Is it cost-effective to introduce rotavirus vaccination in the Dutch national immunization program?

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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 Rotarix and RotaTeq vaccines against rotavirus in infants. It was an update of a previous evaluation, commissioned by the Dutch Health Council. The authors stated that, at the accepted threshold for cost-effectiveness in the Netherlands, neither mass vaccination with Rotarix nor with RotaTeq could be considered to be cost-effective. The methods were valid and the study was well presented, except for some clinical data sources. Overall, the authors’ conclusions appear to be robust.

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

Study objective
This study examined the cost-effectiveness of two national vaccination strategies against rotavirus in infants. The analysis was commissioned by the Dutch Health Council, as an update of an earlier economic evaluation by some of the authors of this study (Zomer, et al. 2008, Jit, et al. 2009, see ‘Other Publications of Related Interest’ below for bibliographic details).

Interventions
Two rotavirus vaccines, namely RotaTeq and Rotarix, were considered as additions to the national immunisation programme. Three doses of RotaTeq were administered, at two, four, and six months of age, while two doses of Rotarix were administered, at two and four months. These were compared with the usual national immunisation programme, which did not include rotavirus vaccination.

Location/setting
Netherlands/primary care.

Methods
Analytical approach:
The study was based on a discrete-event model with a 20-year horizon. The authors stated that two perspectives were adopted, that of the third-party payer and that of society.

Effectiveness data:
The clinical evidence was from relevant studies. The key input was the vaccine efficacy, which was from recently published European cost-effectiveness analyses. Most of the epidemiological data were from Dutch cohort studies.

Monetary benefit and utility valuations:
The disability weights were from published studies.

Measure of benefit:
Disability-adjusted life-years (DALYs), avoided rotavirus infections, avoided hospitalisations, avoided fatalities, and life-years (LYs) gained were the summary benefit measures. LYs gained and DALYs were discounted at an annual rate of 1.5%.

Cost data:
The economic analysis included the vaccine acquisition costs, and the direct health care costs (general practice consultations, specialist consultations, hospitalisations, and drugs). For the societal perspective, it also included the direct non-health care costs (travel and nappies), and indirect non-health care costs (productivity losses due to sick leave for those with rotavirus and due to work absence for their carers). The unit costs were reported and were generally Dutch data. The price of RotaTeq was not available and was estimated by the authors. All costs were in Euros (EUR) and the price year was 2006. A 4% annual discount rate was applied.

Analysis of uncertainty:
A series of one-way sensitivity analyses was carried out, to consider alternative assumptions for the clinical and economic inputs, and to assess the evidence from different published sources. The greatest variation was in the estimates of rotavirus incidence and the number of cases visiting a general practitioner (GP). Quality-adjusted life-years (QALYs) were also assessed as a benefit measure.

Results
In a hypothetical cohort of the Dutch population, with 200,000 newborns potentially being vaccinated each year, without vaccination the expected DALYs were 460, the rotavirus infections per year were 225,000, the hospitalisations per year were 3,800, the fatalities from rotavirus were 3.2, and the Lys lost were 150. With Rotarix the DALYs were 220, rotavirus infections were 182,000, hospitalisations were 850, fatalities were 0.2, and Lys lost were 13. With RotaTeq the DALYs were 230, rotavirus infections were 187,000, hospitalisations were 950, fatalities were 0.3, and Lys lost were 15. The total costs in millions per year were EUR 25 without vaccination, EUR 17.4 with Rotarix, and EUR 17.8 with RotaTeq. The direct health care costs in millions per year were EUR 8.9 without vaccination, EUR 2.5 with Rotarix, and EUR 2.7 with RotaTeq.

The incremental cost per LY gained with Rotarix over no vaccination was EUR 95,000 from the third-party payer perspective and EUR 88,000 from the societal perspective. The incremental cost per DALY avoided was EUR 53,000 from the third-party payer perspective and EUR 49,000 from the societal perspective.

The incremental cost per LY gained with RotaTeq over no vaccination was EUR 100,000 from the third-party payer perspective and EUR 94,000 from the societal perspective. The incremental cost per DALY avoided was EUR 58,000 from the third-party payer perspective and EUR 54,000 from the societal perspective.

The most influential model inputs were the vaccine-related costs, the annual epidemic size, the discount rate, and herd immunity. Using the market price rather than tender prices for the vaccines, or assuming a 4% discount rate, greatly increased the cost-effectiveness ratios. The inclusion of herd immunity produced more favourable results for the vaccines, with an incremental cost per DALY below EUR 20,000 in some cases.

Authors’ conclusions
The authors stated that, at the accepted threshold for cost-effectiveness in the Netherlands, neither a mass vaccination campaign with Rotarix nor with RotaTeq could be considered to be cost-effective. They also stated that further research should investigate the effect of herd immunity on the cost-effectiveness of rotavirus vaccination.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the proposed vaccination strategies were compared against the usual national immunisation programme in the authors’ setting.

Effectiveness/benefits:
The approach used to identify the data sources aimed to include recent relevant studies to update the previous economic evaluation. The authors generally explained their reasons for selecting each estimate from those available. The sources were generally relevant to the Dutch context, but limited information on their methods was provided, making it difficult to judge the validity of the clinical data. The issue of mixing data from potentially different sources was not raised nor discussed. The authors described the key issues involved in the definition of disability weights for rotavirus and alternative estimates were tested in the sensitivity analysis. DALYs were a valid benefit measure and they capture the impact of disease and can be compared with the benefits of other health care interventions.
Costs:
The use of two perspectives was appropriate and made the results relevant for different payers. The costs were listed as individual items and the unit costs and resource quantities were reported, enhancing the transparency of the economic analysis. The price year and the use of discounting were clearly reported. The assumptions were justified and they were tested in the sensitivity analyses. In general, the cost analysis was conducted satisfactorily.

Analysis and results:
The costs and benefits were appropriately synthesised in an incremental analysis, which allowed the identification of the most cost-effective strategy at the commonly quoted threshold of EUR 20,000 per QALY. The results were clearly reported and discussed and all the assumptions were explicitly reported. Appropriate sensitivity analyses were carried out and the authors justified the statistical approach used. They noted some limitations of their analysis, such as the use of a model that did not consider the indirect effects vaccination. Alternative scenarios were considered in the sensitivity analysis. A detailed comparison with previous studies was reported, with the differences and similarities highlighted.

Concluding remarks:
The methods were valid and the study was well presented, except for some clinical data sources. Overall, the authors’ conclusions appear to be robust.

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Other publications of related interest


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