Economic evaluation of varicella vaccination in Swiss children and adolescents

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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
The aim was to compare the cost-effectiveness of three two-dose vaccination strategies against varicella zoster virus. Universal vaccination of toddlers, with or without catch-up for adolescents, reduced the disease burden and resulted in net costs to the third-party payer, but net savings to society, compared with immunisation for adolescents. It was not clear if the vaccine effectiveness data were the best available nor, due to limited sensitivity analysis, how the uncertainty in the effectiveness data affected the cost-effectiveness results.

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

Study objective
The objective was to compare the cost-effectiveness of three vaccination strategies, each using two doses, against varicella zoster virus.

Interventions
The three vaccination strategies were: the usual strategy in Switzerland, which was vaccination of children, aged 11 to 15 years, who had no history or an uncertain history of chickenpox; universal vaccination of susceptible children aged one to two years; and both these strategies, with universal vaccination of one-to-two-year-olds and catch-up vaccination of 11-to-15-year-olds, who had no or an uncertain history of chickenpox. Two doses of the vaccine were given.

Location/setting
Switzerland/primary care.

Methods
Analytical approach:
The authors used a decision-analytic model that had been published and validated, called the Economic Varicella Vaccination Tool for Analysis (EVITA; Iseli, et al. 2009, see ‘Other Publications of Related Interest’ below for bibliographic details). The time horizon, for the base case, was 30 years. The authors stated that the perspectives were that of society and that of the third-party payer.

Effectiveness data:
The evidence came from prospective data collected in the Swiss setting, data from published literature, and the opinions of a panel of experts. The main clinical parameters were the efficacy of vaccination (derived from three published studies), the coverage rates (based on expert opinion), and the varicella complications (based on data from a prospective study conducted in Basel, Switzerland, expert opinion, and estimates from the literature).

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measures of benefit were the number of life-years gained and the benefit-to-cost ratio.

Cost data:
The direct costs included those of vaccination, treating infections, complications, and, for the societal perspective only, productivity losses. The vaccine costs were from Tarmed Suisse Version 1.05.03, while the medical resource patterns
and productivity losses were from a prospective Swiss study. The currency was Swiss francs (CHF) and the price year was 2008. Any cost adjustments were made using the Consumer Price Index for Switzerland. The costs were discounted at an annual rate of 5%.

Analysis of uncertainty:
A series of univariate sensitivity analyses was performed on the model inputs.

Results
The total direct costs, from the payer perspective, were CHF 1,755,971 for vaccinating 11-to-15-year-olds, CHF 3,248,425 for one-to-two-year-olds, and CHF 3,610,748 for both strategies. Compared with vaccinating 11-to-15-year-olds, the net cost of vaccinating one-to-two-year-olds was CHF 1,492,454 and the net cost of both strategies was CHF 1,854,777.

From a societal perspective, the costs were CHF 5,864,872 for 11-to-15-year-olds, CHF 5,241,203 for one-to-two-year-olds, and CHF 5,304,797 for both. Compared with vaccinating 11-to-15-year-olds, the net saving with vaccination of one-to-two-year-olds was CHF 623,669, and the net saving with both strategies was CHF 560,075.

Compared with vaccinating 11-to-15-year-olds, the benefit-to-cost ratio of vaccinating one-to-two-year-olds was 0.30 for the payer and 1.29 for society, and for vaccinating both groups it was 0.27 for the payer and 1.22 for society.

From the payer perspective, the cost per life-year gained, compared with vaccination for 11-to-15-year-olds, was CHF 1,588 with for one-to-two-year-olds, and 1,711 with both strategies.

Authors' conclusions
The authors concluded that universal vaccination of toddlers, with or without catch-up for adolescents, reduced the disease burden and resulted in net costs to the third-party payer, but net savings for society, compared with immunisation for adolescents.

CRD commentary
Interventions:
The interventions were well described. The usual vaccination strategy in Switzerland, which was vaccination of 11-to-15-year-olds who had no or an uncertain history of chickenpox, was included. These comparators were likely to be relevant to other settings, but there might have been alternative vaccines or vaccination strategies that were not evaluated.

Effectiveness/benefits:
The effectiveness data were from a range of sources, which were described in detail, with their references, and the assumptions made were reported. The methods of the literature review were not reported, which makes it impossible to ascertain if the best available evidence was used. The data were appropriate for the study setting. The study had a 30-year time horizon, which captured the differences in health outcome. It was not clear if the complications due to vaccination had a significant impact on quality of life. If they did, the quality-adjusted life-year was a more appropriate measure of benefit. The benefits were not discounted, which was in line with health economic guidelines in Switzerland.

Costs:
The authors reported their perspectives and included the relevant costs for them. The cost estimates were also relevant to the study setting and population. The adjustment of costs to the base year was appropriate, but the full Consumer Price Index was used while the health care component would have been more appropriate, as health care price inflation generally exceeds that of the overall economy. The costs were discounted at the Swiss recommended rate.

Analysis and results:
The analytic approach was adequately described and well referenced, but no diagram of the published and validated model was given and this would have been helpful. The results were reported clearly and in full. The incremental cost-effectiveness ratios and benefit-to-cost ratios were reported for each vaccination strategy, compared with the usual
practice. Incremental cost-effectiveness ratios are preferred to benefit-to-cost ratios because benefit-to-cost ratios only include monetary benefits rather than health benefits. The cost-effectiveness analysis was not a full incremental analysis, but there were no deaths with either of the proposed strategies, so the cheaper one (vaccination of one-to-two-year-olds) was preferred. If quality-adjusted life-years were used, the two strategies would not have been equally effective, due to differences in complication rates. Univariate sensitivity analyses were performed, but only for the benefit-to-cost ratio and not for the incremental cost-effectiveness results. Multivariate and probabilistic sensitivity analyses would have more thoroughly assessed the impact of parameter uncertainty on the results. The reporting was generally good, and the authors discussed the strengths and limitations of their model.

Concluding remarks:
It was not clear if the vaccine effectiveness data were the best available nor, due to limited sensitivity analysis, how the uncertainty in these effectiveness data affected the cost-effectiveness results.

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