Economic evaluation of Haemophilus influenzae type b vaccination in Slovenia

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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.

Health technology
The health intervention examined in the study was Haemophilus influenzae type b (Hib) vaccination in children under 5 years of age.

Type of intervention
Vaccination.

Economic study type
Cost-effectiveness analysis; Cost-benefit analysis.

Study population
The study population comprised a birth cohort of children younger than 5 years of age.

Setting
The setting was community. The economic study was conducted in Slovenia.

Dates to which data relate
Data on effectiveness and resource use were derived from a study published in 1997 and referring to the period 1993-1995. The price year appears to have been 1999.

Source of effectiveness data
Effectiveness data were derived from a Slovenian published study that reported the results of a nationwide active surveillance programme.

Modelling
A decision tree was used to model costs and benefits of the two alternatives considered in the analysis (Hib vaccination and no vaccination).

Outcomes assessed in the review
The epidemiological data used in the decision model were the annual incidence of invasive Hib disease, the number of children in the annual birth cohort, and the following rates: vaccine coverage, wastage, minor febrile reaction, major reaction to vaccine, meningitis, no sequelae, hearing loss, mild and severe neurologic sequelae, and death.

Study designs and other criteria for inclusion in the review
The primary study to derive effectiveness data was a publication reporting the results of a nationwide active
surveillance programme.

Sources searched to identify primary studies
Not relevant as a Slovenian study was used.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Only one published study was used to derive epidemiological data in Slovenia.

Methods of combining primary studies
Not relevant as only one study was used.

Investigation of differences between primary studies
Not relevant.

Results of the review
The results of the review were as follows:

the annual incidence of invasive Hib disease was 16.4/100,000 children;

the number of children in the annual birth cohort was 18,200;

the rate of vaccine coverage was 95%;

the rate of wastage was 5%;

the rate of minor febrile reaction was 1/500;

the rate of major reaction to vaccine was 1/58,000;

the rate of meningitis was 67%;

the rate of no sequelae was 78.1%;

the rate of hearing loss was 12.5% (3.1% for severe hearing loss);

the rate of mild neurologic sequelae was 6.3%;

the rate of severe neurologic sequelae was 3.1%; and

the rate of death was 5.5% of meningitis cases;

Measure of benefits used in the economic analysis
The benefit measure used in the economic analysis was the number of Hib infections prevented through vaccination in comparison with no vaccination. It was derived from modelling and no discount rate was applied.

**Direct costs**

A 5% discount rate was used as costs were incurred over a period of time longer than two years. Unit costs and quantities of resources were reported separately for a limited number of items. The health service costs included in the analysis of direct costs were medical costs (for acute care, hearing loss, and neurologic sequelae) and vaccination programme costs. No detailed breakdown of costs was reported. The cost/resource boundary for direct costs was that of the IHIS. The estimation of quantities was based on the Slovenian published study used in the effectiveness analysis. Costs were derived from actual IHIS rates. Overall costs were estimated using modelling. Quantities of resources were collected over the period 1993-1995. The price year appears to have been 1999.

**Statistical analysis of costs**

Costs were treated deterministically.

**Indirect Costs**

A 5% discount rate was used for indirect costs as lifetime costs were estimated. Unit costs were reported separately from quantities of resources. The indirect costs included in the analysis were sickness allowance for parents of Hib infected children and the value of a life lost, which was calculated using the human capital approach. Indirect costs were included in the analysis as the societal perspective was adopted in the analysis. Resource use was estimated using the Slovenian published study used in the effectiveness analysis, while unit costs were based on actual IHIS rates (for sickness allowance) and per capita annual gross domestic product data (for a life lost) considering an expected life-span of 75 years for Slovenian children born in 1999.

**Currency**

Euros.

**Sensitivity analysis**

One-way sensitivity analyses were conducted to assess the robustness of the estimated benefit-to-cost ratio to variations in vaccine costs and disease incidence.

**Estimated benefits used in the economic analysis**

The number of prevented cases of Hib infections was not reported.

**Cost results**

Total costs of the vaccination and no-vaccination options were not reported. The difference between vaccination costs and costs of Hib disease were Euro 241,555 in terms of acute care costs, Euro 4,025 in terms of medical costs, and Euro 7,230 for the IHIS. However, from the societal perspective, the Hib vaccination strategy led to cost-savings of Euro 118,410. The cost per cohort child was Euro 16 from the perspective of the IHIS and Euro 23.30 from the perspective of society.

**Synthesis of costs and benefits**

Costs and benefits of the interventions were combined by performing a cost-effectiveness analysis. An incremental analysis was conducted as vaccination was implicitly compared with no-vaccination. A benefit-to-cost ratio was also calculated. The cost per case prevented was Euro 510 and the cost per death prevented was Euro 13,390 from the perspective of the IHIS. The benefit-to-cost ratio was 0.98 from the perspective of the IHIS and 1.39 from the point of view of society. The break-even price of the vaccine at which the difference between costs and savings of vaccination
programme was zero was Euro 4.70 from the perspective of the IHIS and Euro 7.00 from the perspective of society (Euro 4.84 in the base case); the break-even point of disease incidence was 16.8/100,000 children from the perspective of the IHIS and 11.6/100,000 children from the perspective of society (16.4/100,000 children in the base case).

Authors’ conclusions
The authors concluded that the introduction of Hib vaccination for infants led to cost-savings from the perspective of society, although it required low extra costs from the perspective of the healthcare payer in Slovenia.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. No-vaccination was selected as the aim of the study was to assess the active value of vaccination among infants. The authors stated that by the beginning of 1999 Hib vaccination was excluded from the routine childhood immunisation programme in Slovenia. You, as a user of this database, should decide whether no-vaccination represents a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The analysis of the effectiveness was based on a published Slovenian study. The authors did not undertake a review of the literature as their analysis was focused on Slovenian population data. A sensitivity analysis was conducted on disease incidence, which represented one of the most critical variables used in the decision model. However, the remaining variables appear quite specific to the study setting.

Validity of estimate of measure of benefit
The benefit measures used in the economic analysis were calculated using modelling. Discounting was not applied although it could have been relevant as lifetime benefits were calculated. Estimated benefits were not reported.

Validity of estimate of costs
The analysis of costs was conducted from two distinct perspectives and it appears that all relevant categories of costs were included in the study. Unit costs were reported for almost all cost items, but a detailed breakdown of cost components (such as staff, materials, etc.) was not given. Cost estimates were treated deterministically. The source of cost data was reported. Cost-estimates were somewhat specific to the Slovenian setting. The authors commented that the additional costs of vaccination and hospitalisation were probably underestimated, but a sensitivity analysis on vaccine cost was conducted as this was the most important variable in the economic evaluation.

Other issues
The authors compared their findings with those from other studies. As regards the issue of the generalisability of the study results to other settings, the authors stated that the vaccine price used in their analysis was similar to that used in the USA, but higher than prices in developing countries. The authors appear to have presented their results selectively.

Implications of the study
The main implication of the study was that the Hib vaccination should be introduced in the routine childhood immunisation programme in Slovenia.

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