Therapy conversion to insulin detemir among patients with Type 2 diabetes treated with oral agents: a modeling study of cost-effectiveness in the United States

Valentine W J, Erny-Albrecht K M, Ray J A, Roze S, Cobden D, Palmer A J

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 study evaluated the cost-effectiveness of insulin detemir (Idet) added to oral hypoglycaemic agents (OHAs) for the treatment of patients with Type 2 diabetes in comparison with OHA alone, neutral protamine Hagedorn insulin added to OHA, and insulin glargine added to OHA. The analysis showed that Idet was a cost-effective strategy from the perspective of the US payer in patients not adequately controlled with the other treatments. Globally, the study was well conducted and presented, although some methodological aspects were reported in the published decision model study.

Type of economic evaluation

Cost-utility analysis

Study objective

The objective of the study was to determine the long-term cost-effectiveness of insulin detemir (Idet) added to oral hypoglycaemic agents (OHAs) for the treatment of patients with Type 2 diabetes, in comparison with other commonly used therapies such as OHA only, neutral protamine Hagedorn insulin (NPH) added to OHA, and insulin glargine (Iglarg) added to OHA.

Interventions

The interventions under examination were four treatments for Type 2 diabetes. These were ldet added to OHA, OHA alone, NPH added to OHA, and Iglarg added to OHA. Idet plus OHA was assumed to be given to patients who achieved inadequate control with the other three treatments.

Location/setting

USA. Primary/secondary care.

Methods

Analytical approach:

A validated computer simulation model was used to assess the cost-effectiveness of the four alternative treatments. The model was populated with published evidence. A lifetime horizon (35 years) was considered. The authors stated that the perspective of the third-party payer was adopted.

Effectiveness data:

The clinical data came from published studies that appear to have been identified selectively on the basis of the published model. The bulk of the information on treatment effect and patient characteristics was derived from the German cohort of a multi-centre observational study (the Predictable Results and Experience in Diabetes through Intensification and Control to Target: an International Variability Evaluation; PREDICTIVE study), involving more than 2,000 patients who were followed for 12 weeks. The key model input was treatment effectiveness, i.e. changes in glycosylated haemoglobin and in body mass index and all hypoglycaemic events.

Monetary benefit and utility valuations:

Quality-of-life estimates were derived from a published study, which was not described. Disutilities for hypoglycaemic events were also considered.

Measure of benefit:

The summary benefit measure was the number of quality-adjusted life-years (QALYs) which were associated with each treatment. QALYs were estimated using the modelling framework and were discounted at an annual rate of 3%. Life expectancy was also reported but was not combined with the costs.

Cost data:
The analysis included the costs of treatment, complications and medications associated with events or conditions related to diabetes. The costs were presented as macro-categories. Quantities of medications reflected actual consumption in the observational study and were costed using average wholesale prices. Other costs were based on published US sources, including diagnosis-related group estimates. Discounting was relevant given the long-term horizon of the analysis, and an annual rate of 3% was applied. The costs were in US dollars ($) and the price year was 2005.

Analysis of uncertainty:
A deterministic univariate sensitivity analysis was undertaken to identify the impact of variations in key model inputs. Alternative ranges of values were either based on authors' opinions or were derived from published sources. A non-parametric bootstrapping approach was also used to calculate mean and standard deviations of model outputs. The results were presented using cost-effectiveness acceptability curves.

Results

The expected mean QALYs and costs were, respectively, 5.056 and $77,624 with Idet+OHA and 4.747 and $75,333 with OHA alone, for an incremental cost per QALY of $7,412.

The expected mean QALYs and costs were, respectively, 4.927 and $81,516 with Idet+OHA and 4.476 and $78,692 with NPH+OHA, for a cost per QALY of $6,269.

The expected mean QALYs and costs were, respectively, 4.951 and $81,718 with Idet+OHA and 4.487 and $79,883 with Iglarg+OHA, for a cost per QALY of $3,951.

The cost-effectiveness acceptability curves showed that, at a willingness-to-pay threshold of $50,000 per QALY, treatment with Idet+OHA had a 95% probability of being acceptable compared with OHA alone, and a 100% probability versus NPH+OHA or Iglarg+OHA.

The univariate sensitivity analysis showed that the cost-effectiveness of Idet plus OHA, compared with the other options, always remained under a threshold of $50,000 per QALY in all cases, although it was sensitive to changes in treatment effect and treatment duration.

Authors' conclusions

The authors concluded that therapy conversion to Idet plus OHA for patients inadequately controlled with OHA alone, NPH plus OHA, or Iglarg plus OHA, was a cost-effective strategy from the perspective of the US payer.

CRD commentary

Interventions:
: The rationale for the selection of the comparators was clear and appropriate, as all strategies were relevant for the authors' setting. The choice was also based on recent results from randomised controlled trials or observational studies.

Effectiveness/benefits:
: Clinical estimates were derived from selectively identified studies. Key data came from a sub-group analysis of an ongoing observational study, representing real world practice. The use of an observational study could present some potential limitations due to the non-randomised design, but the large sample size and comprehensive sensitivity analysis should have overcome this drawback to some extent. The use of German patients rather than US patients should not be an issue for treatment effect, but might create some bias in terms of baseline risk of events. The authors addressed this issue by using baseline characteristics of US patients in the sensitivity analysis, without producing any impact on the final results. Other data were based on the evidence used in the published model, the details of which were reported in part. Little information about the derivation of utility estimates was provided.

Costs:
The analysis of the costs appears to have been consistent with the authors' stated perspective. A breakdown of cost items was not given since the costs were presented as macro-categories. This reflects the accounting system used to derive costs in the USA. The price year was explicitly reported, which will help if reflating the analysis in other time periods. The sources of the costs were reported for all categories.

Analysis and results:
: The authors provided a clear description of the decision model. The costs and benefits were appropriately synthesised. Furthermore, the issue of uncertainty was well addressed and presented. Alternative scenarios were considered and cost-effectiveness acceptability curves were used. The authors noted some possible drawbacks of the analysis, in particular, the use of German data for the US cohort of diabetic patients and the use of treatment effect information from an observational study, as already highlighted.

Concluding remarks:
Overall, the methodology of the study was robust, although some details were not extensively reported as the decision model was based on a previous publication. In general, the authors' conclusions appear robust, as was also demonstrated in the sensitivity analysis.

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Bibliographic details
Valentine W J, Erny-Albrecht K M, Ray J A, Roze S, Cobden D, Palmer A J. Therapy conversion to insulin detemir among patients with Type 2 diabetes treated with oral agents: a modeling study of cost-effectiveness in the United States. Advances in Therapy 2007; 24(2): 273-290

Other publications of related interest
Meneghini LF, Rosemberg KH, Koenen C, et al. Insulin detemir improves glycaemic control with less hypoglycaemia and no weight gain in patients with type 2 diabetes who were insulin naive or treated with NPH or insulin glargine: clinical practice experience from a German subgroup of the PREDICTIVE study. Diabetes Obes Metab 2007;9:902-13.

Palmer AJ, Roze S, Valentibe WJ, et al. The CORE Diabetes Model: projecting long-term clinical outcomes, costs and cost-effectiveness of interventions in diabetes mellitus (types 1 and 2) to support clinical and reimbursement decision-making. Curr Med Res Opin 2004;20 Suppl 1:S5-26.

Palmer AJ, Roze S, Valentibe WJ, et al. Validation of the CORE diabetes model against epidemiological and clinical studies. Curr Med Res Opin 2004;20 Suppl 1:S27-40.

Indexing Status
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MeSH
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