Screening for Chlamydia trachomatis in asymptomatic women attending family planning clinics: a cost-effectiveness analysis of three strategies
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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
Screening for chlamydia trachomatis in asymptomatic women by polymerase chain reaction (PCR) of cervical or urine specimen.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Asymptomatic women attending family planning clinics.

Setting
Family planning clinic. The economic study was carried out in Baltimore, Maryland, USA.

Dates to which data relate
The data from the single effectiveness study were gathered between April 1994 and August 1996. The data for the sensitivity and specificity of PCR were extracted from the literature published between 1993 and 1996. The data on the effectiveness and side effects of doxycycline were derived from a paper published in 1996. The data for the percentage of women developing pelvic inflammatory because of untreated chlamydial infections were obtained from papers published between 1980 and 1996. The data for the percentage of women with pelvic inflammatory disease who became symptomatic in year 1 were extracted from a paper published in 1997. 1995 prices were used.

Source of effectiveness data
The evidence for the final outcomes was derived from a single retrospective study and a decision analytic model. Some of the clinical probabilities were obtained from a review of previously published studies.

Link between effectiveness and cost data
The costing was not performed on the same sample as that used for the effectiveness study. The values of cost items were derived from a review of the literature.

Study sample
The sample size was not determined by a power calculation. 8,354 women fulfilled the inclusion criteria. The exclusion rate was about 7.6%. A total of 7,699 asymptomatic patients were screened by PCR. About 2,810 (36.5%) patients were
eligible to be tested according to the CDC strategy. The age-based strategy necessitated screening 71.4% of the study population (about 5,497 women). According to the universal strategy, 100% of the patients were eligible for the screening.

**Study design**
Cohort study carried out in two family planning clinics.

**Analysis of effectiveness**
It was unclear whether the analysis of the clinical study was based on intention to treat or treatment completers only. The primary health outcomes were the overall observed prevalence rate of chlamydia infection, the percentage of infected women being pregnant, the percentage of infected women being potentially identified by each strategy, the percentage of uninfected women being unnecessarily tested by each strategy, the number of cases of pelvic inflammatory disease, chronic pelvic pain, infertility workups, and ectopic pregnancies in case of no-screening, and cases of inflammatory disease prevented by each strategy.

**Effectiveness results**
The overall observed prevalence rate of chlamydia infection was 6.6%. The percentage of infected women being pregnant was 5.7%.

For each strategy (CDC-defined, age-based, and universal) the results were as follows:

Percentage of infected women potentially identified: 70.4%, 93.3%, and 100%.

Percentage of uninfected women being unnecessarily tested: 34.2%, 69.8%, and 100%.

Cases of inflammatory disease prevented: 64, 85, and 91.

In the case of no screening, the number of cases of pelvic inflammatory disease, chronic pelvic pain, infertility workups, and ectopic pregnancies were 152, 27, 18, and 12, respectively.

**Clinical conclusions**
Screening asymptomatic patients in a family planning population prevented disease.

**Modelling**
A decision analytic model was constructed to simulate a set of possible events associated with each strategy and to estimate and combine the measures of costs and effectiveness.

**Outcomes assessed in the review**
The outcomes assessed in the review were:

the sensitivity and specificity of PCR,

the effectiveness and side effects of doxycycline,

the percentage of women developing pelvic inflammatory disease because of untreated chlamydial infections,

the percentage of women with pelvic inflammatory disease who become symptomatic in year 1,

the percentage of women becoming symptomatic who need either outpatient or inpatient care,
the percentage of women with pelvic inflammatory disease who need surgery for chronic pelvic pain,
the percentage of women with silent pelvic inflammatory disease who become either pregnant or infertile in year 5,
the percentage of women with silent pelvic inflammatory disease who become infertile in year 5 and have at least one infertility workup in year 10,
the percentage of male sex partner infected (assuming a minimum of 1 male sex partner per woman),
the percentage of infected male sex partners who have urethritis,
the percentage of infected male sex partners who develop epididymitis,
the percentage of infants born to infected mothers who experience either chlamydial conjunctivitis or chlamydial pneumonia.

Study designs and other criteria for inclusion in the review
Studies addressing C. trachomatis, PCR or Amplicor, analysing female cervical specimens, utilizing culture as a reference test and performing discrepant analysis, were considered in the review.

Sources searched to identify primary studies
The authors searched Med2000+ and the papers published between 1966 and 1996 to identify the primary studies.

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
The exact number of primary studies included in the review was not explicitly specified. However, about 20 papers were used as references for the clinical probabilities extracted from the literature.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The sensitivity of PCR was 87.6% and the specificity of PCR was 99%.

The effectiveness of doxycycline was 85.7%.

The percentage of patients affected by the side effects of doxycycline was 16%.

The percentage of women developing pelvic inflammatory disease because of untreated chlamydial infections was assumed to be 30%.
The percentage of women with pelvic inflammatory disease who become symptomatic in year 1 was 40%.

The percentage of women becoming symptomatic who need either outpatient or inpatient care was 86%, and 14%, respectively.

The percentage of women with pelvic inflammatory disease who needed surgery for chronic pelvic pain was 18%.

The percentage of women with silent pelvic inflammatory disease who become either pregnant or infertile in year 5 was 7.8% and 12%, respectively.

The percentage of women with silent pelvic inflammatory disease who become infertile in year 5 and have at least one infertility workup in year 10 was 25%.

The percentage of male sex partners infected, assuming a minimum of 1 male sex partner per woman, was 68%.

The percentage of infected male sex partners who have urethritis was 40%.

The percentage of infected male sex partners who develop epididymitis was 2%.

The percentage of infants born to infected mothers who experience either chlamydial conjunctivitis or chlamydial pneumonia was 20% and 10%, respectively.

Measure of benefits used in the economic analysis

The main measures of benefits used in the economic analysis were the cases of inflammatory disease prevented by each strategy and the expected cases of pelvic inflammatory disease for each strategy.

Direct costs

Health care costs were considered. Costs were discounted. Quantities were not reported separately but costs were. The total cost of applying each strategy was the main outcome in the cost analysis. The total costs were divided into the costs of the screening programme and the sequelae costs. The cost items included in those two broad categories were the costs of specimen collection including clinician time, full examination, extra swab, and materials, PCR cost per specimen (including assay, laboratory technician, thermocycler and specimen), the cost of treatment visit including follow-up for positive test result, administration and clinician time and counselling, doxycycline, the cost of side effects, the costs of the women's illness (including pelvic inflammatory disease, symptomatic outpatient, symptomatic inpatient, symptomatic and asymptomatic ectopic pregnancy, chronic pelvic pain, infertility, and workup), the costs of men's illness (including infection, urethritis, and epididymitis), the costs of infants' illness (including conjunctivitis, and pneumonia). The sources of most of the cost items were a review of the literature. Time-in-motion studies were used to estimate the cost of laboratory technician time per specimen. 1995 price data were used.

Indirect Costs

The value of the indirect cost per day was extracted from a published paper. No more details were given.

Currency

US dollars ($).

Sensitivity analysis

A series of univariate and multivariate sensitivity analyses was performed on almost all parameters of the model.

Estimated benefits used in the economic analysis

The cases of inflammatory disease prevented by the CDC-defined, age-based, and universal strategy were 64, 85, and
91, respectively. The expected cases of pelvic inflammatory disease for no screening, CDC-defined, age-based, and universal strategies were 152, 88, 67, and 61, respectively. The duration of alternative strategies' benefits was not explicitly specified but was, apparently, assumed to be 10 years.

Cost results
The discount rate was 3%. The total cost for no screening, CDC-defined, age-based, and universal strategies were $676,203, $445,648, $371,880, and $390,673, respectively. The rate of indirect costs per day was assumed to be $80. The duration of alternative strategies' benefits was not explicitly specified but seems to have been 10 years.

Synthesis of costs and benefits
An incremental cost-effectiveness ratio (additional cost per one extra prevented case of pelvic inflammatory disease relative to the next most efficient strategy) was introduced to combine the costs and benefits of alternative health strategies. The values of the ratio for the CDC-defined, age-based, and universal strategies were -$3602, -$3513, and $3132, respectively. The sensitive parameters were the power of identification of infected women by the age-based screening strategy (if it were less than 88.5%, the universal strategy would be the most cost-effective strategy), the prevalence of chlamydial infection (if the rate were to increase to 10.2%, the universal strategy would become the most cost-effective) and some items of the costs. In a multivariate sensitivity analysis if the prevalence rate dropped to 4.5% and the power of identification of infected women by the age-based screening strategy decreased to less than 82.2%, the universal strategy would become the most cost-effective.

Authors' conclusions
These results suggest that age-based screening provides the greatest cost savings of the three strategies examined. However, universal screening is desirable in some situations. In general, screening performed using any criteria and a highly sensitive diagnostic assay should be part of any chlamydial prevention and control programme or health plan.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear.

Validity of estimate of measure of benefit
As no systematic review of the literature including the criteria used to ensure the validity of the primary studies, methods of combination of primary studies, and investigation of differences between the primary studies was provided, it is not possible to judge objectively the validity of the estimates of the measures of the benefits. A comprehensive list of clinical probabilities obtained from the review of the literature was not given.

Validity of estimate of costs
Resource quantities were not reported separately from the costs. Adequate details of the sources of the estimates of the costs, including the literature review, were not given.

Other issues
The issue of generalisability to other settings or countries was addressed by performing a series of sensitivity analyses. No statistical analysis of costs or benefits was performed. The duration of alternative strategies' benefits and costs were not explicitly specified.

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