Cost-benefit analysis of a new HEDIS performance measure for pneumococcal vaccination

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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 the Health Employer Data and Information Set (HEDIS), a measurement system used to provide standardised information on the quality of managed care organisations (MCOs), was examined.

Type of intervention
Primary prevention and organisational features.

Economic study type
Cost-benefit analysis.

Study population
The study population comprised a hypothetical cohort of elderly MCO enrolees.

Setting
The setting was managed care. The economic study was conducted in the USA.

Dates to which data relate
The effectiveness data were derived from studies published between 1982 and 2001. Resource use was partly derived from studies published from 1980 to 2001. The price year was 2000.

Source of effectiveness data
The effectiveness evidence was derived from a review of completed studies.

Modelling
A decision model was used to assess the economic and clinical benefits of the HEDIS, compared with no programme, in a cohort of 25,000 elderly MCO enrolees. The decision model was based on a Markov process. The time horizon of the model was lifetime (death or age 100 years) and the cycle length was one year. The cohort was divided into unvaccinated and vaccinated states (by duration since vaccination) at the beginning of the first cycle. Unvaccinated individuals could remain unvaccinated, receive a vaccine, or die. Vaccinated individuals could receive a repeat vaccine, not receive a repeat vaccine, or die. Invasive pneumococcal disease (IPD) could develop at any stage of the process.

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

the age distribution of Medicare enrollees;
the pre-HEDIS vaccination rate;
the HEDIS-associated percentage increase in vaccination among unvaccinated elderly;
HEDIS-associated inadvertent revaccinations;
the incidence of IPD in unvaccinated persons;
the effectiveness of the vaccine against pneumococcal serotypes included in the vaccine;
the proportion of IPD caused by serotypes included in the vaccine;
the case fatality rate for IPD;
the all-cause death rates; and
vaccine side effects with new vaccination or revaccination.

**Study designs and other criteria for inclusion in the review**
A formal review of the literature was not undertaken. The design of the primary studies was unclear. The all-cause death rates were derived from US Life Tables.

**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**
Eighteen primary studies provided the effectiveness evidence.

**Methods of combining primary studies**
Not stated.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
The age distribution of Medicare enrollees was 54.3% (range: 51.4 - 54.5) for age 65 to 74 years, 36.2% (range: 33.8 - 36.3) for age 75 to 84 years, and 9.5% for enrollees aged 85 years and older.

The pre-HEDIS vaccination rate was 50% (range: 40 - 60) for 65- to 74-year-olds and 61% (range: 51 - 71) for those aged 75 years and older.

The HEDIS-associated increase in vaccination among unvaccinated elderly (some values were calculated using a logistic
function) was 16% (range: 8 - 28) in year 1, 10% (range: 5 - 15) in year 2, 5% (range: 3 - 7) in year 3, 2% (range: 2 - 3) in year 4, and 1% in year 5.

HEDIS-associated inadvertent revaccinations were 1.5% (range: 0.2 - 2.8).

The incidence of IPD in unvaccinated persons (per 100,000 per year) was 53.6 (range: 42 - 55.2) for 65- to 74-year-olds, 73.4 (range: 68.2 - 88.5) for 75- to 84-year-olds, and 119.9 (range: 115.5 - 184.6) for those aged 85 years and older.

The vaccine effectiveness against pneumococcal serotypes included in the vaccine was 85 to 65% (ranges: 65 - 5 and 95 - 85) for 65- to 74-year-olds, 75 to 35% (ranges: 43 - 0 and 91 - 81) for 75- to 84-year-olds, and 60 to 0% (ranges: 5 - 0 and 83 - 63) for those aged 85 years and older.

The proportion of IPD caused by serotypes included in the vaccine was 88% (range: 84 - 93).

The case fatality rate for IPD was 13% (range: 11 - 15) for 65- to 74-year-olds, 19% (range: 16 - 22) for 75- to 84-year-olds, and 23% (range: 20 - 26) for those aged 85 years and older.

The rate of vaccine side effects was 0.002 (range: 0.001 - 0.003) with both new vaccination and revaccination.

The all-cause death rates were not reported.

Measure of benefits used in the economic analysis
The model led to a reduction in the number of cases of IPD and to a gain in life-years for the HEDIS relative to no programme. An annual discount rate of 3% was applied to the future benefits. The principal benefits used in the economic analysis were averted costs, which included lost productivity due to morbidity and death within the framework of the human capital approach.

Direct costs
The costs were discounted using an annual rate of 3% since they were incurred over a long time. The unit costs were presented separately from the quantities of resources used. The health services included in the economic evaluation were HEDIS reporting, quality improvement interventions, vaccine and administration, travel for vaccination, and the treatment of side effects. The costs averted because of the vaccination intervention were hospitalisations, outpatient visits and medications, skilled nursing facility and Home Health Agency. The costs averted were subtracted from the vaccination costs to assess the cost-savings associated with the use of the HEDIS intervention. Research and development costs for the HEDIS measure were excluded because their impact per enrollee was negligible. The cost/resource boundary of the direct costs was that of the MCO. Resource use was partly derived from studies published from 1980 to 2001, and was partly based on authors' assumptions. The costs came from published studies and Medicare sources. All the costs were presented in 2000 values using the appropriate component of the Consumer Price Index.

Statistical analysis of costs
The costs were presented as mean values with ranges. No statistical test was conducted on either the costs or quantities.

Indirect Costs
The indirect costs were considered as a societal perspective was adopted. The human capital approach was used to assess the economic value of productivity, consisting of earnings and housekeeping services. As in the analysis of the direct costs, a 3% discount rate was applied and the price year was 2000. The unit costs were presented separately from the quantities of resources used. The estimation of the costs and quantities came from published sources.

Currency

NHS Economic Evaluation Database (NHS EED)
Sensitivity analysis
Univariate sensitivity analyses were conducted to assess the impact of variability in the data on the estimated costs. All model inputs were investigated and the ranges of values were identified from the literature. Bivariate sensitivity analyses were performed on model inputs that were likely to have been inter-related. Finally, a Monte Carlo simulation with 5,000 iterations was performed. This assumed triangular probability distributions for model variables that were varied simultaneously.

Estimated benefits used in the economic analysis
The use of the HEDIS for 5 consecutive years in an MCO enrolling 25,000 elderly people led to a reduction of 7.5 cases of IPD and a gain of 15 life-years (11 discounted life-years).

Cost results
The programme costs per enrollee were $5.65.

The net cost-saving per enrollee would be $6.54 for 65- to 74-year-olds, $3.66 for 75- to 84-year-olds, and $2.02 for those aged 85 years and older.

If only the direct costs were considered, the net cost-savings per enrollee would be $2.02.

The sensitivity analysis showed that the use of the HEDIS programme generally led to cost-savings even under very unfavourable scenarios. The exception was variations in vaccine efficacy, in which very low values resulted in the costs of the programme being slightly higher than the costs averted.

The Monte Carlo simulation showed that the HEDIS intervention would be cost-saving 99.8% of the time, with an average net saving of $3.80 per enrollee (95% probability interval: 0.73 - 6.87).

Synthesis of costs and benefits
Costs and benefits were combined in the form of a net-benefit, as reported above.

Authors' conclusions
The implementation of the Health Plan Employer Data and Information Set (HEDIS) programme for the improvement of quality of care was a very cost-effective option in comparison with no programme, as it led to cost-savings from the perspectives of society and the managed care organisation (MCO). In 225 Medicare MCOs with an aggregate enrolment of 5.6 million persons, the use of the HEDIS programme would result in a reduction of 1,700 cases of invasive pneumococcal disease (IPD), a gain of 3,400 life-years, and societal savings of more than $20 million.

CRD COMMENTARY - Selection of comparators
The choice of the comparator (no programme) was appropriate as it reflected standard care for most MCOs. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness used data derived from published studies. However, it was unclear whether a review of the literature was undertaken. In addition, little information on the primary studies (i.e. design, sample population, or type of interventions) was provided. Further, the methods used to extract and then combine the primary estimates were not reported. This makes it difficult to evaluate the sources. More information would have been useful for assessing the validity of the studies used. However, appropriate sensitivity analyses were conducted to address the issue of
uncertainty.

Validity of estimate of measure of benefit
The health benefits were represented in the model by averted costs, which included loss of productivity due to morbidity and death, within the framework of the human capital approach to valuing opportunity costs. This approach is appropriate within the methods of CBA.

Validity of estimate of costs
The authors stated explicitly which perspective was adopted in the study. As such, it appears that all the relevant categories of costs have been included in the analysis. The method used to assess the indirect costs was reported. The unit costs and the quantities of resources used were presented for almost all cost items. The price year and the sources of the data were also reported. Some of the assumptions made in the analysis were discussed and made explicit. Thus, it should be possible to replicate the study and to carry out reflation exercises in other settings. Appropriate discounting was applied and the use of alternative discount rates was investigated. Extensive sensitivity analyses were conducted, using appropriate ranges of values, which made the results of the analysis robust.

Other issues
The authors did not compare their findings with those from other studies, stating that this was the first study designed to assess the economic impact of a national quality measure programme. The issue of the generalisability of the study results to other settings was not explicitly addressed, but several sensitivity analyses were conducted. The authors noted some limitations of their study. First, an increase in vaccination levels could reduce the economic benefits because patients with chronic conditions might have been vaccinated before. Second, some costs incurred by the MCO could have been underestimated. Third, some data relied on literature-based assumptions. Fourth, since some MCOs were already conducting quality improvement interventions, the implementation of the new programme would not result in further benefits. However, in general, the sensitivity analysis addressed most of these issues and the conclusions of the base-case analysis were quite robust.

Implications of the study
The study results suggested that purchasers of health care and public health agencies may be interested in quality improvement programmes that could facilitate the achievement of future national objectives, such as Healthy People 2010.

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None stated.

Bibliographic details

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Other publications of related interest

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Subject indexing assigned by NLM
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