Improving the economic value of photographic screening for optical coherence tomography-detectable macular oedema: a prospective, multicentre, UK study

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 aimed to assess the cost-effectiveness of alternative strategies to screen for macular oedema, based on the identification of different types and patterns of surrogate photographic markers. The authors concluded that the more sensitive, but less specific, screening strategies were unlikely to be cost-effective. Adding optical coherence tomography to screening could reduce the costs without reducing the cases of macular oedema detected and referred. The methods and results were well reported, and the authors’ conclusions are appropriate.

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

Study objective
This study aimed to assess the cost-effectiveness of alternative strategies to screen for macular oedema, based on the identification of different types and patterns of surrogate photographic markers.

Interventions
The sensitivity and specificity of several strategies of screening for combinations of different markers were evaluated. Two strategies were the current English manual grading and the current Scottish manual grading. Other strategies were another manual grading (Strategy 16); a fully automated annotation grading with the inclusion of visual acuity; and a strategy with the inclusion of optical coherence tomography (OCT) before referral (Strategy 8). The strategies were based on the detection of exudates or blot haemorrhages; microaneurysms or dot haemorrhages; and visual acuity measured by the log of the minimum angle of resolution.

Location/setting
UK/out-patient care.

Methods
Analytical approach:
The cost-effectiveness analysis was based on one clinical study. Two analyses were conducted. For the short-term analysis, a decision-tree was used, and for the long-term analysis, a Markov micro-simulation was used. In the Markov model, six health states were defined by the visual acuity in the better seeing eye. The authors stated that a UK NHS perspective was adopted.

Effectiveness data:
The sensitivity and specificity of the different screening strategies for the presence of macular oedema in at least one eye were from a clinical study in which the diabetic retinopathy tests and OCT were applied to every patient and OCT was the reference standard. Full details of this UK-wide, multicentre, prospective, observational cohort study were presented. There was a maximum of four weeks between the retinal photograph and the OCT, with 89% of optical coherence scans conducted on the same day as the retinal photograph. In separate analyses, the sensitivity and specificity were adjusted to account for prevalence in subgroups within the normal population. In the long-term model, the probabilities of moving between visual acuity states were from published UK cohort studies.

Monetary benefit and utility valuations:
Utility values were applied to the different visual acuity health states. A review of the literature was conducted, and
suitable weights were obtained from one UK study. The utilities were estimated directly using the standard gamble method.

Measure of benefit:
For the short-term analysis, the number of cases detected was the measure of benefit. For the long-term analysis, the quality-adjusted life-year (QALY) was used. QALYs were discounted at a rate of 3.5% per annum.

Cost data:
The costs of screening, referral and treatment were included. Screening costs were estimated by a survey of participating centres, and included all equipment, staff, space and overheads. Individual inputs were valued using appropriate unit costs from three of the participating screening centres. The total was divided by the number of patients screened to produce per person costs. Automated annotation grading was assumed not to increase the grading costs. The treatment and social costs of macular oedema and legal blindness were from published UK sources. The price year was 2009 to 2010 and the costs were presented in UK £. They were discounted at a rate of 3.5% per annum.

Analysis of uncertainty:
One-way sensitivity analyses were conducted for the key parameters. Probabilistic sensitivity analysis was conducted to characterise the overall uncertainty in the model inputs.

Results
The costs and outcomes were presented separately. The results were presented using English and Scottish screening and referral costs.

Each strategy was compared with the Scottish manual strategy. Strategy 16 (other manual grading) had an incremental cost-effectiveness ratio of £1,579 using English costs or £985 using Scottish costs per case detected.

Each strategy plus OCT at screening was compared with the Scottish manual strategy plus OCT. Strategy 16 plus OCT had a ratio of £639 using English costs or £528 using Scottish costs. Strategy 8 (with OCT before referral) plus OCT at screening had a ratio of £1,510 using English costs or £1,360 using Scottish costs per case detected.

Extensive deterministic and probabilistic sensitivity analysis results were presented.

Authors' conclusions
The authors concluded that the more sensitive, but less specific, screening strategies were unlikely to be cost-effective. Adding OCT to screening could reduce the costs without reducing the number of cases detected and referred.

CRD commentary
Interventions:
The interventions were described. The current practice in England and that in Scotland were appropriately included.

Effectiveness/benefits:
The effectiveness evidence appears to have been of good quality and from patients relevant to the study setting. The authors appropriately tried to model the long-term health outcomes. The utility weights appear to have come from an appropriate population. Extensive study details were presented.

Costs:
The costing methods were well reported and seem to have been appropriate. Helpfully, both Scottish and English costs were estimated. The report presented the full details for all elements of the costing, except the individual survey results.

Analysis and results:
For both the long-term and short-term analyses, the structure of each model was clearly presented. Uncertainty in the model parameters was appropriately modelled, and uncertainty in the incremental cost-effectiveness result was appropriately evaluated. The analysis methods were well reported, as were the results.

Concluding remarks:
The methods and results were well reported, and the authors’ conclusions are appropriate.

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