Interactive neural network-assisted screening: an economic assessment
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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.

Health technology
Interactive, neural network-assisted (INNA) rescreening for cervical cancer.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Cohort of women starting at age 20 and screened on a triennial schedule until reaching the age of 75.

Setting
Hospital. The study was carried out in the U. S. A.

Dates to which data relate
The effectiveness data were based on a review article published in 1998. The price year was 1997.

Source of effectiveness data
The effectiveness data were based on a review of previously published studies.

Modelling
A nine-state, time varying Markov model, which had been adapted from a model created by Eddy under a grant from the Blue Cross and Blue Shield Association, was used to estimate costs and benefits. This study updated the Eddy model applying to it accuracy data and costs for INNA rescreening.

Outcomes assessed in the review
The outcomes assessed included transition probabilities, lifetime incidence of cervical cancer, lifetime risk of death due to cervical cancer, sensitivity and specificity estimates for INNA rescreening and for unassisted manual examination of cervical smears, and the rate of unnecessary procedures.

Study designs and other criteria for inclusion in the review
Not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
One study published in 1998, which included a synthesis of previous studies, was included in the review.

Methods of combining primary studies
Estimates from individual studies in the review article were aggregated according to study design, population and outcome metric and by the reference standard used to confirm abnormals.

Investigation of differences between primary studies
Not applicable.

Results of the review
The sensitivity and specificity of unassisted manual examination of cervical smears were assumed to be 85% and 99.5%, respectively. The sensitivity and specificity of the INNA system were assumed to be 89 - 100% and 99.5%, respectively. The rate of unnecessary procedures was set at 0.00022.

Measure of benefits used in the economic analysis
The measure of benefit used was the number of life years saved. Health outcomes were discounted at a rate of 3%.

Direct costs
Costs were discounted at a rate of 3%. Quantities and costs were not reported separately. Direct costs included costs of treating cervical cancer, costs of gynaecologic examination, traditional cytologic examination of cervical smears and colposcopy with biopsy (taken from Medicare fee schedules), and costs of INNA testing (taken from Neuromedical Systems Inc.). The quantity/cost boundary adopted was that of the health service. Quantities and costs were derived using modelling studies (Markov model). Costs were updated to 1997 values using the medical care component of the Consumer Price Index.

Statistical analysis of costs
Not included.

Indirect Costs
No indirect costs were included.

Currency
US dollars ($).
Sensitivity analysis
A sensitivity analysis was performed on the sensitivity and specificity of INNA, sensitivity and specificity using relative yields (ratio of detection with INNA versus unassisted manual examination), sensitivity and specificity for unassisted manual screening and the cost of treatment of cervical cancer.

Estimated benefits used in the economic analysis
Unassisted manual screening yielded 25.492 life days. Studies assessing the sensitivity of INNA to known abnormals found results between 26.035 and 26.333. Studies assessing the sensitivity of INNA to false negatives yielded benefits between 25.915 and 26.333. One study assessing the detection of positives found either by INNA or unassisted manual examination revealed a benefit of 25.976. Studies based on relative yields found benefits between 26.385 and 26.44.

Cost results
All studies reported cost results for INNA rescreening in the range $197 to $289.

Synthesis of costs and benefits
Studies assessing the sensitivity of INNA to known abnormals found cost-effectiveness ratios between $39,087 and $79,440 per life year saved. Studies assessing the sensitivity of INNA to false negatives yielded cost-effectiveness ratios between $39,087 and $79,440 per life year saved. One study assessing the detection of positives, found either by INNA or unassisted manual examination, revealed a cost-effectiveness ratio of $69,428 per life year saved. Studies based on relative yields found cost-effectiveness ratios between $34,676 and $36,811. As the sensitivity for unassisted manual screening varied between 60% and 95%, cost-effectiveness ratios ranged from $7,440 to $266,151 per life year saved. Cost-effectiveness ratios were not sensitive to changes in the estimated costs of treatment of cervical cancer. If a false positive rate for INNA of 0.011 was used, the cost-effectiveness ratio increased to $60,368 per life year saved.

Authors’ conclusions
This study supports the use of INNA rescreening as an appropriate expenditure of resources to identify missed cases of cervical epithelial abnormalities and potential cervical cancer.

CRD COMMENTARY - Selection of comparators
The rationale for the selection of the comparator was clear.

Validity of estimate of measure of benefit
The calculation of life years gained was not explicit nor was it immediately obvious in the study.

Validity of estimate of costs
Adequate details were provided of the sources of cost data, prices and the price year. Cost estimates included only those which were relevant from the perspective of the payer or the provider and excluded direct non-medical and indirect costs, which may vary according to the frequency of screening.

Other issues
The cost data are unlikely to be generalisable to other countries. The sensitivity and specificity of tests are likely to vary from setting to setting.

Implications of the study
When applying these results to a new setting, a trial should be undertaken to determine the cost-effectiveness of INNA rescreening which takes into account local costs and sensitivity and specificity of tests.
Source of funding
None stated.

Bibliographic details

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9479347

Other publications of related interest


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Subject indexing assigned by NLM

MeSH
Adult; Aged; Carcinoma /classification /diagnosis /pathology /prevention & control; Cervical Intraepithelial Neoplasia /diagnosis /pathology; Cervix Uteri /cytology; Cohort Studies; Computer Simulation; Cost-Benefit Analysis; Costs and Cost Analysis; Female; Humans; Markov Chains; Mass Screening /economics /instrumentation /methods; Microscopy; Middle Aged; Models, Economic; Neural Networks (Computer); Sensitivity and Specificity; Uterine Cervical Neoplasms /classification /diagnosis /pathology /prevention & control; Vaginal Smears /economics /instrumentation /methods

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