

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

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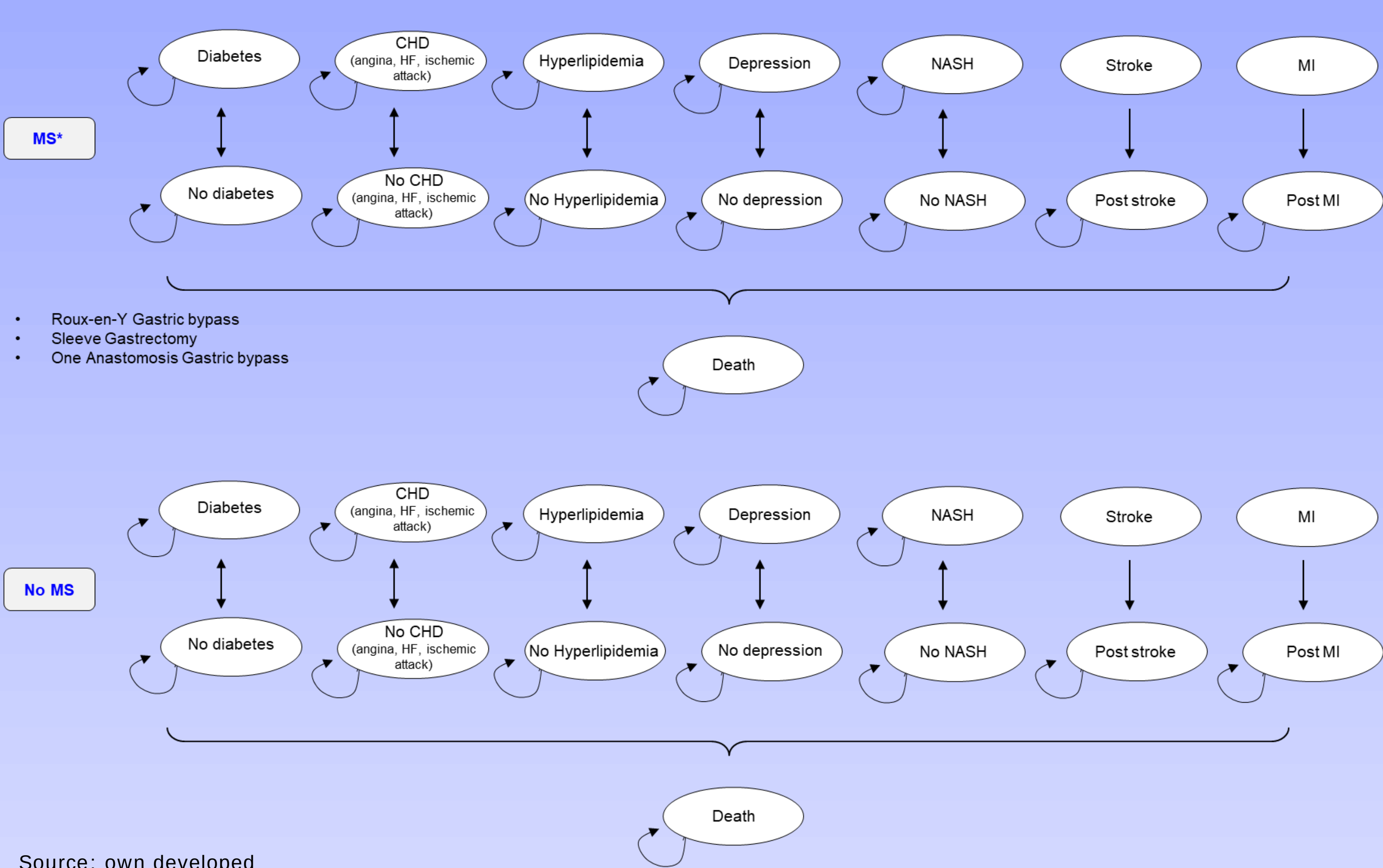
Objectives

The increase of obesity has become a major public-health concern. People with morbid 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≥30 kg/m². At baseline 39.4% of patients 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 processes 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 fibrosis, 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. Monte-Carlo simulation accounted for uncertainty.

Fig. 1: Model Design



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 of comorbidities, mortality rates and quality adjusted survival rates 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 by 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 (14.22LY). 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 €).

Tab. 1: Results, 2017					
Strategy	Total costs (€) per patient	QALYs per patient	ICER per QALY gained	LYs per patient	ICER per LY gained
MS	42,153	9.45	Dominant	14.72	Dominant
No MS	67,126	6.33		14.22	
Difference	-24,973	3.12		0.50	

Source: own calculations MS surgery costs amounts 9,440.63 Euro in the first year.

The MS strategy marked as “Dominant” saves money and improves outcome compared to no surgery (Table 1).

A closer examination of costs shows that MS is associated with higher costs in the first year. Total average costs per patient with MS amounts to 10,784 € (cost for surgery 9,441 €) compared to 2,623 € without MS. Costs in the following years overcompensate surgery costs. Saving in the follow-up period of 20 years amounts to 33,135 € per patient; 17,438 € accounted for diabetes (figure 2).

Fig. 2: Per patient costs, first year

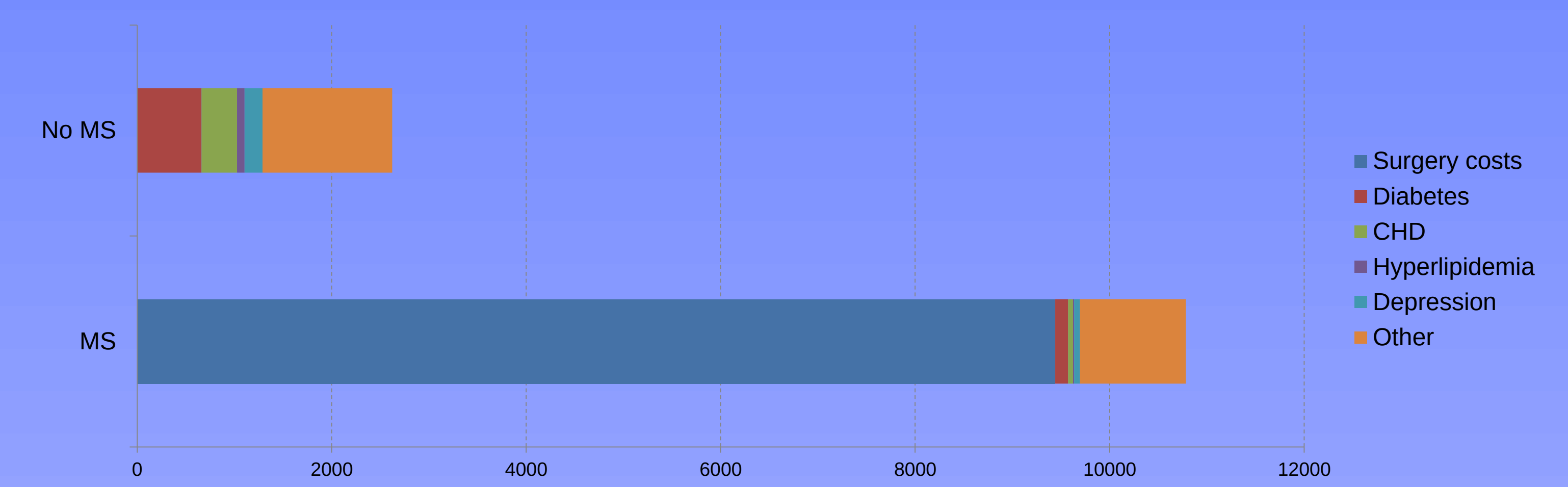
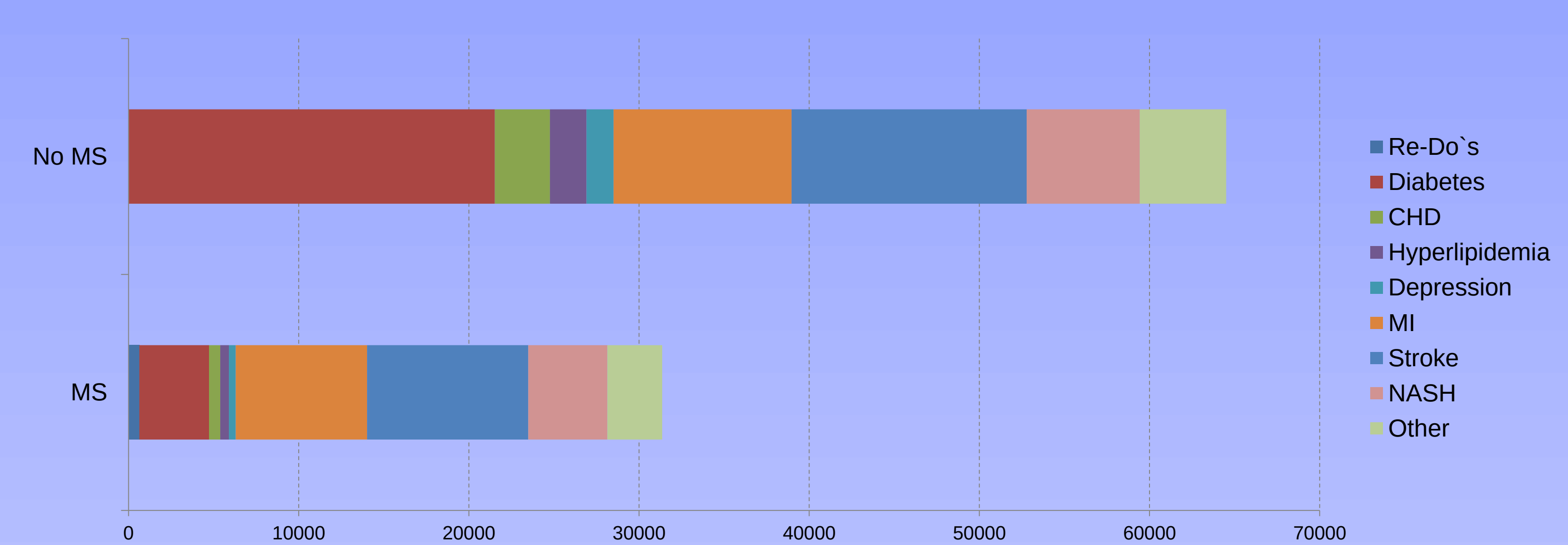


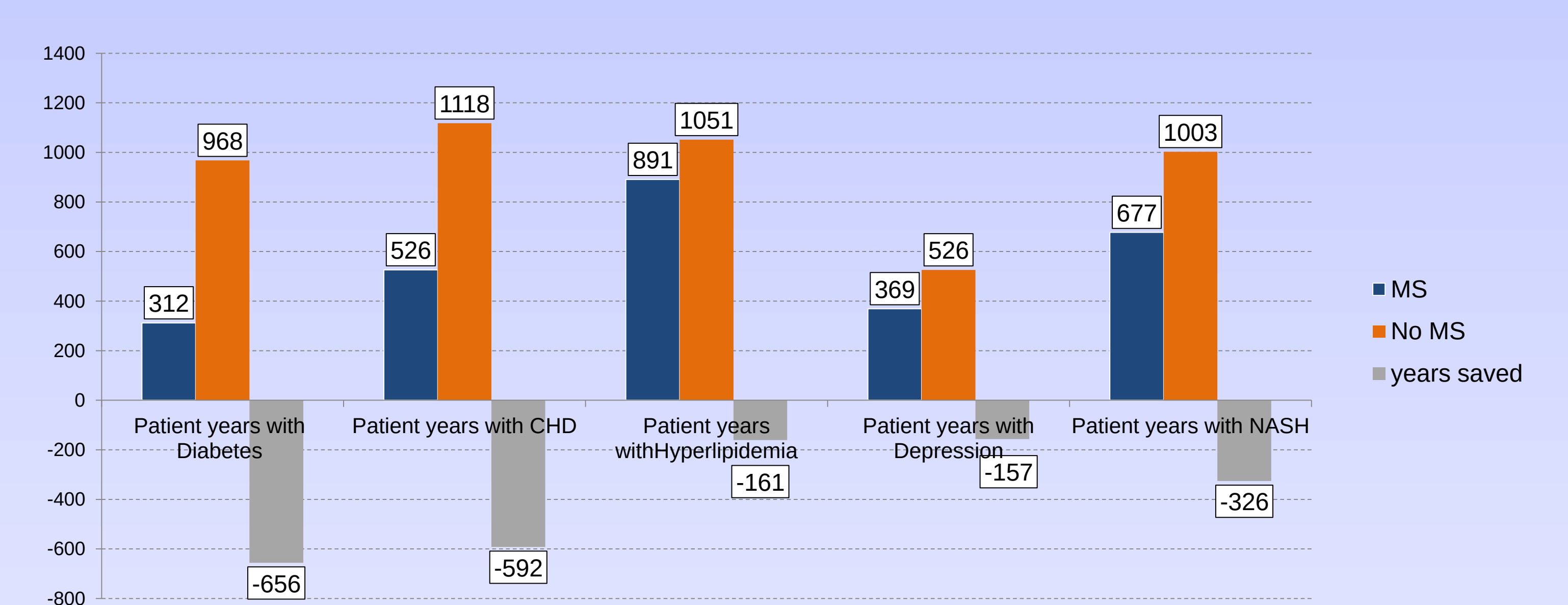
Fig. 3: Per patient costs, following 20 year



Source: own calculations

Over 20 years MS is able to save 656 patient-years with diabetes (-3.7 per patient), 592 patient-years with CHD (-3.3 per patient), 161 patient-years with hyperlipidemia (-0.90 per patient), 157 patient-years with depression (-0.89) per patient and 326 patient-years with NASH (-3.7 per patient).

Fig. 4: D2: Patient year with coexisting condition, per 100 patients

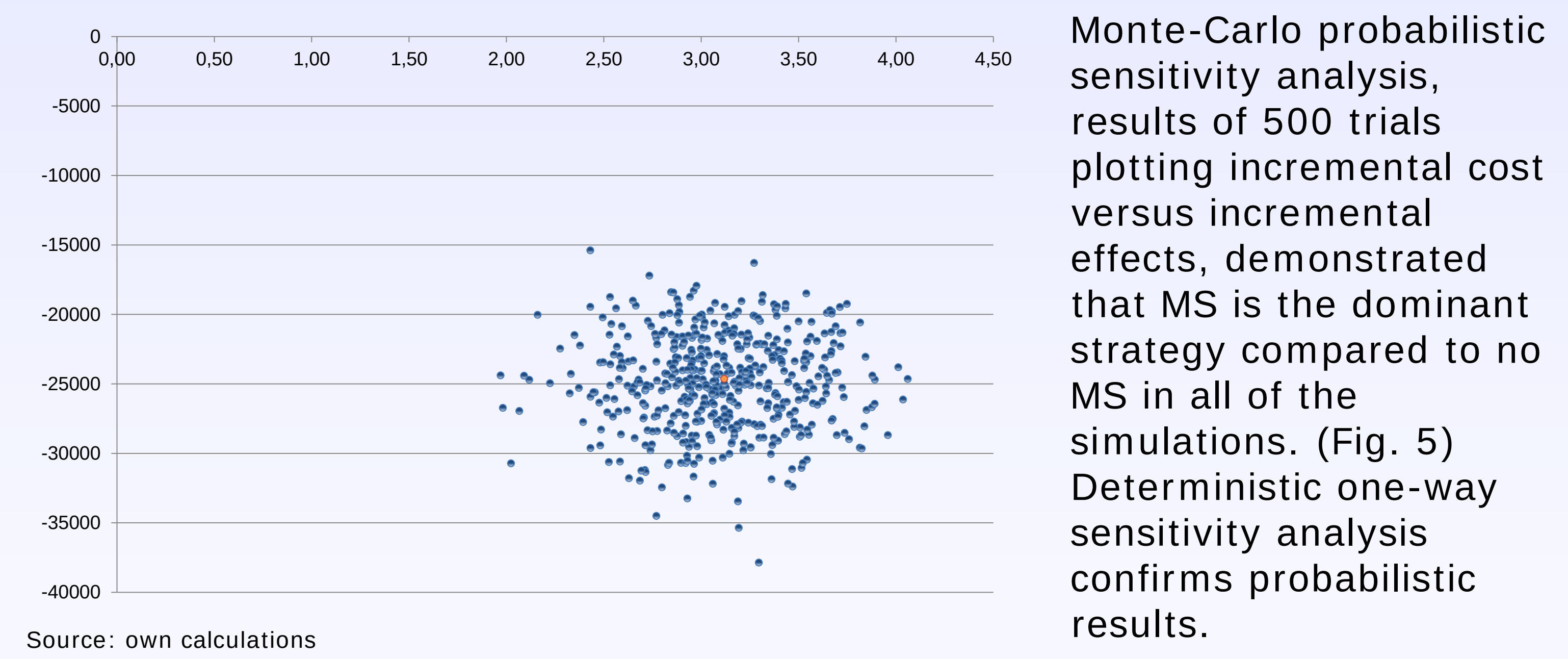


Source: own calculations

Sensitivity Analysis

The probabilistic sensitivity analysis shows the robustness of the model.

Fig. 5: Probabilistic Sensitivity Analysis



Source: own calculations

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.

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Additional Literature with the author