

Cost-effectiveness of human papillomavirus vaccines in Estonia

Objectives: To evaluate the cost-effectiveness of human papillomavirus (HPV) vaccination with bivalent and quadrivalent vaccines alongside cervical cancer screening program in Estonia compared to screening alone.

Methods: Markov cohort model was used to simulate the natural history of HPV infection, cervical cancer and genital warts in Estonia. A hypothetical cohort of 10 000 girls aged 12 was followed until the age of 100. Initial vaccination coverage was assumed to be 95% and booster coverage 85%. Vaccine efficacy was estimated to be 95% against all HPV types covered by the vaccines. Main outcome measures of the model were the morbidity of cervical intraepithelial neoplasia (CIN1-CIN3), genital warts and cervical cancer (local, regional and distant), and cervical cancer mortality. Based on quality of life lost in association with measured outcomes quality-adjusted life-years (QALY) were calculated for the vaccination and non-vaccination cohorts. Costs were considered from the perspective of third party payer and included expenses associated with treatment, prescription drugs and temporary work incapacity benefits. Costs of vaccination included the price of the vaccine and costs of administration. Irrespective of vaccination the costs of pap-smears were also taken into account. Costs and effects were discounted using an annual discount rate of 5%.

Results: In case of vaccination 76 cervical cancer cases and 25 associated deaths would be prevented per cohort of 10 000 girls during their lifetime. In addition vaccination would prevent hundreds of cervical intraepithelial neoplasia cases and most of genital warts cases if the quadrivalent vaccine is used. As compared to non-vaccination arm by vaccination, 86-95 quality-adjusted life years (QALY) will be gained. From the perspective of third party payer the incremental cost effectiveness ratio (ICER) of the bivalent vaccine compared to no-vaccination would be 24 000 € and quadrivalent vaccine 21 500 € per QALY. The key impact factors of cost-effectiveness result were cost of vaccination and discount rate used.

Conclusions: Current analysis indicates that vaccinating against HPV would prevent more than half of cervical cancer cases and deaths. Additionally using the quadrivalent vaccine close to 80% of genital warts cases would be avoided. However, due to relatively high vaccine prices, savings on treatment costs are three times lower than the cost of vaccination program. In most likely scenarios ICER in case of vaccination compared to cervical cancer screening alone will be 20 000–25 000 € per QALY. Current analysis is based on the assumption that HPV vaccines decrease cervical cancer mortality in real life and the validity of this assumption remains to be proven.