Cost-effectiveness of insulin aspart compared to human insulin in pregnant women with type 1 diabetes in the UK

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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
This study evaluated the costs and outcomes associated with insulin aspart and human insulin in pregnant women with type 1 diabetes. The authors concluded that insulin aspart resulted in more live births at term without increasing the total costs, because the cost of management of pre-term birth was high compared with the costs of insulin. Insufficient detail was reported to determine whether the results and conclusions were reliable or not.

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

Study objective
The objective was to assess the costs and outcomes associated with insulin aspart and human insulin, as part of a basal-bolus insulin regimen, in pregnant women with type 1 diabetes.

Interventions
This economic evaluation was based on the Insulin Aspart Pregnancy Study Group trial (Mathiesen, et al. 2007, see ‘Other Publications of Related Interest’ below for bibliographic details) and compared insulin aspart (NovoRapid) versus human insulin (Actrapid), as a basal-bolus regimen with neutral protamine Hagedorn (NPH) insulin. The doses were titrated according to American Diabetes Association guidelines.

Location/setting
UK/primary and secondary care.

Methods
Analytical approach:
This study was based on a single clinical trial. The time horizon was from pregnancy until delivery, plus the expected duration of neonatal care for pre-term infants. The authors stated that they took the UK National Health Service (NHS) perspective.

Effectiveness data:
The evidence came from a single open-label multi-country randomised controlled trial of 322 patients, of whom 302 had known pregnancy outcomes, with 151 in each group. The main outcome was defined retrospectively and was the percentage of women with a live birth at term (37 weeks or more of gestation).

Monetary benefit and utility valuations:
There was no utility measure in the base case, but in a sensitivity analysis, the utility values were estimated using quality-adjusted life weights from, and a method used in, a previous report (Nicholson, et al, 2005, see ‘Other Publications of Related Interest’ below for bibliographic details). No details of this method were reported, but the authors stated that it did not meet the current UK standards.

Measure of benefit:
The percentage of women with a live birth at term (37 weeks or more of gestation) was the measure of benefit. In the sensitivity analysis, quality-adjusted life-years (QALYs) were calculated. The authors did not state whether discounting was used.
Cost data:
The cost categories included insulin, serious treatment-emergent adverse events, hospital births, and hospital admissions for pre-term infants. Some common protocol driven costs were excluded. The resource use for the women with diabetes was from the trial, and that for their babies was assumed, based on the literature. As Actrapid was not available in cartridge form in the UK, the cost of another human insulin in cartridge form was used (Humulin S). The unit costs came from local and national NHS sources. The price year was 2007 and the costs were in UK pounds sterling (£). Reflation of older costs was performed using a health care inflation index.

Analysis of uncertainty:
Non-parametric bootstrapping was used to generate confidence intervals for the costs and effects. Other sensitivity analyses included changing the unit costs and neonatal care duration, administering insulin in vials instead of cartridges, and using QALYs as the benefit. Subgroup analyses were conducted on maternal age, country of enrolment, and haemoglobin A1c levels at baseline.

Results
Significantly more women experienced a live birth at term with insulin aspart (72.8%) than with human insulin (60.9%), which was a gain of 11.9% (95% CI 2.0 to 21.9) with insulin aspart. The total mean costs per patient were £3,222 with insulin aspart and £3,539 with human insulin, which was a saving of £318 (95% CI 576 to 1,353) with insulin aspart.

There was a 95% probability that insulin aspart was more cost-effective at a willingness-to-pay of £5,000 per live birth at term. More QALYs were accrued per pregnancy, with insulin aspart (24.7) than with human insulin (24.0), but this difference was not significant.

The results were robust to the parameters varied and there were no clear differences between subgroups. The regression analysis found no statistically significant associations between the expected costs and the different variables, such as country of enrolment.

Authors' conclusions
The authors concluded that, for pregnant women with type 1 diabetes, compared with human insulin, insulin aspart resulted in more live births at term, without increasing the total costs of treatment, and a prospective trial was needed to confirm these results.

CRD commentary
Interventions:
The reporting of the interventions was sufficient, but there was little discussion on the comparators and it was not clear if the current UK practice and all the relevant comparators were included.

Effectiveness/benefits:
The authors acknowledged that they did not use the primary outcome of the trial, which was maternal hypoglycaemia, and retrospectively chose another outcome. They did not justify this choice, but they did recommend that their results should be confirmed in a prospective trial. They did not report whether this was the only clinical evidence available and there was little discussion about the generalisability of the multi-country data to the UK.

Costs:
The costs were clearly and transparently reported. The costs for an alternative brand of cartridge human insulin were used, as the one tested in the trial was not available in the UK in cartridge form, but the results were robust to variation in this cost.

Analysis and results:
The analysis was based on a randomised controlled trial, but the authors did not describe it in detail. They did not state whether it was based on an intention-to-treat principle, nor the reason to include patients that were excluded in the trial analysis. The impact of uncertainty was reasonably well investigated, but the generalisability of the results was not addressed.
Concluding remarks:
Insufficient detail was reported to determine whether the results and conclusions were reliable or not.

Funding
Funded by Novo Nordisk.

Bibliographic details
Lloyd A, Townsend C, Munro V, Twena N, Nielsen S, Holman A. Cost-effectiveness of insulin aspart compared to human insulin in pregnant women with type 1 diabetes in the UK. Current Medical Research and Opinion 2009; 25(3): 599-605

PubMedID
19232034

DOI
10.1185/03007990802668208

Original Paper URL
http://informahealthcare.com/doi/abs/10.1185/03007990802668208

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Female; Great Britain; Humans; Insulin /analogs & derivatives /therapeutic use; Insulin Aspart; Pregnancy; Pregnancy Outcome; Pregnancy in Diabetics; Retrospective Studies

AccessionNumber
22009102495

Date bibliographic record published
24/03/2010

Date abstract record published
04/08/2010