Cost effectiveness of a smoking cessation program in patients admitted for coronary heart disease
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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.

Health technology
The use of a smoking cessation programme in patients with coronary heart disease (CHD). The programme was based on a booklet that contained fear arousal messages and positive feedback, and was delivered by cardiac nurses without special training in smoking cessation. The intervention was given in hospital and the patients were followed up by telephone for at least 5 months.

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with CHD, including patients admitted to the hospital for acute MI, unstable angina, or recent coronary bypass surgery.

Setting
The setting was a hospital and outpatient department. The economic study was carried out in Norway.

Dates to which data relate
The effectiveness data were derived from studies published between 1983 and 2003. Resource use was mainly obtained between 1999 and 2001. The price year was 2000.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of published studies.

Outcomes assessed in the review
The outcomes estimated from the literature were:

the abstinence rates after the smoking cessation programme or usual care;

the number-needed-to-treat (NNT) to get one additional quitter from the smoking cessation programme; and

the mortality rates for smokers and quitters in low- and high-risk groups.
Study designs and other criteria for inclusion in the review
It was unclear whether the primary studies were identified from a systematic review of the literature or selectively. Data on the effectiveness of the smoking cessation programme came from a clinical trial carried out by the authors of the current study. Two long-term studies were used to derive mortality data (and life expectancy) in patients at high and low risk.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
The validity of the primary studies was ensured by the choice of a clinical trial and studies with a long follow-up.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Three primary studies were the primary source of effectiveness data.

Methods of combining primary studies
The primary studies were not combined since each study provided a discrete series of estimates. The Kaplan-Meier method and the Gompertz parametric survival functions were used for analysing survival data for the first 20 years.

Investigation of differences between primary studies
Not reported.

Results of the review
The 12-month abstinence rates were 37% (44 out of 188) in the usual care group and 57% (57 out of 100) in the intervention group, (p=0.004). The NNT to get one additional patient to quit smoking was 5 (95% confidence interval, CI: 3 to 16). Among patients undergoing coronary bypass surgery, 5 of 8 patients were abstinent in the intervention group compared with 2 of 18 in the usual care group, (p=0.006).

In terms of long-term survival projections, in the low-risk setting, the average annual mortality at 10 years’ follow-up was 1.7%. The difference in mortality between persistent smokers and quitters increased over time. After a median follow-up of 20 years, 46% of quitters had died versus 64% of persistent smokers. The relative risk reduction was therefore 28%. In the high-risk setting, the annual mortality rate was 4.5%. Mortality was 82% in those who continued to smoke versus 37% in those who stopped smoking (a 55% relative risk reduction) after 13 years.

Measure of benefits used in the economic analysis
The summary benefit measure used was the expected number of life-years. These were estimated in the two sub-groups of patients over 5 years, 20 years and over a lifetime horizon. An annual discount rate of 5% was used.

Direct costs
The viewpoint chosen for the analysis of the costs was not explicitly stated. The costs associated with the smoking cessation programme were nursing time, booklet, office rental and telephone calls. The costs of nicotine replacement were not included since these costs were not significantly different between groups. Hospitalisation costs due to future MI or stroke were also excluded as they were characterised by high uncertainty. The unit costs were presented.
separately from the quantities of resources used for most items. The nursing costs came from the average salary of specialised nurses with more than 10 years seniority. Office rental costs were based on data from the Scientific and Industrial Research at the Norwegian Institute of Technology. Telephone costs were determined using prices of the telephone company. Resource consumption was presumably based on the authors’ experience. Discounting was not relevant as the costs per patient were incurred over a short time horizon. The price year was 2000.

**Statistical analysis of costs**
No statistical analyses of the costs were performed.

**Indirect Costs**
The indirect costs were not included in the economic evaluation.

**Currency**
Norwegian kroner (NOK) and Euros (EUR). The 2000 mean exchange rate was EUR 1 = NOK 8.1.

**Sensitivity analysis**
Univariate sensitivity analyses were carried out to assess the robustness of cost-effectiveness estimates in the low-risk setting to variations in the NNT, cost of the programme, gain in life expectancy in quitters, and discount rate for benefits. The sources of the alternative costs were unclear, while alternative effectiveness data came from published studies.

**Estimated benefits used in the economic analysis**
In the low-risk group, the expected life-years gained with the smoking cessation programme over usual care were 0.06 at 5 years, 0.97 at 20 years and 1.13 in the lifetime perspective.

In the high-risk group, the expected life-years gained with the smoking cessation programme over usual care were 0.26 at 5 years, 0.95 at 11 years and 2.77 in the lifetime perspective (25 years).

**Cost results**
The total additional costs associated with the smoking cessation programme over usual care were NOK 510 (EUR 63) per patient.

**Synthesis of costs and benefits**
Incremental cost-effectiveness ratios (ICERs; i.e. the incremental cost per life-year gained) were calculated in order to combine the costs and benefits.

In the low-risk group, the ICER associated with the smoking cessation programme over usual care was NOK 42,500 (EUR 5,230) at 5 years and NOK 2,300 (EUR 280) in the lifetime perspective.

The sensitivity analysis carried out for low-risk patients showed that the base-case results were robust to variations in clinical or economic data. The smoking cessation programme remained highly cost-effective even if the cost of the programme were increased, if no further gains in life expectancy were assumed after 20 years, if the higher bound of the confidence interval of the NNT were used, or if a 3.5% discount rate for benefits was applied.

In the high-risk group, the ICER associated with the smoking cessation programme over usual care was NOK 9,800 (EUR 1,200) at 5 years and NOK 900 (EUR 110) in the lifetime perspective.
Authors' conclusions
The smoking cessation programme was highly cost-effective over usual care in patients admitted for coronary heart disease (CHD) in Norway. The programme also compared favourably with other treatment modalities.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear as it reflected usual care in the authors' setting. However, a clear description of the conventional strategy was not provided. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
It was unclear whether a systematic review of the literature was undertaken to identify the primary studies, but most of the evidence came from a clinical trial performed by the same authors. The design of the primary studies was clearly stated, and the choice of a randomised trial was appropriate. However, one of the long-term studies was not recent and new interventions to help smoke cessation might have been introduced, or their efficacy changed, since it was conducted. It was not reported whether the primary studies were comparable in terms of their study populations and interventions. Key clinical values were varied the sensitivity analysis, which addressed the issue of variability in specific estimates.

Validity of estimate of measure of benefit
The use of life-years as the summary benefit measure was appropriate since life expectancy is a widely used benefit measure that is comparable with the benefits of other health care interventions. Standard methods were used to extrapolate long-term survival from short-term data. The authors investigated the use of an alternative discount rate for future benefits. Since the use of quality-adjusted survival would have been more appropriate, the authors made a rough assessment of quality of life over a short time period, drawing the conclusion that the results of the analysis would not have changed substantially if quality-adjusted life-years had been used.

Validity of estimate of costs
The authors did not state clearly the perspective chosen for the analysis of the costs. However, given the categories of costs included in the analysis, the perspective of the health service payer appears to have been used. Some information on the unit costs and resource consumption was provided, which will help when carrying out reflation exercises in other settings. The source of all the cost data was reported, while quantities of resource use were presumably based on the authors' experience with the disease. The price year was reported, which will facilitate reflation exercises in other time periods. No statistical analyses of the costs were carried out, but the authors investigated the impact of changing cost estimates in the sensitivity analysis.

Other issues
The authors compared their cost-effectiveness estimates with those of commonly used secondary prevention interventions in patients with CHD. The authors considered a simple intervention delivered by nurses with no particular experience in smoking cessation in order to make the programme generalisable to other settings. In addition, sensitivity analyses on key clinical and cost data further enhanced the external validity of the study. The authors acknowledged that relapse might be an important issue in analyses of smoking cessation programmes, but this problem is less frequent after one year of abstinence. It was also noted that, given the impossibility of randomising patients to continued smoking or smoking abstinence after a coronary event, analyses of smoking cessation programmes often have to rely on observational data from patient groups with baseline differences. This might represent a limitation of these types of analysis. Finally, the authors discussed the potential reasons why their calculation of the cost-effectiveness of the smoking cessation programme was underestimated. Among these reasons were the fact that the cost of the programme was set relatively high and the high discount rate. A further reason was potential bias arising from individuals who did not tell the true about their smoking behaviour and were erroneously included in the quitters group, thus reducing the impact of the smoking cessation programme.
Implications of the study
The study results suggest that simple smoking cessation programmes should be implemented as part of routine care for the treatment of patients with CHD.

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