

Chlamydia Screening and Management Practices of Primary Care Physicians and Nurse Practitioners in California

Sarah L. Guerry, MD,^{1,2} Heidi M. Bauer, MD, MPH,¹ Laura Packel, MPH,¹ Michael Samuel, DrPH,¹ Joan Chow, DrPH,¹ Miriam Rhew, MD, MPH,³ Gail Bolan, MD¹

¹California Department of Health Services STD Control Branch, Oakland, Calif, USA; ²Los Angeles County Department of Health Services, Los Angeles, Calif, USA; ³General Preventive Medicine and Public Health, University of California, Berkeley/San Francisco, Berkeley, Calif, USA.

BACKGROUND: Because sexually transmitted chlamydial infections are common among young women, it is critical that providers screen and manage these infections appropriately.

OBJECTIVE: To assess the *Chlamydia* care practices of California primary care physicians and nurse practitioners.

DESIGN: Cross-sectional, self-report mail survey.

PARTICIPANTS: A stratified random sample of primary care physicians and a convenience sample of primary care nurse practitioners in California.

MEASUREMENTS AND MAIN RESULTS: Survey content included 5 topic areas: sexual history taking, management of cervicitis, management of a nonpregnant *Chlamydia*-infected patient, availability of on-site STD services, and *Chlamydia* screening practices and attitudes. Main outcome measure was the reported frequency of *Chlamydia* screening of sexually active women age 25 and younger. Respondents included 708 physicians (49% response rate) and 895 nurse practitioners (63% response rate). Nearly half of physicians (47%, 95% confidence interval [CI], 42% to 51%) and a majority of nurse practitioners (79%, 95% CI, 77% to 82%) reported routine *Chlamydia* screening of women under age 20; similar proportions reported routinely screening women aged 20 to 25 years. Independent predictors of screening among physicians were adolescent medicine specialty, female gender, practicing in a nonprivate setting, and having a higher volume of female patients. Additional findings included the overscreening of women over age 25 by nurse practitioners and the shared concern among providers that *Chlamydia* screening may not be reimbursed.

CONCLUSIONS: The *Chlamydia* care practices of many California primary care providers are inconsistent with current guidelines. Targeted provider education and improved reimbursements are potential strategies for improvement.

KEY WORDS: STD care; sexual health; physician decision-making; *Chlamydia trachomatis*; nurse practitioners.
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Chlamydia trachomatis has been called the "silent epidemic" of reproductive age women and is the most common sexually transmitted bacterial infection in the United States.¹ The majority of chlamydial infections in women are asymptomatic and, untreated may cause pelvic inflammatory disease (PID) and its sequelae: ectopic pregnancy, infertility, and chronic pelvic pain.^{2,3} There is solid evidence that routine screening of young sexually active women prevents PID and reduces the

prevalence of infection in the community.^{4,5} The U.S. Preventive Services Task Force and the Centers for Disease Control and Prevention recommend that sexually active females aged 25 or younger be routinely screened for *Chlamydia*.^{1,6}

Despite national guidelines, surveys have consistently demonstrated incomplete *Chlamydia* screening as well as inadequate risk assessment and education. A national survey in 1999 found that less than one-third of primary care providers reported routine screening of nonpregnant females for *Chlamydia*.⁷ Recent national estimates indicate that less than half of young sexually active women are receiving routine *Chlamydia* screening in managed care.⁸ Studies indicate that adolescents and adults are not routinely receiving sexual risk assessments.⁹⁻¹⁴ Although national data confirm the widespread use of appropriate treatment regimens,¹⁵ only about two-thirds of adolescents receive sexually transmitted disease education and counseling.^{10,12}

California has had numerous initiatives to improve STD screening and care. In 1998, the California *Chlamydia* Action Coalition initiated a multilevel campaign to develop policy and structural interventions to decrease *Chlamydia* infections in California. Several of these activities, including updated and expanded clinical guidelines and provider education incentives, were targeted to primary care providers, with an emphasis in managed care organizations.¹⁶ California's Family Planning Access Care Treatment (Family PACT) Program established reimbursement mechanisms to ensure appropriate diagnostic testing (including urine-based technology) and treatment of sexually transmitted diseases for women 200% or below the federal poverty level.^{17,18}

With scientific evidence for clinical and public health benefits of *Chlamydia* screening and clear consistent clinical guidelines, it is important to assess the knowledge, attitudes, and practices of health care providers that care for the population with the highest rate of chlamydial infection: young sexually active women. This survey focused on the *Chlamydia*-related clinical practices of primary care physicians and nurse practitioners in California in 2002 to identify ongoing policy and training needs.

METHODS

Sampling

A random sample of 2000 California primary care physicians was obtained from the American Medical Association (AMA)

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Address correspondence and requests for reprints to Dr. Guerry: 2615 S. Grand Avenue, Room 500, Los Angeles, CA 90007 (e-mail: sguerry@ladhs.org).

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Physician Masterfile, which included members and nonmembers of the AMA (Medical Marketing Service Inc, Wood Dale, IL). The sample was stratified equally among five primary care specialties: family practice, general practice, internal medicine, obstetrics and gynecology, and pediatrics. In addition, all 68 adolescent medicine providers registered in the AMA database were included in the sample. All 1,815 primary care nurse practitioner members of the California Coalition of Nurse Practitioners were surveyed. Sample sizes were chosen to provide sufficient power (80%) to detect a 15% difference in *Chlamydia* screening rates between physician specialties, given an estimated 60% response rate. Eligibility criteria included practicing in California and providing primary health care to sexually active patients under the age of 30 in the past 3 months. Providers were ineligible if less than 10% of their time was spent providing clinical care or they lacked a valid California telephone number or mailing address.

The questionnaire was mailed to the physician and nurse practitioner samples in December 2001 and March 2002, respectively. All providers received a coupon for a free course given by the California STD/HIV Prevention Training Center. Half of physicians were randomized to receive a \$5 cash incentive mailed with the questionnaire. Two follow-up mailings were sent to physician nonrespondents in February and May 2002 and to nurse practitioner nonrespondents in May and August 2002. Physician nonrespondents were contacted by phone to encourage participation and to confirm fax numbers. In August 2002, all nonrespondent physicians were faxed or sent a fourth mailing. Remaining nonrespondents with available fax numbers were faxed surveys in November 2002.

Data Collection

A self-administered survey about STD practices was developed and pilot tested. Survey topics were chosen based on current guidelines for the screening, diagnosis, and management of chlamydial infections. Data on demographics were collected from the AMA file for physicians and included in the survey for nurse practitioners. Additional practice characteristics included specialty type, primary practice setting, and average number of young female patients (15 to 25 years of age) seen per week.

Survey content was divided into 5 topic areas: (1) sexual history taking, (2) evaluation of a young sexually active patient with signs of symptoms suggestive of urethritis or cervicitis, (3) management of a nonpregnant patient with a positive *Chlamydia* test, (4) availability of STD testing and prevention resources on site, and (5) *Chlamydia* screening practices and attitudes. For questions related to the frequency of specific clinical practices, providers were given a 5-point scale (never, sometimes, half of the time, usually, always). For questions related to attitudes, providers were given a series of statements and asked to respond on a 5-point scale (strongly disagree, disagree, neutral, agree, strongly agree).

Sexual history taking was assessed in three clinical situations: a routine new patient visit, a routine well care or annual visit, and an acute care visit for any reason other than STDs. Providers were asked, "How often do you take a sexual history from a young adult (15 to 25 years of age) in each of the following situations?" Specific topics that were generally included in the sexual history were assessed. *Chlamydia* screening practices were assessed by the following question, "When

you provide care for sexually active females at an annual well-care visit without signs or symptoms of an STD in the following age groups, how often do you test for *Chlamydia*?" Possible responses were given for each of 3 age groups, less than 20, 20 to 25, and 26 to 34 years. Additionally, providers were asked under what circumstances they test asymptomatic women over the age of 25.

Data Analysis

Routine practice was defined as a response of "usually" or "always" to a particular clinical practice question. These variables were dichotomized (never/sometimes/half vs usually/always) for statistical comparison. Similarly, responses to attitude statements were dichotomized (strongly disagree/disagree/neutral vs agree/strongly agree) for statistical comparison. The data were analyzed using SAS and STATA statistical software.^{19,20} Because there was no significant difference in demographics or practice patterns between physicians who received the financial incentive and those who did not, physician samples were combined for final analysis. To generate population estimates, weights were constructed based on the inverse of the sampling fraction of each medical specialty in the AMA database. With the exception of the description of the sample, all analyses used weighted estimates. Because of differences in sampling strategy, comparisons between physician and nurse practitioner samples were not subjected to statistical testing.

For 2×2 cross-tabulation, Yates corrected χ^2 statistic was used. For crosstabulations with greater than 2 categories of variables, statistical associations were determined using the Pearson χ^2 statistic. Statistical significance was defined as $P < .05$. Odds ratio estimates and 95% confidence intervals were used to summarize bivariate associations. Multivariate logistic regression was used to determine independent predictors of routine *Chlamydia* screening of women aged 25 or younger among physicians and nurse practitioners. The outcome variable for the models combined the providers' responses to screening frequency for women under age 20 and 20 to 25 years. A multivariate model was constructed to predict providers that could be targeted for interventions and education. In construction of the model, all demographic variables were tested for significant association with routine screening. Those that were significantly associated with screening at $P < .05$ in the univariate analysis, were included in the model, with the exception of years since completing residency, which was found to be collinear with age. Other tests for collinearity of independent variables in both the physician and nurse models were run and no significant collinearity between these variables was noted. All 2-way interaction terms were tested. While there was suggestion of an interaction between physician specialty and practice setting in multivariate analysis and stratified tables, the model that included this term was unstable because of cells with zero observations.

RESULTS

Of the 2,068 physicians sampled, 1,456 were determined to be eligible for the study and 708 completed the survey (response rate of 49%). Adolescent medicine specialists were more likely to complete the survey compared with other specialties (82% vs 47%, $P < .001$). Internal medicine and general practice pro-

viders had the lowest response rate (42%). There were no significant differences between the demographic characteristics of respondent and nonrespondent physicians. Of the 1,815 nurse practitioners surveyed, 1,418 were determined eligible and 895 (63%) completed the survey. Demographic data for nonrespondent nurse practitioners were unavailable for comparison to respondents. Selected characteristics of the study groups are presented in Table 1.

Sexual Risk Assessment

Providers were more likely to report taking a sexual history from young adults (15 to 25 years old) at routine annual or new patient visits compared with acute care, non-STD related visits (Table 2). The proportions of physicians who reported taking a sexual history at routine annual visits varied significantly by specialty: adolescent medicine providers (95%), obstetrician-gynecologists (85%), pediatricians (85%), family practitioners (69%), internists (67%), and general practitioners (66%) ($P < .001$).

Over 80% of physicians and nurse practitioners reported routinely asking about the following topics in their sexual risk assessments: the use of condoms or other barrier methods, the use of or need for contraception, and recent sexual activity. Over half (55% of physicians and 72% of nurse practitioners) reported asking about number of sex partners. Slightly fewer (55% of physicians and 62% of nurse practitioners) reported asking about gender of sex partners. In addition, only 30% of physicians and 37% of nurse practitioners reported routinely

Table 1. Characteristics of the California Primary Care Providers Included in the Survey Sample

Demographics	Physicians (N=708) N* (%)	Nurse Practitioners (N=895) N* (%)
Age		
Less than 45	264 (37)	372 (42)
45 to 55	226 (32)	401 (45)
Over 55	218 (31)	122 (14)
Gender		
Male	470 (66)	39 (4)
Female	238 (34)	851 (95)
Specialty		
Family Practice	174 (25)	—
General Practice	90 (13)	—
Internal Medicine	113 (16)	—
Pediatrics	125 (18)	—
Obstetrics and Gynecology	164 (23)	—
Adolescent Medicine	42 (6)	—
Number of years in practice		
Less than 10	229 (34)	565 (65)
11 to 20	188 (28)	189 (22)
Over 20	256 (38)	115 (13)
Practice setting		
Private practice	444 (63)	344 (39)
Public clinic	71 (10)	259 (29)
Health maintenance organization (HMO)	113 (16)	123 (14)
Academic	50 (7)	78 (9)
Other	23 (3)	85 (10)
Average number of female patients ages 15 to 25 per wk		
Less than 11	291 (42)	240 (27)
11 to 20	168 (24)	264 (30)
More than 20	238 (34)	381 (43)

*Numbers may not total final N because of missing data.

Table 2. Chlamydia Assessment & Screening Practices and Screening Attitudes Reported by California Primary Care Providers

	Physicians (N=708) %* (95% CI)	Nurse Practitioners (N=895) % (95% CI)
<i>Assessment & Screening</i>		
Routine [†] sexual history taking		
Annual visit	73.3 (69.4 to 77.3)	92.2 (90.5 to 94.0)
New patient	65.7 (61.6 to 69.9)	77.2 (74.5 to 80.0)
Acute care	20.6 (17.3 to 23.8)	29.0 (26.0 to 32.0)
Routine Chlamydia screening		
Females less than 20	46.6 (42.2 to 51.0)	79.3 (76.5 to 82.0)
Females age 20 to 25	47.0 (42.3 to 51.8)	77.9 (75.1 to 80.7)
Females age 26 to 34	31.6 (27.1 to 36.0)	50.3 (46.9 to 53.7)
<i>Screening Attitudes (% AGREE)</i>		
Test may not get paid for	34.8 (30.6 to 39.2)	22.4 (19.6 to 25.1)
Chlamydia prevalence is low in population	18.6 (15.1 to 22.2)	9.9 (7.9 to 11.8)
Routine screening does not result in significant savings	9.9 (7.3 to 12.4)	6.9 (5.2 to 8.6)
Routine screening is time consuming	10.5 (7.6 to 13.5)	3.2 (2.0 to 4.4)
Routine screening involves awkward subject matter to discuss	13.0 (9.8 to 16.2)	2.6 (1.6 to 3.7)

*Weighted for physician specialty.

[†]Routine defined as response of usually/always.

CI, confidence interval.

asking about patient sexual practices (i.e., oral, vaginal, anal intercourse).

Chlamydia Screening

Nearly half of physicians and the majority of nurse practitioners reported routinely screening women age 25 or younger (Table 2). Among physicians, factors independently associated with routinely screening women age 25 or younger included adolescent medicine specialty (compared with internal medicine), female gender, practicing at either a public, a freestanding Health Maintenance Organization (HMO) or "other" setting (compared with private setting), and higher volume of female patients (compared with lowest volume of female patients) (Table 3). Among nurse practitioners, independent predictors of routine Chlamydia screening included practicing in a public, HMO, or "other" setting, younger age, and higher patient volume (Table 4).

Although not currently recommended, reported routine screening of asymptomatic women over the age of 25 was common (Table 2). The most frequently reported reasons for screening older women included the patient's request for a STD check-up (physicians 80% and nurse practitioners 93%), multiple sex partners (physicians 66% and nurse practitioners 83%), previous STD (physicians 56% and nurse practitioners 62%), or indication that partner may have other partners (physicians 56% and nurse practitioners 75%). In addition, the majority of nurse practitioners reported screening older women if they were not using barrier methods consistently (71%) or if they were starting a new relationship (61%).

A common concern among both physicians and nurse practitioners was that Chlamydia tests would not be paid for (Table 2). Agreement with statements regarding lack of reim-

Table 3. Factors Independently Associated with Screening Women 25 and Younger for *Chlamydia* Among California Primary Care Physicians, N=708

Characteristic	Weighted %	Adjusted OR* (95% CI)
Specialty		
Internal Medicine	40.0	Referent
Obstetrics Gynecology	51.2	1.36 (0.75 to 2.47)
Adolescent Medicine	88.1	5.04 (1.64 to 15.51)
Family Practice	41.7	1.07 (0.62 to 1.86)
General Practice	49.4	1.76 (0.90 to 3.43)
Pediatrics	50.9	1.21 (0.68 to 2.14)
Gender		
Male	37.9	Referent
Female	58.5	1.84 (1.18 to 2.86)
Practice setting		
Private	36.3	Referent
HMO†	54.1	1.97 (1.18 to 3.27)
Public	69.3	3.98 (1.98 to 8.01)
Other‡	65.5	3.21 (1.60 to 6.44)
Female patients per week		
Less than 11	36.5	Referent
11 to 20	52.1	1.93 (1.21 to 3.06)
More than 20	52.7	1.64 (0.98 to 2.75)

*Adjusted for specialty, gender, practice setting, age, and female patients per week.

†Freestanding Health Maintenance Organization (HMO).

‡Other practice settings included academic and other unspecified. CI, confidence interval; OR, odds ratio.

bursement or low prevalence of *Chlamydia* was significantly associated with lower reported *Chlamydia* screening rates.

Chlamydia Management Practices and Clinic Services

Presented with a scenario of a nonpregnant patient with a positive *Chlamydia* test, the majority of providers reported routinely treating patients, providing risk-reduction counseling, advising patients to inform partners, and reporting the case to the health department (Table 5). Patient delivered partner therapy for both male and female partners was reportedly provided by nearly half of both physicians and nurse practitioners.

Table 4. Factors Independently Associated with Screening Women 25 and Younger for *Chlamydia* Among California Nurse Practitioners, N=895

Characteristic	%	Adjusted OR* (95% CI)
Practice setting		
Private	63.8	Referent
HMO†	81.6	2.28 (1.34 to 3.88)
Public	89.9	4.70 (2.90 to 7.61)
Other‡	79.8	2.15 (1.35 to 3.43)
Age		
Less than 45	80.5	2.34 (1.42 to 3.85)
45 to 55	76.4	1.74 (1.07 to 2.81)
Greater than 55	66.7	Referent
Female patients per week		
Less than 11	63.0	Referent
11 to 20	78.6	1.96 (1.30 to 2.97)
More than 20	84.5	2.86 (1.91 to 4.27)

*Adjusted for gender, practice setting, age and female patients per week.

†Freestanding Health Maintenance Organization.

‡Other practice settings include academic and other unspecified. CI, confidence interval; OR, odds ratio.

Table 5. Clinical Management and Clinic Services Reported by California Primary Care Providers

	Physicians N=708 % (95% CI)	Nurse Practitioners N=895 %* (95% CI)
<i>Clinical Management</i>		
For patients with cervicitis, routinely†		
Order <i>Chlamydia</i> test	88.1 (85.3 to 91.0)	94.4 (92.8 to 95.9)
Order gonorrhea test	87.8 (84.8 to 90.7)	95.2 (93.8 to 96.6)
Treat presumptively for <i>Chlamydia</i>	60.2 (55.7 to 64.6)	64.0 (60.7 to 67.2)
Treat presumptively for gonorrhea	54.4 (49.8 to 58.9)	51.8 (48.3 to 55.2)
For <i>Chlamydia</i> -infected patients, routinely†		
Call patient and call in prescription	81.9 (78.6 to 85.2)	67.9 (64.7 to 71.0)
Request return for observed treatment	34.9 (30.6 to 39.2)	38.6 (35.3 to 41.9)
Follow-up to confirm treatment	44.5 (40.1 to 49.0)	47.2 (43.8 to 50.6)
Provide risk-reduction counseling	73.9 (69.8 to 78.0)	92.5 (90.7 to 94.3)
Advise abstinence for 7 d	73.7 (69.7 to 77.7)	84.8 (82.4 to 87.2)
Advise patient to inform partners	95.8 (93.9 to 97.7)	97.5 (96.4 to 98.5)
Provide medicine for male partner	45.6 (41.2 to 50.0)	47.1 (43.7 to 50.4)
Provide medicine for female partner	42.0 (37.4 to 46.5)	41.7 (38.3 to 45.1)
Report case to health department	73.2 (69.0 to 77.5)	86.9 (84.7 to 89.2)
Ask health department to contact partner	18.4 (15.0 to 21.9)	20.6 (17.8 to 23.4)
Order test-of-cure at 1 mo	40.1 (35.8 to 44.4)	40.4 (37.1 to 43.7)
Order test re-infection 2 to 6 mo	22.8 (19.1 to 26.5)	23.3 (20.5 to 26.2)
SERVICES IN CLINIC		
Free condoms	18.9 (15.6 to 22.1)	42.8 (39.5 to 46.0)
Urine-based <i>Chlamydia</i> testing	32.7 (28.6 to 36.7)	47.9 (44.7 to 51.2)
Azithromycin on site	37.8 (33.6 to 41.9)	52.4 (49.1 to 55.7)
HIV testing	64.1 (60.0 to 68.2)	76.2 (73.4 to 79.0)

*Weighted for physician specialty.

†Routine defined as response of usually/always. CI, confidence interval.

While almost half of providers reported routinely ordering a test of cure for *Chlamydia*, a small proportion reported testing for reinfection. On site availability of *Chlamydia* related services such as urine-based *Chlamydia* testing and single-dose azithromycin was not commonly reported (Table 5).

DISCUSSION

This survey of primary care physicians and nurse practitioners in California indicated that, although a substantial proportion of providers report appropriate *Chlamydia* care practices, many others report practices inconsistent with current screening and management guidelines. A compelling finding is the lack of appropriate screening among providers: too few physicians are routinely screening women age 25 and younger and too many nurse practitioners are routinely screening women over 25. Our survey findings provide direction for future interventions to increase appropriate *Chlamydia* screening, improve sexual risk assessment, and enhance patient follow-up,

especially with regard to the timing of testing for repeat infection.

It appears that the proportion of California providers routinely taking thorough sexual histories is inadequate. While the proportion of providers who reported taking sexual histories was generally higher than national estimates,⁹ rates have changed little compared with surveys conducted in California several years prior.^{11,12} The role of primary care providers in assessing sexual risk is crucial to providing STD/HIV preventive care by determining which anatomic sites should be examined and tested and conducting patient-centered risk reduction counseling. It is recommended that all adolescents and adults receive STD/HIV risk assessment and risk reduction counseling during well care visits.²¹ Screening adolescents for sexual activity, especially high-risk adolescents with limited access to care, is important at all clinic visits, including urgent care. Few providers reported routinely conducting a sexual risk assessment at urgent care visits. This gap should be a target for improved clinical practice in urgent care settings to identify more adolescents in need of STD screening and counseling. Although commonly reported content areas of sexual risk assessment included recent sexual activity, a minority of providers reported routinely asking specifics about gender of partners, number of partners, or sexual practices. This finding was consistent with other surveys that evaluated components of sexual history taking.^{10,12,22}

Despite current recommendations to screen all sexually active women age 25 and younger for chlamydial infection, the rates of reported routine screening were disappointing, especially among physicians. The rate in California appears higher than some national physician estimates,⁷ but lower than the self-reported screening rate found among primary care physician and nurse practitioners in Colorado.²³ Independent predictors of screening practices identified in this study will be helpful in targeting outreach and education to primary care providers to improve screening rates. For example, internists, family practitioners, general practitioners, and nurse practitioners in private practice settings may benefit from continuing professional education. Provider outreach could address the misperceptions and barriers to screening, including perceptions that *Chlamydia* prevalence is too low to warrant screening. Prevalence monitoring in California has consistently found high rates of infection among young women even in private and managed care practice settings.²⁴ Increasing the availability of urine-based testing may improve screening rates, as it allows providers to screen women for *Chlamydia* without performing a pelvic exam. Policies to ensure adequate reimbursement for *Chlamydia* testing as well as risk assessment and risk-reduction counseling are essential for supporting high quality STD care and clinical practice guidelines.

A high proportion of providers, particularly nurse practitioners, report routinely screening women over age 25 for *Chlamydia*. Current guidelines recommend screening these women only if they have risk factors such as multiple partners.^{1,6} Unnecessary screening in low prevalence populations is not cost-efficient and, because the positive predictive value is lower, may lead to an increased proportion of false positive test results.²⁵ Educating both providers and women about prevalence and risk factors for *Chlamydia* may decrease unnecessary screening.

Deficiencies in repeat testing also were identified. Because the standard treatment efficacy is over 95%, a test of

cure for nonpregnant patients treated with a first-line medication is not recommended. Regardless, 40% of providers reported routinely ordering a test of cure. Because of high rates of repeat chlamydial infections and increased risk of reproductive health complications with multiple infections, repeat testing in 2 to 6 months is recommended.^{1,26,27} Unfortunately, less than one quarter of providers reported retesting women in 2 to 6 months after *Chlamydia* treatment. The cost efficiency of *Chlamydia* management can be improved by developing innovative ways to conduct retesting and educating providers to follow clinical guidelines for test of cure and re-testing.

There are several limitations to this study. Although a physician response rate of less than two thirds is not uncommon, results may be less representative of primary care physicians. It is noteworthy that demographics of nonresponding physicians were similar to respondents. Using a professional society membership to identify nurse practitioner participants limits the generalizability of our results to all nurse practitioners in California. It is possible that members of this organization are more proactive and reflect higher practice standards than nonmembers. In addition, this study relies on provider self-report, which may not reflect true practice. Because of social desirability and awareness of appropriate practice, self-report may overestimate quality clinical practice.

Chlamydia remains a significant public health problem, infecting epidemic numbers of young sexually active women. Despite concerted attempts at *Chlamydia* control, rates in California and throughout the United States remain high. Although this complex problem demands intervention at many levels, a critical part of the solution is widespread, high quality STD/HIV preventive services. This study makes a significant contribution to this effort by identifying gaps in risk assessment, *Chlamydia* screening, and management practices of primary care providers as well as inadequacies in available onsite services and structural and attitudinal barriers to routine screening. In addition to targeted provider education, interventions that increase reimbursement for prevention, testing, and treatment services may well improve the quality of STD care for young women.

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REFERENCES

1. **Centers for Disease Control and Prevention.** Sexually transmitted diseases treatment guidelines 2002. MMWR. 2002;51:1-80.
2. **Hillis SD, Owens LM, Marchbanks PA, Amsterdam LF, MacKenzie WR.** Recurrent chlamydial infections increase the risks of hospitalization for ectopic pregnancy and pelvic inflammatory disease. Am J Obstet Gynecol. 1997;176:103-7.
3. **Stamm WE.** *Chlamydia trachomatis* infections of the adult. In: Holmes KK, Sparling PF, Mardh P-A, et al., eds. Sexually Transmitted Diseases. 3rd ed. New York, NY: McGraw Hill; 1999:407-22.
4. **Scholes D, Stergachis A, Heidrich FE, Andrilla H, Holmes KK, Stamm WE.** Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. N Engl J Med. 1996;334:1362-6.
5. **Bachmann LH, Macaluso M, Hook EW.** Demonstration of declining community prevalence of *Chlamydia trachomatis* infection using sentinel surveillance. Sex Transm Dis. 2003;30:20-4.

6. **U.S. Preventive Services Task Force.** Screening for chlamydial infection: Recommendation and rationale. *Am J Prev Med.* 2001;20(3 suppl):90-4.
7. **St Lawrence JS, Montano DE, Kasprzyk D, Phillips WR, Armstrong K, Leichliter JS.** STD screening, testing, case reporting, and clinical and partner notification practices: a national survey of US physicians. *Am J Public Health.* 2002;92:1784-8.
8. **National Committee for Quality Assurance.** State of Health Care Quality Report, 2003: *Chlamydia* Screening. Available at: http://www.ncqa.org/sohc2003/chlamydia_screening.htm#Results%20and%20Analysis. Accessed April 14, 2004.
9. **Ewing GB, Selassie AW, Lopez CH, McCutcheon EP.** Self-report of delivery of clinical preventive services by U.S. physicians. Comparing specialty, gender, age, setting of practice, and area of practice. *Am J Prev Med.* 1999;17:62-72.
10. **Millstein SG, Igra V, Gans J.** Delivery of STD/HIV preventive services to adolescents by primary care physicians. *J Adolesc Health.* 1996;19:249-57.
11. **Ellen JM, Franzgrote M, Irwin CE, Millstein SG.** Primary care physicians' screening of adolescent patients: a survey of California physicians. *J Adolesc Health.* 1998;22:433-8.
12. **Halpern-Felsher BL, Ozer EM, Millstein SG, et al.** Preventive services in a health maintenance organization: how well do pediatricians screen and educate adolescent patients? *Arch Pediatr Adolesc Med.* 2000;154:173-9.
13. **Lafferty WE, Downey L, Shields AW, Holan CM, Lind A.** Adolescent enrollees in Medicaid managed care: the provision of well care and sexual health assessment. *J Adolesc Health.* 2001;28:497-508.
14. **Burstein GR, Lowry R, Klein JD, Santelli JS.** Missed opportunities for sexually transmitted diseases, human immunodeficiency virus, and pregnancy prevention services during adolescent health supervision visits. *Pediatrics.* 2003;111(5 Part 1):996-1001.
15. **Magid DJ, Stiffman M, Anderson LA, Irwin K, Lyons EE.** Adherence to CDC STD guideline recommendations for the treatment of *Chlamydia trachomatis* infection in two managed care organizations. *Sex Transm Dis.* 2003;30:30-2.
16. **California Chlamydia Action Coalition.** California Sexually Transmitted Disease Initiatives Home Page. Available at: <http://www.ucsf.edu/castd/>. Accessed April 13, 2004.
17. **Brindis CD, Llewelyn L, Marie K, Blum M, Biggs A, Maternowska C.** Meeting the reproductive health care needs of adolescents: California's family planning access, care, and treatment program. *J Adolesc Health.* 2003;32(6 suppl):79-90.
18. **California Family Planning A, Care and Treatment (Family PACT) Program.** Family PACT Home Page. Available at: <http://www.dhs.ca.gov/pfhp/Programs/FamPACT/default.htm>. Accessed April 14, 2004.
19. **SAS.** Statistical software [computer program]. Version 8.2. Cary, NC: SAS Institute; 1999-2001.
20. **STATA.** Statistics/Data Analysis [computer program]. Version 7.0. College Station, Tex: STATA; 1984-2002.
21. **U.S. Preventive Services Task Force. Counseling to Prevent HIV Infection and Other Sexually Transmitted Diseases.** Guide to Clinical Preventive Services. Baltimore, Md: Williams & Wilkins; 1996:723-37.
22. **Boekeloo BO, Marx ES, Kral AH, Coughlin SC, Bowman M, Rabin DL.** Frequency and thoroughness of STD/HIV risk assessment by physicians in a high-risk metropolitan area. *Am J Public Health.* 1991;81:1645-8.
23. **Torkko KC, Gershman K, Crane LA, Hamman R, Baron A.** Testing for *Chlamydia* and sexual history taking in adolescent females: results from a statewide survey of Colorado primary care providers. *Pediatrics.* 2000;106:E32.
24. **California Department of Health Services.** Sexually Transmitted Diseases in California, 2002. Sacramento, Calif: California Department of Health Services; 2004.
25. **Grimes DA, Schulz KF.** Uses and abuses of screening tests. *Lancet.* 2002;359:881-4.
26. **California Chlamydia Action Coalition.** *Chlamydia* Screening and Treatment Practice Guidelines (First Release). Berkeley, Calif: California Chlamydia Action Coalition; December 2001.
27. **California Chlamydia Action Coalition.** *Chlamydia* Screening and Treatment Practice Guidelines. Berkeley, Calif: California Chlamydia Action Coalition; November 2002.