Cost-effectiveness of a pentavalent human-bovine reassortant rotavirus vaccine for children <=5 years of age in Taiwan
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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 routine vaccination against rotavirus, using a pentavalent reassortant-virus vaccine, for children five years old or younger. The authors concluded that universal vaccination was cost-effective, at prices ranging from $20 to $30, from the perspectives of the health care system or society. The methods were valid and the sources of evidence were robust. The authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the cost-effectiveness of routine vaccination against rotavirus, using a pentavalent reassortant-virus vaccine, for children five years old or younger.

Interventions
The universal immunisation programme consisted of three doses (at two, four, and six months old) of the pentavalent (serotypes G1, G2, G3, G4, and P1A[8]) human bovine (WC3 strain) reassortant rotavirus vaccine (RotaTeq). The comparator was no vaccination.

Location/setting
Taiwan/primary care.

Methods
Analytical approach:
The analysis was based on a Markov model, with a hypothetical birth cohort of 220,260 Taiwanese children, for their first five years of life. The authors stated that it was carried out from the perspectives of both the health care system and society.

Effectiveness data:
Country-specific studies were supplemented with data from other settings that were most relevant for the simulation. The patterns of disease were mainly from a Mexican study of health care professionals, who monitored children for symptomatic or asymptomatic episodes, every two weeks for the first two years of life. The epidemiological data were from Taiwanese sources, where available. The efficacy of vaccination was a key input for the model, and was based on evidence from the Rotavirus Efficacy and Safety Trial (REST), a large-scale, placebo-controlled, phase III trial of nearly 70,000 children. Some assumptions were made for the coverage and other model inputs.

Monetary benefit and utility valuations:
The utility values were from a Canadian study that assessed the impact of the disease on children and their carers, using the Health Utilities Index (HUI2) plus the visual analogue scale (VAS) for children, and the European Quality of life (EQ-5D) questionnaire plus the VAS for parents or carers.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure.
Cost data:
The health care perspective included the costs of the immunisation programme and the direct medical costs of rotavirus disease. The societal perspective included these costs plus travel to health care facilities, oral rehydration therapy given at home, extra nappies, and parental work days missed to care for sick children. The resource consumption and cost estimates were from a recently published, prospective, cross-sectional, surveillance study of rotavirus gastroenteritis, conducted in hospitals and out-patient paediatric clinics in Taiwan. Other Taiwanese sources were used for other inputs. For example, official wages were used to estimate the cost of a work day missed. All costs were reported in $ and in Taiwan dollars (TWD). The price year was 2010.

Analysis of uncertainty:
One-, two-, and three-way sensitivity analyses were carried out to assess the impact of variations in most of the inputs for the model, using ranges from alternative sources of evidence.

Results
All clinical outcomes improved with vaccination. From a societal perspective, at a price of $25 per dose, the total costs for the whole birth cohort were $20,488,836 without vaccination and $19,723,823 with vaccination.

From the health care perspective, the cost per QALY gained with vaccination over no vaccination was $2,261, which was considered highly cost-effective, using the World Health Organization (WHO) criterion based on gross domestic product. From a societal perspective vaccination was dominant as it was more effective and less expensive than no vaccination.

The price per dose at which vaccination was cost neutral was $21.80 (TWD 688) for the health care perspective and $26.20 (TWD 827) for the societal perspective. Vaccination remained highly cost-effective in all scenarios considered in the sensitivity analyses. The inclusion of carers’ utility losses was the most influential input for the analysis.

Authors’ conclusions
The authors concluded that universal vaccination against rotavirus was cost-effective, at prices ranging from $20 to $30, from the perspectives of the health care system or society.

CRD commentary
Interventions:
The selection of the comparators was appropriate for the study setting and for similar countries where a routine rotavirus immunisation programme was not already implemented.

Effectiveness/benefits:
The methods and conduct of a literature review were not reported, but the authors justified the relevance of the key data sources and, in general, these appear to have been valid. For example, vaccine efficacy was from a large clinical trial that should have had high internal validity. Local estimates were mainly used for the epidemiological data. Extensive sensitivity analyses were appropriately carried out on the clinical inputs to assess the uncertainty in the results. A number of clinical outcomes were reported and QALYs were the summary benefit measure, which was appropriate as they capture the impact of disease on survival and quality of life, for both the children and their carers. A study that used appropriate instruments provided the preferences for health conditions associated with rotavirus, but the relevance of these Canadian data for Taiwan was not discussed.

Costs:
Both a third-party payer and a societal perspective were considered and the cost items reflected these viewpoints. The resource use and costs were mainly from a prospective study conducted in Taiwan. Different vaccine prices were considered, while administration costs were not included as the vaccine would be given in the routine vaccination programme. The costs were varied in the sensitivity and scenario analyses. The price year was reported, but it was unclear whether discounting was applied and this was relevant given the five-year time horizon.

Analysis and results:
The results were reported for the base case and for various scenarios, but the expected QALYs were not given. A deterministic approach was used to assess uncertainty and the results were clearly illustrated and discussed. The authors
compared their results with those of other published studies, which generally showed the cost-effectiveness of universal vaccination. But differences in some model parameters could substantially change the cost-effectiveness results and the findings should be considered to be specific to the authors’ setting.

Concluding remarks:
The methods were valid and the sources of evidence were robust. The authors’ conclusions appear to be valid.

Funding
Funded by Merck and Co, Inc, manufacturer of RotaTeq.

Bibliographic details
Itzler RF, Chen PY, Lac C, El Khoury AC, Cook JR. Cost-effectiveness of a pentavalent human-bovine reassortant rotavirus vaccine for children <=5 years of age in Taiwan. Journal of Medical Economics 2011; 14(6): 748-758

PubMedID
21919673

DOI
10.3111/13696998.2011.614303

Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Absenteeism; Adolescent; Cost-Benefit Analysis; Gastroenteritis /economics /prevention & control; Health Services /economics /utilization; Humans; Immunization Programs /economics; Markov Chains; Quality-Adjusted Life Years; Reproducibility of Results; Rotavirus Infections /economics /prevention & control; Rotavirus Vaccines /administration & dosage /economics; Taiwan; Vaccines, Attenuated /administration & dosage /economics

AccessionNumber
22011002017

Date bibliographic record published
05/07/2012

Date abstract record published
14/09/2012