

Novel health economic evaluation of a vaccination strategy to prevent HPV-related diseases: the BEST study

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CRD summary

This study assessed the cost-effectiveness of quadrivalent multi-cohort human papillomavirus (HPV) vaccination, for girls. The authors concluded that the multi-cohort vaccination programmes were cost-effective, in Italy. The methods were valid and the study was generally reported well. The authors' conclusions appear to be appropriate.

Type of economic evaluation

Cost-utility analysis

Study objective

This study assessed the cost-effectiveness of quadrivalent multi-cohort human papillomavirus (HPV) vaccination, for girls.

Interventions

The quadrivalent HPV vaccination for girls, in addition to cervical screening, was compared with screening alone. Three cohort strategies were assessed: girls aged 12 and 15 years (two-cohort strategy); girls aged 12, 15 and 18 years (three-cohort strategy); and girls aged 12, 15, 18 and 25 years (four-cohort strategy).

Location/setting

Italy/primary care.

Methods

Analytical approach:

The analysis was based on a Markov state-transition model, with annual cycles. The time horizon was 90 years. The model was calibrated to fit Italian epidemiological, clinical, demographic, and economic data. The authors stated that the perspective of the Italian National Health Service was adopted.

Effectiveness data:

The effectiveness estimates came from published studies. A few clinical estimates, such as the duration of protection, were based on authors' assumptions, informed by clinical expert opinion. The epidemiological data were from Italian sources. The main clinical endpoint was the efficacy of the vaccine in preventing HPV infection, and HPV-related diseases, including cervical cancer.

Monetary benefit and utility valuations:

The utility values were from a published study of Italian females, and they were elicited using the time trade-off approach.

Measure of benefit:

Quality-adjusted life-years (QALYs) were the measure of benefit. Future benefits were discounted at an annual rate of 1.5%.

Cost data:

The economic analysis considered the direct medical costs of the vaccination (including administration), screening, diagnosis, and the management of HPV-related diseases. The cost estimates were mostly from the Italian National Health Service. All costs were reported in Euros (EUR). Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:

A probabilistic sensitivity analysis was conducted to assess the impact of uncertainty in the model inputs, by fitting probability distributions alongside all model parameters, and using 50,000 Monte Carlo simulations. The results were presented using cost-effectiveness acceptability curves. The authors performed an expected value of perfect information analysis to find the value of acquiring additional information for the parameters.

Results

The incremental discounted costs of vaccination, over screening alone, were EUR 43,472,580 for the two-cohort strategy, EUR 70,335,900 for the three-cohort strategy, and EUR 93,407,500 for the four-cohort strategy.

Assuming lifetime protection, the cost per QALY gained was EUR 12,013 (95% CI 2,364 to 22,481) for the two-cohort

strategy, EUR 13,232 (95% CI 4,432 to 22,939) for the three-cohort strategy, and EUR 15,890 (95% CI 7,179 to 25,139) for the four-cohort strategy.

The expected value of perfect information was EUR 12.6 per patient, implying that the impact of uncertainty in the model inputs, on decision making, was not substantial.

Authors' conclusions

The authors concluded that the multi-cohort quadrivalent vaccination programmes were cost-effective, in Italy.

CRD commentary

Interventions:

The vaccination strategies were clearly reported. The selection of the comparators was appropriate. The proposed vaccination strategies, plus the usual screening programme, were compared with screening alone.

Effectiveness/benefits:

The effectiveness data were mostly from published studies. The method used to synthesise the data from different sources was unclear. There was no indication that a systematic review was performed, so it is unclear whether all of the best available evidence was used. The clinical sources included randomised controlled trials, which are considered methodologically sound and have good internal validity. The authors made assumptions for some inputs, such as the duration of vaccine protection. QALYs were an appropriate benefit measure, given the impact of HPV infection, leading to cervical cancer, on quality of life and survival. The utility weights were from a published Italian study and brief details were provided on the method used to assess the utilities and the population studied, both of which appear to have been appropriate.

Costs:

The perspective was clearly defined and it appears that all the relevant costs were considered. Total cost categories were presented, without a breakdown of individual items, and the resource use was not presented separately. This will make it difficult to replicate the analysis for other settings. The sources for the unit costs, for treatment and follow-up of HPV-related lesions, were provided, and the main one was the Italian National Health Service. The discount rate was given, but the price year was not reported.

Analysis and results:

The analytic approach was appropriate and the model structure was presented in a supplementary file. The incremental analysis was appropriate for determining the cost-effectiveness of the vaccination strategies. Uncertainty in the results was appropriately assessed in a probabilistic sensitivity analysis and an expected value of perfect information analysis. Alternative vaccination scenarios were considered. The results of the main analysis and the sensitivity analyses were well reported. The authors acknowledged several limitations to their study, including the fact that their model did not take into account herd immunity effects from vaccination.

Concluding remarks:

The methods were valid and the study was generally reported well. The authors' conclusions appear to be appropriate.

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