Cost-effectiveness analysis of a universal vaccination programme with the 7-valent pneumococcal conjugate vaccine (PCV-7) in Sweden


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 explore the health economic impact of including seven-valent pneumococcal conjugate vaccine in the general vaccination programme. The authors concluded that the health benefits of a vaccination programme could be achieved for a moderate or low cost per QALY gained. They reported adequate details of their methodology and the results were reported in detail. The quality of the methodology was adequate, and the authors’ conclusions appear to be valid.

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

Study objective
The objective was to explore the potential health economic impact of including seven-valent pneumococcal conjugate vaccine (PCV-7) in the general vaccination programme in Sweden.

Interventions
The authors compared a universal pneumococcal vaccination (PCV-7) with no vaccination programme.

Location/setting
Switzerland/primary care.

Methods
Analytical approach:
A published Markov model (Wisloff et al. 2006, see “Other Publications of Related Interest” below for bibliographic details) was used to compare the costs and effects of universal pneumococcal vaccination with no vaccination programme. The time horizon of the study was the lifetime of the patient. The authors reported that the perspective of the economic analysis was societal.

Effectiveness data:
The effectiveness and clinical data were derived from a variety of sources including published evidence, randomised controlled trials (RCTs), and national data. The main clinical effectiveness parameter was vaccine efficacy. This parameter was derived from a trial on the impact of the vaccine on invasive pneumococcal disease and on radiologically confirmed pneumonia.

Monetary benefit and utility valuations:
The utility estimates were derived from the Harvard Centre for Risk Analysis (2005).

Measure of benefit:
The measures of benefit were life-years and quality-adjusted life-years (QALYs) gained.

Cost data:
The direct costs were those of treating pneumococcal infections (including septicaemia, meningitis, pneumonia and acute otitis media) and chronic health states after infection (including neurological sequelae, epilepsy and impaired hearing), and the vaccine costs. The medical resources were derived from Norwegian estimates, which were validated.
by Swedish expert opinions. The unit costs were derived from the Regional Healthcare Board and the retail pharmacy price of the vaccine. The indirect costs included productivity losses, for both patients and relatives, due to illness, disability and death. The cost of absence from work was assumed by expert opinion. The costs of lost productivity were derived from Swedish statistics. All costs were reported in Euros (EUR), using an exchange rate of 1 Swedish kronor (SEK) was equivalent to EUR 0.106643. The price year was 2006 and, as costs could be incurred over the lifetime of the patient, future costs were discounted at 3% per annum.

Analysis of uncertainty:
A series of one-way sensitivity analyses were performed by varying the estimates for the central variables. In addition, the authors included the potential herd immunity effect of the vaccine in the model when performing the sensitivity analysis.

Results
The average life-years gained per patient were 30.62222 with the vaccination programme and 30.62138 with no vaccination.

The average QALYs gained per patient were 30.61583 with vaccination and 30.61437 with no vaccination.

The average cost per patient was EUR 2,229 with vaccination and EUR 2,186 with no vaccination.

The costs and benefits were combined using an incremental cost-effectiveness ratio (i.e. the additional cost per life-year gained) and an incremental cost-utility ratio (i.e. the additional cost per QALY gained). Compared with no vaccination, the additional cost with vaccination per life-year gained was EUR 51,390 and per QALY gained was EUR 29,215.

The results of the sensitivity analysis showed that the discount rate, inclusion of indirect costs, vaccine efficacy, and unit costs of the vaccine were the most influential variables. Including the impact of herd immunity reduced the cost per life-year gained to EUR 6,560 and per QALY gained to EUR 5,500.

Authors' conclusions
The authors concluded that the health benefits of a national vaccination programme could be achieved for a moderate or low cost per QALY gained.

CRD commentary
Interventions:
The intervention studied was clearly described. The justification given for using no vaccination programme as the comparator was that it was current practice in the authors' settings.

Effectiveness/benefits:
The effectiveness and clinical data as well as the utility values were derived from a number of different sources. No information was given as to how these sources were identified, and it was not clear whether the authors performed a systematic review of the literature. As a result it is not possible to assess whether all the relevant data were included in the model. However, for each model parameter the authors provided adequate details on the study or source from which it was derived.

Costs:
Given the societal perspective adopted, it appears that all relevant cost categories were included in the analysis. In addition, the authors adequately reported the sources used to identify resource use and unit costs. The price year, currency exchange rate, time horizon, and discount rate were all appropriately reported.

Analysis and results:
The Markov model used by the authors was published elsewhere (Wisloff et al. 2006). The authors provided adequate details of the model and its structure and it was presented graphically. The authors conducted an appropriate incremental analysis, and the results for non-dominated strategies were fully and clearly presented. One-way sensitivity analyses were performed, which although they go some way in exploring the uncertainty in the model parameters, do
not capture overall uncertainty in the model. A probabilistic sensitivity analysis, would have been a better way to measure the overall uncertainty. The results were reported in detail as were the results of the one-way sensitivity analyses. In their discussion, the authors highlighted the limitations of their study.

Concluding remarks:
Overall, the authors reported sufficient detail of their methodology. The results were fully reported, and the quality of the methodology was adequate. Given the scope of the study, the authors' conclusions appear to be valid.

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Other publications of related interest


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