A cost-utility analysis of laser photocoagulation for extrafoveal choroidal neovascularization


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.

Health technology
The use of laser photocoagulation therapy for extrafoveal choroidal neovascularisation (ECN) in age-related macular degeneration was compared with no therapy.

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
The study population comprised patients in 12 clinical centres with choroidal neovascular membranes with a posterior edge that was angiographically determined to be 200 to 2,500 micrometres from the centre of the foveal avascular zone. Other inclusion criteria were appearance of drusen, a best-corrected visual acuity of 20/100 or better, symptoms related to neovascular membranes, no prior photocoagulation for the study eye, and no other ocular disease that could affect visual acuity. Also, age older than 50 years and informed consent. No exclusion criteria were stated.

Setting
The setting appears to have been primary and secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness evidence was taken from previously reported data from the Macular Photocoagulation Study (MPS) Group during 1982 to 1991. The MPS patients' longevity data were from the 1997 statistics of the Centres of Disease Control and Prevention's National Centre for Health Statistics published in 1999. The utility values were derived from a study published in 1999. The resource use data were derived from a payment schedule, as determined by the Centres for Medicare and Medicaid Services, which was matched to current procedural terminology (CPT) data derived from Medicare reimbursement averages in the USA in 2000. The price year was 2001.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing appears to have been undertaken on the same patient sample as that used in the effectiveness study.

Study sample
No power calculations to determine the sample size were reported. In addition, no specific sample size appears to have
been planned. A total of 224 patients were included in the study. Data from 198 patients were collected during the 5-year follow-up period.

**Study design**
The study was based on a prospective, randomised, controlled trial that was undertaken in 12 clinical centres (i.e. a multi-centre trial). The patient allocation method used in the randomisation process was not reported. The patients were followed up for 5 years.

**Analysis of effectiveness**
The analysis of the clinical study seems to have been conducted on the basis of treatment completers only. The primary health outcome used was the mean visual acuity. The comparability of the groups at baseline was not reported.

**Effectiveness results**
Five years after enrolment in the study, the mean visual acuity was 20/200 in untreated eyes and 20/125 in treated eyes.

At the 5-year follow-up, there was a relative risk of 1.5 for the treatment group of significant visual loss from baseline, and more mean lines lost from baseline vision for the untreated group.

**Clinical conclusions**
Laser photocoagulation for ECN resulted in a better visual acuity than no treatment.

**Modelling**
To compare the cost and utility of treatment and no treatment, a straightforward decision analysis tree was constructed from 36 months to 14 years after treatment for the 41% of the cohort with bilateral choroidal neovascularisation at the time of randomisation. A Markov model for the remaining 59% of the cohort with unilateral ECN was also used to analyse the cost and utility of treatment and no treatment. The time horizon appears to have been 14 years.

**Measure of benefits used in the economic analysis**
The measure of benefits used was the quality-adjusted life-year (QALY). The time trade-off method was used to assess the utility values of different ocular health states. In a study published in 1999 by one of the authors of the present paper, a cohort of 323 consecutive ophthalmic patients with 20/40 or worse vision in at least one eye completed questionnaires to assess time trade-off utility values.

**Direct costs**
The direct costs included the costs of an initial outpatient consultation, laser photocoagulation of the choroidal neovascularisation, two fluorescein angiography studies, and the re-treatment costs of laser photocoagulation at 3 months or more. The re-treatment costs included three ocular follow-up visits, three fluorescein angiograms and laser photocoagulation of the choroidal neovascular membrane. The unit costs and the resource quantities were reported separately. The costs were discounted at a rate of 3% per year. The price year was 2001.

**Statistical analysis of costs**
No statistical analysis of the costs was reported.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
One-way sensitivity analyses were carried out to investigate the effects on the costs per QALY of variations in the annual discount rate, costs and all utility values being investigated. The ranges seem to have been selected on the basis of assumptions.

**Estimated benefits used in the economic analysis**
The total QALYs gained from laser treatment in the 41% of patients with bilateral choroidal neovascularisation was 0.185 over 14 years (the mean life-expectancy of the reference case). Discounted at 3% per year, this was 0.122 QALYs. The weighted discounted QALY gained by this sub-group of patients with bilateral disease at the time of initial treatment was 0.050.

The net benefit from laser treatment in the 59% of patients with unilateral ECN was 0.0526 undiscounted QALYs gained, or 0.0407 discounted QALYs gained over 14 years. The weighted discounted QALY gained by this sub-group of patients with unilateral disease at the time of initial treatment was 0.024.

The incremental benefit gained from treatment versus no treatment for the average patient was 0.074 (0.050 + 0.024).

**Cost results**
The total discounted expenditure for laser treatment of ECN was $1,715.

**Synthesis of costs and benefits**
The costs and benefits were combined by calculating an incremental cost-effectiveness ratio (ICER). The ICER of laser therapy for ECN versus no therapy for a reference case was $23,176 per QALY gained.

Sensitivity analyses showed that variations in the discount rate, costs and utility values would result in changes in the QALYs gained, but that all the costs per QALY were well within the conventionally accepted cost-effectiveness parameters.

**Authors’ conclusions**
Laser photocoagulation for extrafoveal choroidal neovascularisation (ECN) associated with age-related macular degeneration is a cost-effective procedure when judged by conventional standards.

**CRD COMMENTARY - Selection of comparators**
No explicit justification was given for using no treatment as the comparator.

**Validity of estimate of measure of effectiveness**
The study was based on a prospective, randomised, multi-centred controlled trial. This was appropriate for the study question because well-conducted randomised controlled trials are the ‘gold’ standard study design when comparing different health interventions. However, little information was given on the method of randomisation, no power calculations were reported, and the sample size may have been too small to detect statistically significant differences. There was also a lack of information on the patients. It is therefore not possible to assess whether there were systematic differences that might have caused differences in the results between the patient groups. Further, the
outcomes were analysed on the basis of treatment completers only.

**Validity of estimate of measure of benefit**
The summary of benefit measure (i.e. the QALY) was appropriate as it considered patient preferences associated with particular ocular health states. The utility values were derived from a study, for which little information was provided on how representative the sample was. Discounting was applied to the health benefits, which was appropriate.

**Validity of estimate of costs**
The perspective of the study was not explicitly reported. However, only medical costs were included and the societal costs of disease, including loss of workdays and productivity, were not included. Uncertainty in the costs was tested by varying them by a 20% decrement and a 20% increment. Discounting was applied to the costs and the annual discount rate was varied in the sensitivity analysis. The price year was reported.

**Other issues**
The issue of the generalisability of the results was not addressed. The authors reported several potential biases in the study. For example, not considering the loss of workdays and productivity, and the assumptions made on future costs, re-treatment costs and effects.

**Implications of the study**
The authors suggested that the cost-effectiveness results presented in this study should not be construed as criteria upon which to base, or not to base, treatment. There were no recommendations for further research.

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**Other publications of related interest**


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