Opportunistic screening for genital infections with Chlamydia trachomatis in sexually active population of Amsterdam. II: Cost-effectiveness analysis of screening women


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
Ligase chain reaction (LCR) testing in women with genital infections with Chlamydia trachomatis (CT).

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Hypothetical heterosexually active women, in sub-groups aged 15-19, 15-24, 15-29 and 15-34.

Setting
The study was set in general practices in Amsterdam, The Netherlands.

Dates to which data relate
The literature reviewed dated from 1980-1997. Statistical data were for 1997. 1996 resource use and cost data were used.

Source of effectiveness data
Effectiveness data were derived from a literature review and statistical data from the Dutch Bureau of Statistics (CBS), and authors’ estimates.

Modelling
A disease and intervention model (in effect a decision tree) was used, describing the progression of disease and the effects of screening.

Outcomes assessed in the review
Data on health care needs for CT complications were derived from various sources. The outcomes assessed in the review were:

- Age specific estimations about the number of women who want to become pregnant;
percentage that refuses treatment once identified as having CT;
percentage cured after accepting treatment;

development of complications, in particular the percentage of women with pelvic inflammatory disease (PID), chronic pelvic pain, infertility or ectopic pregnancy due to CT, and newborn babies with pneumonia or with conjunctivitis

**Study designs and other criteria for inclusion in the review**
The authors stated that the most recent and relevant publications were used. No further details were provided.

**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**
Ten primary studies were included.

**Methods of combining primary studies**
Not stated.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
Details of age specific estimations about the number of women who wanted to become pregnant were not presented. Other results were as follows:

- percentage that refuses treatment once identified as having CT, 10%;
- percentage cured after accepting treatment, 95%;
- development of complications, in particular the percentage of women with:
  - (a) asymptomatic pelvic inflammatory disease (PID), 15%;
  - (b) symptomatic PID, 10%;
  - (c) chronic pelvic pain, 18%;
  - (d) infertility due to CT, 11%;
  - (e) ectopic pregnancy, 9%;
(f) newborn babies with pneumonia, 15%;

(g) newborn babies with conjunctivitis, 30%.

These data formed the principal input parameters for the model.

**Methods used to derive estimates of effectiveness**
The sensitivity and specificity of the ligase chain reaction test (LCR-test) were based on an assumption made by the authors.

**Estimates of effectiveness and key assumptions**
The sensitivity of the LCR test was assumed to be 80% and the specificity 100%. These data also formed part of the input parameters for the model.

**Measure of benefits used in the economic analysis**
The measures of benefits used were women cured from CT and complications avoided (pelvic inflammatory disease (PID), chronic pelvic pain, ectopic pregnancy, infertility and pneumonia of newborns). Health states were not given values.

**Direct costs**
Direct costs were based on conservative estimates of necessary care and costs per unit of care. Estimates of necessary care were based on guidelines for treatment provided by the Centers for Disease Control and Prevention (CDC; Atlanta, USA), registered hospital days (SIG, Zorginformatie, Utrecht), previous Dutch research and the international literature. Estimates of the costs per day of care, costs of hospital research and treatment (tariffs from the Centraal Orgaan Tarieven Gezondheidszorg) medication and GP visits were taken from the literature. All costs were estimates based on 1996 prices. Costs for chronic pelvic pain were assumed to occur 5 years after PID and were therefore discounted at 4% per year. Ectopic pregnancy and infertility were assumed to occur 10 years after infection for women aged between 15-19 years, 5 years after infection for women aged between 20-24 years, and 2 years after infection for women aged between 25-34 years. These costs were also discounted at 4% per year.

**Statistical analysis of costs**
No statistical analysis was reported.

**Indirect Costs**
Indirect costs of production loss were estimated using the friction cost method. These costs were based on absence from work time (sick leave) and the costs of treating each complication. Sick leave was valued against age and gender, which was added to the employer's contribution. These cost data were corrected for part-time employment, unemployment and adjusted for the effects of inflation. Discounting was appropriately applied and a price year used according to the direct costs reported above.

**Currency**
Dutch guilders (Dfl).

**Sensitivity analysis**
Four screening strategies were analysed, based on women between 15-19, 15-24, 15-29 and 15-34 years. Three additional sensitivity analyses were performed. One-way sensitivity analyses were performed on assumptions regarding the PID-transfer percentages in the model, one varying the discount rate between 2% and 6%, and one assuming a
sensitivity of the test of 90% instead of 80%. The authors presented these results for the 15-29 age group.

**Estimated benefits used in the economic analysis**
Estimated benefits were not reported separately. The reader is referred to the synthesis of costs and benefits results below.

**Cost results**
Direct and indirect costs associated with complications (in 1996 guilders, not discounted) were:

- PID: direct medical costs, Dfl 8,228; costs of lost production, Dfl 844 for 15-24 years (Dfl 1,941 for 25-34 years); 
- Chronic pelvic pain: direct medical costs, Dfl 8,068; costs of lost production: Dfl 1,392 for 15-24 years (Dfl 2,110 for 25-34 years); 
- Ectopic pregnancy: direct medical costs, Dfl 6,021; costs of lost production, Dfl 1,753 for 15-24 years (Dfl 1,753 for 25-34 years); 
- Infertility: direct medical costs, Dfl 6,458; costs of lost production, Dfl 1,031 for 15-24 years (Dfl 1,031 for 25-34 years); 
- Pneumonia in newborns: direct medical costs, Dfl 33,626; costs of lost production, not applicable; 
- Conjunctivitis in newborns: direct medical costs, Dfl 82; costs of lost production: not applicable.

Cost of LCR-test: Dfl 45 per test.

**Synthesis of costs and benefits**
Cost-effectiveness was expressed in net costs per cured woman and in net costs per avoided complication. Net costs was expressed as the difference between the costs of screening with treatment of CT-positives and the benefits of avoided costs for treatment of complications.

The cost-effectiveness of the screening strategy was calculated as the weighted mean of age-specific results. Weighting factors were the age distribution of Amsterdam women within the four age groups, the age-specific sexual activity, the age-specific fractions of women with at least one GP visit per year and the age-specific fractions of women who accepted the test.

The cost-effectiveness of screening by age group was as follows, per cured women/per avoided complication:

- ages 15-19: Dfl -179 per woman and Dfl -510 per avoided complication; 
- ages 15-24: Dfl -2 per woman and Dfl -6 per avoided complication; 
- ages 15-29: Dfl 107 per woman and Dfl 302 per avoided complication; 
- ages 15-34 Dfl 321 per woman and Dfl 913 per avoided complication;

Break-even test costs were calculated based on the costs of a LCR test where the total costs and benefits were equal. The break-even test costs for the age group 15-29 were Dfl 38.70 and for the age group 15-34, Dfl 30.20.

Introducing a screening programme for women aged between 15-29 years in Amsterdam would mean that in one year 56,000 out of 86,000 would qualify for screening. The inclusion criteria would be sexually active women who visited a GP at least one time a year and who would accept the test. This corresponds to a net investment of Dfl 350,000 (test and treatment costs of Dfl 2.58 million minus direct and indirect savings of Dfl 2.23 million for avoided complications) and
results in a maximum of 3,255 cured women and 1,153 avoided serious complications.

If the screening programme were limited to women aged 15-24 years the benefits would have equalled the costs (Dfl.1.10 million in costs versus Dfl.1.11 million in savings). This investment would have resulted in a maximum of 1,748 cured women and 617 avoided serious complications.

The results of the sensitivity analyses (based on a screening programme for women aged 15-29 years) were:

- with a PID-transfer percentage of 20% (instead of 25%), the net costs per cured woman or avoided complication increased by 150%.
- With a PID-transfer percentage of 30% (instead of 25%), the net costs per cured woman or avoided complication decreased by 120%.
- Varying the discount rate between 2% and 6% resulted in small changes of 25%.
- Using a test sensitivity of 90% instead of 80% resulted in a reduction of the net costs per cured woman or avoided complication of 80%.

Authors’ conclusions
The authors concluded that screening for CT infection in the GP practices in Amsterdam in combination with appropriate treatment has a beneficial cost-effectiveness value when the target group is limited to women up to 30 years of age. Universal implementation of the screening programme investigated in women aged 19-24 years would result in approximately equal savings and costs, whereas screening all 15-29 year-old women would require a net investment of DFL 350,000. Screening women up to 35 years of age also seems to be a cost-effective strategy.

CRD COMMENTARY - Selection of comparators
The comparator of no screening was appropriate and allowed the relative costs and benefits of the intervention to be assessed.

Validity of estimate of measure of effectiveness
It is difficult to assess objectively the validity of the estimates of effectiveness as some were derived from a review of the literature, for which details of the search strategy and inclusion criteria were not provided, and others from the authors' assumptions for the sensitivity and specificity of the LCR test. However, the authors did mitigate this to some degree by the sensitivity analyses that were undertaken to address variability in their estimates.

Validity of estimate of measure of benefit
The benefit measure was appropriate and was derived directly from the effectiveness estimates using modelling.

Validity of estimate of costs
The authors adopted thorough and progressive techniques in their cost analysis, for example in the adoption of discounting for relevant complications, the use of friction costs to assess productivity losses, the inclusion of price years and adjustments for inflation, and the listing of costs for all relevant complications and tests. The adoption of the societal perspective also helps with the validity of the cost results and therefore the generalisability to other settings. Appropriate sensitivity analyses were also undertaken to account for variability in the estimates used in the modelling.

Other issues
The authors pointed out that the cost-effectiveness of the screening strategy may be improved by the adoption of the programme, which would reduce the unit cost of the screening test, and by improvements in the sensitivity of the test. The authors make good comparisons regarding the societal benefits and costs of the screening programme with regard
to other screening programmes such as flu vaccination for the elderly and screening for hepatitis B for newly born infants. The authors point out some limitations of their analysis and suggest that future studies should address dynamic aspects of the spread of infectious diseases such as reinfection of cured women by the same partner, tracing infected people and the influence of the programme on CT prevalence.

**Implications of the study**
The implications of the study are those associated with the authors' conclusions, as recorded above.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
10321301

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Adolescent; Adult; Chlamydia Infections /diagnosis /epidemiology /prevention & control; Chlamydia trachomatis /isolation & purification; Cost-Benefit Analysis; Female; Genital Diseases, Female /diagnosis /prevention & control; Humans; Mass Screening /economics; Models, Economic; Netherlands /epidemiology; Pregnancy; Pregnancy Complications, Infectious /diagnosis /prevention & control; Women's Health

**AccessionNumber**
21999006762

**Date bibliographic record published**
31/10/2001

**Date abstract record published**
31/10/2001