# Burden of Non-adherence to Type 1 Diabetes Mellitus Therapeutic Guidelines in France

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## Introduction

Type 1 diabetes mellitus (T1DM) represents about 10% of the diabetes case in France and half of them are diagnosed before their 20th birthday. The French prevalence is 13.5 cases per 100,000 children of less than 15 years of age. For unknown reasons, the prevalence of T1DM is constantly increasing since about two decades and there is a trend towards earlier incidence. (1)

Consequently, the cohort of prevalent patients is growing in France. It is known that a tight control of blood glucose and other physiological parameters such as systolic blood pressure and cholesterol play an important role in preventing complications associated with T1DM. Despite the improvements in available drugs and devices, many patients still don't meet the clinical guidelines.

## Objectives

The aim of this study was to investigate the burden of type 1 diabetes mellitus (T1DM) in France associated with non-adherence to clinical guidelines. The IMS CORE Diabetes Model (CDM) was applied using clinical data from the IMS Lifelink Diabetes Cohort in France.

## Methods

The IMS CORE Diabetes Model (CDM) is a health economic model based on 17 inter-dependent sub-models that simulate micro- and macrovascular complications associated with diabetes (2).

Physiological parameter inputs such as HbA1c, blood lipids, body mass index (BMI), and systolic blood pressure (SBP) were taken from real-life data and compared with guidelines from the "Haute Autorité de Santé".

T1DM patients (age ≥ 18) who visited a general physician between May 2011 and May 2014 and have received at least one insulin prescription were included in the analysis. Costs and outcomes were discounted at 4% per annum. Costs of complications were inflated to 2013 values. Public references such as L'Agence technique de l'information sur l'hospitalisation (ATIH) as well as published references (3, 4, 5, 6) were used.

## Results

A cohort of 605 T1DM patients (43% male) was analyzed. Mean age at inclusion in the cohort visit was 58 years, HbA1c was 7.8%, SBP was 132 mmHg, and BMI was 28 kg/m$^2$. Smokers represented 23% of the cohort. In contrast, the HAS recommends an HbA1c lower than 7.5%, SBP lower than 130 mmHg, BMI of less than 25 kg/m$^2$ and smoking abstinence is recommended.

Results from economic modeling using the CDM suggest that for prevalent T1DM patients in France, potential savings for the health care system associated with meeting the therapeutic guidelines would be on average of 1,659 EUR per patient from a lifetime perspective. Most of the savings would come from the prevention of renal complications. Any new complication would be delayed by 2.4 months on average.

Assuming that there are currently 160,000 T1DM patients in France (11) and that they would all meet the HAS recommendations, this could translate in 265 million EUR savings over their lifetime.

## Conclusions

Our results showed that the therapeutic recommendations were not strictly followed among T1DM patients in France. Better adherence to the T1DM guidelines would lead to cost savings in the French healthcare system and improved patient outcomes.

Table 1) Cohorts baseline characteristics

| Patient Demographics | Optimal management cohort Mean | Optimal management cohort Reference | Real-life cohort Mean | Real-life cohort Reference |
|---|---|---|---|---|
| Mean age (years) | 57.81 | 7 | 57.81 | 1 |
| Time since diagnosis (years) | 15.42 | 1 | 15.42 | 1 |
| Proportion male | 0.49 | 1 | 0.49 | 1 |
| **Baseline Risk Factors** | | | | |
| HbA1c (%) | 7.50 | 8 | 7.84 | 1 |
| Systolic blood pressure (mmHg) | 130.00 | 9 | 132.00 | 1 |
| HDL cholesterol (mg/dL) | 40.00 | 3 | 54.30 | 1 |
| LDL cholesterol (mg/dL) | 160.00 | 3 | 97.30 | 1 |
| Triglycerides (mg/dL) | 150.00 | 10 | 134.00 | 1 |
| Body mass index (kg/m$^2$) | 25.00 | 3 | 27.60 | 1 |
| Prop. smoker | 0.00 | 3 | 0.234 | 1 |
| **Baseline Complications** | | | | |
| Proportion angina | 0.170 | 1 | 0.170 | 1 |
| Proportion peripheral vascular disease | 0.144 | 1 | 0.144 | 1 |
| Proportion stroke | 0.078 | 1 | 0.078 | 1 |
| Proportion heart failure | 0.115 | 1 | 0.115 | 1 |
| Proportion microalbuminuria | 0.131 | 1 | 0.131 | 1 |
| Proportion background diabetic retinopathy | 0.153 | 1 | 0.153 | 1 |
| Proportion history of amputation | 0.064 | 1 | 0.064 | 1 |
| Proportion neuropathy | 0.158 | 1 | 0.158 | 1 |

Table 2) Lifetime cost

| | Optimal management cohort | Real-life cohort | Difference (EUR) |
|---|---|---|---|
| Total Costs | 26,612 | 28,271 | -1,659 |
| Diabetes management | 3,035 | 3,008 | 27 |
| Cardiovascular disease | 3,064 | 3,163 | -99 |
| Renal complications | 9,774 | 10,899 | -1,125 |
| Diabetic foot | 5,697 | 5,864 | -167 |
| Ocular complications | 5,042 | 5,337 | -295 |

Table 3) Time alive and free of complications

| | Optimal management cohort (years) | Real-life cohort (years) | Difference (months) |
|---|---|---|---|
| Any complications | 1.42 | 1.27 | 1.80 |
| Background Retinopathy | 6.95 | 6.45 | 6.00 |
| Proliferative Retinopathy | 17.30 | 16.88 | 5.04 |
| Microalbuminuria | 7.66 | 7.19 | 5.64 |
| Gross Proteinuria | 16.71 | 16.22 | 5.88 |
| End Stage Renal Disease | 18.44 | 18.07 | 4.44 |
| First foot Ulcer | 14.36 | 13.94 | 5.04 |
| Amputation | 17.08 | 16.74 | 4.08 |
| Neuropathy | 8.47 | 7.97 | 6.00 |
| Peripheral Vascular Disease | 14.51 | 14.21 | 3.60 |
| Congestive Heart Failure | 17.73 | 17.36 | 4.44 |
| Angina | 14.96 | 14.70 | 3.12 |
| Myocardial Infarction | 18.18 | 17.81 | 4.44 |
| Stroke | 17.51 | 17.13 | 4.56 |
| Cataract | 16.99 | 16.71 | 3.36 |
| Macular Edema | 14.96 | 14.46 | 6.00 |
| Severe Vision Loss | 17.06 | 16.66 | 4.80 |

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