The cost utility of bupropion in smoking cessation health programs: simulation model results for Sweden
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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 study compared the use of bupropion tablets (Zyban, GlaxoSmithKline), two 150-mg tablets per day, with nicotine replacement therapy (patches or gum) as part of a smoking cessation programme.

Type of intervention
Public health intervention: smoking cessation programme.

Economic study type
Cost-utility analysis.

Study population
The study population comprised smokers aged 35 years or older.

Setting
The setting was primary care. The geographical location was Sweden.

Dates to which data relate
The effectiveness and resource use data were taken from studies published between 1999 and 2002. The price year was 2001.

Source of effectiveness data
The effectiveness data were derived from a review and synthesis of published studies, as well as estimates of effectiveness based on opinion.

Modelling
A published Global Health Outcomes simulation model was augmented in order to include the indirect effects of smoking cessation on production and consumption in the economy and to include morbidity-specific quality-adjusted life-years (QALYs) gained. This model was then used to identify the effectiveness, resource use and costs associated with the two alternative interventions. The model considered five diseases. Specifically, chronic obstructive pulmonary disease (COPD), asthma, coronary heart disease (CHD), stroke and lung cancer. The model simulates the development of morbidity and mortality for the cohort incorporating prevailing age for a 20-year period. The simulation distinguished between men and women, considered different age groups (<35, 35-69 and >70), and different types of smokers (current, recent quitters and long-term quitters). The model excluded co-morbidities. Each cycle was one year in length and the model lasted for 20 years. Full details of the model population were presented in the paper.
Outcomes assessed in the review
The following model input parameters were identified from published studies:

- the quit rates with bupropion, nicotine patches and nicotine gum;
- the relative risk reduction in COPD, asthma, CHD, stroke and lung cancer following smoking cessation;
- the QALY weights of asthma, CHD and stroke;
- treatment effectiveness;
- the prevalence, incidence, morbidity and mortality rates for each disease considered; and
- smoking prevalence and quit rates.

Study designs and other criteria for inclusion in the review
No inclusion criteria were reported, although country-specific data or studies appear to have been favoured. The authors stated that the quit rates of the treatment programmes were taken from a published meta-analysis conducted as part of a systematic review.

Sources searched to identify primary studies
Not reported.

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

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

Number of primary studies included
The model parameters were identified from approximately 12 published studies.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The following model input parameters were identified from published studies.

- The quit rate was 18.9% with bupropion, 15.6% with nicotine patches, and 15.0% with nicotine gum.
- Smoking prevalence was 22% for men aged 35 to 69 years, 15% for men aged 70+ years, 27% for women aged 35 to 69 years, and 13% for women aged 70+ years.

Following smoking cessation:
the relative risk reduction in COPD (for both age groups and both genders) was 0.72;

the relative risk reduction in asthma was 0.74 (both age groups) for men and 0.54 for women;

the relative risk reduction in CHD was 0.62 for men aged 35 to 69 years and 0.44 for women aged 35 to 69 years;

the relative risk reduction in CHD was 0.80 for men aged 70+ years and 0.82 for women aged 70+ years;

the relative risk reduction in stroke was 0.42 for men aged 35 to 69 years and 0.39 for women aged 35 to 69 years;

the relative risk reduction in stroke was 0.67 for men aged 70+ years and 0.75 for women aged 70+ years;

the relative risk reduction in lung cancer was 0.39 for men (both age groups) and 0.38 for women (both age groups).

Other model input parameters were reported in full in the paper.

Methods used to derive estimates of effectiveness
As published quality of life data were not available for COPD and lung cancer, the authors made assumptions about these values.

Estimates of effectiveness and key assumptions
The authors made assumptions about the QALYs associated with COPD and with lung cancer.

Measure of benefits used in the economic analysis
The measure of health benefit used in the economic analysis was the QALYs. The valuation of health states was calculated from disability-adjusted life-year weights published in the literature.

Direct costs
The direct costs of the health care payer were identified. The resource use data was derived from the model. Cost data on hospital care were taken from diagnosis-specific estimated costs. GP costs were taken from a representative sample of GPs in Sweden. The source of the unit costs of bupropion, nicotine patches and nicotine gum do not appear to have been provided in the paper. The price year was 2001 and future costs were discounted at a rate of 3% per annum.

Statistical analysis of costs
No statistical analysis of the costs was undertaken.

Indirect Costs
The indirect costs arising from lost productivity and future consumption were estimated in this study. The data were taken from a previous study set in Sweden. The price year was 2001 and future costs were discounted at a rate of 3% per annum.

Currency
Swedish kroner (SEK).

Sensitivity analysis
One- and two-way sensitivity analyses were undertaken to assess variability in the data. A Monte Carlo sensitivity analysis was also performed. The source of the ranges and the distribution of the variables used in the sensitivity analyses were not given in the paper.
**Estimated benefits used in the economic analysis**
The use of bupropion compared with nicotine patches resulted in 4,073 additional QALYS in men and 5,201 QALYS in women.

Compared with nicotine gum, bupropion resulted in 4,814 additional QALYS in men and 6,147 additional QALYS in women.

**Cost results**
The total health care costs averted with bupropion versus nicotine patches was SEK 50,073,220 for men and SEK 72,727,847 for women.

The indirect costs accounted for a saving of SEK 122,305,699 for men and SEK 111,956,131 for women.

Compared with nicotine gum, bupropion resulted in health care savings of SEK 59,177,442 for men and SEK 85,962,911 for women.

The indirect costs averted were SEK 144,543,099 for men and SEK 132,311,792 for women.

**Synthesis of costs and benefits**
The incremental saving of bupropion compared with nicotine patches, including the indirect costs, was SEK 23,400 for men and SEK 16,600 for women. If the indirect costs were excluded, the incremental costs were SEK 6,600 (men) and SEK 4,900 (women), respectively. The incremental saving of bupropion compared with nicotine gum, including the indirect costs, was SEK 33,300 for men and SEK 26,500 for women. When excluding the indirect costs, the cost-savings were SEK 3,200 (men) and SEK 5,000 (women), respectively.

Stochastic sensitivity analyses showed that there was an 80% chance of bupropion being cost-saving in comparison with nicotine patches. Comparisons with nicotine replacement therapy were more favourable.

**Authors' conclusions**
Bupropion is a cost-effective therapy in comparison with nicotine patches or nicotine gum.

**CRD COMMENTARY - Selection of comparators**
The authors compared the use of bupropion plus four nurse visits for motivational support with the use of nicotine patches and nicotine gum plus two nurse visits for motivational support. No clear reason for this choice of the comparator was given in the paper. You should consider how these options compare with usual practice in your own setting.

**Validity of estimate of measure of effectiveness**
The authors did not state that a systematic review was used to identify model parameters. There were no details of the search and quality criteria used to identify the primary sources, and few details of the process used to assess the studies. However, the authors did note that the effectiveness of the smoking cessation programmes was taken from a meta-analysis of quit rates. The authors did not consider the impact of any differences between the primary sources on the model parameters. Given the level of reporting of the methods used to identify and use the studies from which the model parameters were derived, it was not possible to ascertain whether the best available evidence had been used to populate the model. The use of probabilistic sensitivity analyses helps to address this issue, although a systematic review of the literature has to be considered the 'gold' standard.

**Validity of estimate of measure of benefit**
The utilities of health states were either taken from published studies or assumed by the authors. In assuming the health utility of COPD and lung cancer the authors assessed these conditions in relation to those where published values were available and estimated values accordingly. These valuations of health states were incorporated into the model, which estimated QALYs. This means that the health benefit identified in this study can be compared across a broad range of health interventions.

Validity of estimate of costs
The economic analysis was conducted using two perspectives, a health care perspective and a societal perspective. All appropriate health care costs appear to have been included in the study. However, from a societal perspective, the loss of taxation from reduced tobacco sales does not seem to have been included. This means that the study may have overestimated the cost-utility of both smoking cessation programmes. Comprehensive sensitivity analyses were undertaken. These varied both resource use and cost data, leading to a robust assessment of the reliability of the study results. Future costs were discounted at an appropriate rate. These factors will add to the generalisability of the study findings. A clear price year was reported, which will aid any future reflation exercises.

Other issues
The authors do not appear to have presented their results selectively and their conclusions reflected the scope of their analysis. However, they did not discuss whether the greater effectiveness of bupropion plus four nurse visits for motivational support compared with nicotine replacement therapy plus two nurse visits was due to the additional motivational support or the therapy. They compared their study findings with similar studies and noted reasons for their differences. The detail of the modelling was well reported and the authors made valid attempts to be transparent in what they did.

Implications of the study
The authors did not make any direct recommendations for further research or changes to practice.

Source of funding
Supported by GlaxoSmithKline, Sweden.

Bibliographic details

PubMedID
16537864

DOI
10.1378/chest.129.3.651

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Bupropion /economics; Chewing Gum; Cost-Benefit Analysis; Dopamine Uptake Inhibitors /economics;