Economic evaluation of varicella vaccination in Italian children and adolescents according to different intervention strategies: the burden of uncomplicated hospitalised cases

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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 objective was to determine the costs and consequences of alternative vaccination programmes against varicella for toddlers and adolescents in the general Italian population. The authors concluded that universal varicella vaccination in young children was highly beneficial from the societal perspective in reducing the huge economic burden of the hospitalised and uncomplicated cases of varicella. The methodology and the reporting were satisfactory and the authors' conclusions appear to be appropriate.

Type of economic evaluation
Cost-benefit analysis

Study objective
The objective was to determine the costs and consequences of alternative vaccination programmes against varicella, for toddlers and adolescents in the general Italian population.

Interventions
Three vaccination strategies were evaluated: vaccination with two doses in toddlers aged 12 to 18 months, vaccination with two doses in adolescents aged 13 years, and vaccination in both of these groups. These were compared with a strategy of no vaccination, in models with age-structured cohorts representing the Italian population aged 0 to 70 years.

Location/setting
Italy/primary and secondary care.

Methods
Analytical approach:
A state-transition model was constructed to determine the clinical, epidemiological and economic impact of the alternative vaccination programmes, using mainly published evidence. The model was based on the published EVITA model (Halloran, et al. 1994, see 'Other Publications of Related Interest' below for bibliographic details). A 30 year time horizon was specified and the authors stated that societal and national health service perspectives were considered.

Effectiveness data:
The clinical data was obtained from published literature, based on observational clinical and epidemiological studies and clinical trial data from Italy, or where no Italian data were available from other European countries, and expert opinion. The key clinical parameters were vaccine efficacy including waning effects, and the incidence of complications, hospitalisations and death due to varicella.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The primary measures of clinical benefit were the reduction in the number of varicella cases, the number of complications and the number of deaths related to varicella.

Cost data:
From the national health service perspective, the analysis included the direct medical costs related to varicella vaccination and administration, and the costs of treatment of varicella and complications of varicella. From the societal perspective, the analysis also included the indirect costs of productivity losses of parents caring for sick children. These costs were derived from published sources and were presented in Euros (EUR). The time horizon of the analysis was 30 years and a discount rate of 3% was applied to future costs and benefits.

Analysis of uncertainty:
A univariate sensitivity analysis was performed by varying the model inputs across a plausible range. A multivariate sensitivity analysis was also performed to explore the outcomes in terms of the best and worst cases.

Results
Without a vaccination programme, the model estimated a total of 501,644 varicella cases and 27,341 varicella-related complications. Vaccination of toddlers (12 to 18 months) reduced the cases to 93,783 and complications to 5,041, vaccination in adolescents reduced cases to 450,081 and complications to 23,959, and vaccination in both groups reduced cases to 88,751 and complications to 4,761.

From the societal perspective, with no vaccination, the average annual cost of varicella was approximately EUR 100 million (81% indirect costs) and with vaccination of toddlers and both groups the costs were less than EUR 50 million. From the national health service perspective, the average annual cost of vaccination compared with no vaccination ranged from EUR 4,030,698 for adolescents to 7,965,639 for both age groups.

From the societal perspective, all the vaccination strategies provided a positive benefit-to-cost ratio (the intervention cost more, but became cost saving after the intervention); the ratio ranged from 2.60 (1.66 discounted) for adolescents to 3.47 (2.13 discounted) for toddlers. From the national health service perspective, the return on investment did not indicate net savings; the values ranged from 0.36 (0.21 discounted) for adolescents to 0.67 (0.38 discounted) for toddlers.

The benefit-to-cost ratios and return on investment results remained consistent in direction through univariate and multivariate sensitivity analyses.

Authors' conclusions
The authors concluded that universal varicella vaccination in young children was highly beneficial from the societal perspective in reducing the huge economic burden of the hospitalised and uncomplicated cases of varicella.

CRD commentary
Interventions:
The interventions appeared to be appropriate comparators and the proposed vaccination strategies were compared with the current practice in the authors’ setting, which was no vaccination. These strategies are also likely to be relevant in other settings.

Effectiveness/benefits:
The epidemiological and clinical data in general were derived from multiple published studies. The authors did not provide any detailed information on these studies beyond their references. The methods used to identify the literature were not reported, making it difficult to ascertain if the best available evidence was used. The efficacy of the second dose was based on expert opinion; it is not clear whether the literature search had revealed any other source of data. The summaries of benefit appeared to be appropriate for both of the stated perspectives.

Costs:
The authors reported the perspectives and those costs relevant to the perspectives of the national health service and society appear to have been included. The cost estimates were relevant to the population and setting and were derived from published data. The authors reported that future costs were subject to a discount rate of 3%, which seems appropriate, whilst future benefits were unadjusted; but the results were reported with discounting of costs and benefits.

Analysis and results:
Overall, the analytical approach was satisfactorily reported, although the model structure was not reported in full and there was no diagram. The authors stated that the model was published and validated, and they referenced Hammerschmidt, et al. 2003 (see 'Other Publications of Related Interest' below for bibliographic details). The results were reported adequately. Appropriate univariate and multivariate sensitivity analyses were performed and reported, although the full parameter uncertainty may not be captured using these techniques. Overall, the level of reporting was good, particularly for the base-case estimates of the effectiveness and costs.

Concluding remarks:
Overall, the methodology and the reporting of study were satisfactory. Appropriate comparisons were made and the results appear to be reliable. The authors' conclusions appear to be appropriate.

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