The Health Technology Report Series has been developed by the Institute of Family Medicine and Public Health at the University of Tartu.

The effectiveness and cost-effectiveness of pneumococcal vaccination in Estonia

Summary

Objective: To evaluate the impact of pneumococcal vaccination with 13-, 15- and 20-valent vaccines by analysing the effectiveness and cost-effectiveness of the nationwide vaccination of children under the age of one year in Estonia compared to non-vaccination.

Methods: To meet the objective, literature reviews were compiled to provide evidence on the effectiveness, safety, and cost-effectiveness of pneumococcal vaccination. To assess the cost-effectiveness in Estonia, a Markov model was developed to model the incidence of meningitis, bacteremia, sepsis, pneumonia, and otitis media in the population without vaccination and after vaccination with PCV13, PCV15, and PCV20 using a 2 + 1 dose schedule. A lifetime time horizon was used, and vaccine coverage was assumed to be 81,7% – similar to the hexavalent vaccine included in the current national vaccination schedule. Since there are no consistent data on the serotype-specific effectiveness of vaccines, a cost-effectiveness analysis was conducted for two different vaccine effectiveness scenarios. In the first scenario, it was assumed that all vaccines were equally effective against all serotypes, except for serotype 3, for which a lower effectiveness was applied. In the second scenario, vaccine effectiveness was differentiated. Costs and effects were discounted using an annual discount rate of 3,5%. The model evaluated the number of avoidable pneumococcal infections and differences in costs and quality-adjusted life-years using incremental cost-effectiveness ratios. An additional budget impact analysis of pneumococcal vaccination within the national immunisation programme was performed.

Results: In the base-case scenario, the most significant health benefit was achieved with vaccination using PCV20 in the first scenario and PCV15 in the second scenario. In the first scenario, the incremental cost-effectiveness ratios were €58,280, €54,857, and €55,986 per quality-adjusted life-year for vaccinating with PCV13, PCV15, or PCV20, respectively. In the second scenario, the incremental cost-effectiveness ratios were €53,451, €45,390 and €61,133 per additional quality-adjusted life-year, respectively. The sensitivity analysis showed that the results were most influenced by the discount rate, vaccination coverage, vaccine price, the probability of developing bacteremia, and the use of a four-dose vaccination schedule. The budget impact analysis showed that vaccinating approximately 10,000 infants per year would cost an additional €8.4 million with PCV13, or PCV15, and €9.3 million with PCV20, for the Estonian Health Insurance Fund over five years, compared to non-vaccination.

Conclusions: Adding pneumococcal vaccination to the national immunisation programme would decrease the incidence of pneumococcal infections in Estonia; however, using a cost-effectiveness threshold of €20,000 or €40,000 per added quality-adjusted life-year, the vaccination is not cost-effective compared to non-vaccination.

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