Cost-effectiveness of primary HPV screening for cervical cancer in Germany: a decision analysis

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 evaluate the cost-effectiveness of several strategies for primary cervical cancer screening, using human papillomavirus (HPV) testing, in Germany. The authors concluded that HPV testing was more effective than cytology alone and could be cost-effective if performed at intervals of two years or longer. The methods seem to have been appropriate and, assuming that the clinical data were appropriately sourced, the conclusions reached by the authors appear to be valid for Germany.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to evaluate the long-term effectiveness and cost-effectiveness of primary cervical cancer screening based on human papillomavirus (HPV).

Interventions
There were eighteen strategies of testing for HPV alone or in combination with cytology, with varying screening intervals, test combinations, and follow-up algorithms.

Location/setting
Germany/primary and secondary care.

Methods
Analytical approach:
A Markov model, with a lifetime horizon, was developed to represent cervical cancer, screening, and the preventive strategies. The authors stated that the perspective was that of the health care system.

Effectiveness data:
The progression and regression of disease data were from the literature. The accuracy of the diagnostic tests was from international meta-analyses. After treatment for pre-cancerous lesions, patients were assumed to return to full health. The treatment of invasive cervical cancer produced a higher mortality than no screening for the first five years, with equal mortality thereafter. Age-specific screening adherence was calculated from published German data.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measure of benefit was life-years gained and these were discounted at an annual rate of 3%.

Cost data:
The costs of screening and treatment for the different cervical cancer stages were calculated. The resource use was from guidelines and a German panel of experts. The reimbursement costs were from health care databases and pharmaceutical prices. These costs were adjusted for out-patient care, using a weighted average for East and West Germany and social and private health insurance. In-patient cervical cancer treatment was calculated using diagnosis-
related group data. The costs were in 2007 Euros (EUR), inflated if necessary, using the consumer price index. They were discounted at an annual rate of 3%.

**Analysis of uncertainty:**
Parameter uncertainty was investigated in extensive one-way and multi-way sensitivity analyses, varying the HPV test costs, the screening adherence, the starting age for screening, the reduction in HPV incidence, and the annual discount rate.

**Results**
HPV screening was more effective, resulting in a 71 to 97% reduction in cervical cancer cases, compared with no screening, while cytology alone resulted in a 53 to 93% reduction. The incremental cost-effectiveness ratio (ICER) ranged from EUR 2,600 per life-year gained with five-yearly cytology, to EUR 155,500 per life-year gained with annual cytology from age 20 to 29 years then annual HPV testing from age 30 years.

Annual cytology alone was dominated by the HPV strategies, as it was less effective and less cost-effective. Increasing the age for screening initiation from 20 to 25 years did not reduce the effectiveness by a relevant amount, but did lower the costs.

Based on the sensitivity analyses, biennial Papanicolaou (Pap) cytology screening in women aged 25 to 29 years, with biennial HPV testing for women aged 30 years or older was the best strategy.

**Authors' conclusions**
The authors concluded that HPV testing was more effective than cytology alone and could be cost-effective if performed at intervals of two years or longer. In Germany, the best strategy was biennial cytology for women aged 25 to 29 years, then biennial HPV testing from age 30 years.

**CRD commentary**
Interventions:
An extensive range of comparators was evaluated, and this included the usual practice, recommended by German guidelines. The strategies might be widely used in other settings.

Effectiveness/benefits:
The authors stated that they used conservative estimates for the diagnostic accuracy for HPV testing compared with cytology. They stated that they used the best available evidence for the natural history of cervical cancer, and validated it against German registry data, but they did not describe how they searched for or selected these data. It was not clear if adverse events due to treatment were included, but the authors found no quality of life data for these events, which suggests that they were not. The measure of benefit was life-years gained, as no quality of life data were found.

Costs:
The analysis of the costs was performed from the perspective of the health care system. It appears that all the relevant costs were included. The cost estimates were from sources relevant to the setting and the population. Expert opinion was appropriately used where information was otherwise lacking. Such estimates are less certain, but some costs were varied in the sensitivity analysis.

Analysis and results:
The reporting appears to have been appropriate. The model was internally validated, using epidemiologic data from German cancer registries. The authors reported a number of limitations to their study. As well as those already mentioned, they stated that they did not take into account the different HPV types. The model structure was described in detail, with a diagram, and both the model parameters and their sources were reported in full.

Concluding remarks:
The methods seem to have been appropriate and, assuming that the clinical data were appropriately sourced, the conclusions reached by the authors appear to be valid for the German setting.
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