

ECONOMIC IMPACT OF TYPE 2 DIABETES AND DIABETES-ASSOCIATED COMPLICATIONS: A LARGE CLAIMS-BASED STUDY

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Background

Demographic changes, together with a steadily improving prognosis for a variety of life-threatening and chronic diseases, contribute to aging of the type 2 diabetes (T2DM) population and thus increases its multimorbidity. Consequently, these patients require not only multiple medications but also more frequent hospital admissions and other medical care in general, which imposes a large economic burden on society.

Prevalence of patients with DM in the Czech Republic is growing rapidly; from 804,987 diabetics in 2007 to 936,124 in 2017 (a 16% increase; 8.9% of the population in 2017) (1). In order to formulate an effective response to this potential financial drain, it is crucial to adequately describe the economic burden imposed by this disease at different stages and the associated complications. To this end, we assessed health insurance claims data, a valuable yet still underutilized source of real-world evidence.

Objectives

- The main objective was to provide reliable estimates of the direct health care costs associated with the management of T2DM using administrative claims data.
- To assess the association between health care costs and the co-occurrence of diabetes-related complications and comorbidities.
- To identify the causes of increased costs.
- To analyze adherence to T2DM guidelines.
- To suggest future steps for potential savings.

Methods

A retrospective prevalence-based cost-of-illness study analyzed health insurance claims. Data were provided by the second-largest health insurance fund in the Czech Republic (1,307,000 insured; 12.5% of the population). We estimated mean annual total costs of T2DM and explored diabetes-related multimorbidity, i.e., the co-occurrence of micro- and macrovascular complications together with its influence on health care costs (in 4/2019, €1 = 25.677 CZK).

The selection of diabetic patients was defined by:

- two consecutive records of ICD-10 diagnosis and
- at least one prescription of antidiabetic medication (ATC A10).

The following complications (defined as events using ICD-10 diagnoses) frequently used in diabetic models (2–4) were considered:

- macrovascular complications:** angina pectoris, chronic heart failure, myocardial infarction, stroke, and other ischemic heart diseases
- microvascular complications:** retinopathy, blindness, diabetic foot, lower-extremity amputation, nephropathy, and end-stage renal disease.

Costs for inpatient and outpatient care, pharmaceuticals, medical devices, and other direct medical costs were assessed in the years 2013–2017.

Finally, we also used administrative claims data to assess patient and physician adherence to guidelines (5) as a potential culprit of increased costs of diabetes-related complications. Patients undergoing a screening examination were identified using reference numbers of the relevant medical procedures claimed to the insurance company.

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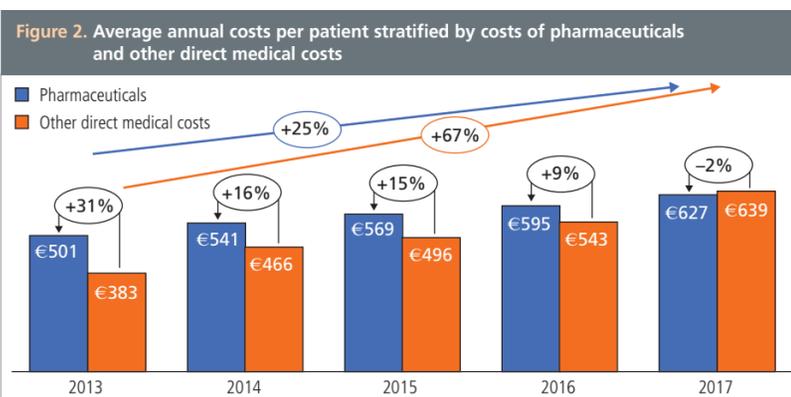
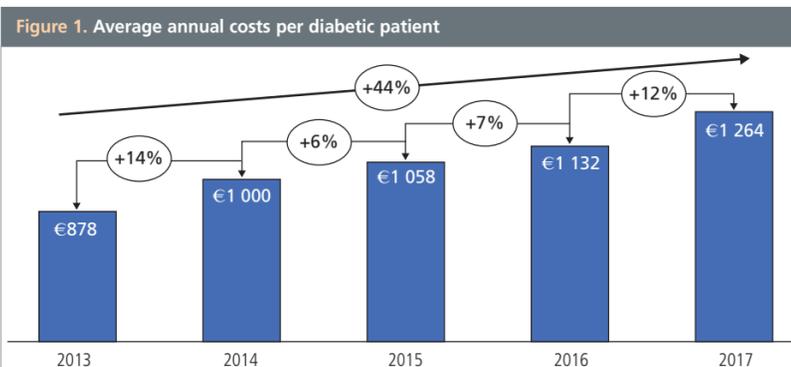
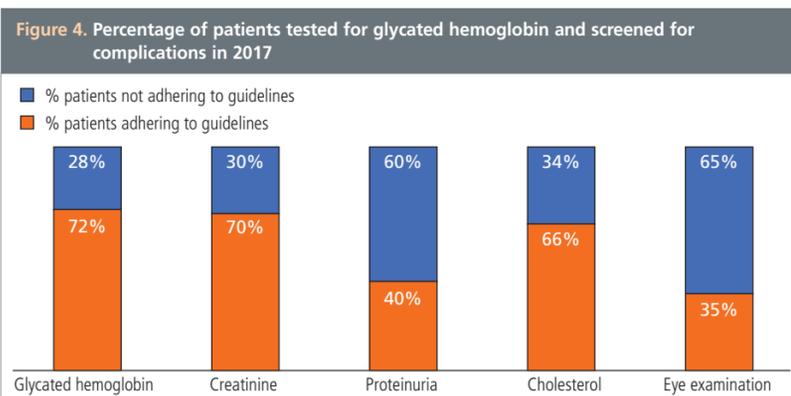


Figure 3. Annual costs per patient stratified by the co-occurrence of micro- and/or macrovascular complications

Vascular complications	Percentage of total diabetic patients (number)	Average costs per patient per year	% difference from baseline, i.e. diabetic patient without complications
None	52% (32 955)	€656	0%
Micro	22% (13 549)	€1 058	+61%
Macro	13% (7 881)	€1 281	+95%
Micro & macro	14% (8 510)	€2 025	+209%
Total	100% (62 895)	€1 006	+53%



Conclusions

The results suggest that the costs of T2DM are substantial and have been rapidly growing both over time and with associated complications. Diabetes-related complications were identified as the main driver of costs. This is in line with previous studies from other countries (6,7).

The main limitation of this study was associated with the narrowness of the administrative claims data:

- On the one hand, these data represent a unique source for cost-of-illness studies based on their extensive population coverage and detailed real-costs from a health payers' perspective.
- On the other hand, detailed clinical and laboratory results were missing, and neither out-of-pocket expenditure nor indirect costs are included in the data set.
- Furthermore, we were limited by the scope of the database, i.e., from 2013 to 2017.

To our knowledge, this is the first Czech study providing contemporary real-world analysis of average diabetic patient costs stratified by associated complications. Moreover, the analysis reliably captures the costs associated with T2DM using a large, detailed, and highly representative source of data.

Politically, our findings should support health care stakeholders in evaluating optimal resource allocation across different prevention and intervention programs. More specifically, the results of our analysis indicate surprisingly significant nonadherence to current clinical guidelines. Thus, we identified a large opportunity for future improvements in screening and early diagnosis of diabetes-related complications. Such health policy goals could lead to a significant reduction in the economic burden associated with T2DM.

Results

- The overall sample was comprised of 62,895 patients with T2DM.

Figure 1 presents a steady increase in mean total costs per diabetic patient per year (pppy), from €878 in 2013 to €1,264 in 2017 (+44%).

- In 2013, pharmaceuticals were the major contributor to direct health care costs. However, their share gradually declined until it became minor in 2017 (i.e., < 50%), as shown in **Figure 2**. The average expenditure on pharmaceuticals pppy increased by 25%, while other direct medical costs increased by 67% from 2013 to 2017.

- As illustrated in **Figure 3**:

- 52% of patients had no complications

- with mean total direct costs equal to €656 pppy

- 22% had microvascular complications

- with mean total direct costs equal to €1,058 pppy (+61% relative to the baseline without complications)

- 13% had macrovascular complications

- with mean total direct costs equal to €1,281 pppy (+95%)

- 14% had both micro- and macrovascular complications

- with mean total direct costs equal to €2,025 pppy (+209%)

- Figure 4** shows adherence to T2DM guidelines (5):

- The most striking finding of our analysis was perilously inadequate screening for retinopathy, with 65% of patients not adhering to the guidelines in 2017.

- The level of glycated hemoglobin was tested according to guidelines in 72% of patients.

- Creatinine was measured in 70% of patients.

- Proteinuria was tested in 40% of diabetic patients.

- Level of cholesterol was examined in 66% of patients.