An alternative cost effectiveness analysis of ThinPrep in the Australian setting

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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

Two strategies for the screening of average-risk women were examined. One strategy was based on liquid-based cytology (LBC) (ThinPrep; Cytyc Corp., Boxburgh, USA) and the other was based on the Pap smear test. The length of the screening cycle was 2 years.

Type of intervention

Screening.

Economic study type

Cost-effectiveness analysis.

Study population

The study population comprised a hypothetical cohort of 1.6 million average-risk Australian women participating in the biennial screening programme.

Setting

The setting appears to have been secondary care. The economic study was carried out in Australia.

Dates to which data relate

The effectiveness data were derived from a prior model published in 2003, and another study published in 2003. The resource use data were derived from a study published in 2002. The price year was not reported.

Source of effectiveness data

The effectiveness evidence was derived from a synthesis of studies and estimates based on authors' assumptions.

Modelling

A decision tree model was used to examine the clinical and economic impacts of using ThinPrep in comparison with the conventional Pap smear test. A model produced by the Medicare Services Advisory Committee (MSAC) was updated using new data and assumptions (Medicare Services Advisory Committee 2002, see 'Other Publications of Related Interest' below for bibliographic details). The time horizon was 2 years. The model assumed that the number of cancers avoided will depend on the proportion of high-grade lesions that are invasive cancer on detection, and the proportion of high-grade lesions that would progress to invasive cancer over the 2-year time horizon of the model.

Outcomes assessed in the review

The authors did not report in detail the outcomes needed to conduct the cost-effectiveness analysis. They only reported that, from the prior model of MSAC, they replaced the assumption on sensitivity and specificity with data derived from
one recent published study. Therefore, the outcomes estimated from the literature were the sensitivity and specificity of the ThinPrep and Pap smear tests.

**Study designs and other criteria for inclusion in the review**
Sensitivity and specificity was assessed from a review of 24 English language articles, from a total of 47 identified from a search of MEDLINE. The authors also reported that they used data generated from the NICE study, a large scale clinical trial conducted in the England and Wales (National Institute for Clinical Excellence 2003, see 'Other Publications of Related Interest' below for bibliographic details). However, it was unclear what kind of data were derived from this study.

**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**
A primary study provided the clinical evidence (sensitivity and specificity).

**Methods of combining primary studies**
Not relevant since only one study was considered.

**Investigation of differences between primary studies**
Not relevant since only one study was considered.

**Results of the review**
The authors graphically presented the sensitivity, specificity and the relevant ranges of ThinPrep and Pap smear tests.

**Methods used to derive estimates of effectiveness**
The authors used assumptions from the MSAC model to assess the efficacy of treatment available for invasive cancer of the cervix.

**Estimates of effectiveness and key assumptions**
MSAC assumed that 4% of high-grade lesions would progress to cancer over the 2-year cycle of the screening programme.

**Measure of benefits used in the economic analysis**
The summary benefit measures were the life-years gained (LYG) and the number of high-grade lesions detected. It appears that only the LYG were discounted. This was carried out at a rate of 5%.
Direct costs
The cost/resource boundary of the study was that of the public health care system. The resources used in the economic analysis were associated with those of screening by Pap smear or ThinPrep, investigating a cytological prediction of an abnormality, managing a cytologically predicted low-grade abnormality, and treating a lesion. The resource use data were obtained directed from a published study (MSAC report). The unit costs were presented only for some items. Discounting was not reported, although it was relevant since the costs were incurred during a long timeframe; it appears to have been reported in the primary study. The price year was not reported.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not included in the economic analysis.

Currency
Australian dollars (AUD).

Sensitivity analysis
Monte Carlo simulations were conducted to test the robustness of the model results, using approximate 95% confidence intervals for the sensitivity and specificity. For the Pap test, mean values of 68% (+/- 2.6) and 79% (+/- 2.8) were applied to test sensitivity and specificity, whilst for ThinPrep the mean values were 76% (+/- 1.4) and 86% (+/- 2.4), respectively.

Estimated benefits used in the economic analysis
On average, ThinPrep estimated 0.0131 cases detected, resulting in 0.0032 LYG, whilst the Pap test estimated 0.0118 cases detected, resulting in 0.0028 LYG. The differences for ThinPrep versus the Pap test were 0.0014 cases detected and 0.0003 LYG.

For the total hypothetical cohort of 1.6 million Australian women, ThinPrep resulted in an additional 2,240 cases detected and 480 LYG.

Cost results
The ThinPrep strategy cost AUD 143.80 and the Pap test cost AUD 147.27. This resulted in cost-savings of AUD 3.46 with the use of ThinPrep. For the total cohort population, the cost-saving was AUD 5,536,000 per annum.

Synthesis of costs and benefits
An average cost-effectiveness ratio was calculated to combine the costs and benefits. The average cost was AUD 10,940 per case detected and AUD 45,583 per LYG for ThinPrep, and AUD 12,521 per case detected and AUD 52,172 per LYG for the Pap test.

The costs and benefits were also summarised in the form of an incremental cost-effectiveness ratio (ICER; incremental cost divided by the incremental benefit). However, ThinPrep was a dominant strategy in that it was both less expensive and more effective than the comparator. Therefore, no ICER was calculated.

The Monte Carlo simulation predicted that ThinPrep would dominate the Pap test on almost 74% of occasions, and would provide an acceptable ICER in another 25% of occasions. The use of ThinPrep would not be cost-effective in less than 1% of occasions.
Authors' conclusions
The use of ThinPrep dominated the conventional Pap smear test in the screening for cervical cancer in average-risk women in the Australian setting.

CRD COMMENTARY - Selection of comparators
The selection of the comparator was clear as it represented the conventional cervical screening programme. You should decide whether it is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The authors did not state explicitly whether a systematic review of the literature had been undertaken. Much of the effectiveness evidence came from a previous report. The design of the primary study used in the outcome assessment was described (a quantitative survey), so the validity of the sources used could be assessed. Only the sensitivity and specificity were examined in the sensitivity analysis. No details of the other input parameters included in the model were provided, and there was no information on the data derived from the NICE study. Therefore, the validity of the present study was based on the validity of the MSAC report.

Validity of estimate of measure of benefit
The summary benefit measure was appropriate because it captured the impact of the interventions on LYG, which is the most relevant dimension of health affected by cervical cancer. In addition, the use of LYG enables comparisons with the benefits of other health care interventions. However, the impact of screening on quality of life was not investigated. It was unclear whether the benefits were discounted.

Validity of estimate of costs
The authors stated explicitly the perspective adopted in the study. As such, all the relevant categories of costs were included in the analysis. Some costs were not reported separately from the quantities, which could limit the possibility of replicating the cost analysis. The costs were obtained directly from a published study. The costs were treated deterministically and no statistical analysis of the costs was performed. No sensitivity analysis was conducted to assess the robustness of the cost estimates used. It was unclear whether discounting was conducted, although it was relevant because of the long time horizon. The price year was not reported, which limits reflation exercises in other settings.

Other issues
The authors compared their findings with other studies. In particular, the authors stated the conclusion from this study was contrary to that from another one, although in both studies the decision model and costs were the same and the only difference was the effectiveness inputs. The issue of the generalisability of the study results to other settings was addressed. The external validity of the study was difficult to assess objectively, as few details were provided on the outcome parameters used in the model and the sensitivity analysis was limited to sensitivity and specificity parameters. The authors reported only one limitation of their study. Specifically, they expressed concern about the quality of the studies used to derive the model parameters. In particular, they noted the Level 3 evidence with cohort controls; the fact that the reference test was not applied to all screening participants; and that funding for many of the studies was partially or completely provided by manufacturers of LBC technologies.

Implications of the study
The authors did not make any explicit recommendations for changes in policy and practice, or the need for further research. However, they did suggest that their results support the use of ThinPrep in the Australian population of average-risk women.

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None stated.
Bibliographic details

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Other publications of related interest


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