Economic model of sustained-release bupropion hydrochloride in health plan and work site smoking-cessation programs

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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 sustained-release (SR) bupropion hydrochloride in health plan and work site smoking-cessation programmes.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of 100,000 employees or health plan members, and 60,000 adult dependants.

Setting
The setting was a hospital and the community. The economic analysis was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were taken from studies published between 1990 and 1999, from US government databases, and from information collected by a large national benefit consulting firm and Glaxo Wellcome. The cost data were obtained from sources published between 1984 and 1997. The price year was 1997.

Source of effectiveness data
The effectiveness data were taken from a review of the literature. In addition, the authors made assumptions about the effectiveness.

Modelling
Regression equations were used to predict smoking status according to age group, gender, health plan or industry type, and region of the country.

Outcomes assessed in the review
The review assessed the proportion (%) of current smokers, former smokers and nonsmokers; the proportion (%) of smokers attempting smoking cessation; the rate of smoking cessation at one year; recidivism; and smoking-related disease rates.
Study designs and other criteria for inclusion in the review
The effectiveness data were gathered from national surveys, clinical trials and other data sources.

Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

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

Number of primary studies included
Sixteen primary studies were included in the review.

Methods of combining primary studies
The effectiveness data were derived from individual studies, which were not combined.

Investigation of differences between primary studies
Not stated.

Results of the review
No results were given for the proportion of smokers, recidivism or disease rates.

The results showed that 34% of smokers attempt to quit each year.

If the smoking-cessation treatments were covered by a health plan, 14% of smokers attempting to quit would use bupropion SR, and the remaining 86% would use either other aids or no aids.

If the smoking-cessation treatments were not covered by a health plan, 7% of smokers attempting to quit would use bupropion SR, and the remaining 93% would use either other aids or no aids.

Among the group of smokers using bupropion SR, 97% would use bupropion SR alone and 3% would use bupropion SR with nicotine patches.

Among the group of smokers not using bupropion SR, 30% would use other pharmacological aids and 70% would use no aids.

For bupropion SR alone, the rates of smoking cessation at one year were 13.7% with no counselling, 15.4% when combined with a low level of counselling, and 75.55% when combined with a high level of counselling.

For bupropion SR plus nicotine patches, the rates of smoking cessation at one year were 18.9% with no counselling, 20.6% when combined with a low level of counselling, and 28.2% when combined with a high level of counselling.

For nicotine patches, the rates of smoking cessation at one year were 7.7% with no counselling, 9.4% when combined with a low level of counselling, and 17.0% when combined with a high level of counselling.

For no aids, the rates of smoking cessation at one year were 1.3% with no counselling, 3.2% with a low level of counselling, and 7.5% with a high level of counselling.
The rates of smoking cessation at one year associated with no smoking-cessation benefit were 3.96% with no counselling, 5.77% with a low level of counselling, and 11.25% with a high level of counselling.

The rates of smoking cessation at one year associated with a smoking-cessation benefit were 4.71% with no counselling, 6.51% with a low level of counselling, and 12.14% with a high level of counselling.

Twenty per cent of female smokers stopped smoking temporarily when they were pregnant.

**Methods used to derive estimates of effectiveness**
The authors made a number of assumptions.

**Estimates of effectiveness and key assumptions**
The key assumptions were:

1. The age of 85 years was used as the final time point for the model, due to the lack of available information on many smoking-related conditions beyond this age.

2. The members of the cohort could leave the model by leaving the employer or health plan, or by dying. There was a 10% turnover of the cohort per year.

3. The members leaving would be replaced by individuals of the same age and gender if aged less than 65 years, and would not be replaced if aged 65 years or above.

**Measure of benefits used in the economic analysis**
The measures of benefits were the number of people ceased smoking, the number of chronic obstructive pulmonary disease (COPD) cases avoided, and the number of deaths postponed.

**Direct costs**
The direct costs were discounted at an annual rate of 3%. The quantities and unit costs were not reported separately. The direct costs were the cost of smoking-cessation aids, the cost of counselling, the cost of bupropion SR, medical care costs for both acute and chronic conditions, and the cost of smoking-related diseases. The quantity/cost boundary adopted was that of the health care service. The cost of bupropion SR was based on average wholesale prices. The costs of smoking-cessation aids were taken from a published study. The medical care costs for both acute and chronic conditions were inflated using the medical care component of the consumer price index. The costs of smoking-related diseases were taken from the literature. The price year was 1997.

**Statistical analysis of costs**
The authors reported the total cost, the costs per member per month and the costs per employee per year.

**Indirect Costs**
These were excluded for the managed-care organisation analyses. The indirect costs were discounted at an annual rate of 3%. The quantities and unit costs were not reported separately. The indirect costs were the costs of absenteeism and decreased productivity, assuming that those for ex-smokers were the same as for nonsmokers. The quantity/cost boundary adopted was that of the society. The price year was 1997.

**Currency**
US dollars ($).
Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
Coverage of smoking cessation by managed care organisation.

After 20 years, an additional 1,631 to 2,034 people had quit smoking, 316 to 398 COPD cases had been prevented, and 30 to 37 deaths had been postponed. The outcome depended on the geographical location, with the South performing the best and the West performing the worst.

Coverage of smoking cessation by employers.

After 20 years, an additional 1,953 to 3,886 people had quit smoking, 420 to 670 COPD cases had been prevented, and 36 to 69 deaths had been postponed. The outcome depended on the geographical location, with the South performing the best and the West performing the worst.

Cost results
The cumulative cost of health care (to age 65) without a benefit (saving) in smoking-cessation was approximately $3.7 billion for managed care organisations. With a smoking-cessation benefit, the cost of health care decreased by $7.9 to $8.8 million. The cumulative savings over 20 years ranged from $5.7 million in the West to $6.4 million in the Midwest. The cost of providing full coverage ranged from $0.04 to $0.06 per member per month for the first year. The break-even point was 4.5 years.

The cumulative cost of health care (to age 65) without a benefit (saving) in smoking-cessation was approximately $5.4 billion for employer health plans. The total costs, including those resulting from absenteeism and decreased productivity, were $200 to $300 million higher. With a smoking-cessation benefit, the health care costs decreased by $8.3 million to $14.0 million and the smoking-related indirect costs decreased by $5.1 million to $7.7 million. The cumulative savings over 20 years ranged from $10.1 million in the West to $17.6 million in the Midwest. The cost of providing full coverage ranged from $1.69 to $3.29 per employee per year for the first year. The break-even point for both health care and indirect costs was 3.5 years for the South and 3.0 years for the other regions.

Synthesis of costs and benefits
The authors did not combine the cost and health benefit measures into a cost-effectiveness ratio.

Authors’ conclusions
The results suggested that a smoking-cessation benefit was associated with increased levels of smoking cessation and decreased levels of smoking-related morbidity and mortality. In addition, there were savings in health care costs, and “savings at a substantial multiple of expenses.”

CRD COMMENTARY - Selection of comparators
The comparators were justified by reference to the literature. You should decide if these health technologies are relevant to your own setting.

Validity of estimate of measure of effectiveness
The authors did not state that a systematic review of the literature had been undertaken. No information was provided on how the studies were identified, or the methods used to select and assess the included studies. More information about the design of the review could have been reported. The authors noted that, while effectiveness estimates were derived from a variety of sources, the results might not be generalisable to all the situations examined by the model. In addition, the model did not consider the effect of spousal smoking status on the participation in, or success of, the
smoking-cessation programmes. The measure of effectiveness covered mortality and morbidity, although there was no reflection on the quality of life.

**Validity of estimate of measure of benefit**

The estimation of benefits was obtained directly from the effectiveness analysis (see comments in the 'Validity of estimate of measure of effectiveness' section). Measures such as mortality could have been used as a summary measure of benefit, for example, to calculate the incremental cost-effectiveness ratios. However, given the information that the coverage of smoking cessation was both more effective and cheaper than no coverage, the decision on adoption was straightforward to make.

**Validity of estimate of costs**

A feature of the cost analysis was that all relevant direct and indirect cost categories seem to have been included. In addition, the price year was reported, which makes it easier to replicate the cost results in other settings. However, there were no sensitivity analyses on the quantities or costs. Also, the quantities and costs were not reported separately, which limits the generalisability of the results. The authors acknowledged that they did not consider the costs associated with adverse events resulting from bupropion SR.

**Other issues**

The authors made appropriate comparisons of their findings with those from other studies, and addressed the issue of generalisability to other settings. The authors do not seem to have presented their results selectively. The authors noted that the population participating in smoking cessation comprised relatively healthy smokers, who were quitting in an effort to maintain their health. This study may therefore suffer from a lack of generalisability.

**Implications of the study**

The authors argued that smoking-cessation benefit was associated with increased levels of smoking cessation, decreased levels of smoking-related morbidity and mortality, savings in health care costs and lost productivity. The applicability to the NHS was difficult to judge due to the different methods of provision and costs. However, the study may be useful as an example of alternative or supplementary provision, for example by an employer.

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