Evaluating the cost-effectiveness of self-monitoring of blood glucose in type 2 diabetes patients on oral anti-diabetic agents: a long-term modelling study 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
This study examined the cost-effectiveness of once, twice, or three times daily self-monitoring of blood glucose, compared with no self-monitoring, for patients with type 2 diabetes, who were treated with oral antidiabetic drugs, from the perspective of the third-party payer. The authors concluded that self-monitoring was likely to be cost-effective, in Switzerland. The methods were robust, which should ensure the validity of the authors’ conclusions.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of once, twice, or three times daily self-monitoring of blood glucose, compared with no self-monitoring, for patients with type 2 diabetes, who were treated with oral antidiabetic drugs.

Interventions
The interventions were once, twice, or thrice daily self-monitoring of blood glucose. The comparator was no self-monitoring.

Location/setting
Switzerland/primary care and community (home).

Methods
Analytical approach:
The analysis was based on the Center for Outcomes Research (CORE) Diabetes Model, which projected the long-term costs and clinical outcomes associated with diabetes. A 30-year time horizon was considered. The authors stated that the perspective of the third-party payer was adopted.

Effectiveness data:
Most of the clinical data had already been incorporated in the simulation model. The key data for this analysis were from a large four-year observational study of a subgroup of 5,867 patients from the Kaiser Permanente diabetes registry in the USA. This provided the data on the treatment effect of once, twice, or three times daily self-monitoring of blood glucose. The effect was measured by changes in glycated haemoglobin (HbA1c). Additional data were from another Kaiser Permanente cohort, a subpopulation of the National Health and Nutrition Examination Survey (NHANES), and the UK Prospective Diabetes Study (PDS) outcome model.

Monetary benefit and utility valuations:
The utility values were mainly from the UK PDS.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%. Several other outcomes were reported, such as life-years gained and all diabetes complications.

Cost data:
The economic analysis included the costs of oral antidiabetic drugs, self-monitoring once, twice, or three times per day,
patient management, and the treatment of complications. The annual costs for each category were reported in detail. These costs and associated resource quantities were from a Swiss economic evaluation. The costs were in Swiss francs (CHF), for the price year 2006, and a 3% annual discount rate was applied.

Analysis of uncertainty:
A Monte Carlo simulation was undertaken to calculate the mean and standard deviation for the model outcomes. Cost-effectiveness acceptability curves were generated for various willingness-to-pay (WTP) thresholds. One-way sensitivity analyses were undertaken on the key assumptions of the model, using published and assumed ranges of values. Two-way sensitivity analyses were carried out on selected inputs.

Results
The projected lifetime QALYs were 5.155 with no self-monitoring, 5.212 with once daily, 5.283 with twice daily, and 5.322 with thrice daily self-monitoring. The costs were CHF 116,059 with no self-monitoring, CHF 116,587 with once daily, CHF 117,709 with twice daily, and CHF 118,958 with thrice daily self-monitoring.

The incremental cost per QALY gained, over no self-monitoring, was CHF 9,177 with once daily, CHF 12,928 with twice daily, and CHF 17,342 with thrice daily self-monitoring.

At a WTP threshold of CHF 80,000 per QALY, the probability of being cost-effective, compared with no screening, was 66.8% for once daily, 80.9% for twice daily, and 83.9% for thrice daily self-monitoring. The incremental cost-utility ratios were sensitive to variations in the time horizon and the modelled improvement in glycated haemoglobin, but self-monitoring was cost-effective even in the worst scenarios.

Authors’ conclusions
The authors concluded that self-monitoring of blood glucose was likely to be cost-effective for patients in Switzerland.

CRD commentary
Interventions:
The selection of the comparators was appropriate and they should be applicable in other settings.

Effectiveness/benefits:
A selected data were used, in addition to those in the CORE model, which included all the necessary epidemiological inputs for the disease. The new data were from a large cohort of patients enrolled in an observational study that assessed the efficacy of the three frequencies of daily self-monitoring. These were likely to have been real-world data, from a US cohort, which should have been transferable to the authors’ context. Further inputs were from other valid and well-known sources. These inputs were not identified by a systematic search, but appear to have been appropriate for this analysis. The benefit measure was appropriate for capturing the impact of the disease on both survival and quality of life, which are relevant for patients with diabetes. No details were given of the methods used to elicit the patient preferences. The authors stated that the impact on health utility of self-monitoring, such as worry and depression, was not considered, as there were contradictory findings in the literature.

Costs:
The analysis of costs and the cost categories were consistent with the perspective adopted. Most of the costs were presented as category totals and were not broken down into individual items. Each cost category was reported, with the annual costs. These were from a published economic evaluation, conducted in the authors' setting and they are likely to be appropriate, but no details of the study were provided. Alternative cost estimates were assessed in the sensitivity analyses. Reflation exercises for other time periods should be possible as the price year was clearly stated. Conventional discounting was applied.

Analysis and results:
The results were clearly reported and the costs and benefits were appropriately synthesised, in an incremental analysis, which allowed the identification of the best strategy. Appropriate analyses were used to investigate the uncertainty. The results of these sensitivity analyses were extensively presented and the findings appear to be generalisable to settings with a similar cost structure. The authors acknowledged that a limitation of their analysis was the use of an
observational study for the treatment effect and the possibility selection bias or confounding could not be ruled out.

**Concluding remarks:**
The methods were robust, which should ensure the validity of the authors' conclusions.

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