Cost-effectiveness of insulin glargine versus NPH insulin for the treatment of type 2 diabetes mellitus, modeling the interaction between hypoglycemia and glycemic control in Switzerland

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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.

CRD summary
The objective was to evaluate the cost-effectiveness of insulin glargine, compared with neutral protamine Hagedorn insulin, for the treatment of type 2 diabetes mellitus. The authors concluded that insulin glargine was cost-effective within the assumptions of their study. The methods were adequate, but those used to obtain the effectiveness estimates were not reported in detail. The results were reported fully and the authors’ conclusions appear to be valid, but their external validity relies on the appropriateness of the clinical inputs.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of insulin glargine, compared with neutral protamine Hagedorn (NPH) insulin, in the treatment of type 2 diabetes mellitus.

Interventions
Insulin glargine was compared with human NPH insulin.

Location/setting
Switzerland/community care.

Methods
Analytical approach:
A modified discrete-event model was employed to consider the long-term economic and health impact of reductions in hypoglycaemia due to achieving target glycated haemoglobin (HbA\textsubscript{1c}) levels. The time horizon was 40 years. The authors did not explicitly report the perspective.

Effectiveness data:
The clinical and effectiveness data were from a wide range of sources including: Swiss life tables, clinical databases, trials, and cohort studies. The main effectiveness estimates were the treatment effects of each insulin intervention on the hypoglycaemic events. This information was from a literature search of the MEDLINE database, which identified a number of trials.

Monetary benefit and utility valuations:
The utility estimates were from the UK Prospective Diabetes Study (Clarke, et al. 2004, see ‘Other Publications of Related Interest’ below for bibliographic details) or from publications in the Health Outcomes Data Repository (HODaR) database.

Measure of benefit:
Life-years and quality-adjusted life-years (QALYs) gained were the summary benefit measures. Future outcomes, over the 40 years, were discounted at an annual rate of 3.5%.

Cost data:
The direct costs were those of treatment for micro- and macro-vascular events, physicians’ services, laboratory services, ergotherapy services, orthopaedic appliances, rehabilitation, long-term care in homes for the elderly, emergency care, and the drugs. The costs were from a number of sources, including Swiss fee schedules, official drug price lists, published studies, Swiss diagnosis-related group (DRG) data, hospital statistics, and expert opinion. Future costs were discounted at an annual rate of 3.5%. The price year was 2006 and all costs were reported in Swiss francs (CHF).

Analysis of uncertainty:
One-way sensitivity analyses were undertaken to assess the effects of varying the key assumptions and model parameters, on the results. The parameters that were varied included the hypoglycaemic risk and risk reductions, the costs of complications, the utility decrements, the follow-up, and the discount rate.

Results
The average life-years gained were 14.897 with insulin glargine, compared with 14.847 with NPH insulin. The average QALYs gained were 10.207 with insulin glargine, compared with 10.109 with NPH insulin.

The average cost per patient was CHF 62,691 for insulin glargine, compared with CHF 60,113 for NPH insulin.

Compared with NPH insulin, the additional cost per life-year gained (incremental cost-effectiveness ratio) for insulin glargine was CHF 51,100, and the additional cost per QALY gained (incremental cost-utility ratio) was CHF 26,271.

The incremental cost-utility ratio was most sensitive to changes in the costs, the utility decrements, and the relative risk of hypoglycaemia.

Authors’ conclusions
The authors concluded that insulin glargine was cost-effective, in Switzerland, within the assumptions of their study.

CRD commentary
Interventions:
The interventions were clearly described.

Effectiveness/benefits:
The clinical and effectiveness data were from a wide range of sources, including Swiss data and data from other countries. The references for these sources were reported. They were identified by a review of the literature in the MEDLINE database, but the methods of this review, and any inclusion or quality criteria were not reported. Searching one database was unlikely to identify all relevant clinical trials. For these reasons, it is not possible to determine if all the relevant evidence was included in the model.

Costs:
The perspective was not explicitly reported, but all the major costs relevant to a health care system perspective appear to have been included. The sources for the unit costs, the costs, and the resource use were reported, as were the time horizon, price year, and discount rate.

Analysis and results:
All the evidence on health outcomes and costs was synthesised using a discrete-event simulation. The details of the model were provided, including a diagram. The impact of uncertainty on the model results was assessed in one-way sensitivity analyses. This type of analysis goes some way towards evaluating uncertainty, but a probabilistic sensitivity analysis can evaluate the overall model uncertainty. The authors reported that the main limitation to their study was that it included effectiveness estimates from international studies rather than Swiss sources.

Concluding remarks:
The methods were adequate, but those used to obtain the effectiveness estimates were not reported in detail. The results were reported fully and the authors’ conclusions appear to be valid, but their external validity relies on the appropriateness of the clinical inputs.
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