Cost-effectiveness of screening swab or urine specimens for Chlamydia trachomatis from young Canadian women in Ontario


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
Seven diagnostic and screening programmes for Chlamydia trachomatis (C. trachomatis) were compared:

- diagnostic testing using antigen detection or nucleic hybridisation (NAH), performed on endocervical swabs (programme A);
- diagnostic testing using endocervical swab-based nucleic acid amplification (NAA) (programme B);
- diagnostic testing using urine-based NAA (programme C);
- screening using endocervical swab-based NAA (programme D);
- screening using urine-based NAA (programme E);
- screening using only endocervical swab-based NAA on high-risk women (i.e. women who have had two or more partners in the last year) (programme F); and
- screening using only urine-based NAA on high-risk women (programme G).

Type of intervention
Screening and diagnosis.

Economic study type
Cost-effective analysis.

Study population
The study population comprised women aged 15 to 24 years, who were residing in Ontario.

Setting
The setting was primary care. The economic study was carried out in Ontario, Canada.

Dates to which data relate
The effectiveness data related to 1992 and 1999, while the resource use data related to 1995 and 1999. The prices used were for 1992 and 1997. All prices were reported in 1999 Canadian dollars.

Source of effectiveness data
The effectiveness data were derived from a review or synthesis of published studies and estimates based on experts’ opinions.
Modelling
A Markov model with monthly cycles was undertaken to access the cost outcomes associated with each programme.

Outcomes assessed in the review
The outcome assessed in the review was the baseline prevalence of C. trachomatis.

Study designs and other criteria for inclusion in the review
Not stated.

Sources searched to identify primary studies
MEDLINE was searched for articles published between 1970 and 1999.

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
Two primary studies were included in the review.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The baseline prevalence of C. trachomatis was 4%.

Methods used to derive estimates of effectiveness
Three questionnaires were developed in order to derive the estimates of effectiveness. These questionnaires were sent to five physicians who represented the opinion leaders in their field.

Estimates of effectiveness and key assumptions
The proportion of 15- to 19-year-olds tested for C. trachomatis due to the presence of symptoms was 10%. The proportion of 20- to 24-year-olds was 15%.

The probability of being tested in a swab-based screening programme, or diagnostically, due to the presence of symptoms was 30% for the 15 - 19 age group and 50% for the 20 - 24 age group.

The probability of being tested in a urine-based screening or diagnostic programme was 70% for the 15 - 19 age group and 75% for the 20 - 24 age group.
The sensitivity of diagnostic testing was 70% with antigen detection or NAH, 85% with a urine-based NAA, and 95% with a swab-based NAA.

The probability was:

30% for symptomatic C. trachomatis;

35% for symptomatic pelvic inflammatory disease (PID);

50% for C. trachomatis spontaneously clearing;

95% for being tested for C. trachomatis or PID if there were symptoms;

95% for the successful treatment of C. trachomatis or PID; and

20% for C. trachomatis cases being detected, treated and reported.

**Measure of benefits used in the economic analysis**
The measures of health benefit used in the analysis were the number of cases of C. trachomatis, PID, chronic pelvic pain, ectopic pregnancy, infertility and neonatal complications that occurred annually for each programme. These were estimated from the Markov model.

**Direct costs**
The direct costs included in the study were for the antigen detection tests, the NAA tests, the professional fees for the swab-based and urine-based screening tests, treatment for confirmed C. trachomatis, and the costs associated with treating PID (inpatients and outpatients). Medication costs were also included. These were estimated by adding a 10% mark up and a dispensing fee ($6.11) to the price listed in the Ontario Drug Benefit formula. The total cost for diagnostic testing and screening included both the physician fees and the laboratory costs. The costs of handling the swab and urine samples were also included.

**Statistical analysis of costs**
A statistical analysis was not performed.

**Indirect Costs**
The indirect costs included in the study were for ectopic pregnancy, chronic pelvic pain, neonatal conjunctivitis, paediatric pneumonia, paediatric asthma and the lifetime costs of infertility treatment.

**Currency**
Canadian dollars (Can$).

**Sensitivity analysis**
A sensitivity analysis was performed on the following variables:

- the level of participation in the screening programme;
- the monthly risk of a C. trachomatis infection;
- the length of the C. trachomatis infectious period;
- the discount rate used for future health costs and effects;
the professional fees for the swab and urine-based screening programmes; and

the different levels of C. trachomatis infections used to examine the impact of the monthly C. trachomatis risk on the costs and effects of each programme.

Estimated benefits used in the economic analysis
The annual number of cases of C. trachomatis with programme A was 37,756. Only 7,726 of these would be diagnosed and treated.

For this cohort there would be 5,335 PID cases, 1,587 cases of chronic pelvic pain, 384 ectopic pregnancies, 573 cases of infertility and 536 vertically transmitted infections.

Over the 10-year period, there would be 377,557 cases of C. trachomatis with programme A, 307,315 with programme B, 333,583 with programme C, 294,930 with programme D, 308,276 with programme E, 302,533 with programme F, and 323,881 with programme G.

Cost results
The total costs were Can$102.5 million with programme A, Can$87.3 million with programme B, Can$96.0 million with programme C, Can$141.8 million with programme D, Can$174.9 million with programme E, Can$96.3 million with programme F, and Can$107.9 million with programme G.

Synthesis of costs and benefits
The estimated benefits and costs were combined using the cost per cases of C. trachomatis averted.

The swab-based diagnostic testing and screening programmes (B, D and F) dominated the antigen detection and urine-based diagnostic testing and screening programmes (A, C, E and G). Programme B had the lowest total cost over the 10-year period. Moving from programme B to F (from swab-based diagnostic testing to screening on high-risk women using swab-based NAA) cost an extra Can$1,873 per case of C. trachomatis averted. Moving from F to D (and screening all women aged between 15 and 24 years) cost an extra Can$5,990 per case of C. trachomatis averted.

As the level of participation increased, the incremental cost-effectiveness ratios for programmes F and D increased slightly, showing that the cost-effectiveness ratio is not very sensitive to this variable. As the monthly risk of infection decreased, the cost-effectiveness ratio decreased considerably. Comparing a 10% and 1% monthly risk, the cost-effectiveness ratio was reduced from 1,557 to 70 for programme F, and from 4,626 to 382 for programme D. This means that, as the risk falls, screening programmes become less attractive. The cost-effectiveness ratios for programmes F and D also fell for a 3-month C. trachomatis infectious period. The results for programmes A, C, E and G were not reported in the study because these programmes were dominated for all of the ranges studied.

As the discount rate for future costs and effects increased, the cost-effectiveness ratios for both programmes F and D increased. This means that the higher the discount rate, the more attractive screening becomes.

Authors' conclusions
The health care system can reduce the costs and the number of cases of Chlamydia trachomatis (C. trachomatis) by switching from antigen detection or nucleic hybridisation (NAH) diagnostic testing to swab-based diagnostic testing of symptomatic women.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used. The intention was to investigate women who would and would not have been tested for C. trachomatis without a screening programme.
Validity of estimate of measure of effectiveness
The authors stated that a review of the literature had been undertaken. However, it was unclear whether a systematic review had been conducted to identify relevant research and minimise biases. The authors did not consider the impact of differences between the primary studies when estimating the effectiveness. Five opinion leaders in the field answered a questionnaire to estimate the effectiveness data, but the study authors did not report how these physicians were selected. The estimates were not investigated in a sensitivity analysis.

Validity of estimate of measure of benefit
The estimate of the health benefit was modelled. The instrument used to derive the measure of health benefit, a Markov Model, was appropriate.

Validity of estimate of costs
The perspective of the Ontario Ministry of Health was adopted, but not all the relevant costs were included. The authors identified the costs that had been omitted. These were personal out-of-pocket costs, productivity losses, the costs of testing, the cost of screening and treating infected men, and the cost of contact tracing. These omissions may have led to an overestimation of the cost-effectiveness results.

A sensitivity analysis of the quantities and prices was not conducted and this may limit the interpretation of the study's findings.

Other issues
The authors made appropriate comparisons of their findings with those from other studies. However, they did not address the issue of generalisability to other settings. The authors appear to have presented their results selectively. The study enrolled women aged 15 to 24 years and this was reflected in the authors' conclusions.

The authors pointed out several limitations of their study. First, the true value of the baseline prevalence of C. trachomatis was unknown. Second, participation in screening programmes and advertising costs were also unknown. For screening to be successful there needs to be a high participation rate, but it is not known how much advertising is needed to achieve this. Finally, rather than relying on data from the literature or experts' opinions, it would have been better to have obtained actual data from randomised controlled trials.

Implications of the study
Doctors should be encouraged to switch from antigen detection or NAH diagnostic testing to swab-based NAA diagnostic testing.

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None stated.

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