Cost-effectiveness and cost-utility of insulin glargine compared with NPH insulin based on a 10-year simulation of long-term complications with the Diabetes Mellitus Model inpatients with type 2 diabetes in Switzerland

Brandle M, Azoulay M, Greiner R A

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study examined the use of insulin glargine (IG) for the treatment of patients with Type 2 diabetes mellitus.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of 10,000 patients with Type 2 diabetes mellitus that was not adequately controlled by oral antidiabetic agents. The model was run for cohorts with levels of glycated haemoglobin (HbA1c) of 8, 9 and 10%.

Setting
The setting was primary care. The economic study was set in Switzerland.

Dates to which data relate
The effectiveness data were obtained from a clinical trial published in 2003. The resource use data were obtained from public sources and literature dating from between 2001 and 2005. The price year was 2005.

Source of effectiveness data
The clinical parameters associated with the model included the HbA1c value achieved, and the HbA1c reduction for each of the three treatment arms.

Modelling
A published and validated Diabetes Mellitus Model (DMM) covering a period of 10 years was used to project the long-term clinical and economic benefits associated with IG treatment as a replacement for NPH insulin for six different scenarios. In the DMM, the course of diabetes and the risk of developing a long-term complication were simulated using a Markov process. The cycle length was 1 year. The time horizon of the model was 10 years. Patient cohorts were defined in terms of levels of HbA1c and other patient parameters, such as age, gender, duration of diabetes, blood pressure and lifestyle.

Sources searched to identify primary studies
The main effectiveness data were obtained from a published clinical trial (Fritsche et al. 2003, see 'Other Publications of Related Interest' below for bibliographic details). The details of the clinical trial were not reported. Assumptions about long-term HbA1c values were partially based on the UKPDS trial.

**Methods used to judge relevance and validity, and for extracting data**
The process used to identify the data was not reported. No inclusion criteria for any parameters were specified.

**Measure of benefits used in the economic analysis**
The summary measure of health benefit used was the quality-adjusted life-years (QALYs). The utility scores were obtained from published values of the EuroQol EQ-5D that had been derived from 4,641 patients with Type 2 diabetes in five European countries. The QALYs were discounted at a rate of 3% per year.

**Direct costs**
The analysis of the costs appears to have been carried out from the perspective of the Swiss health care system. The categories of costs included in the analysis and the unit costs were reported. Resource use was determined by the model. The unit cost data were derived from publicly available sources and published literature. The price year was 2005. Discounting was performed at an annual rate of 3%.

**Statistical analysis of costs**
No statistical analyses of the costs were conducted.

**Indirect Costs**
Productivity costs were not included in the economic analysis.

**Currency**
Swiss francs (CHF).

**Sensitivity analysis**
Univariate sensitivity analyses were performed to investigate the impact of variations in discount rate and HbA1c levels on the model outcomes. Two arms of the trial evaluated optimistic and pessimistic estimates of effectiveness, which is a form of sensitivity analysis.

**Estimated benefits used in the economic analysis**
For a baseline HbA1c level of 9%, the QALYs per 1,000 patients were 2,601 for the IG optimistic case scenario, 2,515 for the IG pessimistic case scenario and 2,478 for NPH insulin.

The incremental QALYs per patient were 0.123 for the IG optimistic case scenario over NPH insulin and 0.037 for the IG pessimistic case scenario over NPH insulin.

**Cost results**
For a baseline HbA1c level of 9%, the total cost per patients were CHF 32,600 for the IG optimistic case scenario, CHF 33,935 for the IG pessimistic case scenario and CHF 32,250 for NPH insulin.

The difference in total costs per patient was CHF 305 for the IG optimistic case scenario versus NPH insulin and CHF 1,685 for the IG pessimistic case scenario versus NPH insulin.
Synthesis of costs and benefits
Incremental cost-effectiveness ratios were calculated in order to combine the costs and benefits of the alternative treatment scenarios.

For a baseline HbA1c level of 9%, the incremental costs per QALY gained (CHF/QALY) were 2,853 with the IG optimistic case scenario over NPH insulin and 45,701 with the IG pessimistic case scenario over NPH insulin. IG became dominant (i.e. less costly and more effective than its comparator) in the optimistic scenario for a cohort of patients with an HbA1c level of 10%.

Authors' conclusions
Compared with NPH insulin therapy, insulin glargine (IG) was cost-effective for the treatment of patients with Type 2 diabetes mellitus.

CRD COMMENTARY - Selection of comparators
The treatment strategies compared were reported clearly and were the current practice in Switzerland.

Validity of estimate of measure of effectiveness
The effectiveness data were derived from the literature, but it was unclear if the primary studies were identified through a systematic review of the literature. Neither the sources searched to identify them, nor the characteristics of the studies retrieved were reported.

Validity of estimate of measure of benefit
The estimation of health benefits (QALYs) was modelled in the DMM. The methods used to estimate the utility weights were described in full.

Validity of estimate of costs
The costs included appear to have reflected the perspective reported for the analysis. The sources of the cost data and resource use were reported in full, along with cost adjustments, including both price year and discounting. A detailed breakdown of the unit costs was reported. A univariate sensitivity analysis was performed to assess the impact of uncertainty.

Other issues
The authors stated that their findings were consistent with those from other published studies. The issue of the generalisability of the study results to other settings was addressed through the sensitivity analyses. This enhances the external validity of the study. The analysis referred to patients with Type 2 diabetes mellitus with poor control of their disease, and this was reflected in the authors' conclusions. The authors noted that defining the cohort without long-term complications at the start of simulation might result in the underestimation of incremental cost-effectiveness ratios.

Implications of the study
The study results support the use of IG for the treatment of patients with Type 2 diabetes mellitus in Switzerland.

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**Other publications of related interest**
Because readers are likely to encounter and assess individual publications, NHS EED abstracts reflect the original publication as it is written, as a stand-alone paper. Where NHS EED abstractors are able to identify positively that a publication is significantly linked to or informed by other publications, these will be referenced in the text of the abstract and their bibliographic details recorded here for information.


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Aged; Computer Simulation; Cost-Benefit Analysis; Diabetes Mellitus, Type 2 /complications /drug therapy /economics; Epidemiologic Methods; Female; Health Care Costs; Hemoglobin A, Glycosylated /drug effects; Humans; Hypoglycemic Agents /economics /therapeutic use; Insulin /analogs & derivatives /economics /therapeutic use; Insulin Glargine; Insulin, Isophane /economics /therapeutic use; Insulin, Long-Acting; Male; Middle Aged; Quality of Life; Quality-Adjusted Life Years; Switzerland

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