Cost-effectiveness of implementing automated grading within the national screening programme for diabetic retinopathy in Scotland

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 aim of the study was to evaluate the cost-effectiveness of using an automated system in place of level 1 manual grading in the National Screening Programmes for diabetic retinopathy. The authors concluded that automated grading was likely to be a cost-effective alternative to manual grading. The study methodology appears appropriate and was reported clearly. The authors’ conclusions appear to reflect the scope of their analysis.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The aim of the study was to evaluate the cost-effectiveness of using an automated system in place of level 1 manual grading in the UK National Screening Programmes for diabetic retinopathy.

Interventions
A system of automated grading was compared with manual grading at the level 1 stage of a multi-level grading system. The first sets of images are graded by either the automated system or manually by a level 1 grader. Once initial grading has taken place, individuals appear to follow the same screening pathway.

Location/setting
UK/community.

Methods
Analytical approach:
A decision tree model was used to synthesise the costs and screening outcomes over a 1-year period for the two interventions being evaluated. The authors stated that the perspective adopted was that of the National Health Service.

Effectiveness data:
The effectiveness data were derived from a published study that assessed the efficacy of automated and manual grading on a set of 14,406 images from 6,722 Scottish patients. The patients' demographic characteristics were similar to those in the rest of Scotland. The main clinical input parameters included the prevalence of no retinopathy, mild background retinopathy, observable retinopathy and referable retinopathy, and the efficacy of grading.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The measures of benefit were the number of referable cases detected and the number of appropriate screening outcomes.

Cost data:
The cost analysis considered the costs of grading at each of the 3 levels, including the salaries of nurses and hospital consultants, training costs and the cost of further software development. The useful lifespan of the software was assumed to be 10 years and the software costs were discounted over the 10-year period at a rate of 3.5% per year. The
cost of quality assuring the manual grading strategy was also included. The price year was 2006. The costs were in UK pounds sterling (£).

Analysis of uncertainty:
A one-way sensitivity analysis was performed on all individual parameters, these being varied within the ranges of the 95% confidence intervals or other plausible ranges. Probabilistic sensitivity analysis (PSA) using Monte Carlo simulation was also conducted in order to address uncertainty around the cost and efficacy parameters.

Results
Over the 1-year assessment period, the automated strategy was expected to identify 5,560 cases and 158,170 appropriate outcomes, and the manual strategy 5,610 cases and 158,271 appropriate outcomes.

The expected costs were £230,400 for the automated strategy and £432,000 for the manual strategy.

The incremental cost-effectiveness ratios of manual strategy versus the automated strategy were £4,088 per additional care detected and £1,990 per appropriate screening outcome.

The results were most sensitive to changes in the proportion of referable cases detected by both interventions.

Authors' conclusions
The authors concluded that automated grading was likely to be a cost-effective alternative to manual grading within the screening programme for diabetic retinopathy.

CRD commentary
Interventions:
The interventions were described in full. At the time of the study, the manual grading system was currently being employed in Scotland and the automated strategy was still under development.

Effectiveness/benefits:
The effectiveness evidence was obtained from a published study that assessed the efficacy of automated and manual grading systems in the national screening programme for diabetic retinopathy in Scotland. Further details of the study were not provided. As such, it is difficult to assess the validity of the study. However, the authors stated that the two study groups were comparable in respect of their baseline characteristics. The evidence came from a large group of patients in Scotland. In general, the reporting of the assessment of primary outcomes was good.

Costs:
The analysis of the costs was restricted to a few categories related to the grading. The unit costs and resource quantities were presented. Discounting was conducted for the relevant item of costs and the price year was reported, thereby simplifying future reflation exercises. The cost results were reported in full.

Analysis and results:
On the whole, the analytic approach was well reported and the results were presented clearly and in full. A one-way sensitivity analysis was appropriately conducted to determine the robustness of the results. Uncertainty around the model input parameters was well addressed by means of a PSA. Overall, the level of reporting was good, including the model outcomes. In addition, the authors discussed their findings in relation to other studies and acknowledged the limitations of their analysis.

Concluding remarks:
The study methodology appears appropriate and was reported clearly. The authors' conclusions appear to reflect the scope of their analysis.

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