Cost effectiveness of hepatitis B vaccination strategies in Ireland: an economic evaluation

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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 universal hepatitis B vaccination using a six-component vaccine in comparison with a selective strategy of vaccinating only high-risk infants with a monovalent hepatitis B vaccine. The authors concluded that universal vaccination was cost-effective from the perspective of the third-party payer. The study was generally well conducted, but could have been more extensively reported, especially with respect to the data sources. The use of valid sensitivity analyses makes the authors’ conclusions more robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of universal versus selective hepatitis B vaccination for newborn infants.

Interventions
The two strategies were universal hepatitis B vaccination using a three-dose six-component vaccine compared with a selective strategy of vaccinating only high-risk infants with a three-dose monovalent hepatitis B vaccine. In the universal strategy, the hepatitis B vaccination was added to a five-component vaccine already in use.

Location/setting
Ireland/primary care and hospital.

Methods
Analytical approach:
This economic evaluation was based on a Markov model with an 80-year time horizon. The authors stated that the perspective of the Irish Health Service Executive was adopted.

Effectiveness data:
The clinical data came from a selection of known, relevant studies, the methodological characteristics of which were only briefly reported. For example, vaccine uptake and the proportion of low- versus high-risk newborns were taken from data collected at the Rotunda Maternity Hospital in Dublin. The annual risk of hepatitis B virus (HBV) infection was also taken from Irish databases. Disease progression data were obtained from published studies, the details of which were not reported. Some experts’ opinions were used. The primary input to the model was the vaccine efficacy, which came from a recent German randomised controlled trial.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
Life-years (LYs) were the summary benefit measure and were discounted at 3.5% per annum.

Cost data:
The economic analysis included the costs of vaccination (acquisition and administration, in hospital or primary care) and the direct medical costs of HBV infection. The cost of monovalent vaccine was based on the official price for the most widely used preparation for children in 2005. The incremental cost of the six-component vaccine over the five-component vaccine, currently used in Ireland, was based on a range of assumed prices as this vaccine was not available.
in the Irish market at the time of the study. The hospital personnel costs came from the Department of Health and Children salary scales. Staff time in primary care was derived from official data published by the General Medical Services (Payments) Board. The cost of HBV infection was based on a range of standard sources. All costs were in Euros (EUR) and were discounted at an annual rate of 3.5%. The price year was 2005.

Analysis of uncertainty:
One- and two-way sensitivity analyses were undertaken on the key model inputs, using ranges of values based on either published data or assumptions. A probabilistic sensitivity analysis (i.e., a second-order Monte Carlo simulation) was undertaken using probability distributions selected on the basis of the parameter properties and the source data for the estimates. Cost-effectiveness acceptability curves were presented.

Results
In a birth cohort of 60,000 infants over 80 years, the expected costs were EUR 860,000 with the selective strategy and EUR 3,340,000 with the universal strategy. The LYs were 2,593,413.00 with the selective strategy and 2,593,479.99 with the universal strategy. The incremental cost-effectiveness ratio (ICER) of the universal strategy over the selective strategy was EUR 37,018.

In the deterministic sensitivity analysis, the ICER ranged from EUR 2,197 (no discount rate for both costs and benefits) to EUR 77,984 (5% discount rate for both costs and benefits). One influential model input was the incidence of acute HBV infection, but the most influential inputs were the cost of the six-component vaccine (ICERs from EUR 10,992, lowest price, to EUR 67,200, highest price) and the discount rate. The probabilistic analysis showed that the probability that universal vaccination was cost-effective at a willingness-to-pay threshold of EUR 45,000 per LY gained was 83.9%.

Authors’ conclusions
The authors concluded that universal vaccination could be a cost-effective alternative to selective immunisation against HBV from the perspective of the Irish third-party payer.

CRD commentary
Interventions:
The selection of the comparators was appropriate as the proposed strategy was recommended by the World Health Organization and was compared against the current pattern of care in the authors’ setting.

Effectiveness/benefits:
The effectiveness data were derived from published studies, but no systematic search of the literature was reported. Only few details were reported of the characteristics of the primary sources for data, such as their design, patient population, or type of intervention. This makes it difficult to ascertain if the best available evidence was used. However, it seems that most of the evidence was taken from appropriate sources. For example, the main effectiveness parameter (vaccine efficacy) was derived from a published randomised controlled trial, which should have ensured that these estimates were robust. The epidemiological data were taken from Irish sources to reflect the authors’ setting. LYs are an appropriate benefit measure and they permit cross-disease comparisons.

Costs:
The costs appeared to reflect the stated perspective. Details were reported for the calculation of vaccine costs, such as the sources of data and assumptions. No information on the derivation of disease-related costs was provided, which limits the possibility of replicating the analysis in other settings. More details were presented in an online data supplement. The use of discounting and the price year were explicitly reported. The costs were treated deterministically in the base case, but variability around the economic estimates was investigated in the sensitivity analyses.

Analysis and results:
The costs and benefits were appropriately synthesised, and both the total and incremental results were presented. The two approaches used in the sensitivity analysis ensured a valid assessment of the issue of uncertainty, and the findings were clearly reported and discussed. The authors compared their findings with those from other studies and they highlighted the differences in methods and populations analysed. In general, this study was specific to Ireland and may
be difficult to transfer to other settings.

**Concluding remarks:**
The study was generally well conducted, but could have been more extensively reported, especially with respect to the data sources. The use of valid sensitivity analyses makes the authors’ conclusions more robust.

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