, progression of T2D is due to consequence of poor glycemic control and manifests as microvascular damage (retinal bleeding and damage, nephropathology,

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neuronal damage) and macrovasculature sequelae (cardiovascular disease, peripheral vascular disease and cerebrovascular disease) [6,7]. Clinically, understanding which variables are potential indicators of disease progression, both at the time of T2D diagnosis and during ongoing treatment, would help with designing more effective patient-centered treatment options and pathways. To our knowledge, there have been no large, real-world analyses of this nature. We have previously used real-world data to examine changes and trends in medical services, drug usage patterns, and related costs over periods of 5 and 6 years in patients with T2D [5,8]. Other published studies have investigated particular aspects of T2D disease progression, including predictors of retinopathy development and progression [9], predictors of hospital readmission [10], and correlations between drug adherence and improved glycemic control [11].

The purpose of this study was to gather data on general treatment characteristics over 8 years in a cohort of patients with newly-diagnosed T2D and how such characteristics differed according to patient age and the degree of disease progression evident at the end of the 8 years, as measured by worsening comorbidity status.

2. Materials and methods

2.1. Study design

This was a retrospective study of patients who were newly diagnosed with T2D in 2006. The data were from administrative claims obtained from the Truven Health MarketScan® Commercial and Medicare Supplemental Databases (US data) for 2006 through 2014 (index date year [2006] and follow-up study years 1 through 8 [2007–2014]). These databases contain administrative claims data for more than 170 million individuals in the US, including over 9 million with a diagnosis of T2D. All data were of persons living in the United States, which were rendered anonymous before being released, and are fully compliant with the Health Insurance Patient Portability and Accountability Act of 1996.

Eligible patients were at least 18 years of age and received a first diagnosis of T2D in 2006 (index date). For patients to be identified as newly diagnosed T2D, they had to meet the criteria of a first diagnosis of T2D occurring in 2006 and whose start of continuous enrollment was at least 6 months prior to said diagnosis. T2D diagnosis was defined as patients having at least 2 diagnoses for T2D according to ICD-9 (International Classification of Diseases, Ninth Revision, 1996) codes 250.×0 (diabetes mellitus type 2) and 250.×2 (diabetes mellitus type 2, controlled), or at least 1 T2D diagnosis + at least 1 claim for oral antidiabetic drugs (OADs) and no more than 1 diagnosis of type 1 diabetes according to ICD-9 code 250.×1. Furthermore, patients were to have continuous enrollment in a health insurance plan containing prescription drug benefits for the entire study period.

The seven comorbidities factored into the Diabetes Complications Severity Index (DCSI) score (cardiovascular disease, cerebrovascular disease, peripheral vascular disease, retinopathy, neuropathy, nephropathy, and metabolic conditions) were evaluated annually, every 12 months after the patient's index date. Each comorbidity was scored as not present (0), present (1), or severe (2), with the exception of neuropathy which was scored only as 0 (none) or 1 (present). The ICD-9 codes used to identify DCSI complications are provided in online supplemental Table 1. The seven individual scores were summed to obtain the DCSI value, with a possible maximum score of 13 [12]. Higher scores are indicative of

Table 1 – Baseline demographic characteristics for DCSI category subgroups.[a]

Demographic	Final DCSI at year 8			
	0	1–2	≥3	All
N	5070 (29.9%)	6129 (36.2%)	5751 (33.9%)	16,950 (100%)
Age[a] (yr), mean[*]	49.6	52.3	59.8	54.2
Age[a] (yr), % by category[b,*]				
18–44 (N = 3223)	30.0	19.9	8.5	19.0
45–64 (N = 10,439)	61.8	67.0	55.6	61.6
≥65 (N = 3288)	8.2	13.2	35.9	19.4
Male (%)[b,*]	49.4	48.4	53.2	50.3
Region, % of patients[b,*]				
Central	32.0	33.5	40.2	35.3
North	10.0	9.8	10.2	10.0
South	48.2	47.6	40.9	45.5
West	9.2	8.6	8.3	8.7
Insurance, % of patients[b]				
Commercial	91.1	85.9	62.4	79.5
Medicare	8.9	14.2	37.6	20.5

DCSI, Diabetes Complications Severity Index.

[a] Age at baseline reflects time of type 2 diabetes mellitus diagnosis.

[b] All percentages shown are within their respective DCSI group (column). All values shown were significant.

[*] $P < 0.001$ DCSI ≥3 vs DCSI 0 and DCSI 1–2 categories.