Cost-effectiveness of live attenuated influenza vaccine versus inactivated influenza vaccine among children aged 24-59 months in the United States

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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.

CRD summary
This study examined the cost-effectiveness of two influenza vaccines, a live attenuated vaccine and an inactivated vaccine, for children aged between 24 and 59 months. The authors concluded that, the live attenuated vaccine was less costly and more effective than the inactivated vaccine. The methodology was valid and the authors’ conclusions appear to be appropriate.

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

Study objective
The objective was to compare the cost-effectiveness of two vaccines for the prevention of influenza in healthy children aged 24 to 59 months.

Interventions
The two vaccines were live attenuated influenza vaccine, trivalent, and inactivated influenza vaccine, trivalent.

Location/setting
USA/primary care.

Methods
Analytical approach:
A decision analytic model was populated with data from the literature to compare the cost-effectiveness of the two vaccines. The time horizon was 180 days and the authors stated that a societal perspective was adopted.

Effectiveness data:
The effectiveness data were mainly derived from a published, randomised, double-blind, multinational study, which was a head-to-head comparison of the two vaccines in children aged under five years. Further data were derived from other published literature. The primary clinical parameters were the probability of uncomplicated and complicated influenza and vaccine-associated adverse events.

Monetary benefit and utility valuations:
The utility values for the different health states were obtained from published studies. The methods used to derive them were not reported.

Measure of benefit:
The authors used quality-adjusted life-years (QALYs) as the primary measure of benefit. The cases of influenza, acute otitis media, and lower respiratory infections, hospitalisations, emergency room visits, and out-patient physician visits avoided were secondary measures of benefit. The remaining life-years were appropriately discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of vaccine acquisition, administration, and adverse events; hospitalisation and out-patient care due to influenza or vaccine-related adverse events; drugs due to influenza; and transportation. The
indirect costs, such as caregiver absenteeism from work and usual activities due to vaccination for influenza, were also included. The resource use data were based on the principal study. The costs were either derived from official national sources or from the published literature. They were reported in US dollars ($) and appropriately adjusted and reported for the price year 2006. Some assumptions were required and were reported in detail.

Analysis of uncertainty:
The parameter uncertainty was investigated through one-way sensitivity analysis on all the model parameters. A scenario allowing secondary wild-type influenza virus transmission among household members was investigated. Probabilistic sensitivity analysis, using Monte Carlo simulation, was used to investigate the variation in clinical outcomes and resource utilisation on the results. The method used to derive the parameter distributions was only briefly reported.

Results
The total average cost per vaccinated child was $155.81 with the live attenuated vaccine and $201.61 with the inactivated vaccine. For a cohort of 100,000 vaccinated children the live attenuated vaccine was estimated to result in cost-savings of $4.6 million compared with the inactivated vaccine.

For a cohort of 100,000 children the live attenuated vaccine resulted in 93,267 QALYs gained and the inactivated vaccine resulted in 93,230 QALYs gained, which was a difference of 36 QALYs. The live attenuated vaccine was the dominant strategy as it was less costly and more effective than the inactivated vaccine. This remained the case when the secondary measures of benefit were used.

The one-way sensitivity analyses demonstrated that the results were most sensitive to variation in the days of work absenteeism, relative vaccine efficacy of the two vaccines, vaccine cost, influenza attack rate, and percentage of children vaccinated with a double dose. The probabilistic sensitivity analysis demonstrated that the live attenuated vaccine had a probability of being the dominant strategy of 100%.

Authors' conclusions
The authors concluded that the live attenuated vaccine reduced the influenza rate at a lower cost compared with the inactivated vaccine, for children aged 24 to 59 months.

CRD commentary
Interventions:
The choice of comparators was explicitly defined. The live attenuated vaccine and the inactivated vaccine were the only two influenza vaccines available in the authors' setting (USA) at the time of this study.

Effectiveness/benefits:
The authors selected one head-to-head randomised controlled trial (RCT) for the effectiveness data. This and another two head-to-head RCTs were, according to the authors, the most appropriate sources of data available, due to the strengths of their design. Other clinical parameters were based on studies retrieved through a literature review, the details of which were not reported. As the utility values were obtained from published studies, little information was provided on their derivation, but the benefit measures were both generic and disease-specific and were appropriate for detecting the impact of the vaccines on children's health. The use of QALYs will allow cross-disease comparisons. Future life-years were appropriately discounted.

Costs:
The categories of costs reflected the societal perspective, but the costs were only reported as macro-categories. Except for hospitalisation days, the unit costs and resource quantities were not presented separately, which means that it will be difficult to replicate the analysis for other settings. The source of the data was described and all other aspects of the cost study, such as the price year, inflation adaptation, and assumptions were given.

Analysis and results:
The costs and benefits were appropriately combined in an incremental analysis, which indicated a superior economic and clinical profile for the live attenuated vaccine. The parameter uncertainty was appropriately investigated using both
a deterministic and a probabilistic approach. The results of the base case and the sensitivity analysis were reported satisfactorily. The authors discussed the issue of the generalisability of their results to other settings and further limitations to their study, which stemmed mainly from the principal RCT.

Concluding remarks:
Overall, the study was based on valid methodology and was well presented. The authors’ conclusions appear to be appropriate.

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