The prevalence of diabetes is reaching epidemic proportions worldwide, with type 2 diabetes (T2DM) being the most expressive form of the disease, accounting for 90% of all cases. There are currently 425 million people affected by the condition globally, although as population grows and societies grow older, this number is expected to reach 629 million by 2045 [1a, 1b]. Care of T2DM imposes a huge financial burden on health systems partly due to direct prescription costs, and indirect expenditure associated with costly micro-, and macrovascular complications. As a consequence, long-term cost effectiveness of diabetes therapies is becoming a public health priority. The main objectives of the present study were to investigate long-term health outcomes and costs for patients initiated on Basal Supported Oral Therapy (BOT) using human or analogue insulins in the Hungarian setting.

Study Population
The study was based on the Claims Database of the National Health Insurance Fund of Hungary which covers all publicly financed inpatient and outpatient events in Hungary (e.g. diagnoses, medication, use of medical aids and devices). For the current analyses, we created cohort study of all T2DM patients initiated on BOT (long acting insulin) during the years 2009–2010. The first two years were used as baseline period, hence the study period spanned from 1st January 2011 to 31st December 2016. Patients were excluded if they had any drug dispensation with relevant ICD codes (E10/E11/E14) between 01.01.2009 and 31.12.2009. Two patient sub-groups, BOT-H and BOT-A were identified, depending on their treatment to be cost-effective. The choice of the endpoint group was made, based on the different benefits of the analogue insulin, in terms of expected occurrence and relative risk of appointed events.

Methods

Propensity Score Matching (PSM) method was applied to separate the effect of analogue and human insulin therapies from the effect of the covariates that predict receiving that treatment. The Health Economic Simulation works by generating pairs of patients: one of them belonging to the BOT-H patient arm and the other to the BOT-A arm. Variations on demography, date of therapy initiation and retrospective (baseline) comorbid events related to a particular arm were included in the Individual Sampling Model using the results of the statistic models above. In case of cost calculations 320 EUR/HUF FX rate was applied.

Results

Figure 3 shows the evaluation of cost-effectiveness for the appointed dimensions: if we are willing to spend an additional daily reimbursement expenditure of 1.25 EUR per patient for one prevented cardiovascular event per 100 patient-years for the initiation of BOT-A therapy we would have a 77.8% chance for the treatment to be cost-effective.

III. MULTICRITERIAL ASSESSMENT

The cost-effectiveness ranking of therapy switches between BOT-H and BOT-A depends on the chosen rate of efficiency, expected saving, expected efficiency and expected cost-effectiveness. Based on the aforementioned criteria, the weighted evaluation of therapy switches can be used during decision-making.

IV. HEALTH ECONOMIC MODELLING

Analysed patient subgroup: patients who were free of cardio-, and cerebrovascular complications at baseline.

Method: What-if analysis based on Simulated Patient-Level Decision Tree Model. The propensity adjusted Cox Proportional Hazard method was applied to separate the effect of analogue and human insulin therapies from the effect of the covariates that predict receiving that therapy. The Health Economic Simulation works by generating pairs of patients: one of them belonging to the BOT-H patient arm and the other to the BOT-A arm. Variations on demography, date of therapy initiation and retrospective (baseline) comorbid events related to a particular arm were included in the Individual Sampling Model using the results of the statistic models above. In case of cost calculations 320 EUR/HUF FX rate was applied.

Despite the higher medication costs of analogue based BOT, this therapeutic approach was associated with a substantial reduction in the occurrence of macrovascular complications after therapy initiation and an acceptable cost-effectiveness compared to human insulin based BOT. Although the primary requirement for the initiation of more expensive therapies is usually not to prevent complications, but to avoid further deterioration of patients already at risk of exposure, our study draws on valuable clinical and health-economic conclusions which confirm the need for the broader use analogue insulin products by providing greater efficiency and financing aspects of diabetes care. Establishment of such evaluation process of data analysis and statistical methodologies helps survey tasks and assist decision makers in providing an appropriate supply structure for a cost-effective and value-based healthcare system.

References


[4] 1Healthware Consulting Ltd.; 2First Department of Internal Medicine, Semmelweis University; 3Sanofi Aventis Ltd - Hungary

Figure 1

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