Testing for Chlamydia and Sexual History Taking in Adolescent Females: Results From a Statewide Survey of Colorado Primary Care Providers

Kathleen C. Torkko, MS, MSPH*; Kenneth Gershman, MD, MPH*‡; Lori A. Crane, PhD, MPH*; Richard Hamman, MD, DrPH*; and Anna Barón, PhD*

ABSTRACT. *Objectives.* **Little is known about the practice patterns of primary care providers as they relate to assessing risk of and screening for chlamydial infections, an important cause of preventable reproductive morbidity in young women in the United States. The present cross-sectional study was undertaken to assess levels of chlamydia testing, sexual history taking, and prevention practices by Colorado primary care physicians, nurse practitioners, and physician assistants who provide gynecologic care to adolescent females (13–19 years old).**

Methods. **Between July 1998 and October 1998, an anonymous, self-administered questionnaire was mailed to a 25% random sample (n = 1265) of Colorado physicians (family practitioners, internal medicine specialists, obstetrician-gynecologists, and pediatricians), nurse practitioners, and physician assistants. Practitioners were identified through professional organization membership, state-licensing bodies, and listings in the yellow pages.**

Results. **After estimating the eligibility rate among nonrespondents, the adjusted response rate was 71.5%. Only 53.8% of providers reported regularly testing sexually active female adolescents for chlamydia; 71.8% of providers regularly took a sexual history. Female providers reported significantly higher levels of regularly taking a sexual history (87.2% vs 60.6% of males), feeling comfortable discussing sex (94.4% vs 77.8%), discussing sexually transmitted disease (STD) prevention (81.5% vs 71.3%), and testing for chlamydia (64.4% vs 38.6%). Among provider types, obstetrician-gynecologists, nurse practitioners, and pediatricians were most likely to report regularly taking a sexual history (90.1%, 88.6%, and 76.0%, respectively). Internal medicine specialists were the least likely to report taking a sexual history (43.9%). Pediatricians and nurse practitioners were the most likely to report testing sexually active adolescent females for chlamydia (74.1% and 70.1%, respectively), whereas physician assistants and internal medicine specialists were the least likely (46.0% and 38.5%, respectively).**

In multivariate analysis, variables independently associated with regularly taking a sexual history included female provider gender (odds ratio [OR]: 5.5; 95% confidence interval [CI]: 2.9–10.9), obstetrics/gynecology specialty (OR: 4.0; 95% CI: 1.7–10.3; referent group: family practitioners), and provider comfort level in discussing sex (OR: 4.9; 95% CI: 2.3–11.1). Variables independently associated with regularly testing adolescent females for chlamydia included female provider gender (OR: 2.8; 95% CI: 1.6–4.8), regularly discussing STD prevention (OR: 2.1; 95% CI: 1.1–4.1), and regularly discussing limiting the number of patients' sex partners (OR: 2.4; 95% CI: 1.4–4.1).

Conclusions. **Only a little over one half of providers (54%) reported regularly performing chlamydia tests on adolescent females who are sexually active by history. Because this falls well short of the recommendations of the Centers for Disease Control and Prevention to test all sexually active female adolescents, efforts are needed to improve STD clinical practices of Colorado physician and nonphysician providers of primary care for adolescent females. Particular efforts are needed to close the provider gender gap.** *Pediatrics* **2000;106(3). URL: http://www.pediatrics.org/cgi/content/full/106/3/e32;** ***adolescent medicine, chlamydia infections, questionnaires, physicians, nurse practitioners, physician assistants, guideline adherence, knowledge, attitudes, practice, physician's practice patterns, sexually transmitted disease prevention, control.***

ABBREVIATIONS. STD, sexually transmitted disease; CDC, Centers for Disease Control and Prevention; −2LL, minus 2-log likelihood; OR, odds ratio; CI, confidence interval.

Chlamydia is the most frequently reported sexually transmitted disease (STD) in the United States with over 600 000 cases reported in 1998.[1] In Colorado, 9850 positive chlamydia tests were reported in 1998. Thirty-three percent of these tests were in adolescent females.[2]

Genital chlamydial infections are an important cause of preventable reproductive morbidity in women in the United States.[3] These infections are responsible for up to 60% of pelvic inflammatory disease, with a substantial risk of infertility and ectopic pregnancy.[4,5] Early detection and treatment of cervical chlamydial infections can prevent pelvic inflammatory disease[6] and have a strong protective effect against infertility.[7] Eradication of genital chlamydial infections would eliminate an estimated 80% of tubal factor infertility and 50% of tubal pregnancies.[8]

The sociodemographic factor most strongly associated with chlamydial infection in women is young age (<20 years old).[9–13] The guidelines of the Centers for Disease Control and Prevention (CDC) recommend testing all sexually active adolescent females for chlamydia regardless of other risk factors.[14] This

From the *Department of Preventive Medicine and Biometrics, University of Colorado Health Sciences Center; and ‡Disease Control and Environmental Epidemiology Division, Colorado Department of Public Health and Environment, Denver, Colorado.

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Reprint requests to (K.C.T.) University of Colorado Health Sciences Center, 4525 E 8th Ave, Denver, CO 80220. E-mail: kathleen.torkko@uchsc.edu

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recommendation is supported by several studies.[9,15,16] However, the limited number of published provider surveys has shown that the percentage of physicians who report testing all sexually active adolescents ranges from 29% to 51%.[17,18]

Not only do providers have a critical role in testing, they also have an important role in controlling STDs through risk assessment and counseling.[19] This requires that providers take appropriate sexual histories including assessment of sexual activity.[20] Because 38% of adolescents report that they are sexually active by the ninth grade, physicians need to take sexual histories and to discuss sexual risks with young adolescents as well as with older adolescents.[21]

Little is known about the practice patterns of physicians in Colorado as they relate to assessing risks and screening for chlamydial infections. Even less is known about the practice patterns of nonphysician clinicians (physician assistants and nurse practitioners), a group of health care professionals that is increasingly providing primary care.[22] We undertook the current descriptive study to assess levels of chlamydia testing, sexual history taking, and prevention practices in adolescent females (13–19 years old) by physician and nonphysician clinician primary care providers in Colorado, and to determine correlates of these clinical practices.

METHODS

A cross-sectional mail survey of primary care providers in Colorado was conducted from July 1998 to November 1998 using an anonymous, self-administered questionnaire. The target study group was practitioners who provide any gynecological care, thus having the opportunity to test for chlamydia. Membership lists were obtained from state professional organizations for family practitioners, obstetrician-gynecologists, pediatricians, and internists, and from state licensing boards for nurse practitioners and physician assistants. A 25% systematic random sample was taken separately from each list (ie, every fourth name was selected from a random start) resulting in an initial sample size of 1105.

A secondary source for each of the 4 physician groups came from the yellow pages on the Internet.[23] Using the sampling technique described above, a 25% sample was taken from those names listed by specialty in the yellow pages that were not included on the professional society lists. This added 160 physicians to the study for a final sample size of 1265. This final number represented a nonweighted cross-sectional sample of primary care providers who might be providing gynecologic care in Colorado.

The survey instrument consisted of 35 questions printed on 2 pages in a pamphlet format. There was no information on the survey to identify individual providers. Questions included provider demographics, sexual history taking and prevention practices, numbers of adolescent females seen each week, knowledge-based questions on chlamydial infections, and screening practices. The study was granted exemption from institutional review board review by the Colorado Department of Public Health and Environment, based on the anonymous survey design. A β-version of the survey instrument was tested in a convenience sample of 120 practitioners before the primary mailing.

For the primary survey, a total of 3 separate mailings were sent to unresponsive providers. Each mailing included a cover letter, survey instrument, preaddressed envelope with return postage (business reply), and preaddressed postcard with return postage (business reply). Providers were directed to fill out and return the postcard stating that they had either completed and returned the survey or that they were not eligible (with reason) to participate in the survey. The postcard was used to track which providers returned surveys, while maintaining the anonymous study design and allowed providers the opportunity to request a copy of the 1998 STD treatment guidelines of the CDC. Personalization (eg, hand addressing envelopes) was increased with each mailing in an attempt to increase response rates. Mail returned as address unknown was checked through the Internet white pages and resent when another address was found.

Response rate for the survey was calculated with the formula recommended by the Council of American Survey Research Organizations.[24] This formula assumes that the proportion of eligible providers among nonrespondents is the same as that among respondents (see "Appendix").

Outcome Measures

The 2 main outcome measures for this study were the reported likelihood of regularly taking a sexual history from an adolescent female patient (13–19 years old) and the frequency of regularly testing sexually active adolescent females for chlamydia. For the first outcome measure, regularly was defined as those providers who responded very likely or likely on a 5-point Likert scale to the question: "How likely are you to take a sexual history from a female patient during a routine (annual or new patient) visit?" For the second outcome measure, regularly was defined as those who answered often or always on a 5-point Likert scale to the question: "How often do you test adolescent females (13–19 years old) for chlamydia if the patient is sexually active by history?"

Scale Construction for Questions With Combined Responses

Separate responses were solicited for younger and older adolescent age groups (ie, 13–15 vs 56–19 years old) on several questions. Because provider responses did not differ significantly for younger and older adolescents, the age group-specific responses were combined using the Cronbach α to verify internal reliability. Combined questions included how comfortable providers were discussing sex with their patients (Cronbach $\alpha = .77$), how often the provider discussed STD prevention ($\alpha = .70$), if the provider believed that the chlamydia prevalence in their patient population is >1% ($\alpha = .83$), and how likely the provider was to take a sexual history ($\alpha = .72$).

Another scale measured how regularly (always or often) a provider took a detailed sexual history from females patients 13 to 34 years old by summing answers to 5 questions. These questions assessed how often the provider asked their female patients about new sex partners, numbers of recent sex partners, condom use, history of STDs, and symptomatic sex partners (Cronbach $\alpha = .87$).

Statistical Analysis

Data were analyzed using SAS (SAS, Cary, NC).[25] Analysis of variance and 2-sample t tests were used to test for differences in means. χ^2 analysis was used to test for differences in proportions. The Spearman rank correlation coefficient was used to check for correlation between independent variables.

Separate multiple logistic regression models were constructed for the 2 outcome measures. Only variables associated with the outcome measures in univariate analysis (χ^2; $P < .1$) were included in the logistic regression models. Variables were manually removed from logistic regression models one at a time to assess their effect on the negative 2-log likelihood (−2LL) measure and on provider gender, which emerged as the main independent variable. Those variables that significantly changed either the −2LL or the odds ratio (OR) for gender (±10%, ie, confounding variables) were kept in the model. All other variables were removed. Previously removed variables were reintroduced into the smaller model to verify their lack of contribution to this new model. This process was repeated with the new model, removing further variables as necessary, until the remaining model had the smallest difference between the −2LL statistic and the Akaike's Information Criterion statistic (most parsimonious model) compared with other models.

RESULTS

Of the 1265 surveys mailed to providers, 353 providers (27.9%) indicated that they were not eligible to be surveyed (eg, not currently practicing, do not provide gynecological care); 45 (3.6%) were no longer at the listed address and no further address

could be found; and 9 (<1%) returned postcards indicating their refusal to participate. Two hundred eighty-two providers (22.3%) did not return a postcard or a survey and were considered nonrespondents. The final number of completed surveys received was 576 for an adjusted response rate of 71.5%. This rate was calculated after accounting for the large number of ineligible providers (see "Appendix" for formula). The response rate was higher for females than for males (84.1% vs 71.2%; $P < .01$). Nurse practitioners (78.2%) were more likely to respond than either physicians (69.5%) or physician assistants (68.9%; $P < .01$). Pediatricians were less likely to provide gynecologic care, compared with the other provider types. Thirty-three percent of responding pediatricians said that they did not provide gynecologic care, compared with 25% of internal medicine specialists, 7% of family practitioners, and 27% and 26% of physician assistants and nurse practitioners, respectively.

Characteristics of responding providers are summarized in Table 1. Physicians comprised nearly two thirds of respondents. Female providers made up more than one half of respondents attributable in part to the nurse practitioners surveyed, who, as a group, were 96% female. Physicians were 44% female and physician assistants were 63% female. Family practice was the largest practice specialty type, followed by obstetrics/gynecology. Respondents were overwhelmingly white, non-Hispanic. More than one half of the respondents came from the state's single large metropolitan area (Denver/Boulder); one fifth were rural practitioners. As might be expected, the majority of physicians (61%) reported working in the Denver metropolitan area, compared with 49% of nurse practitioners and 41% of physician assistants. Approximately one third of nurse practitioners and physician assistants reported working in smaller cities. The percentage of rural providers was ~20% across professional groups. Among physicians, pediatricians reported the second highest percentage (after internal medicine physicians) of urban practice location (67%).

TABLE 1. Characteristics of Survey Respondents

Characteristics	No.*	(%)
Profession		
Physician (medical doctor and doctor of osteopathy)	378	(65.6)
Nurse practitioner	134	(23.3)
Physician assistant	64	(11.1)
Specialty		
Family practice	265	(46.4)
Obstetrics/gynecology	134	(23.5)
Internal medicine	96	(16.8)
Pediatrics	38	(6.7)
Adolescent/student health	12	(1.4)
Other	26	(4.7)
Gender		
Female	333	(57.8)
Male	243	(42.2)
Race/ethnicity		
White, non-Hispanic	522	(92.4)
Hispanic/Latino	22	(3.9)
Asian American	15	(2.7)
Other	6	(1.1)
Age (y)		
>30	22	(3.9)
30–39	165	(29.5)
40–49	230	(41.1)
50–59	111	(19.9)
60+	31	(5.5)
Years since completing training		
<5	107	(18.9)
5–14	202	(36.8)
15–24	176	(31.2)
25+	74	(13.1)
Practice location		
Denver/Boulder metropolitan area	324	(56.3)
Smaller cities	143	(24.8)
Smaller towns/rural	109	(18.9)

* Numbers may not add up to study total because of missing data.

Sixty-one percent of physician assistants and 59% of nurse practitioners reported seeing 6 or more adolescent females each week, compared with 44% of physicians ($P < .01$). Among physicians, 56% of pediatricians reported seeing 6 or more adolescents per week, the largest proportion among the physician groups. Sixty-nine percent of nurse practitioners reported ever taking a course offered by the Denver STD Prevention Training Center, compared with 29% of physician assistants and 13% of physicians ($P < .01$). Male providers were older than females (mean: 46.2 and 42.0 years, respectively; $P < .01$) and had more years of experience since completing training (17.8 and 10.8, respectively; $P < .01$).

Sexual History Taking and Testing for Chlamydia

Overall, 71.9% of providers reported regularly (always or often) taking a sexual history from adolescent females 13 to 19 years old. Only 53.8% of providers reported that they regularly (always or often) tested sexually active adolescent females for chlamydia. If the responses were restricted to those who answered always (per CDC recommendations), this percentage was 26.3%. Taking a sexual history was associated with testing for chlamydia. Those providers who indicated that they always or often took a sexual history from adolescent females during an annual or new patient examination were more likely to regularly test sexually active females for chlamydia ($r = .27$; $P < .01$).

Results of univariate analysis for association of variables with the 2 outcome measures are shown in Table 2. Many of the same variables were associated with both outcomes (taking a sexual history and testing female adolescents for chlamydia). These included: provider gender (female), profession (nurse practitioner), knowledge of the age group at highest risk for chlamydia, whether the provider regularly discussed prevention measures with their patients, whether the provider started the STD discussion with their patients, and whether their patient population was >5% Medicaid-eligible. Variables not associated with either outcome were provider age, race, practice location, number of adolescents seen per week, and the proportion of minority patients.

Given the strong association between provider gender and both outcomes, the sexual history taking, risk assessment, and testing variables were stratified by gender (Table 3). Female providers consistently reported being more likely than males to ask about all aspects of sexual history, to be more comfortable

TABLE 2. Univariate Analysis for Association of Independent Variables With Regularly Taking a Sexual History and Regularly Testing for Chlamydia (Adolescent Female Patients Only)*

Variables		Regularly Take Sexual History		Regularly Test for Chlamydia	
		%	*P* Value	%	*P* Value
All		71.9		53.8	
Provider general	Female	85.2	<.01	64.4	<.01
	Male	53.4		38.6	
Provider age	<40	71.5	.88	48.0	.08
	≥40	72.2		56.3	
Provider race	White, non-Hispanic	72.3	.72	52.8	.19
	Other	69.4		63.4	
Profession	Physician (medical doctor/ doctor of osteopathy)	67.7	<.01	49.1	<.01
	Physician assistant	62.1		46.0	
	Nurse practitioner	88.6		70.1	
Practice location	Denver/Boulder	73.7	.35	54.1	.87
	Smaller cities/rural	69.9		53.4	
No. adolescents seen/wk	≥6	74.8	.08	56.3	.22
	≤5	67.6		51.0	
Knows females <20 y old are highest risk group	Yes	79.5	<.01	60.3	<.01
	No	63.9		47.1	
Starts STD discussion (rather than patient)	Yes	78.1	<.01	59.1	<.01
	No	55.5		39.1	
Believes chlamydia prevalence in patients is	>1%	73.3	.19	56.7	<.01
	<1%	64.9		34.5	
Provider is comfortable talking about sex	Yes	79.7	<.01	58.0	<.01
	No	29.0		33.8	
Regularly discusses prevention	Yes	87.7	<.01	63.7	<.01
	No	32.6		31.1	
Regularly discusses condom use	Yes	74.9	<.01	56.1	<.01
	No	41.0		29.6	
Regularly discusses limiting number of sex partners	Yes	79.3	<.01	61.4	<.01
	No	53.4		34.0	
Patient population	≥5% minority	72.6	.34	53.5	.90
	<5% minority	67.5		54.3	
	≥5% Medicaid	76.8	<.01	57.1	.05
	<5% Medicaid	63.6		48.1	

* Percentages represent providers who answered "always" or "often."

TABLE 3. Reported Differences by Provider Gender in Sexual History Taking, Risk Assessment, and Testing Sexually Active Adolescents (13 to 19 Years Old)*

	Females $n = 331$ %	Males $n = 240$ %	*P* Value
Starts STD discussion with patients	79.7	68.6	<.01
Is comfortable discussing sex	92.9	73.4	<.01
Regularly discusses			
STD prevention	87.9	51.9	<.01
Abstinence	71.1	62.4	<.01
Condom use	95.9	85.8	<.01
Limiting number of sex partners	77.5	65.6	<.01
Test adolescent female patient			
With signs/symptoms	98.4	94.5	.01
With history of exposure	95.3	90.4	.03
When patient has behavioral risks	86.3	66.8	<.01
During routine physicals	17.1	6.4	<.01

* Percentages represent providers who answered "always" or "often."

discussing sex, to be more likely to discuss STD prevention, and to regularly test for chlamydia given different interview and examination findings.

Among provider professions, nurse practitioners were more likely to report regularly taking sexual histories than either physicians or physician assistants (88.6%, 67.7%, and 62.1%, respectively; $P < .01$). They were also more likely to report regularly testing sexually active adolescent females for chlamydia than either physicians or physician assistants (70.1%, 49.1%, and 46.0%, respectively; $P < .01$). Among physicians, obstetrician-gynecologists reported the highest percentage of regularly taking a sexual history (90%). They were followed by pediatricians (76%), family practitioners (62%), and internal medicine physicians (44%). As for testing, 74% of pediatricians reported doing this regularly, followed by 51% of obstetrician-gynecologists, 47% of family practitioners, and 38% of internal medicine specialists. Female physicians were much more likely than were male physicians to report regularly taking a

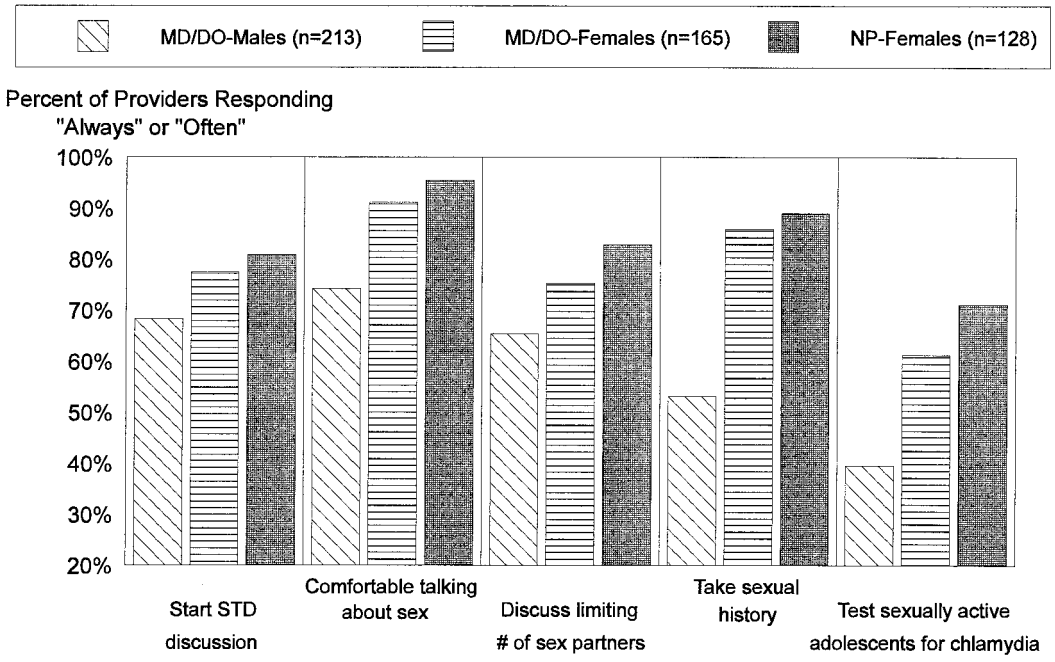

Fig 1. Comparison of male physicians, female physicians, and female nurse practitioners.

TABLE 4. Results of Multiple Logistic Regression for Regularly Taking a Sexual History From Adolescent Females

Variables	OR	95% CI
Female provider	5.48	2.89–10.86
Physician assistant	.37	.15–.94
Nurse practitioner	2.11	.76–6.93
Physician	(Referent)	
Obstetrics/gynecology specialty	4.00	1.73–10.32
Internal medicine	.39	.16–.94
Family practice	(Referent)	
Provider is comfortable talking to adolescent females about STDs	4.90	2.25–11.12
Provider starts STD conversation with adolescent patients	2.70	1.41–5.21
Patient population is >5% Medicaid insured	2.03	1.13–3.70

TABLE 5. Results of Multiple Logistic Regression for Regularly Testing Sexually Active Adolescent Females for Chlamydia

Variables	OR	95% CI
Female provider	2.79	1.62–4.83
Provider age (y)	1.05	1.02–1.08
Regularly discusses prevention with adolescent females	2.13	1.12–4.10
Regularly discusses limiting sex partners with adolescent females as part of prevention message	2.35	1.36–4.08

sexual history (85.9% vs 53.1%; $P < .01$), and to report testing sexually active adolescent females for chlamydia (61.2% vs 39.5%; $P < .01$). Sexual history taking, STD prevention, and chlamydia testing practices of female physicians tended to be more similar to those of female nurse practitioners than to those of male physicians (Fig 1).

In multivariate analysis, the single factor most strongly correlated with both outcomes was female gender of provider (Tables 4 and 5). Compared with males, female providers were more likely to report regularly taking a sexual history (OR: 5.5; 95% confidence interval [CI]: 2.9–10.9) and regularly testing sexually active adolescent females (OR: 2.7; 95% CI: 1.6–4.8). Other variables positively associated with regularly taking sexual histories from adolescent females were provider comfort level about discussing STDs with adolescent patients, provider willingness to initiate conversations about STDs, and a patient population >5% Medicaid insured. Obstetrics/gynecology providers were more likely to report regularly taking a sexual history, while internal medicine providers were the least likely. Compared with physicians, physician assistants were less likely to report asking for a sexual history; nurse practitioners were not significantly different from physicians in this respect. Other variables positively associated with regularly testing sexually active adolescent females for chlamydia included (Table 5): believing that the prevalence of chlamydia infections in their female patients was >1%, regularly discussing limiting numbers of sexual partners as a part of the prevention message, regularly discussing STD prevention with adolescent female patients, taking a detailed sexual history, and older provider age.

DISCUSSION

This study examined chlamydia screening and risk assessment practices by women's primary care providers who provide gynecological care in Colorado, including physicians, nurse practitioners, and physician assistants. The 2 strongest findings of the study are that only one half of these primary care providers in Colorado reported regularly (always or often) testing sexually active female adolescent patients for chlamydial infections, and that female providers more frequently reported regularly assessing risk,

discussing prevention, and testing female adolescent patients for chlamydia than did male providers.

Study Limitations

Several limitations of the present study should be noted. Professional society membership lists are a convenient way to identify participants for a survey. They are not complete, however, because not all physicians join these societies. The search of the Internet yellow pages was an attempt to identify practicing physicians who do not belong to professional societies. Although it is unlikely that the entire population of primary care providers in Colorado was part of our sampling frame, we do not believe substantial numbers were missed. Nurse practitioners may have been undersampled as well. Although the State Board of Nursing list should be a complete listing of licensed nurses in Colorado, nurses are not required to indicate advanced practice nursing degrees on the license application. Such undeclared nurse practitioners would not have been part of the sampling frame. To the extent that our sampling frame was incomplete, this could limit the generalizability of the study.

One area that may need further study is how provider practice setting may influence the outcomes of interest. Because of the changing nature of practice settings and mixed practices, this is a difficult variable to measure. We decided both a priori and during analysis that professional training and specialty were more important to the outcomes of interest than provider setting. One practice pattern that was not assessed in this study was that in which a nurse practitioner or physician assistant might do the risk assessment and the physician perform the actual test. This could have the effect of underestimating testing levels for the nonphysician clinicians and sexual history-taking levels for physicians. Also not assessed was the situation in which primary care providers do not test because their adolescent female patients report receiving these services elsewhere (eg, family-planning clinics).

Although 71.5% is a respectable response rate for a mail survey, the validity of our findings may be affected by the extent to which nonrespondents differ from respondents. Because nonrespondents were more likely to be male, a group that reported less frequent testing and risk assessment practices, the rates for testing and sexual history taking found in this survey are probably overestimates of the true rates. In addition, self-reported behaviors tend to be overestimates of actual practice.[26,27]

Although this study was conducted in one state, the results are likely to be broadly generalizable, given similar results from other published reports[17,18] and the fact that many of the providers surveyed may have trained in other states.

Testing Sexually Active Adolescents

The finding that 54% of providers reported regularly (and only 26% always) testing sexually active female adolescents for chlamydia is in line with other published studies,[17,18] but falls well short of meeting the CDC recommendation of testing all sexually active adolescent females. Why are testing rates so low? Our results suggest that providers may not believe that their patient population is at risk for chlamydial infections and that they may have problems discussing sexuality, especially with their younger patients. Although we did not assess this, providers may be unaware of the CDC recommendations or they may not believe such recommendations are appropriate for their patients. Certainly, pediatric literature on STD care for adolescent females supports the CDC recommendations.[28,29]

Older provider age was associated with regularly testing for chlamydia. This finding was somewhat unexpected. More recently trained providers might be expected to be better at assessing risk and testing because of more recent, up-to-date training. This is apparently not the case.

The willingness of providers to discuss prevention issues was significantly related to testing. Those who reported specifically advising their patients to limit numbers of sex partners were more likely to test than those who do not regularly discuss the topic. Perhaps physicians who are aware of the particular risks adolescents face are more likely to take the time to discuss prevention and are more likely to assess whether the patient is sexually active and to test when necessary.

Preconceived ideas by a provider about low-risk status in their patients can lead to minimal-risk assessment of the patients.[30] This, in turn, may lead to undertesting. The current study found that providers who perceived little or no risk for chlamydia (prevalence: $<1\%$) in their adolescent female patient population were less likely to report testing regularly.

Other testing technologies that do not require a pelvic examination (ie, urine testing) were not assessed in this study. At the time that the survey was conducted, these technologies were not believed to be in widespread use in the state. As urine testing for STDs becomes more widely available, the acceptability of testing among both providers and adolescent female patients may certainly increase.

Provider Gender Differences

Female providers reported taking sexual histories and testing sexually active adolescent females for chlamydial infections more often than did male providers. These findings are supported by previous studies that found that compared with males, female physicians do a more thorough job of assessing human immunodeficiency risk, are more comfortable talking to adolescents about sexuality, and are more likely to counsel patients about condom use.[30–32] Our study may be the first to include nurse practitioners and physician assistants.

Similar to other studies that show that male physicians report more difficulty talking with teenagers,[32,33] female providers in the current study reported being significantly more comfortable talking to adolescents about STDs. Female providers were more likely to report starting discussions about STDs and to report regularly discussing STD prevention. Our findings agree with previous studies that have found that female physicians are more inclined than

male physicians to counsel patients about condom use.[33]

It is not clear why women practitioners provide more STD prevention than men do; however, gender differences may appear early in medical training. A survey of senior medical students found that men were more likely than women to believe that a sexual history is not relevant or is unimportant.[34] One study in Quebec went so far as to recommend increasing the numbers of female physicians to have beneficial effects on prevention of STDs and undesired pregnancies.[33]

Although reported behaviors may overrepresent actual practice behaviors, there is little reason to believe that the tendency to overreport actual practices would differ by provider gender. Given the consistency of the present results with other studies, and the fact that gender is associated with nearly all items in the present study, it is likely that the reported gender differences actually represent real practice differences.

Assessing Risk and Taking Sexual Histories

Previous studies show that STD risk questioning is associated with physicians' comfort with discussing patients' sexual practices.[30] If providers wait for patients to ask or are uncomfortable discussing sex with their adolescent females, they are less likely to test for human immunodeficiency virus.[35] The current study found that providers who are comfortable talking to adolescents about sex are much more likely to report taking a sexual history than are providers who are uncomfortable with the topic.

Obstetrics/gynecology providers were more likely than other specialty types to report regularly taking a sexual history from their adolescent female patients, followed by pediatricians. Literature is available to help the adolescent health care provider determine appropriate sexual and STD care, including techniques to help with risk assessment.[28,29,36,37] Internal medicine providers and physician assistants were less likely to report taking a sexual history. This may indicate an underemphasis on STD prevention training for these groups.

Recommendations

The reported frequency of testing sexually active adolescent females, the group at highest risk for chlamydia, is substantially lower than recommended among primary care providers in Colorado. There is every reason to believe that the current results reflect the national situation. Public health agencies and professional societies may need to improve the dissemination of chlamydia control recommendations to providers. Training efforts to improve sexual history taking, risk assessment, and STD-testing practices should begin early in professional training. Particular efforts should be made to close the provider gender gap that currently exists. Enhanced training in interviewing techniques with adolescents may be one way to increase provider comfort in discussing sexuality with young female patients. Successful control of chlamydia and other STDs are likely to depend on improving provider practices.

APPENDIX

The formula for calculating response rate is:

$$\frac{\text{No. completed surveys}}{\text{(No. completed surveys)} + \left[\left\{\frac{\text{No. completed surveys}}{\text{(No. completed surveys} + \text{No. known ineligibles)}}\right\} \times \text{(No. nonrespondents)}\right]} \times 100.$$

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