Cost-effectiveness of smoking cessation to prevent age-related macular degeneration

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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
The objective was to examine the cost-effectiveness of smoking cessation in the prevention of macular degeneration. The authors concluded that smoking cessation was unequivocally cost-effective in reducing the burden of age-related macular degeneration. The study was generally well conducted and the authors’ conclusions were robust, but more extensive reporting of the data, especially for the costs, would have been useful.

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

Study objective
The objective was to examine the cost-effectiveness of smoking cessation in the prevention of macular degeneration alone.

Interventions
The smoking cessation programme, which was the Massachusetts Tobacco Control Program, comprised treatment services, a mass media campaign, a tobacco surcharge, and other local policies. The costs of this for 1,000 smokers who quit were compared with no intervention.

Location/setting
USA/primary care and community.

Methods

Analytical approach:
The analysis was based on a modified version of a published Markov model, using a hypothetical sample of 1,000 smokers aged 15 to 19 years, who were followed-up until the age of 85 years. The authors stated that a societal perspective, excluding patient time and travel costs, was adopted.

Effectiveness data:
The clinical data on the incidence of macular degeneration in smokers came from a selection of known, relevant studies, mainly conducted in the USA. A comprehensive literature review in the MEDLINE database identified the relevant sources of data on the incidence of macular degeneration in quitters. Seven relevant studies, with 1,488 patients, were selected; two were prospective cohort studies, three were cross-sectional studies, and two were case-control studies. Other inputs for age-related macular degeneration came from an earlier paper, by the authors of this paper, and were augmented by data from other US sources to estimate the death rates. The key clinical input was the decline in risk of macular degeneration after quitting.

Monetary benefit and utility valuations:
The utility valuations were derived from the previous study on macular degeneration and the details of this were not given.

Measure of benefit:
The summary benefit measures were cases of macular degeneration, cases of blindness, blind-years, and quality-adjusted life-years (QALYs), which were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs associated with the smoking cessation programme and the management of age-related macular degeneration. The former costs were derived from the Massachusetts Tobacco Control Program, implemented in the 1990s. The latter costs were based on the previous study on macular degeneration by the authors of this paper. This assumed that ranibizumab was the treatment of choice. It was supplemented with data on Medicare fees for geographic atrophy from another study. All costs were in US dollars ($) and the price year was 2004. A 3% annual discount rate was applied.

Analysis of uncertainty:
A deterministic sensitivity analysis was undertaken to investigate whether the model results were robust to variations in some key model inputs. Published ranges of values were used for some inputs. A threshold analysis was also carried out to determine the cost per quitter that would produce a cost per QALY of $50,000.

Results
The model showed that, in comparison with no intervention, smoking cessation resulted in 48 fewer cases of macular degeneration, 12 fewer cases of blindness, 21 fewer blind-years, and 1,611 more QALYs in the cohort of 1,000 people who stopped smoking. The programme saved about $2.52 million, when the costs of caregivers for people with macular degeneration and vision loss were included. Smoking cessation was dominant, because it was both more effective and less expensive than no intervention.

In the scenario in which caregiver costs were excluded, the incremental cost per QALY gained with the programme was $197. The programme remained dominant, or highly cost-effective, in all scenarios considered in the sensitivity analysis, and the cost per QALY gained remained well below the commonly quoted threshold of $50,000 per QALY.

The cost per quitter that produced a cost per QALY of $50,000 was over $77,000 (it was assumed to be $1,400 in the base case).

Authors’ conclusions
The authors concluded that smoking cessation was unequivocally cost-effective in reducing the burden of age-related macular degeneration.

CRD commentary
Interventions:
Few details of the smoking cessation programme were given, as this had been described in a previous analysis. The selection of no intervention as the comparator was appropriate.

Effectiveness/benefits:
Mixed sources of data were used to estimate the clinical inputs for the model. Some of these studies and databases were known to the authors while others were identified through a literature review. The key details, such as the total sample size and the design of each study, were reported. None of the studies was a randomised trial, the design of which would have ensured a high internal validity. The authors did not discuss issues, such as the homogeneity of the patient populations and the types of interventions delivered, which might be relevant when using data from a variety of sources. Several benefit measures were used; some were disease-specific and might be of importance for clinicians. QALYs not only capture the impact of the interventions on a patient’s health, but also allow cross-disease comparisons to be made. No information on the derivation of the utility values was provided.

Costs:
The analysis of costs included two main cost categories, which were not broken down into individual items. No information on the types of costs, unit costs, and quantities of resources was given. The authors stated that a societal perspective was taken, but patient time and travel costs were excluded, which means the perspective of the payer may have been adopted. Details on the sources of the cost data were not reported. The transparency of the economic analysis was limited. Other details such as price year and use of discounting were reported. The cost estimates were treated deterministically.

Analysis and results:
The costs and benefits were appropriately synthesised using an incremental approach, which highlighted the superior clinical and economic profile of smoking cessation. The issue of uncertainty was investigated using a univariate approach. The use of a more comprehensive methodology would have been more appropriate. The study findings were clearly presented. Details of the creation of the model for the risk of developing macular degeneration were extensively presented. Appropriate discounting for both benefits and costs was applied, given the long-term horizon of the analysis. The authors compared the cost per quitter for the programme with those from other publications and concluded that, in all cases, smoking cessation was cost-effective.

Concluding remarks:
The study was generally well conducted and the authors’ conclusions were robust, but more extensive reporting of the data, especially for the costs, would have been useful.

Funding
Supported by a grant from the Cancer Council Victoria.

Bibliographic details

PubMedID
18783631

DOI
10.1186/1478-7547-6-18

Original Paper URL
http://www.resource-allocation.com/content/pdf/1478-7547-6-18.pdf

Other publications of related interest


Indexing Status
Subject indexing assigned by CRD

MeSH
Aged; Cost-Benefit Analysis; Humans; Macular Degeneration; Quality-Adjusted Life Years; Smoking Cessation

AccessionNumber
22008102016

Date bibliographic record published
31/03/2009
Date abstract record published
20/01/2010