Impact of Metabolic Surgery on Cost and long-term Health Outcome: A Cost-Effectiveness approach

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Objectives

The increase of obesity has become a major public health concern. People with metabolic obesity exhibit an increased risk of diabetes, cardiovascular disease (CVD), depression, non-alcoholic steatohepatitis (NASH), stroke and myocardial infarction (MI) leading to the development of multiple comorbidities often in young age. The disease burden is associated with reduced quality of life and an elevated risk of death. Metabolic surgery (MS) is the most effective treatment against obesity. The aim of this study was to evaluate the costs and outcomes of MS, based on hospital-records (2014) of two Austrian specialized centers. MS was compared with no-surgery in patients with a BMI ≥230 kg/m². At baseline 39.4% exhibit diabetes, 77.9% CVD, 35.3% hyperlipidemia and 35% are depressed.

Methods

MS was documented retrospectively over one year follow-up to collect resource utilization data of 177 patients (mean age 43 years; 21 Roux-en-Y Gastric bypass, 21 Sleeve Gastrectomy and 135 One Anastomosis Gastric bypass). A cohort-simulation-model was developed, which includes specific Markov process for coexisting comorbidities to simulate the long-term consequences of (1) diabetes including diabetic-complications (ulcer, amputation, retinopathy, blindness and end stage renal disease), (2) CHD, (3) hyperlipidemia, (4) depression, (5) NASH including cirrhosis, liver transplant and hepatocellular carcinoma (HCC), (6) MI and (7) stroke over a 20 year time horizon. The model includes fifteen health-states to describe the long-term follow-up. Probabilities and utilities derived from literature. QALYs, LYs and total costs were discounted at 3% p.a.

Clinical Data

Base case incidence rates of coexisting conditions derived from patients records of a retrospective database taken from the Medical University of Vienna and the Hospital Hollabrunn. Disease progression was extrapolated over 20 years. Transition probabilities or comorbidities derived from probabilities and utilities as well as health adjusted survival values derived from the literature.

Resource Use and Costs

Resource use of MS surgery procedures, complications and re-operations as well as for treating comorbidities derived from the retrospective database of the two centers. Data on the resource use of the long term follow-up was collected in two steps. First, the medical resources derived from literature (e.g. disease specific guidelines). In a second step this literature review was verified by experts. Direct medical-costs were calculated based on the year 2017 (€) presented from the payer’s perspective. Direct medical costs derived from a number of publicly available sources like outpatient clinic catalogue as well as the DRG catalogue (LKF) and official price lists for the Austrian Health insurances funds. When necessary, prices were adjusted to 2017 prices using the consumer price index.

Results

MS leads to costs of 42,153 € per patient and 9.45 QALYs (14.72 LY) over a 20 year time horizon. No MS is associated with 67,126 € and 6.33 QALYs (14.22 LY). Total cost saving for MS amounts to 24,973 € per patient and a QALY gain of 3.12. Operated persons exhibit cost-savings for comorbidities of 33,157 €, which offsets procedure costs including reoperations (10,080 €).

Sensitivity Analysis

The probabilistic sensitivity analysis shows the robustness of the model.

Conclusion

MS is associated with substantial savings in long-term health-care costs, expected health-benefits and reduced onset of disease related complications. MS significantly increases the quality of-life. Patients with diabetes and NASH benefit most from MS.

References


Additional literature with the author.

Fig. 1: Model Design

Fig. 2: Per patient costs, first year

Fig. 3: Per patient costs, following 20 year

Fig. 4: B2: Patient year with conflicting condition, per 1000 patients

Fig. 5: Probabilistic Sensitivity Analysis

Table 1: Results, 2017

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Total costs (€) per patient</th>
<th>QALYs per patient</th>
<th>ICER per QALY gained (€)</th>
<th>LYs per patient</th>
<th>ICER per LY gained (€)</th>
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<td>MS</td>
<td>42,153</td>
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<tr>
<td>No MS</td>
<td>67,126</td>
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<tr>
<td>Difference</td>
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Source: own calculations