The cost-effectiveness of saxagliptin versus NPH insulin when used in combination with other oral antidiabetes agents in the treatment of type 2 diabetes mellitus in Poland

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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 study examined the cost-effectiveness of saxagliptin versus insulin as second-line therapy with either metformin or sulphonylurea after failure of the respective monotherapies for patients with type 2 diabetes. The authors concluded that saxagliptin-based strategies improved health outcomes and were cost-effective compared with insulin-based treatments. The study used a conventional cost-effectiveness framework and a valid simulation model. The authors’ conclusions appear robust.

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

Study objective
The study examined the cost-effectiveness of saxagliptin versus insulin as second-line therapy with either metformin or sulphonylurea after failure of the respective monotherapies for patients with type 2 diabetes.

Interventions
Two separate comparisons were considered: a combination of metformin plus saxagliptin was compared against metformin plus insulin in patients who failed metformin monotherapy; and a combination of sulphonylurea plus saxagliptin was compared against sulphonylurea plus insulin in patients who failed sulphonylurea monotherapy.

Location/setting
Poland/primary care.

Methods
Analytical approach:
The analysis was based on the published and validated Cardiff Diabetes Model that simulates management of diabetic patients over a time horizon of 40 years. The authors stated that the perspective was that of the Polish National Health Fund.

Effectiveness data:
A selective approach was used to identify relevant sources of evidence. Most data had been already incorporated in the model and were based on evidence from the United Kingdom Prospective Diabetes Study (UKPDS). Additional data taken from country-specific sources and published studies were used to populate the model. Efficacy of treatment in terms of change in HbA1c and body weight was a key input of the model and was taken from several studies including a meta-analysis of 14 clinical trials and a systematic review. No head-to-head studies were available.

Monetary benefit and utility valuations:
Utility valuations were derived from published sources. Most data were taken from UKPDS given the lack of Polish data.

Measure of benefit:
Quality-adjusted life-years (QALYs) and life-years were used as the summary benefit measures and were discounted at an annual rate of 3.5%.
Cost data:
The economic analysis included costs of treatments and diabetes-related events (congestive heart failure, myocardial infarction, stroke, ischaemic heart disease, amputation, blindness, end-stage renal disease and severe hypoglycaemia). These costs were taken from official tariffs set by the Ministry of Health or country-specific diabetes sources. Some data were obtained from personal communications with experts. Costs were in Polish zloty (PLN) and were also expressed in US dollars ($). The price year was 2009. A 5% annual discount rate was applied.

Analysis of uncertainty:
One- and two-way sensitivity analyses were carried out to identify key inputs of the model. A probabilistic sensitivity analysis was performed to generate cost-effectiveness acceptability curves.

Results
In the metformin model, QALYs, life-years and costs were 13.20, 22.58, and $10,066 with metformin plus insulin and 13.33, 22.58 and $11,396 with metformin plus saxagliptin. The incremental cost per QALY gained with metformin plus saxagliptin was $9,966 over metformin plus insulin. When using life-years, metformin plus saxagliptin was dominated by metformin plus insulin, which was similar in effectiveness but cheaper.

In the sulphonylurea model, QALYs, life-years and costs were 13.18, 22.53 and $10,406 with sulphonylurea plus insulin and 13.32, 22.53 and $11,688 with sulphonylurea plus saxagliptin. The incremental cost per QALY gained with sulphonylurea plus saxagliptin was $8,953 over sulphonylurea plus insulin. Incremental cost per life-year gained was $852,127.

At a threshold of $36,300 per QALY gained, the probability of saxagliptin strategies being cost-effective was 74% in the metformin model and 76% in the sulphonylurea model. The most influential inputs were disutilities, weight gain, assumptions related to a second-line therapy, HbA1c at baseline, patient age and dose of insulin in second-line treatment. The incremental cost per QALY did not exceed $18,150 in any of the simulations.

Authors' conclusions
The authors concluded that saxagliptin-based strategies improved health outcomes and were cost-effective compared with insulin-based treatments.

CRD commentary
Interventions:
The selection of the comparators was appropriate in that combination therapies were compared after monotherapy failure. These options accorded with Polish official recommendations for management of type 2 diabetes. Only insulin was a reimbursed second-line oral treatment in the authors' setting.

Effectiveness/benefits:
Most clinical inputs were derived from a published model. The authors stated that little evidence was available for the Polish setting and most inputs had to be obtained from studies conducted elsewhere. Treatment effect was taken from sources with high internal validity such as meta-analyses of clinical trials or systematic reviews. No head-to-head studies were available and this was acknowledged as a potential bias. Adjustments to the Polish populations were made and an extensive sensitivity analysis was conducted. Both life-years gained and QALYs were valid benefit measures and enabled comparisons with other disease areas. Utility weights and disutilities were taken not from Polish estimates but from several studies that were not fully described. Given that all cost-effectiveness results were driven by differences in quality of life scores this represented a key point to take into account.

Costs:
The economic analysis was consistent with the perspective stated by the authors. The categories of costs were appropriate. Data sources were reported clearly and reflected the viewpoint of the national health care payer. Costs were presented as macro-categories and were not broken down into individual items except for drug costs. Some data were based on expert opinions (probably due to the lack of valid published estimates). Currency conversions were reported. Other details of the analysis such as the price year and use of discounting were stated clearly. Cost inputs were varied in the sensitivity analyses.
Analysis and results:
The study results were presented extensively. An incremental approach was used to synthesise costs and benefits of the alternative strategies. Both deterministic and probabilistic analyses were used to investigate the issue of uncertainty. The results of the sensitivity analyses were reported clearly. No details of the distributions associated with the model parameters were given and it was unclear whether a first- or second-order probabilistic analysis was conducted. The authors acknowledged that, although the lack of head-to-head studies was a limitation of the analysis, it appeared that most assumptions favoured the insulin option and the results could be considered conservative against saxagliptin. The issue of transferability of study results was not explicitly addressed and the findings appeared specific to the Polish setting.

Concluding remarks:
The study used a conventional cost-effectiveness framework and a valid simulation model. The authors’ conclusions appear robust.

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