Primary screening for human papillomavirus compared with cytology screening for cervical cancer in European settings: cost effectiveness analysis based on a Dutch microsimulation model

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- Economic evaluation of human papillomavirus vaccination in the United Kingdom (*BMJ* 2008;337:a769)
- Hypersensitivity reactions to human papillomavirus vaccine in Australian schoolgirls: retrospective cohort study (*BMJ* 2008;337:a2642)
- Cost effectiveness analysis of including boys in a human papillomavirus vaccination programme in the United States (*BMJ* 2009;339:b3884)
- Long term predictive values of cytology and human papillomavirus testing in cervical cancer screening: joint European cohort study (*BMJ* 2008;337:a1754)

STUDY QUESTION When is screening for human papillomavirus (HPV) in Europe more cost effective than and preferable to cytology screening?

SUMMARY ANSWER Primary HPV screening was the preferred primary test in women over the age of 30 in many European scenarios. Primary cytology screening was preferred only when cytology was at low cost and when HPV was highly prevalent and its testing was costly.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS Screening for cervical cancer using HPV tests has higher sensitivity but lower specificity than cytology for detecting clinically relevant lesions. Previous cost effectiveness analyses on HPV screening are heterogeneous, partly because key variables differ between countries. Five realistic European scenarios showed that primary HPV screening was often preferable.

Main results

The results were consistent for incremental cost effectiveness thresholds between €20 000 and €50 000 per quality adjusted life year (QALY) gained.

Design

Our base case analyses of HPV screening versus cytology screening investigated the cost effectiveness of more than 1500 screening policies using the microsimulation model MISCAN. The policies varied by type of primary and triage tests, number of screening rounds, screening interval, and age at first screening. We compared these policies for five realistic scenarios differing in key variables: risk of cervical cancer, previous screening, quality associated test characteristics, costs of testing, and prevalence of HPV.

Sources of effectiveness

The costs and effects (in terms of the numbers of life years gained and QALYs gained) of the screening policies were accounted for until all simulated women had died to determine the efficient strategies.

Data sources

The MISCAN-cervix model was validated using Dutch data. All costs were derived from cost studies in the Netherlands. European data came from international databases and studies.

Results of sensitivity analysis

With a high prevalence of HPV primary cytology screening was preferred only if higher costs for HPV screening (total €64; £54; $85) were assumed. In case of low costs for cytology (total €26), primary cytology was preferred, notwithstanding the lower sensitivity and specificity that accompanied the lower costs. These results were independent of the background risk level.

Limitations

Screening strategies were not permitted to switch during a woman's lifetime. Some of the parameters that were not varied in the sensitivity analyses were based on Dutch data. We estimated the prevalence of HPV using the percentage of HPV positive women in randomised controlled trials of cervical cancer screening with HPV testing as the primary test, which may not be representative of real practice. We assumed full attendance at follow-up screenings and referrals for colposcopy. Use of QALYs depends on the reliability of quantification of quality of life aspects of screening and cervical cancer.

Study funding/potential competing interests

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Preferred primary test for different levels of sensitivity of human papillomavirus (HPV) screening (90% *v* 95%), and laboratory costs of HPV test (€21 *v* €33)

	Laboratory costs HPV test €21		Laboratory costs HPV test €33	
Scenarios	**90% sensitive**	**95% sensitive**	**90% sensitive**	**95% sensitive**
Base case (low risk):	HPV	HPV	HPV	HPV
Average risk, high HPV prevalence	HPV	HPV	Cytology	Cytology
Average risk, low sensitivity and specificity of cytology	HPV	HPV	HPV	HPV
Low risk, low specificity of cytology	HPV	HPV	HPV	HPV
High risk, high HPV prevalence	HPV	HPV	Cytology	Cytology
High risk, no past screening, and low sensitivity, specificity, and cost of cytology	Cytology	Cytology	Cytology	Cytology

Results were consistent for incremental cost effectiveness thresholds between €20 000 and €50 000 per QALY gained.
€1.00 (£0.84; $1.31).