Evaluation of the cost effectiveness of exenatide versus insulin glargine in patients with sub-optimally controlled type 2 diabetes in the United Kingdom

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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 examine the cost-effectiveness of exenatide versus insulin glargine in patients aged 40 years or more with sub-optimally controlled type two diabetes. In all scenarios, insulin glargine was found to be dominant over exenatide at the current UK National Health Service prices. The study appears to have been based on a valid methodology, with good reporting of the sources and results. The authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to examine the cost-effectiveness of exenatide versus insulin glargine in patients aged 40 years or more with sub-optimally controlled type two diabetes.

Interventions
Exenatide and insulin glargine were administered in addition to oral hypoglycaemic agents (metformin and sulphonylurea at their maximum doses). The average dosage of glargine was 25 international units per day.

Location/setting
UK/primary care.

Methods
Analytical approach:
A published, discrete event simulation model based on the UK Prospective Diabetes Study (UKPDS) was used to determine the clinical and economic impact of the two strategies. The time horizon of the analysis was 40 years. The authors stated that the perspective of the National Health Service (NHS) was adopted.

Effectiveness data:
The clinical data were derived from a selection of known, relevant studies. The baseline cohort profiles and short-term drug effectiveness data were taken from a published head-to-head randomised controlled trial (RCT). The long-term probabilities of adverse effects, such as ischaemic heart disease, myocardial infarction, congestive heart failure (coronary heart disease), stroke, blindness in one eye, end stage renal disease, and amputation, were taken from the UKPDS and a population-based study on the burden of hypoglycaemic events. The key clinical inputs were the rate of hypoglycaemic events (daytime and nocturnal) and weight loss with exenatide versus insulin glargine.

Monetary benefit and utility valuations:
The utility estimates were taken from the UKPDS or were generated via the Health Outcomes Data Repository database. The utility decrements associated with each event were considered mainly on the basis of the EuroQol at five dimensions (EQ-5D) questionnaire.

Measure of benefit:
Quality-adjusted life-years (QALYs) were used as the summary benefit measure. A 3.5% annual discount rate was applied to those accrued after the first year.
Cost data:
The health services were drugs (including daily glucose monitoring for insulin glargine) and treatment of diabetes-related complications. The drug costs were estimated using the average wholesale prices in the UK and assuming that they were used at their maximum daily dosage. Other costs were obtained from published sources such as the UKPDS, The Diabetes Control and Complication Trial, and other reports. The costs were presented as macro-categories. All costs were in UK pounds sterling (£) and the price year was 2007. Future costs were discounted at an annual rate of 3.5%.

Analysis of uncertainty:
A deterministic sensitivity analysis was undertaken to consider the uncertainty around the clinical assumptions regarding the long-term efficacy of the two drugs. Another area of uncertainty was that of discontinuation rates. The results were presented for three scenarios. In the first scenario, patients who discontinued treatment remained in the analysis. In the second, patients who discontinued treatment were removed from the analysis and, in the third, patients who discontinued exenatide were switched to insulin glargine.

Results
In all scenarios, insulin glargine was simultaneously more effective and less expensive, and was thus the dominant strategy.

In a cohort of 1,000 patients, when patients who discontinued were ignored, the discounted costs were £14,567,526 with exenatide and £9,280,312 with insulin glargine and the discounted QALYs were 7,683 with exenatide and 7,864 with insulin glargine.

When those who discontinued were removed from analysis, the costs were £13,255,912 with exenatide and £9,296,371 with insulin glargine and QALYs were 7,000 with exenatide and 7,865 with insulin glargine.

When those who discontinued were switched to insulin glargine, the costs were £14,092,624 with exenatide and £9,296,371 with insulin glargine and QALYs were 7,703 with exenatide and 7,865 with insulin glargine.

The results of the sensitivity analysis corroborated the base-case findings and, in all circumstances, insulin glargine remained the dominant option.

Authors' conclusions
The authors concluded that, even under conservative assumptions, insulin glargine was dominant over exenatide at the current UK NHS prices. Thus, exenatide was not a cost-effective strategy for the routine treatment of patients with type two diabetes.

CRD commentary
Interventions:
The authors provided a justification for the selection of the two treatments, which at that time were not recommended by the National Institute for Clinical Excellence (NICE) for routine use in people with type two diabetes, but were recommended for specific cases.

Effectiveness/benefits:
The sources of clinical data were selected by the authors and this selection appears to have been appropriate. For example the effectiveness evidence was obtained from the only head-to-head RCT available. In general, RCTs are considered a robust source of evidence. Furthermore, the UKPDS represents a valid source of evidence due to the strengths of this type of study. Uncertain assumptions about the long-term impact of the two drugs were tested in the sensitivity analysis. The authors provided an extensive description of the methodology used to derive the utility valuations. All the assumptions made in the derivation of the QALYs were made explicit and were clearly discussed. QALYs are appropriate given the impact of the disease on the patient's quality of life. They have the further advantage of being comparable with the benefits of other health care interventions.

Costs:
The analysis included all the categories of costs relevant to the viewpoint. The types of costs were reported and a justification for the exclusion of some cost categories was given. For example, the costs of glucose monitoring, such as blood glucose testing meters or finger-pricking devices, were not included because they were not available on the NHS. The costs were mainly derived from other published reports and, as a result, little information on their derivation was given. A breakdown of cost items was not given and unit costs were not presented separately from resource quantities. Other details of the economic analysis such as the price year and the use of discounting were reported. Variations in the economic inputs were not considered in the sensitivity analysis.

**Analysis and results:**
An incremental analysis was appropriately used to combine the costs and benefits. The issue of uncertainty focused on the clinical endpoints and their impact on the study findings was extensively investigated. The results of both the base-case and the sensitivity analyses were clearly presented for all the scenarios considered. The published modelling framework used in the analysis had been validated in several reports. The authors compared their findings with those from other studies, and potential explanations for different conclusions drawn in other studies were given. A key limitation was also reported to be the unrealistically low dose of insulin glargine. However, this uncertain input was investigated in the sensitivity analysis.

**Concluding remarks:**
The study appears to have been based on a valid methodology, with good reporting of the sources and results. The authors' conclusions appear to be valid.

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