Vaccination of risk groups in England using the 13 valent pneumococcal conjugate vaccine: economic analysis

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
This study aimed to estimate the cost-effectiveness of vaccination with a 13-valent pneumococcal conjugate vaccine, for those at a high risk of invasive pneumococcal disease, in the UK. The authors concluded that it was unlikely that vaccination would be cost-effective, and better evidence on the effectiveness of vaccination against non-bacteraemic pneumonia was needed. The methods were good. There were a few limitations to the study, but the conclusions reached by the authors appear to be appropriate.

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

Study objective
The objective was to evaluate the cost-effectiveness of direct vaccination, with the 13-valent pneumococcal conjugate vaccine, for those at a high risk of invasive pneumococcal disease, as an addition to the 23-valent polysaccharide vaccination programme, for those at high risk, considering the potential indirect benefit from infant vaccination.

Interventions
The 13-valent pneumococcal conjugate vaccine, for those at high risk aged two years or older, in addition to the 23-valent polysaccharide vaccination, for those at high risk, and the usual infant vaccination programme, which provided herd immunity, was compared with the normal risk-based 23-valent polysaccharide vaccination and usual infant vaccination.

High-risk patients were those with splenic dysfunction, chronic respiratory disease, chronic heart disease, chronic kidney disease, chronic liver disease, diabetes, a compromised immune system, or HIV infection.

Location/setting
UK/primary care.

Methods
Analytical approach:
A cohort decision model was used to synthesise data from the literature for the cost-effectiveness analysis. The cohort was based on a recent study of patients admitted to hospitals in England, with culture-confirmed invasive pneumococcal disease. The time horizon was lifetime and the authors stated that the study perspective was that of the UK NHS.

Effectiveness data:
The data for the risks of different types of sequelae, the effect of the 13-valent vaccine on non-bacteraemic pneumonia, the herd effect, the vaccine efficacy, the number of vaccine doses, and the duration of protection, were from a variety of sources. The primary clinical evidence was the efficacy of the 13-valent pneumococcal conjugate vaccine, which was collected, using a published framework, from an expert panel of five members of the Pneumococcal Subcommittee of the Joint Committee on Vaccination.

Monetary benefit and utility valuations:
The sources for the utility values were three published studies that reported the utility decrements for bacteraemia, meningitis, non-bacteraemic pneumococcal pneumonia, and the sequelae from meningitis. Two of these three studies
assessed Dutch patients.

Measure of benefit:
The main summary measure of benefit was the quality-adjusted life-year (QALY), which was used to produce the ratio of cost per QALY.

Cost data:
The direct cost categories were vaccination with the 13-valent pneumococcal conjugate vaccine; admissions, hospital stay, and treatments, where pneumococcal disease was the main cause of admission; and lifetime treatment after meningitis. The costs of hospital admissions and procedures, by NHS resource group, were based on national reference costs for the NHS. The lifetime cost of meningitis was from a cost-effectiveness study, and the costs of the vaccines were estimated using their price and administration costs from the British National Formulary. The price year was 2009 to 2010 and, where necessary, the costs were adjusted using the hospital and community health services pay and price index. They were discounted at a rate of 3.5% per year.

Analysis of uncertainty:
Univariate, probabilistic, threshold, and scenario analyses were undertaken. The results were presented in tables and cost-effectiveness acceptability curves.

Results
The 13-valent pneumococcal conjugate vaccination programme for those at high risk was estimated to prevent 406 cases of invasive pneumococcal disease and result in a gain of 1,923 QALYs, compared with the usual practice (including herd immunity effects). The programme was estimated to cost £233 million, of which £202 million was the cost of the vaccines.

The incremental cost-effectiveness ratio of the vaccination programme was estimated to be £183,680 per QALY gained, assuming no impact on non-bacteraemic pneumonia.

Only vaccination of one risk group, those with chronic liver disease, resulted in a ratio of cost per QALY that was below £30,000 (the usual threshold for cost-effectiveness in the study setting), resulting in a cost per QALY gained of £20,324. Other ratios for the individual risk groups ranged from £61,239 to £1,204,091.

When an impact on non-bacteraemic pneumonia was assumed, the ratios for the individual risk groups ranged from £10,825 to £37,686. The full results of the sensitivity analyses were presented and, amongst other things, they suggested that the predicted herd effects of the infant programme, and the vaccine efficacy, each had a large impact on the incremental cost-effectiveness ratios.

Authors' conclusions
The authors concluded that, with their baseline assumptions, it was unlikely that a 13-valent pneumococcal conjugate vaccination for those at high risk would be cost-effective, but the uncertainty could be reduced by better evidence on the effectiveness of vaccination against non-bacteraemic pneumonia.

CRD commentary
Interventions:
The description of the intervention was sufficient and the intervention was compared with the usual practice, in the study setting, which was an appropriate comparator.

Effectiveness/benefits:
The effectiveness of the 13-valent vaccine was from an expert panel as there was limited evidence on its efficacy. The details of the process were fully reported in an appendix. Other data for the model were from recent relevant sources, but the methods used to identify these sources were not described. The authors used estimates from the literature for the utility values for the estimation of the QALYs, but it was not clear how these studies were identified and whether the best available data were used. Neither the instruments used, nor whose preferences were elicited, were reported. For these reasons, it is difficult to assess the quality of the estimation of the QALYs.
Costs:
The costs were consistent with the stated perspective. The sources for the resource use and prices were appropriate for
the setting, but the details of the estimation of the lifetime costs after meningitis were not given. The price year was
clearly stated and appropriate methods, using health care inflation rates, were used to adjust the costs. Discounting was
appropriate, given the time horizon of the analysis, and the rate was in line with recommendations for the UK. The
costs were reported item by item in a table, but the associated resource use and prices were not presented separately.

Analysis and results:
A cohort model was used to synthesise the data, but only limited details were provided. The incremental analysis was
appropriate for comparing the relative cost-effectiveness of introducing the new vaccination to the usual practice.
Appropriate methods to assess the full impact of uncertainty were used, and the reporting of these analyses was good.
The authors reported the results in full, and considered important limitations to their study. Overall, the study appears to
have been well conducted, and most of the limitations were due to limitations in the data.

Concluding remarks:
The methods were good. There were a few limitations to the study, but the conclusions reached by the authors appear to
be appropriate.

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