A predictive model of the economic effects of an influenza vaccine adjuvant for the older adult (age 65 and over) population

Lee BY, Ercius AK, Smith KJ

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 evaluated the potential costs and health effects of an enhanced influenza vaccine for adults aged 65 years or older. The authors concluded that providing an adjuvant influenza vaccine for older adults was likely to produce higher effects, lower morbidity, and cost savings. Despite the lack of evidence to substantiate the cost and effectiveness of the adjuvant vaccine, the methods were appropriate and were clearly and transparently reported, and the conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to evaluate the cost and health effects of an enhanced influenza vaccine for adults aged 65 years or older. A hypothetical population of older US adults, who were either living in the community or in a nursing home, was analysed.

Interventions
The standard influenza vaccine was compared with an influenza vaccine that included an adjuvant to enhance or prolong the patient's response to the vaccine.

Location/setting
USA/primary care.

Methods
Analytical approach:
A decision-analytic model was used to synthesise data from published scientific literature and other sources. The analysis had a one-year time horizon (a single influenza season) and the authors stated that it was carried out from the perspectives of society and a third-party payer.

Effectiveness data:
The rates of influenza and pneumonia, local and systemic vaccine side-effects, influenza-induced pneumonia, and death were from a selection of relevant published studies. The remaining clinical data were from randomised controlled trials, systematic reviews, and authors' assumptions. A hypothetical range of adjuvant effectiveness was used and, in the base case, it was assumed to increase the effectiveness to equal that of the standard vaccine in adults aged 20 to 64 years.

Monetary benefit and utility valuations:
The utility weights for influenza and pneumonia were from published studies, while authors’ estimates were used for the vaccine side-effects.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs).

Cost data:
The cost categories included standard and adjuvant vaccine costs, influenza treatment costs, productivity losses for out-
patient visits, out-patient visits, in-patient stays and deaths, and the treatment costs for vaccine side-effects. The unit costs were based on US fee and price schedules and publicly available national reports. In the base case, it was assumed that the adjuvant vaccine cost the same as the standard vaccine. All costs were presented in 2007 US dollars ($).

Analysis of uncertainty:
The parameter uncertainty was measured in one-way sensitivity analyses, using 95% confidence intervals, for most of the model parameters. Probabilistic sensitivity analyses were undertaken, with Monte Carlo simulations. The results were presented in tables and cost-effectiveness acceptability curves.

Results
From a societal perspective, the mean costs per person over one year ranged from $39.26 to $69.78 for the adjuvant vaccine when its additional cost ranged from zero to $30. The mean costs for the standard vaccine ranged from $76.13 to $77.18, with the different price simulations. The mean QALYs per person were 0.81 for the adjuvant vaccine and 0.79 or 0.78 for the standard vaccine.

In the base case, where the adjuvant cost nothing, the adjuvant vaccine was dominant, as it was less costly and more effective. The adjuvant vaccine remained dominant, from both a societal and a third-party payer perspective, even when its cost was $10, $20, or $30 more than that of the standard vaccine.

Two-way sensitivity analyses showed that when the adjuvant vaccine was as effective as the standard influenza vaccine in younger adults and the adjuvant price was no more than $65, the adjuvant vaccine provided better effectiveness at lower overall costs. The probabilistic sensitivity analyses indicated that, when the cost of the adjuvant was less than $20, the adjuvant vaccine always cost less and produced more QALYs.

Authors' conclusions
The authors concluded that providing adjuvant influenza vaccine to older adults in the USA was likely to produce higher effects, lower morbidity, and cost savings.

CRD commentary
Interventions:
The interventions appear to have been appropriate comparators, but they were not well described. Neither the vaccine dose, nor the type of adjuvant were stated. The study population was adequately described.

Effectiveness/benefits:
The clinical effectiveness parameters were from relevant published research, including several meta-analyses. The data sources were clearly reported, as were all the assumptions made. There was no evidence for the vaccine effectiveness, through improved immunity, in aging adults, and this important input had to be assumed. The methods used to measure the utilities were not stated, but the sources were referenced and should be consulted to assess their methods and the quality of these data. No discounting was necessary due to the short time horizon.

Costs:
A societal perspective was used and included the relevant direct medical resources and productivity losses, during influenza illness. Other societal costs, such as the time taken to receive the vaccine and the resources involved in a vaccination programme, were omitted and might have been important. The costs were appropriately adjusted for inflation and no discounting was necessary due to the short time horizon.

Analysis and results:
The analytic approach was satisfactorily reported, with the model structure and a diagram. The results were reported clearly and considerable variations in parameters were tested in the sensitivity analyses and did not change the key findings. The authors reported a number of limitations to their study, including the possible underestimation of influenza prevalence in older adults and the omission of individual comorbidities or other socio-demographic characteristics and their impact on health outcomes.

Concluding remarks:
Despite the lack of evidence to substantiate the cost of the adjuvant vaccine and its effectiveness, the methods were appropriate and were clearly and transparently reported. The conclusions appear to be appropriate.

**Funding**
Supported by the National Institute General Medical Sciences Models of Infectious Agent Study (MIDAS).

**Bibliographic details**
Lee BY, Ercius AK, Smith KJ. A predictive model of the economic effects of an influenza vaccine adjuvant for the older adult (age 65 and over) population. Vaccine 2009; 27(16): 2251-2257

**PubMedID**
19428839

**DOI**
10.1016/j.vaccine.2009.02.024

**Original Paper URL**
http://dx.doi.org/10.1016/j.vaccine.2009.02.024

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adjuvants, Immunologic /economics; Aged; Aged, 80 and over; Aging /immunology; Computer Simulation; Humans; Influenza Vaccines /economics /immunology

**AccessionNumber**
22009101139

**Date bibliographic record published**
09/09/2009

**Date abstract record published**
02/03/2011