The impact of switching to polymerase chain reaction for the diagnosis of Chlamydia trachomatis infections in women

Forward K R

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
The use of a molecular method, based on polymerase chain reaction (PCR), to test for Chlamydia trachomatis (CT). The COBAS AMPLICOR C. trachomatis test (Roche Diagnostics) was compared with an enzyme immunoassay (EIA), performed on the Syva MicroTrack II Autoreader (Behring Diagnostics, Inc.).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women who had been tested for CT at the Queen Elizabeth II Health Sciences Centre or at the Izaak Walton Killam Health Centre.

Setting
The practice setting was secondary care. The economic study was carried out at the Queen Elizabeth II Health Sciences Centre, Nova Scotia, Canada.

Dates to which data relate
The author examined records of testing performed between 1 April 1998 and 31 December 2001, then calculated the cost of both EIA and PCR at the time the switchover occurred (June to July 2001). Thus, it could be assumed that 2001 prices were used.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same sample as that used in the effectiveness study.

Study sample
No sample size was planned in the planning phase of the study and no power calculations were performed retrospectively. To assess the impact of the switch from EIA to PCR-based methods, the author examined all the EIA tests performed from 1 April 1998 to June or July 2001, and then all the PCR-based tests performed from June or July 2001 to 31 December 2001. In total, 62,288 EIA tests were performed on specimens submitted by women during the
first study period, while 9,559 PCR tests were performed during the second study period.

**Study design**

This was a comparative diagnostic study with historical controls. Nearly all of the tests were performed at the Queen Elizabeth II Health Sciences Centre, although approximately 2,000 were performed at the Izaak Walton Killam Health Centre.

**Analysis of effectiveness**

All the tests performed (except approximately 2,000 which were undertaken at a neighbouring childrens' and womens' health centre) seem to have been included in the analysis. The primary health outcome used in the analysis was the number of positive results for CT. All the results were interpreted according to the manufacturers' guidelines. Internal controls were used for urethral, but not cervical specimens. There were no significant differences in the numbers of EIA tests (1,611 specimens, range: 1,373 - 1,715) and PCR-based tests (1,613) performed monthly. The author reported a number of potential confounding variables. These included changes in physician practices, changing testing patterns, and changes in the prevalence of CT infections in the community over the two timeframes studied.

**Effectiveness results**

Of the 62,288 EIA tests performed, 2,061 (3.33%) were positive.

In the 6 months when testing was almost exclusively using PCR-based methods, 463 tests (4.84%) were positive. This represented a 46% increase in the proportion of positive tests in comparison with EIA. On average, fewer than 2% of the results were false positives when using the Cobas Amplicor PCR method.

**Clinical conclusions**

The study revealed that the decision to switch from EIA to a PCR-based method increased the rate of positive test results for CT.

**Measure of benefits used in the economic analysis**

The health benefit measure used in the economic analysis was the number of positive test results.

**Direct costs**

The resource quantities and the costs were not reported separately. The direct costs included in the analysis were those of the two health centres providing diagnostic tests for CT. The author calculated the costs of both EIA and PCR-based tests in terms of reagents, other supplies and labour costs at the time the switchover occurred. The total direct costs included the costs of confirmation testing, and additional testing of grey zones and other problem specimens. The instruments used for testing were acquired on a reagent rental agreement, which was incorporated into the test cost. Discounting was irrelevant, as the costs were incurred in a short time, and was not conducted. The study reported the average costs. It could be assumed that the price data referred to 2001. The author did not include the costs of training time.

**Statistical analysis of costs**

The costs were treated deterministically (i.e. as point estimates).

**Indirect Costs**

No indirect costs were included in the analysis.
Currency
Canadian dollars (Can$).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The average cost of an EIA test (initial screening and subsequent confirmation and other testing) was $7.49, while the average cost of a PCR-based test was $10.10.

Synthesis of costs and benefits
The estimated costs and benefits were combined as the costs per positive test result. The cost was $208 for each positive detected by PCR and $226 for each positive detected by EIA. This represented a difference per positive test result of $18.

Authors' conclusions
The switch from enzyme immunoassay (EIA) to polymerase chain reaction (PCR) produced a significant increase in the number of Chlamydia trachomatis (CT) infections diagnosed, perhaps explaining in part the recent increases in the number of CT cases reported in Canada. Even though the decision to switch to a PCR-based method did increase the cost of testing, the cost of each positive test by PCR was $18 less than that for EIA.

CRD COMMENTARY - Selection of comparators
The use of EIA tests as the comparator was justified on the grounds that it had represented current practice in the diagnosis of CT in the author's setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis used a comparative study with historical controls. The study design was appropriate since the results on the impact of switching to PCR-based methods were compared with tests conducted previously using EIA. The study sample was representative of the study population. There were no significant differences in the numbers of EIA and PCR tests performed monthly. However, using a comparative study with historical controls could mean that other factors, such as changes in physician practices, testing patterns and changes in the prevalence of CT in the community, may have affected the author's conclusions. However, the author stated that it was unlikely that the observed increases in positive test results were due to changes in physician practices, since the EIA kits they had been provided with were simply replaced with specimen collection kits. According to the author, it was also unlikely that changes in the prevalence of CT occurred after the switch, as the number of specimens submitted or incidence of gonorrhoea did not vary during that timeframe. A concurrent analysis using the same sample would have increased the validity of the analysis, but would have involved higher cost.

Validity of estimate of measure of benefit
The estimation of benefits (number of positive test results) was obtained directly from the effectiveness analysis. Since this study was only concerned with the diagnosis of CT infections, the choice of estimate was fully justified.
Validity of estimate of costs
All the categories of cost relevant to the perspective adopted appear to have been included in the analysis. In addition, for each category of cost, all the costs seem to have been included. However, the author did not include any learning time costs associated with the switch to PCR-based testing. This omission is unlikely to have affected the author's conclusions. The costs and resource use were not reported separately, and the price year had to be assumed. These two factors will not only hamper generalisability to other settings, but will make any reflation exercises difficult. No statistical analysis of the costs was performed, with the costs being treated as point estimates. Thus, the reliability of the cost results provided by the author is uncertain, as no account of variability or uncertainty in costs was acknowledged. Since the costs of the EIA and PCR tests were calculated at the same time, it was unnecessary to inflate costs in the first timeframe.

Other issues
The author made appropriate comparisons with another study (Scoular et al., see Other Publications of Related Interest” below), which reported that testing involving ligase chain reactions (a molecular method) revealed an increase in the detection rate from 4.8 to 7.8% in comparison with EIA. The issue of generalisability was also partly addressed when comparing these results. The author does not appear to have presented his results selectively. The author reported no further limitations of the study.

Implications of the study
The author recommended that all regions with laboratory resources permitting the use of newer technologies should use molecular methods to diagnose CT. This would avoid CT infections going undiagnosed, hence untreated, leading to adverse consequences and higher costs in the future. For that reason, the author also recommended that consideration should be given to the long-term impact of improved case detection on the incidence of the disease.

Source of funding
None stated.

Bibliographic details

PubMedID
12790500

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM
MeSH
Chlamydia Infections /diagnosis; Chlamydia trachomatis /isolation & purification; Female; Humans; Immunoenzyme Techniques /economics; Nova Scotia; Polymerase Chain Reaction /economics

AccessionNumber
22003009662

Date bibliographic record published
30/04/2004

Date abstract record published
30/04/2004