Cost-effectiveness of cervical cancer screening with human papillomavirus DNA testing and HPV-16,18 vaccination

Goldhaber-Fiebert J D, Stout N K, Salomon J A, Kuntz K M, Goldie S J

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 evaluated the cost-effectiveness of different screening strategies for cervical cancer at different age groups in two populations: women who had not been vaccinated with the human papillomavirus vaccine (HPV-16,18), and women who would have received HPV-16,18 as pre-adolescent girls between the ages of 9 and 12 years. The authors concluded that the use of HPV DNA screening as a triage test for younger women, and as a primary test for older women, was more cost-effective than current screening in their setting. Although there are some weaknesses in the clinical data, the analysis was thorough and transparent.

Type of economic evaluation

Cost-utility analysis

Study objective

The study evaluated the cost-effectiveness of different screening strategies for cervical cancer applied at different age groups in two populations. The populations studied were women who had not been vaccinated with the human papillomavirus vaccine (HPV-16,18) and women who would have received HPV-16,18 as pre-adolescent girls between the ages of 9 and 12 years.

Interventions

The main tests evaluated were HPV DNA testing for cervical specimens and cytology testing (Pap test). Various combinations of these tests were evaluated through screening protocols differing in terms of the triage test used, the age of screening initiation and the frequency of screening.

Location/setting

USA/primary care.

Methods

Analytical approach:

The authors used a microsimulation model with a lifetime horizon. Details of the model development, modelling assumptions and calibration were reported. The authors also referred the reader to a separate study for further modelling details (Goldhaber-Fiebert et al., see 'Other Publications of Related Interest' below for bibliographic details). The authors stated that a societal perspective was adopted in the analysis.

Effectiveness data:

The effectiveness data were obtained from a non-systematic review of the literature. The process used to identify the data was not reported. Inclusion criteria were not specified, nor were the methods used to select the estimates.

Monetary benefit and utility valuations:

The utilities were derived from published studies.

Measure of benefit:

The measure of benefit was the quality-adjusted life-years (QALYs).

Cost data:

The cost categories included cost of vaccination, screening tests, administration and counselling, outpatient diagnostic follow-up, treatment costs for cancer and cervical intraepithelial neoplasia, and the patients' transport and time costs. The cost estimates were derived from published literature. The resource quantities were not reported. Appropriate adjustments for inflation were conducted, and the costs were reported in US dollars ($) for the price year 2004. Discounting was performed at an annual rate of 3%.

Analysis of uncertainty:
Second-order parameter uncertainty was investigated by varying the 50 unique good-fitting model parameters defined by the model calibration. Different scenarios were also explicitly reported and investigated, and the results shown as a range of incremental cost-effectiveness ratios (ICERs) presented in ascending order of costs.

Results

For unvaccinated women, cytology with HPV test triage every 3 years, starting at age 21 years and shifting to HPV test with cytology triage at the age of 30, resulted in an incremental cost per QALY of $78,000 compared with the next most costly strategy.

For girls vaccinated at the age of 12, the same screening methods initiated at age 25 years and switching at 35 years, resulted in an incremental cost per QALY of $41,000 and $188 000 for screening every 5 and 3 years, respectively (each compared with the next most costly strategy).

The ICERs of all the different scenarios investigated in sensitivity analyses were explicitly reported; however, they are too numerous to be reported here. ICERs were presented for all strategies.

Authors' conclusions

The authors concluded that, for vaccinated and unvaccinated women, using HPV DNA screening as triage test at younger ages, and as a primary test at older ages, is more cost-effective than current screening guidelines.

CRD commentary

Interventions:
The interventions were reported clearly and the scenarios evaluated were well-presented.

Effectiveness/Benefits:
The effectiveness data were derived from published literature. It is not possible to judge the validity of the data given the information provided in the current paper. The utility weights were also derived from published literature, but the methods used to estimate them were not described.

Costs:
The authors reported that a societal perspective had been adopted; however, there was no attempt to consider productivity losses due to illness. Summary category costs were reported and resource use was not reported separately, which will prevent the analysis from being easily reworked for other settings. Appropriate adjustments, discounting and the price year were reported. All scenarios tested in the sensitivity analyses were described in adequate detail and the results reported clearly.

Results and Analysis:
Although the authors calibrated the model and assessed the model's internal and external validity, relevant information was not provided in this paper. However, the modelling assumptions were fully discussed. The authors do not appear to have presented their results selectively, although they presented incremental quality-adjusted life-days in the results table when it might have been clearer to present incremental QALYs. The strategies were ranked in terms of cost in order to calculate the ICERs, and the results were reported clearly. Extensive sensitivity analyses were conducted and the results were presented in full, which may improve the generalisability of the findings. In addition, a balanced discussion on the limitations of the study was provided.

Concluding remarks:
The methodology of the study appears, on the whole, to have been appropriate, and the results were reported clearly.

The authors have presented a thorough analysis.

Funding
Funding received from the National Science Foundation, National Cancer Institute, Agency for Healthcare Research and Quality, Bill and Melinda Gates Foundation, and Harvard Center for Risk Analysis.

Bibliographic details
Goldhaber-Fiebert J D, Stout N K, Salomon J A, Kuntz K M, Goldie S J. Cost-effectiveness of cervical cancer screening with human papillomavirus DNA testing and HPV-16,18 vaccination. Journal of the National Cancer Institute 2008; 100(5): 308-320

Other publications of related interest
Goldhaber-Fiebert JD, Stout NK, Ortendahl J, Kuntz KM, Goldie SJ, Salamon JA. Modelling human papillomavirus and cervical cancer in the United States for analyses of screening and vaccination. Popul Health Metr 2007;5:11.

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Age Factors; Aged; Aged, 80 and over; Alphapapillomavirus /genetics /isolation & purification; Biopsy; Child; Colposcopy; Computer Simulation; Cost-Benefit Analysis; DNA, Viral /isolation & purification; Female; Human papillomavirus 16; Human papillomavirus 18; Humans; Mass Screening /economics /methods; Middle Aged; Models, Econometric; Papillomavirus Vaccines /administration & dosage; Quality-Adjusted Life Years; United States; Uterine Cervical Neoplasms /economics /pathology /prevention & control /virology

AccessionNumber
22008100482

Date bibliographic record published
09/08/2008

Date abstract record published
03/11/2008