Cost-effectiveness of human papillomavirus vaccination in Belgium: do not forget about cervical cancer screening

Thiry N, De Laet C, Hulstaert F, Neyt M, Huybrechts M, Cleemput I

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 examine the cost-effectiveness of adding a human papillomavirus vaccine for 12-year-old girls to the recommended cervical cancer screening programme, focusing on the potential decline in uptake of screening after vaccination. The authors concluded that vaccination was cost-effective only if the uptake of screening was maintained. The study was well conducted and the findings were clearly presented. The authors’ conclusions appear to be valid.

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

Study objective
The objective was to examine the cost-effectiveness of adding a human papillomavirus (HPV) vaccine for 12-year-old girls to the recommended cervical cancer screening programme in women, focusing on the potential decline in uptake of screening after vaccination.

Interventions
The interventions were HPV vaccination plus screening versus screening alone. HPV vaccination was administered in three doses at the age of 12 years, with a booster 10 years later. Screening occurred every three years for women aged 25 to 64 years.

Location/setting
Belgium/primary care.

Methods
Analytical approach:
The analysis was based on a Markov model, with a cohort of 58,600 12-year-old girls (the Belgian target cohort) and a lifetime horizon. The authors stated that the perspective of the Belgian health care payer was adopted and this included those costs borne by the National Institute for Health and Disability Insurance, the Ministry of Health, and the patients.

Effectiveness data:
The clinical data were from a selection of relevant studies. Most of the epidemiological inputs on cancer incidence and mortality were derived from Belgian sources, such as national registries, life tables, and published articles. The data on vaccine efficacy was from published studies, including a meta-analysis and clinical trials. The coverage rates for screening and vaccine uptake, which were the key inputs to the model, were based on evidence for other vaccines or screening options and authors’ opinions.

Monetary benefit and utility valuations:
The utility values were derived from a population study in Flanders and from the literature.

Measure of benefit:
Quality-adjusted life-years (QALYs) and life-years (LYs) were the summary benefit measures and they were discounted at an annual rate of 1.5%. The numbers of avoided cervical cancer cases and avoided cervical cancer deaths were also reported.
Cost data:
The economic analysis included the costs of vaccination, screening, and treatment of cancer. These costs were estimated from official reimbursement tariffs and patients’ co-payments, except for the treatment of cervical cancer, which was based on a French study due to a lack of Belgian data. All costs were in Euros (EUR) and a 3% annual discount rate was applied to future costs. The price year was 2006.

Analysis of uncertainty:
The issue of uncertainty was analysed in an extensive probabilistic sensitivity analysis, with 1,000 Monte Carlo simulations. The distributions assigned to the model inputs were reported and credible intervals were generated. Scenario analyses were performed on the discount rates, model time frame, vaccine price, and age of vaccination (16 rather than 12 years).

Results
In the base case, assuming that screening coverage remained unchanged at 79% after vaccination and with a booster dose at 22 years, the vaccination scenario added EUR 397 (95% CrI 383 to 410) and led to a gain of 3.18 life-days (95% CrI 1.43 to 5.01) and 5.02 quality-adjusted life-days (95% CrI 2.17 to 8.09) in comparison with screening alone. The incremental cost per LY gained with vaccination was EUR 51,256 (95% CrI 28,208 to 103,147) and the incremental cost per QALY gained was EUR 32,665 (95% CrI 17,447 to 68,078).

In the scenario that assumed that screening coverage reduced to 59% (a reduction of 20%), the HPV vaccination strategy was dominated by screening alone, which means it was more expensive and less effective. A threshold analysis showed that, with a reduction in screening uptake of 10% or more compared with the status quo, due to the introduction of vaccine, the vaccination strategy was dominated. More favourable estimates for the vaccination strategy were achieved when assuming lifelong vaccine protection, with lower discount rates for QALYs, or with reduced vaccine prices.

Authors' conclusions
The authors concluded that HPV vaccination was cost-effective only if the initial uptake of screening was maintained.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the recommended screening strategy in Belgium was compared with the proposed vaccination strategy. The details of the two comparators were appropriately reported.

Effectiveness/benefits:
Selected sources were used to populate the model. A literature review is usually considered to be the best way to identify inputs, but the selection appears to have been appropriate given that country-specific sources were used for the epidemiological inputs and controlled trials, which are generally considered to be valid sources, were used for the efficacy data. The authors extensively discussed the selection of published data. The two benefit measures were appropriate for capturing the impact of the interventions on patients’ health. Both of them are also comparable with the benefits of other health care interventions.

Costs:
The economic analysis was consistent with the viewpoint of the study. More information on the methods of the cost analysis was presented in an online appendix. Some of the unit costs were presented, but no information on the patterns of resource consumption was given. The price year and the use of discounting were reported. Belgian data were used, when available. Some of the costs were varied in the sensitivity analysis, particularly the vaccine price.

Analysis and results:
The incremental approach used to synthesise the costs and benefits was appropriate and the results were clearly reported. The issue of uncertainty was satisfactorily addressed, using various approaches that investigated different aspects. A Markov model was appropriate for simulating the progression of disease and a clear description of the model structure was given. The authors acknowledged some limitations of their analysis, such as the exclusion of herd immunity and the impact of vaccine on genital warts. The findings were compared with those of other published
evaluations, which generally favoured the vaccine strategy more. The main reason for this was that this study considered the negative impact of vaccination on screening uptake, which was not considered in most of the other analyses.

Concluding remarks:
The study was well conducted and the findings were clearly presented. The authors’ conclusions appear to be valid.

Funding
Funded by the Belgian Government.

Bibliographic details

PubMedID
19366497

DOI
10.1017/S0266462309090217

Original Paper URL
http://journals.cambridge.org/action/displayAbstract?fromPage=online& amp;aid=5449576

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Belgium /epidemiology; Child; Cohort Studies; Cost-Benefit Analysis; Female; Health Care Costs /statistics & numerical data; Humans; Markov Chains; Mass Screening /economics /utilization; Papillomavirus Vaccines /administration & dosage /economics; Quality-Adjusted Life Years; Uterine Cervical Neoplasms /diagnosis /epidemiology /prevention & control; Vaccination /economics

AccessionNumber
22009101678

Date bibliographic record published
05/08/2009

Date abstract record published
07/07/2010