PERIODIC HEALTH EXAMINATION, 1996 UPDATE: 2. SCREENING FOR CHLAMYDIAL INFECTIONS

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Abstract • Résumé

Objective: To update the 1984 recommendations of the Canadian Task Force on the Periodic Health Examination on the routine screening of asymptomatic patients for infection with *Chlamydia trachomatis*.

Options: Screening, with the use of culture or nonculture tests, of the general population, of certain high-risk groups or of all pregnant women; or no routine screening.

Outcomes: Rates of asymptomatic and symptomatic chlamydial infection, perinatal complications, long-term complications of infection (i.e., pelvic inflammatory disease, infertility and ectopic pregnancy), coinfection with other sexually transmitted diseases, disease spread, hospital care, complications of therapy and costs of infection and of screening.

Evidence: Search of MEDLINE for articles published between Jan. 1, 1983, and Dec. 31, 1995, with the use of the major MeSH heading "chlamydial infections," references from recent review articles and recommendations by other organizations.

Values: The evidence-based methods of the Canadian Task Force on the Periodic Health Examination were used. Advice from reviewers and experts and recommendations of other organizations were taken into consideration. Prevention of symptomatic disease and decreased overall costs were given high values.

Benefits, harms and costs: The greatest potential benefits of screening asymptomatic patients for chlamydial infections are the prevention of complications, especially infertility and perinatal complications, and the prevention of disease spread. There is no evidence that screening of the general population for chlamydial infections leads to a reduction in complications, and screening may increase costs. However, there is evidence that annual screening of selected high-risk groups and of pregnant women during the first trimester is beneficial in preventing symptoms and reducing the overall cost resulting from infection.

Recommendations: There is fair evidence to support screening and treatment of pregnant women during the first trimester (grade B recommendation) as well as annual screening and treatment of high-risk groups (sexually active women less than 25 years of age, men or women with new or multiple sexual partners during the preceding year, women who use nonbarrier contraceptive methods and women

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who have symptoms of chlamydial infection: cervical friability, mucopurulent cervical discharge or intermenstrual bleeding; grade B recommendation). There is fair evidence to exclude routine screening of the general population (grade D recommendation).

Validation: These recommendations are similar to those of the US Preventive Services Task Force and the US Centers for Disease Control and Prevention, Atlanta.

Sponsor: These guidelines were developed and endorsed by the Canadian Task Force on the Periodic Health Examination, which is funded by Health Canada and the National Health Research and Development Program. The principal author (H.D.D.) was supported in part by the Ontario Ministry of Health and the Canadian Infectious Diseases Society Lilly Fellowship.

Objectif : Mettre à jour les recommandations de 1984 du Groupe d'étude canadien sur l'examen médical périodique au sujet du dépistage de routine de l'infection à *Chlamydia trachomatis* chez des sujets asymptomatiques.

Options : Dépistage, au moyen de cultures ou d'autres analyses, auprès de certains groupes à risque élevé dans la population générale, ou des femmes enceintes, ou aucun dépistage de routine.

Résultats : Taux d'infection à chlamydia asymptomatique et symptomatique, complications périnatales, complications à long terme de l'infection (c.-à-d. inflammation pelvienne, infécondité et grossesse ectopique), infection simultanée par d'autres maladies transmises sexuellement, propagation de la maladie, soins à l'hôpital, complications de la thérapie et coûts de l'infection et du dépistage.

Preuves : Recherche dans MEDLINE d'articles publiés entre le 1er janv. 1983 et le 31 déc. 1995 au moyen de la grande rubrique MeSH «chlamydial infections», références tirées de comptes rendus récents et recommandations d'autres organisations.

Valeurs : On a utilisé les méthodes fondées sur des données probantes du Groupe d'étude canadien sur l'examen médical périodique. On a tenu compte des conseils d'examinateurs et d'experts et de recommandations d'autres organisations. On a accordé une grande importante à la prévention de la maladie symptomatique et à la réduction des coûts totaux.

Avantages, préjudices et coûts : Les plus grands avantages éventuels du dépistage d'infections à chlamydia chez des sujets asymptomatiques sont la prévention des complications, et surtout de l'infécondité et des complications périnatales, et la prévention de la propagation de la maladie. Rien n'indique que le dépistage des infections à chlamydia dans la population en général entraîne une réduction des complications. Le dépistage peut augmenter les coûts. Des données probantes indiquent toutefois que le dépistage annuel auprès de groupes à risque élevé choisis et chez les femmes enceintes au cours du premier trimestre de la grossesse aide à prévenir les symptômes et à réduire le coût global découlant de l'infection.

Recommandation : Il y a des données probantes de qualité moyenne à l'appui du dépistage et du traitement en ce qui concerne les femmes enceintes au cours du premier trimestre (recommandation de catégorie B), ainsi que du dépistage annuel et du traitement pour ce qui est des groupes à risque élevé (femmes de moins de 25 ans actives sexuellement, hommes ou femmes à partenaires sexuels nouveaux ou multiples au cours de l'année précédente, femmes qui utilisent des contraceptifs autres que les barrières et femmes qui ont des symptômes d'infection à la chlamydia : friabilité du col, écoulements cervicaux mucopurulents ou pertes intermenstruelles; recommandation de catégorie B). Il y a des données probantes de qualité moyenne pour exclure le dépistage de routine dans la population en général (recommandation de catégorie D).

Validation : Ces recommandations ressemblent à celles du US Preventive Services Task Force et des Centers for Disease Control and Prevention des États-Unis à Atlanta.

Commanditaires : Ces lignes directrices ont été mises au point et appuyées par le Groupe d'étude canadien sur l'examen médical périodique, qui est financé par Santé Canada et le Programme national de recherche et développement en matière de santé. Le principal auteur (H.D.D.) a bénéficié de l'appui du ministère de la Santé de l'Ontario et a reçu la bourse Lilly de la Société canadienne des maladies infectieuses.

The options for screening asymptomatic patients for infection with *Chlamydia trachomatis*, with the use of culture and nonculture tests and with subsequent treatment, are: (1) routine screening of the general population, (2) selective screening of certain high-risk groups, (3) screening of all pregnant women, or (4) no routine screening. In 1984, the Canadian Task Force on the Periodic Health Examination reviewed the evidence then available and concluded that there was fair evidence to support exclusion of routine screening of the general population for chlamydial infections from the periodic health examination (grade D recommendation), poor evidence to support inclusion or exclusion of screening of high-risk groups (grade C recommendation), and fair evidence to support screening of pregnant women (grade B recommendation).[1]

For this article, we reviewed recent evidence to update the 1984 recommendations. In addition to published evidence, advice from reviewers and experts and recommendations of other organizations were taken into consideration. Prevention of symptomatic disease and decreased overall costs were considered important.

A MEDLINE search of articles published from Jan. 1, 1983, to Dec. 31, 1995, was conducted by exploding the major MeSH heading "chlamydial infections" with the subheadings "complications," "diagnosis," "drug therapy," "economics," "cost," "epidemiology," "etiology," "history," "microbiology," "mortality," "mass screening," "prevention and control," "therapy" and "transmission." Relevant articles identified through the search were reviewed with an emphasis on screening, outcome and treatment. Pertinent references from these studies were also reviewed, along with references from recent review articles and articles suggested by three expert reviewers. Guidelines for rules of evidence established by the Canadian Task Force on the Periodic Health Examination[2,3] were used to classify the quality of study designs in a hierarchical fashion. The "causal pathway" approach proposed by Battista and Fletcher[4] in 1988 was used to examine the evidence to determine whether secondary prevention of chlamydial infection through screening and treatment may prevent specified complications. The two principal authors (H.D.D. and E.W.) were responsible for reviewing the literature and for providing a written report to all of the members. Consensus was then reached on the thoroughness of the review and the grading of the evidence and recommendations.

Burden of suffering

Infection with *C. trachomatis* is the most common sexually transmitted disease (STD) in North America,[5–7] causing infection in two to three times more people than *Neisseria gonorrhoeae*.[8] In Canada, the incidence rate of *C. trachomatis* infection is estimated to be 216 per 100 000 people per year[9] (Table 1). Although there are no Canadian estimates of the associated cost of infection, in the United States there are more than 4 million infections each year, with an estimated cost in 1990 of $2.2 billion (US).[6]

Infection among women

Most infections (60% to 80%) among women are asymptomatic, but the spectrum of symptoms includes mucopurulent cervicitis,[15–17] endometritis,[18–21] salpingitis,[22–27] postabortal pelvic sepsis[24,28] and perihepatitis.[29] There is often coinfection with other STDs, especially gonorrhea. An estimated 44% to 79% of women with gonorrhea also have an infection with *C. trachomatis*.[11,22,30] In numerous case–control and cohort studies, chlamydial infection has been associated with the long-term complications of pelvic inflammatory disease (PID), infertility (Table 2) and ectopic pregnancy[21,36,42] (Table 3). Serologic studies suggest that at least 64% of cases of tubal infertility[31–40,50] and 42% of ectopic pregnancies[43–49] are attributable to chlamydial infection. Screening of different populations of women in Canada have shown prevalence rates of 1% to 25%[10–14,51] (Table 1). In Canada, the women at the highest risk of chlamydial infection are sexually active young women 15 to 19 years of age, followed by those 20 to 25 years of age.[9] Other factors associated with increased risk of infection among women include two or more sexual partners per year or a new partner in the preceding year, low socioeconomic status, use of nonbarrier contraceptive methods, intermenstrual bleeding, cervical friability and purulent cervical discharge. Infection rates among pregnant women range from 5% to 25%.[14,52–58] In prospective cohort studies, conjunctivitis developed in 11% to 44%[59] of infants born to mothers with *C. trachomatis* infection, and pneumonia developed in 11% to 20% of such infants[60–63] during the first year of life.

Infection among men

Among men, the spectrum of symptoms caused by *C. trachomatis* includes urethritis, epididymitis and conjunctivitis.[64,65] Prostatitis, proctitis and proctocolitis caused by homosexual transmission of the infection have been described; however, experts do not agree on whether *C. trachomatis* infection causes prostatitis.[66] Up to 50% of reported cases of nongonococcal urethritis and 31% of cases of acute epididymitis are caused by

Table 1: Prevalence of *Chlamydia trachomatis* infection estimated in Canadian studies

Study	City	Sample	Prevalence rate, %
Hughes et al[10]	Ottawa	Adolescents who were not sexually active	0
		Adolescents who were sexually active	15
Bowie et al[11]	Vancouver	College students	7–25
Massé et al[12]	Montreal	Women attending a local community clinic	7
Sellors et al[13]	Hamilton, Ont.	Women attending a family planning unit	7
Levallois et al[14]	Quebec City	Women attending an abortion clinic	11

infection with C. *trachomatis*.[5,67] An estimated 1% to 21% of all men are asymptomatic carriers of the infection and may act as a reservoir for its spread.[68] Lower age, multiple sexual partners in the preceding year and a history of gonorrhea in the past year are associated with an increased likelihood of chlamydial infection among men.[68]

MANOEUVRE

TESTING

There is no simple, inexpensive laboratory test for diagnosing C. *trachomatis* infection. Different screening tests are required depending on the anatomical site from

Table 2: Results of studies of *C. trachomatis* infection and its relation to infertility

Study	City	Study group	*C. trachomatis* infection prevalence rate, %	Odds ratio (OR) or relative risk (RR)
Conway et al[31]	Bristol, England	Infertile women with damaged fallopian tubes	75	OR = 12.2
		Infertile women with normal fallopian tubes	31	
Gump et al[32]	Burlington, Vt.	Infertile women with prior pelvic inflammatory disease (PID)	64	OR = 4.5*
		Infertile women with no prior PID	28	
Svensson et al[33]	Lund, Sweden	Infertile women 1 year after having PID	23	OR = 4.8†
		Matched controls	6.7	
Thejls et al[34]	Uppala, Sweden	Infertile women with prior PID	60	RR = 3.8*
		Infertile women with no prior PID	16	
Rowland et al[35]	Cambridge, England	Infertile women with tubal disease	54	OR = 3.6
		Infertile women with no tubal disease	21	
Lunenfeld et al[36]	Beer Sheva, Israel	Infertile women with tubal disease	73	OR = 2.9
		Infertile women no tubal disease	50	
Kosseim et al[37]	Winnipeg	Infertile women	72	OR = 4.4
		Fertile women	22	
Osser et al[38]	Malmo, Sweden	Infertile women with tubal disease	86	OR = 10.6
		Matched pregnant women	40	
Kane et al[39]	London, England	Infertile women with tubal disease	36	OR = 4.5
		Infertile women with no tubal disease	12	OR = 1.1
		Fertile women	11	OR = 1.0
Henry-Suchet et al[40]	Paris, France	Infertile women with tubal disease	67	OR = 3.7
		Infertile women with no tubal disease	36	
Fedele et al[41]	Milan, Italy	Infertile women	37	NS‡
		Fertile women	22	

*$p < 0.001$.
†$p < 0.02$.
‡NS = not significant.

which a sample is obtained. In women, examining the cervix with a speculum and obtaining an endocervical swab sample are the appropriate methods. In prepubertal girls, the site of infection with *C. trachomatis* or *N. gonorrhoeae* is the immature vagina.[69,70] Therefore, a speculum examination to obtain a cervical specimen is unnecessary and may cause trauma.

Chlamydial culture from cervical swab specimens has an estimated sensitivity of 75% to 90% and a specificity of 100%, but requires 2 to 3 days for a result.[71] Cotton-tipped aluminum swabs or rayon-tipped plastic swabs are superior to calcium alginate or cotton-tipped wooden swabs for maximum yield of the culture.[72,73] Culturing specimens to diagnose *C. trachomatis* infection is expensive and time consuming and requires technical expertise that is not available to most clinical laboratories. Cytologic testing with the use of Giemsa staining or other methods is 95% to 100% sensitive in detecting conjunctivitis, but has low sensitivity in the diagnosis of genital infections.[74] Direct fluorescent antibody (DFA) testing with the use of fluorescein-conjugated monoclonal antibodies and enzyme-linked immunoassay (ELISA) are the nonculture techniques to diagnose cervical infections most widely used in clinical practice.[75–99] The time needed to obtain a result in DFA testing ranges from 15 minutes to 1 hour, and the time needed for an ELISA result is 3 to 5 hours. These methods are not recommended for testing throat or rectal specimens nor for testing specimens taken from sexually abused children because *C. trachomatis* may cross-react with bacterial flora, resulting in a false-positive test result. The sensitivity of DFA testing is 70% to 100%, and its specificity is 85% to 98% when compared with culture of cervical and urethral specimens taken from women.[76,79,100] ELISA has a sensitivity of 67% to 98% in testing cervical infections, and its specificity can be increased from 85% to almost 100% by the use of confirmatory blocking antibody assays.[101] Polymerase chain reaction (PCR) testing of cervical specimens taken from women is 95% to 100% sensitive and almost 100% specific. Its use is increasing as a result of the availability of commercial kits.[102–115] DNA probes are about 95% sensitive and 98% to 100% specific when compared with culture. The results of DNA probes may be available within 2 to 4 hours, and, like ELISA, the technique can be used for large volumes of samples. However, the use of this method is currently limited because of its high cost.[116–120] Recently, the ligase chain reaction (LCR) test was demonstrated to be highly effective in detecting *C. trachomatis* in the urine of women with and without signs of infection, with a sensitivity of 93.8% and a specificity of 99.9% when compared with an expanded gold standard of culture-positive and discordant specimen peers tested by DFA and an alternative LCR assay.[120]

In men, *C. trachomatis* infections have traditionally been diagnosed by culture, DFA testing or ELISA of

Table 3: Results of studies of *C. trachomatis* infection and its relation to ectopic pregnancy (EP)*

Study	City	Study group	*C. trachomatis* infection prevalence rate,* %	OR or RR
Svensson et al[43]	Lund, Sweden	Women with an EP	65	OR = 7.1
		Women with acute cervicitis	69	OR = 18.6
		Women who had a cesarean section	21	OR = 1
Hartford et al[44]	Los Angeles	Women with an EP and contralateral tubal disease	50	RR indeterminate
		Women with an EP but no contralateral tubal disease	0	
Brunham et al[45]	Winnipeg	Women with an EP	56	OR = 4.3
		Women with a normal pregnancy	22	
Walters et al[46]	San Antonio, Tex.	Women with an EP	82	OR = 2.9
		Women with a normal pregnancy	58	
Miettinen et al[47]	Tampere, Finland	Infertile women with a history of EP	40	RR = 5.7
		Infertile women with normal fallopian tubes	7	
Robertson et al[48]	Southampton, England	Women with an EP	76	OR = 4.13
		Women with a normal pregnancy	38	
Chaim et al[49]	Beer Sheva, Israel	Women with an EP	32	OR = 4.9
		Healthy women	8	

*Determined by serologic testing for antibodies to *C. trachomatis*.

samples obtained with urethral swabs.[93,121] Newer techniques such as LCR and PCR testing of first-void urine specimens give a yield that approaches that obtained with urethral swabs.[112,122,123] These tests have a sensitivity of 95% to 100% and a specificity of 100% when performed on first-void urine from men. These noninvasive alternatives to culture for screening for chlamydial infection may become more widespread with the availability of commercial kits.

Treatment

Tetracyclines are the drugs of choice for treatment of *C. trachomatis* infection among nonpregnant women and among men.[1,5,124] Several clinical trials have shown that tetracycline, doxycycline and minocycline have similar efficacy.[125–128] To treat uncomplicated infections, the recommended dosage of tetracycline is 500 mg orally four times daily for 7 days, doxycycline 100 mg orally twice daily for 7 days, and minocycline 100 mg once daily for 7 days.

Traditionally, erythromycin (500 mg orally four times daily for 7 days) has been recommended for pregnant women and patients for whom tetracycline is contraindicated.[1,5,124] Erythromycin cures chlamydial infection among 90% or more of patients who can take it.[129] The main drawback of the 2-g dose is the high incidence of gastrointestinal side effects. Three recent double-blind randomized trials[130–132] have shown that amoxicillin (500 mg orally three times daily for 7 days) is as efficacious as erythromycin and that fewer patients taking amoxicillin discontinued therapy as a result of side effects.

The recent introduction of azithromycin has allowed single-dose therapy as an alternative to conventional therapy. In prospective studies,[133–140] a single 1-g dose of oral azithromycin was as effective as doxycycline (100 mg twice daily for 7 days) in eradicating uncomplicated urogenital *C. trachomatis* infections among men and women. The side effects were mainly gastrointestinal, mild and equally frequent in the two treatment groups. Ofloxacin (300 mg twice daily for 7 days) is also efficacious for the treatment of uncomplicated infections in nonpregnant women.[141–158] Estimates of the efficacy of available therapies for chlamydial genital infections, and of the costs of this therapy, are shown in Table 4. A recent cost-effectiveness analysis comparing the use of erythromycin, tetracycline, doxycycline, ofloxacin and azithromycin for the treatment of uncomplicated chlamydial cervicitis on the basis of current US drug costs concluded that doxycycline and tetracycline are the most cost-effective drugs.[153] However, if its cost were lower, azithromycin would be the most cost-effective drug in situations in which compliance is a concern.

Effectiveness of Screening

Although effective treatment of chlamydial infection is available and economic evaluations support screening of selected groups,[6,50,153,181–189] only one controlled study has shown that screening of nonpregnant women leads to a reduction in complications.[190] In this study of a large health maintenance organization in Seattle, women at risk of infection randomly assigned to receive routine screening were less than half as likely to have PID during the next year (1% of screened women v. 2.2% of women not screened). For screening to be effective along the causal pathway,[2] not only does the presence of the disease need to be demonstrated but there must also be evidence that treatment leads to prevention of complications. This prevention outcome has only been shown in the screening of women at a high risk of infection[190] and of pregnant women. Mass screening has the potential harms of increased costs, unnecessary treatment of patients with false-positive test results (includ-

Table 4: Treatment regimens for *C. trachomatis* infection, with their efficacy and cost

Drug regimen	Probability of cure, %	Retail cost (and cost with prescribing fee)*
Tetracycline (500 mg qid for 7 d)[125,153,159–162]	79–98	4.45 (15.54)
Erythromycin (500 mg qid for 7 d)[129–132,153,156,163–170]	77–91	2.93 (13.69)
Doxycycline (100 mg bid for 7 d)[126,127,137,139–141,143,145–150,153,171–173]	82–99	8.82 (19.72)
Azithromycin (1 g, single dose)[133–140,153,174]	88–99	19.43 (30.52)
Ofloxacin (300 mg bid for 7 d)[141,143–158,165,175–177]	93–99	36.44 (47.87)
Amoxicillin (500 mg tid for 7 d, only recommended for pregnant women)[130–132,157, 173,178–180]	85–98	4.22 (15.00)

*Based on Calgary-area costs in January 1996 and mean prescribing fees of two area pharmacies.

ing potential side effects of drugs) and other negative effects of diagnosing such patients incorrectly.

Studies of screening pregnant women

Five published studies have assessed the outcomes of screening pregnant women.[163,191–195] The first,[191] a retrospective cohort study, showed a 5.8% prevalence rate of chlamydial infection among 5875 pregnant women screened with DFA testing during their first prenatal visit and every 2 to 3 months thereafter. Patients with a chlamydial infection who were successfully treated with erythromycin had significantly lower rates of premature delivery (2.87%) than those in whom therapy failed to resolve the infection (13.92%) and than those who had a negative result of the test for chlamydial infection (11.89%). There were also significantly lower rates of premature rupture of membranes, premature contractions and small-for-gestational-age infants among the mothers who were successfully treated than among those in whom treatment had failed. In a prospective cohort study[192] involving 11 554 women screened with the use of culture at their first prenatal visit, 9111 subjects did not have a chlamydial infection, 1110 had an infection and were treated with erythromycin, and 1323 had an infection and were not treated. Premature rupture of membranes and small-for-gestational-age babies were twice as common in the untreated group as in the treated or uninfected groups. There was also a fourfold improvement in perinatal mortality rates in the treated group, compared with the untreated group.

The third study[195] provided weak evidence of improved outcomes of screening. During their third trimester, 1082 women were tested with a culture for *C. trachomatis*. Eighty-five (7.8%) had a positive result, and erythromycin (500 mg twice daily for 10 days) was prescribed for 38 of these women. There were no complications among the treated women, whereas 5 of the 47 women not treated had complications (endometritis, postpartum fever, an infant with chorioamnionitis or an infant with retarded growth). Only 37 infants (41%) were available for follow-up.

In all of these positive studies, the outcomes may have been due not to the eradication of *C. trachomatis* but to other effects of erythromycin therapy. It has been shown that erythromycin therapy during the third trimester for women with an infection with *Ureaplasma urealyticum* or *Mycoplasma hominis* reduces the incidence of low birth weight in their infants and increases mean birth weight.[194]

A fourth study[193] of poorer quality showed no difference in the incidence of pneumonia and conjunctivitis among the infants of treated and untreated women who were screened for chlamydial infection and who were from a population with a high prevalence of the disease (26%). This study was limited by a small sample (199 women) and by the possibility that other confounding factors affected the untreated women. A fifth prospective cohort study[163] involved 184 pregnant women screened by culture at their first prenatal visit and treated with erythromycin, if their test result was positive, at 36 weeks' gestation. Seventy-seven women (42%) were lost from the study, and only 83 infants had complete follow-up. Chlamydial disease was considered the end point. Two infants whose mothers had been treated had pneumonia and one had conjunctivitis (for a total complication rate of 5%), whereas four infants of untreated women had pneumonia and had conjunctivitis (for a total complication rate of 21%).

Thus, three cohort studies[191,192,195] have provided fair (level II) evidence that screening and intervention lead to better outcomes for some perinatal complications. Of the remaining two smaller studies,[163,191] one supported screening but the other did not. The optimal frequency of screening of pregnant women to prevent complications has not been defined.

Costs and economic evaluations

Chlamydial infections in the United States are estimated to cost over $2.2 billion (US) a year.[6] Infections among women account for more than 79% of this cost. Economic evaluations support screening of asymptomatic patients under specific conditions.[13,153,181–186,188,189,196,197] Phillips and associates[197] used decision analysis to estimate the clinical and economic implications of testing asymptomatic women for cervical infection with *C. trachomatis* during routine gynecologic visits. A strategy of no routine testing was compared with one involving routine testing with the use of culture or of nonculture tests (DFA test or ELISA). They concluded that screening with the use of the nonculture tests would reduce overall costs if the prevalence of infection was 7% or greater, and that screening with the use of culture would reduce costs if the prevalence rate was 14% or more.

In Canada, Estany and collaborators[196] calculated that screening women with the DFA test or ELISA would be cost-effective if the prevalence rate of chlamydial infection detected through each method exceeded 6% and 7%, respectively. The mean cost of a DFA test or an ELISA was estimated at $11. Sensitivity analysis showed that the two most important factors in cost savings were the probability of PID developing as a result of chlamydial infection and the cost of the test. Sellors and colleagues[13] recently determined that selective screening of sexually active young women with ELISA is an effective and efficient strategy for detecting chlamydial infection.

Their model was based on a mean of $8.66 for culture and $9.33 for ELISA. Nettleman and coworkers[185] estimated that DFA testing of all pregnant women would be cost-effective if the test cost less than $6.30 (US) or the prevalence rate of infection exceeded 6%.

Recommendations (Table 5)

Although there is sufficient evidence to link chlamydial infections to many complications, there is currently insufficient evidence that screening is effective in preventing these complications in general populations of men and of nonpregnant women. Therefore, routine screening of the general population is not recommended (grade D recommendation). However, the heavy burden of illness caused by chlamydial infection and the favourable economic evaluation studies suggest that annual screening of certain populations at a high risk of asymptomatic chlamydial infection may be useful in preventing symptoms and reducing the overall cost of infection (grade B recommendation). These high-risk groups are (1) all sexually active women less than 25 years of age, (2) men or women who had a new sexual partner or more than one partner in the preceding year, (3) women of any age who use nonbarrier contraceptive methods and (4) women with symptoms of *C. trachomatis* infection such as cervical friability, mucopurulent cervical discharge or intermenstrual bleeding. When considering screening, physicians should note that it may take several weeks after exposure for infection to be detected. Finally, although the benefits of this manoeuvre may be related to subsequent treatment with erythromycin, there is fair evidence (level II-2) that screening all pregnant women during the first trimester leads to improved pregnancy outcomes (grade B recommendation).

Validation

The current recommendations are similar to the previous recommendations of the Canadian Task Force on the Periodic Health Examination,[1] except that screening of high-risk groups has been upgraded from a C to a B recommendation.

The recent 1996 US Preventive Services Task Force guide[200] also recommends routine screening of asymptomatic patients, but only pregnant women younger than 25 years of age or at a high risk of infection (timing of the screening is not stated). The Canadian Expert Interdisciplinary Advisory Committee on Sexually Transmitted Diseases in Children and Youths[201] has suggested more extensive screening, but many of its screening recommendations were intended for the detection of STDs

Table 5: Summary of manoeuvres, effectiveness, levels of evidence and recommendations for screening for chlamydial infection

Manoeuvre	Effectiveness	Level of evidence	Recommendation
Screening for chlamydial infection with the following methods: culture or polymerase chain reaction (PCR) for all sites, direct fluorescent antibody (DFA) testing for genitourinary, conjunctival, rectal and nasopharyngeal sites, enzyme-linked immunoassay (ELISA) for genitourinary or conjunctival sites, or DNA probes for genitourinary sites. Subsequent treatment with the following drugs: erythromycin or amoxicillin for pregnant women, or tetracycline, azithromycin or ofloxacin for nonpregnant women and for men	**Pregnant women**		
	Erythromycin treatment of women with an infection leads to improved perinatal and postnatal outcomes for their infants	Cohort studies[163, 190–192,194] (II-2)	Fair evidence to support screening of pregnant women during their first prenatal visit and subsequent treatment (B)
	High-risk groups*		
	Available screening tests are accurate and reliable	Cohort studies of DFA,[76,79,100] ELISA[197] and PCR[112,123,198] (II-2)	Fair evidence to support annual screening of high-risk groups (B)
	Treatment is effective in eliminating chlamydia. One study[190] shows that screening leads to reduction of complications	Randomized controlled trials[129,131,136,138,145] (I)	Fair evidence to support annual screening of high-risk groups (B)
	General population		
	Available screening tests are accurate and reliable but have poor positive predictive value and cost-effectiveness when prevalence is low. No study shows that screening and early detection lead to reduction of complications	Modelling studies[13,186,195,196]	Fair evidence to exclude routine screening of the general population (D)

*High-risk groups are sexually active women less than 25 years of age, women with new sexual partners, women or men with multiple sexual partners during the previous year, women who use nonbarrier contraceptive methods and women who have symptoms of chlamydial infection (cervical friability, mucopurulent cervical discharge or intermenstrual bleeding).

other than chlamydial infection. This committee recommended screening sexual contacts of people proven to have or suspected of having urethritis or STDs, selected high-risk adults, pregnant adolescents, male and female prostitutes, street youth, users of illicit drugs, young women undergoing therapeutic abortion, patients with a history of STDs, children who have been sexually abused and their siblings, and neonates if one or both parents are known to have urethritis, cervicitis, PID, epididymitis or STDs.

The US Centers for Disease Control and Prevention, Atlanta, have recently suggested screening women with mucopurulent cervicitis, sexually active women less than 20 years of age and women 20 to 24 years of age who are inconsistent in their use of barrier contraceptives or have had a new sexual partner or more than one partner during the last 3 months.[124]

Future research

A prospective, well-designed randomized community trial of screening for chlamydial infections, involving two similar asymptomatic populations and follow-up evaluation of complications, is warranted. Furthermore, as improved detection methods become less expensive, more evaluations of the cost-effectiveness of screening with the use of these methods will be needed.

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