Cost-effectiveness of childhood vaccination against rotavirus in Norway

This is an excerpt from the full technical report, which is written in Norwegian.

The excerpt provides the report's main messages in English.

No. 31–2009

Health technology assessment publication

kunnskapssenteret

Title	Cost-effectiveness of childhood vaccination against rotavirus in Norway
Norwegian title	Kostnadseffektivitet av å inkludere vaksinasjon mot rotavirus i det norske barnevaksinasjonsprogrammet
Institution	Norwegian Knowledge Centre for the Health Services (Nasjonalt kunnskapssenter for helsetjenesten) John-Arne Røttingen, *Director*
Authors	Samdal, Kristian, *Project leader, Researcher* Hagen, Gunhild, *Health economist* Flem, Elmira, *Doctor* Klemp, Marianne, *Research manager*

ISBN	978-82-8121-316-6
ISSN	1890-1298
Report	No. 31 – 2009
Project number	468
Type of report	Health Technology Assessment
No. of pages	58 (79 incl. attachments)
Client	The Norwegian Knowledge Centre for the Health Services
Subject heading (MeSH)	Rotavirus; Vaccines; Rotavirus Vaccines; RIX4414 vaccine; RotaTeq; Cost-Benefit Analysis
Keywords	Rotarix; cost effectiveness
Citation	Samdal K, Hagen G, Flem E, Klemp M. Cost-effectiveness of childhood vaccination against rotavirus in Norway. Report from Kunnskapssenteret no. 31–2009. Oslo: Norwegian Knowledge Centre for the Health Services, 2009.

Norwegian Knowledge Centre for the Health Services summarizes and disseminates evidence concerning the effect of treatments, methods, and interventions in health services, in addition to monitoring health service quality. Our goal is to support good decision making in order to provide patients in Norway with the best possible care. The Centre is organized under The Norwegian Directorate for Health, but is scientifically and professionally independent. The Centre has no authority to develop health policy or responsibility to implement policies.

We would like to thank all contributers for their expertise in this project. Norwegian Knowledge Centre for the Health Services assumes final responsibility for the content of this report.

Norwegian Knowledge Centre for the Health Services
Oslo, June 2006

Key messages

Cost-effectiveness of childhood vaccination against rotavirus in Norway

Background

Rotavirus is a leading cause of acute gastroenteritis among infants and children under 5 years old. In Norway, there are two vaccines (Rotarix® and Rotateq®) licensed for preventing rotavirus gastroenteritis. The Norwegian Knowledge Centre for the Health Services was assigned by the National Institute of Public Health to estimate the cost-effectiveness of including vaccination against rotavirus in the childhood immunization programme.

Methods

We performed a cost-utility analysis that compared costs and effects of the two vaccine alternatives to a non-vaccination strategy. The analyses were based on a model that estimated costs per quality adjusted life-years for the vaccine candidates. The results were presented as incremental cost-effectiveness ratios, and were presented both from a healthcare- and a societal perspective. NOK 500 000 per quality adjusted life-years gained was used as threshold for defining cost-effective interventions.

Results

Incremental cost-effectiveness ratios from a healthcare perspective:

- Rotarix®: NOK 687 500 per quality adjusted life-year gained
- Rotateq®: NOK 762 000 per quality adjusted life-year gained

Incremental cost-effectiveness ratios from a societal perspective:

- Rotarix®: NOK 27 500 per quality adjusted life-year gained
- Rotateq®: NOK 104 000 per quality adjusted life-year gained

Conclusions

With NOK 500 000 per quality adjusted life-years gained as threshold for cost-effectiveness, it is unlikely that vaccination against rotavirus will be a cost-effective intervention when viewed from a healthcare perspective. However, adopting a societal perspective, which also included indirect costs related to production losses from parent's sick absence, the conclusion was changed to vaccination being considered a cost-effective intervention.

Executive summary

Cost-effectiveness of childhood vaccination against rotavirus in Norway

BACKGROUND

Rotavirus is a leading cause of acute gastroenteritis in infants and young children. It is considered the most important cause of severe diarrhea in this age-group, and is annually estimated to cause 454 000 – 705 000 deaths worldwide. The majority of these deaths occur in developing countries, but the incidence rates of the infection are similar in developed countries, and it is assumed that all children will have at least one infection by the age of 5 years old. Despite low mortality of rotavirus infections in developed countries, the infection is associated with a significant disease-burden in terms of hospitalizations and outpatient visits. In a broader perspective the burden of disease is also related to costs to society due to production losses of parents being home from work to tend for their sick children. The benefits of vaccination against rotavirus in Norway will therefore be highly related to reducing the number of hospitalizations and outpatient visits in the healthcare sector, and also reducing sick absence for the parents.

Vaccination is considered an effective intervention to reduce the burden of disease related to rotavirus infections, and there are two vaccines licensed for use in Norway. These are Rotarix® (GlaxoSmithKline plc., Brentford, United Kingdom) and Rotateq® (Merck & Co. Inc., Readington, New Jersey, USA). Both vaccines have shown high protection and high security in large randomized controlled trials. However, there are also high costs related to introducing vaccination for routine use, and today, vaccination against rotavirus infections is not included in the childhood immunization programme.

The Norwegian Knowledge Centre for the Health Services was assigned by the National Institute of Public Health to estimate the cost-effectiveness of including vaccination against rotavirus in the childhood immunization programme in Norway. The report is meant to aid an expert group from the National Institute of Public Health, whose mandate is to give advice to the Norwegian Directory of Health for “right” use of rotavirus vaccines in Norway.

METHODS

The economic evaluation was performed as cost-utility analyses were costs were expressed in Norwegian kroner and effects were expressed in quality adjusted life-years. The analyses were presented both from a healthcare perspective, that included direct medical costs related to vaccination, and a societal perspective, that also included indirect costs due to production losses from parent's absence from work. We considered two interventions, vaccination with Rotarix® and vaccination with Rotateq®, which were compared to a non-vaccination strategy.

The cost-utility analyses were based on a decision model designed in the software TreeAge®, and the model was populated with data on relevant costs, effects of vaccination, epidemiology and quality of life. The model was designed as a Markov model with 4 Markov states, which followed a hypothetical Norwegian birth cohort of 60 000 children in a lifelong perspective. NOK 500 000 per quality adjusted life-years gained was used as a threshold for cost-effective interventions. Both costs and effects were discounted with a discount rate of 4% per year.

The results were expressed as costs per quality adjusted life-years gained, and were presented separately from a healthcare- and a societal perspective. The healthcare perspective was supplied with costs per avoided hospitalization related to vaccination, while the societal perspective was supplied with the reduction in sick absence related to vaccination. We also performed probabilistic sensitivity analyses, and one-way sensitivity analyses on parameters used in the model.

RESULTS

Healthcare perspective:

Incremental cost-effectiveness ratios:

- Rotarix®: NOK 687 500 per quality adjusted life-year gained
- Rotateq®: NOK 762 000 per quality adjusted life-year gained

Costs per avoided hospitalization related to vaccination:

- Rotarix®: NOK 63 000
- Rotateq®: NOK 66 000

Probability of the most cost-effective intervention when willingness to pay per quality adjusted life-years gained was NOK 500 000:

- No vaccination: 86 %
- Rotarix®: 14 %
- Rotateq®: 2,5 ‰

Societal perspective:
Incremental cost-effectiveness ratios:

- Rotarix®: NOK 27 500 per quality adjusted life-year gained
- Rotateq®: NOK 104 000 per quality adjusted life-year gained

Reduction in parent's absence from work related to vaccination:

- Rotarix®: 73 %
- Rotateq®: 69 %

Probability of the most cost-effective intervention when willingness to pay per quality adjusted life-years gained was NOK 500 000:

- No vaccination: 2 %
- Rotarix®: 94 %
- Rotateq®: 4 %

Budget impact:
Annually costs of vaccinating a birth cohort of 60 000 Norwegian infants with vaccine coverage from 90 – 100 %:

- Rotarix®: NOK 80,5 mill - NOK 89,5 mill
- Rotateq®: NOK 83,5 mill - NOK 92,5

DISCUSSION

The model is based on several assumptions and limitations which must be considered when interpreting the results. In addition, some of the model parameters with the highest impact on the results are associated with considerable uncertainties. Comparison between the two vaccine candidates must be handled with care, as these are based on indirect comparison.

CONCLUSIONS

Vaccination is an effective intervention against rotavirus gastroenteritis. However, it is also related with considerable costs. Based on study assumptions and using NOK 500 000 as threshold for cost-effective interventions, it is unlikely that routine vaccination against rotavirus will be cost-effective from a healthcare perspective (approximately 14 % and 2,5 ‰ for Rotarix® and Rotateq®, respectively). However, by adopting a societal perspective, including indirect costs due to production losses, the conclusion was changed to vaccination being considered cost-effective with a probability of approximately 94 % for Rotarix® and 4 % for Rotateq®. From a societal perspective there was also a decent probability of vaccination being deemed as cost saving to society (about 39 %). The analyses do not provide clear answers of which of the two vaccine candidates to be preferred. This must be addressed after potential bidding rounds have been completed and final vaccine prices are available.

Norwegian Knowledge Centre for the Health Services summarizes and disseminates evidence concerning the effect of treatments, methods, and interventions in health services, in addition to monitoring health service quality. Our goal is to support good decision making in order to provide patients in Norway with the best possible care. The Centre is organized under The Directorate for Health and Social Affairs, but is scientifically and professionally independent. The Centre has no authority to develop health policy or responsibility to implement policies.

Norwegian Knowledge Centre for the Health Services
PB 7004 St. Olavs plass
N-0130 Oslo, Norway
Telephone: +47 23 25 50 00
E-mail: post@kunnskapssenteret.no
Full report (pdf): www.kunnskapssenteret.no