

Screening for Asymptomatic Chlamydia Infections Among Sexually Active Adolescent Girls During Pediatric Urgent Care

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Objective: To develop and evaluate an intervention to increase *Chlamydia trachomatis* (CT) screening among sexually active adolescent girls during pediatric urgent care.

Design: Ten pediatric clinics were randomly assigned to an intervention (5 clinics) or control group (5 clinics). The proportion of sexually active girls screened for CT was estimated over 18 months (April 2005-September 2006).

Setting: Large health maintenance organization in northern California.

Participants: Pediatric clinics providing urgent care services for adolescent girls aged 14 to 18 years.

Intervention: In the intervention clinics, a team of providers and clinic staff met monthly to redesign their clinic system to improve CT screening during urgent care. Controls received an informational lecture on CT screening.

Main Outcome Measures: Clinic-specific proportions of sexually active adolescent girls screened for CT.

Results: The change over time in clinic-specific CT screening rates in urgent care was significantly greater in the intervention group than in the control group (likelihood ratio, $\chi^2=18.7$; $P<.001$). Between baseline and the fifth intervention period, the proportions of girls screened for CT increased by 15.93% in the intervention group and decreased by 2.13% in the comparison clinics.

Conclusions: The intervention significantly improved the proportion of adolescent girls screened for CT during urgent care. Despite this success, substantial barriers to screen for CT in urgent care remain. Innovative strategies to provide basic information about CT, other sexually transmitted infections, and pregnancy are greatly needed since many teens are never seen for preventive care in a given year.

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CHLAMYDIA TRACHOMATIS (CT) is the most common reportable bacterial sexually transmitted infection (STI) in the United States, with the highest rates among adolescents and young adult women.¹ Untreated CT infections can lead to pelvic inflammatory disease, ectopic pregnancy, and infertility.¹⁻⁸ Since most of these infections have no symptoms,^{1,3,4} routine

See also pages 585 and 592

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screening is the only way to detect the majority of CT cases. Despite recommendations for at least annual screening for CT among all sexually active adolescents and young adults younger than 26 years,^{9,10} screening rates remain low. In a national telephone survey, only 21% of 18- to 19-year-olds and 16.6% of 25- to 29-year-olds reported receiving any type of STI care (including both counseling or testing).^{11,12}

To this end, our research team developed a clinical practice improvement inter-

vention (CPI) that significantly increased screening of sexually active girls during regularly scheduled preventive health visits¹³ as well as boys in this same setting.^{14,15} Most of the progress in screening programs has occurred in the context of preventive well visits of adolescents.^{13,16,17} However, many adolescents do not use preventive well-care visits and rely on urgent care for their health care needs. For instance, data from 2 different health maintenance organizations (HMOs) in the western United States show low rates of preventive care with more than two-thirds of all adolescent care visits being same day, ie, urgent care appointments,¹⁸⁻²¹ where preventive services such as CT screening are not routinely delivered. This is particularly disconcerting because adolescents who use urgent care for their health care may be at a higher risk for CT than those who are seen for preventive health care services because they tend to be older, have higher sexual activity rates, and may only access urgent, not preventive, health services.¹⁸ Additionally, adolescents seen in emergency/

urgent care settings for nonemergency problems are at higher risk for CT than those who receive regular preventive care. Prevalence studies found that adolescents and young adults screened for CT and/or gonococci in the urgent care/emergency department have infection rates generally higher than those screened during routine well-care visits, with infections rates in urgent care ranging from 8.0% to 9.8%.²²⁻²⁶

There is a mismatch between where adolescents access health care (eg, urgent care) and the delivery of preventive health services, including CT screening, which occurs more often during well-care visits that are used by a limited proportion of adolescents. To begin to address this apparent disconnect between clinical need and actual service delivery, we began to explore the feasibility of implementing CT screening in urgent care for teens. In one of our studies on urgent care use patterns of adolescents, we found that most adolescents find it acceptable for clinicians to ask them about their sexual histories and are willing to provide a urine sample for CT testing during urgent care visits even if the visit is not related to the adolescent's reproductive health.²⁷ Others have found similar acceptability results.²⁸⁻³⁰ Despite this information, there remain formidable barriers to delivering a preventive health care service such as CT screening in the context of an urgent care visit. These barriers include limited visit time, acuity-focused reason for visit, lack of assured confidentiality in the setting, and continued reluctance of providers, especially pediatricians, to engage in appropriate discussions of sexual risk and available sexually transmitted disease services in many settings, including urgent care.³¹⁻³⁹ As a result, there has been little attention given to improving CT screening efforts in urgent care and efforts to improve CT screening have been largely unsuccessful.¹⁶

The goal of this study was to build on our prior successful CPI well-care intervention model,¹³ modify the model so that it was more applicable to the urgent care setting, implement the revised CPI in urgent care, and evaluate its effectiveness in improving CT screening rates of sexually active adolescent girls attending urgent care.

METHODS

SETTING

This study was performed in partnership with the largest HMO in northern California (serving 1 in 3 residents) over an 18-month period between April 2005 and September 2006. Adolescents and young adults compose approximately 15% of the HMO's population. All adolescents are seen for primary care in the pediatric setting (up to 18 years of age). Pediatric practices consist of small practice groups of 5 to 15 providers who carry a slate of primary care patients. An acting chief of pediatrics heads each pediatric clinic facility site. General pediatric clinics maintain 2 types of visits: (1) preventive well care visits (scheduled for 20-25 minutes each) and (2) urgent care visits, also known as "same-day visits" (scheduled for 10-15 minutes). Most urgent care visits are seen within the same physical site as well-care visits by the available practice pediatricians. Each site has a slate of nurses, medical assistants, registration clerks, and administrators who work within a designated pediatric clinic site as a health care team.

SAMPLE AND STUDY DESIGN

There were a total of 43 pediatric clinics. Ten pediatric clinics were excluded from participation because they had participated in our previous intervention. Of the remaining 33 clinics, the 10 largest clinics were chosen to participate. All of the pediatric chiefs invited to participate in this study agreed to the randomization of their practice sites to either an intensive intervention or a comparison clinic. There were no refusals to participate. On agreement to participate, 5 clinic sites were randomly assigned, via a computer random assignment number, to receive either the CPI/urgent care intervention (described in the following section) or to the control group. Participants were not informed about whether they were assigned to the intervention or control group. The 5 clinics in the control group received a 1-hour traditional didactic educational presentation regarding adolescents' risk for CT, type of testing available for CT at their HMO, use patterns of adolescents (well care vs urgent care), the sexually transmitted disease risk profile of adolescents in urgent care, the rationale for screening sexually active adolescent girls in urgent care, and tools, already developed and available, to improve their clinic's CT screening practices.

INTERVENTION

The CPI for urgent care was based on work described by Shafer and colleagues.¹³ For urgent care, the same general intervention methods were used. The Adolescent Care Teams (ACTeams) were composed of a general pediatrician, a pediatrician with specialized training or interest in adolescent health, clinic manager, and medical assistants to champion the cause of CT screening in urgent care. The ACTeam was tasked with determining the most efficacious system for identifying sexually active teens, obtaining the urine specimen, transporting the urine to the laboratory, communicating positive results confidentially to the teenager, and setting up a follow-up treatment (eg, partner-treatment protocols). This was accomplished during interactive 1-hour monthly meetings (over supported light lunch). During these meetings, the ACTeams reviewed their progress, problem solved barriers, and continued the development, implementation, testing, refinement, and reimplementation of the evolving CT screening clinic protocol. This intervention method is derived from the Plan, Do, Study, Act model for practice improvement,⁴⁰ which guided the ACTeam through a systematic analysis and rapid improvement process. This "cycle" was repeated monthly as incremental progress was attained over time toward the project's goal.⁴¹ **Figure 1** shows a representation of the ACTeam cycles and corresponding anticipated changes in CT screening rates. Testing practice system changes using small samples over a short period allowed practices to make incremental changes and determine what worked in an observable fashion before committing extensive resources to full implementation.

Because the 2 systems (well care and urgent care) had different work flows; systems of care and expectations on the part of providers, staff, and patients; and different time constraints, the urgent care intervention needed to be able to redirect as many of the steps of the screening effort from the physician to other staff and the patient. Information also needed to be gathered from the adolescent in a confidential manner and communicated to the provider in a way that did not decrease the clinic flow of patients in the urgent care setting. To support the urgent care mission, we worked with the ACTeams and developed sample tools to help them redesign their clinic system to facilitate incorporation of CT screening into the visit. Tools included a work sheet with a template for reviewing each step in the individual clinic systems and identifying successes

and barriers at each step of screening, handouts articulating the clinic's confidentiality policy, a brief confidential questionnaire with information about CT and the test, questions to identify teens eligible for CT testing, stickers/stamps for obtaining and recording the teen's confidential contact number in the event the test results were positive, and precompleted laboratory requisition forms. Adolescent Care Teams then determined what tools to use, customized the tools as needed, and decided how to implement them.

Urine specimens from sexually active adolescents were transported to the local site laboratory and on to the HMO's regional laboratory for processing in Oakland, California, by routine transportation. Teens were given the option to decline being tested, even if they were sexually active. Reports from clinic teams indicated that very few teens declined the recommendation to be screened for CT. In addition, if teens had been tested for CT within the past year and did not have any risk factors that would warrant rescreening, they were not required to provide a urine sample. However, in a busy urgent care setting, it was not always possible for the medical staff to access patient records or assess this information, so on some occasions, there was more than 1 test in a given year and these duplicates were removed from the data set. The urine specimens were processed according to the manufacturer's specifications using Aptima Combo 2 Assay (Gen-Probe, San Diego, California) to detect CT. The urine specimens from those teens deemed not at risk by questionnaire were discarded prior to shipment. Teens whose specimens tested positive for CT were contacted via the confidential contact number and were treated and provided follow-up care in accordance with the Centers for Disease Control and Prevention and their own clinic protocols.¹

DATA ANALYSES: OUTCOME MEASURE

To estimate the clinic-specific proportions of adolescent girls screened for CT, the following formula was used for each clinic and period:

CT Screening Rate = Number of Urgent Care CT Tests Done / (Number of Girls Seen for Urgent Care Visit × Estimated Sexual Activity Rate).

Urgent care visits were defined as nonwell, acute care, or same-day appointments as recorded in the central data system. To evaluate the effectiveness of the intervention, if a teen received a CT test within 3 days after the urgent care visit, the teen was counted in the numerator as having been screened. Data were provided to the research team as deidentified data on a quarterly basis. Duplicate tests and visits for each period were excluded from analyses. For the denominator, sexual activity rates were estimated from anonymous surveys of teens immediately after their urgent care visit from pediatric clinic sites over a 1-month period prior to the onset of the intervention. The number of teens seen for urgent care (exclusive of duplicates) was then multiplied by the sexual activity rate for each clinic to give the total number of estimated teens eligible for CT screening.

Baseline characteristics between the experimental and comparison clinics were analyzed using Mann-Whitney statistical tests. The 18-month study period was divided into six 3-month intervals to provide more stable estimated screening rates. Baseline rates were calculated for 3 months prior to the intervention and each subsequent screening rate was calculated during the implementation of the intervention using the same method. Thus, the data consisted of 6 repeated measures for each of the 10 study sites. To evaluate changes in proportions of adolescent girls screened for CT over the 6 repeated measures between the intervention and comparison groups, we used

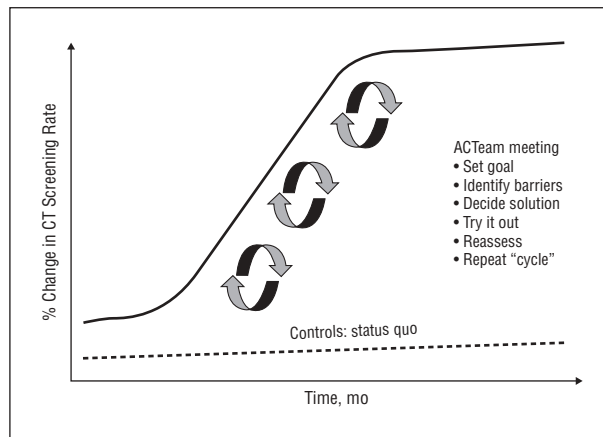


Figure 1. Rapid cycle changes representation of the Adolescent Care Team (ACTeam) cycles and corresponding anticipated changes in *Chlamydia trachomatis* (CT) screening rates.

linear mixed-effects models⁴² using SAS software package, version 9 (SAS Institute Inc, Cary, North Carolina). These models contained the CT screening proportions as the outcome variable and time, group, and their interaction as predictors. The models contained a random intercept to accommodate the repeated measures over time within clinics. Our interest focused on the interaction term as it measured the difference in changes over time in screening rates between intervention and control clinics. Within each treatment group, we compared the fit of a model with linear change in the screening rates over time to one that allowed arbitrary magnitudes of change using likelihood ratio tests. For both intervention and control sites, we found that models assuming linear change in screening rates described the data well; for both treatment groups, the likelihood ratio tests were not statistically significant, with $P > .25$.

RESULTS

There were no statistically significant differences between the intervention and comparison clinics in the proportion of adolescent girls screened for CT during the 3-month baseline period (23.4% in the intervention group were screened vs 28.8% in controls) nor were there any significant differences between intervention and comparison clinics on sexual activity rates, CT infection rates, number of providers, sex of providers, or age of teens seen in urgent care (variables that could potentially influence screening practices) (**Table 1**). Race/ethnicity data were not available from the database of this HMO.

As a result of the intervention, the change in clinic-specific proportions of adolescent girls screened for CT in urgent care was significantly greater in the intervention group than in the control group (likelihood ratio, $\chi^2 = 18.7$; $P < .001$). **Figure 2** displays the plot of CT screening rates over time along with the fitted lines for each group. The fitted linear mixed-effects model yielded estimates of change in the proportions screened per month in each group along with associated 95% confidence intervals. In the intervention group, the estimated change was 0.0114 per month (95% confidence interval, 0.0076 to 0.0151). The estimated difference between the changes in the intervention and controls groups (ie, the difference in the slopes) was 0.0129 per month (95% confidence interval, 0.0078 to 0.0182).

Table 1. Baseline Characteristics of Intervention and Comparison Clinics

Variable (Girls)	Mean (95% CI)		P Value
	Intervention Clinics	Control Clinics	
Proportion screened for CT, %	23.4 (11.0-35.8)	28.8 (16.4-41.2)	.497
Sexual activity rate, %	37.2 (31.2-43.2)	35.8 (29.8-41.8)	.71
Positive CT test results, %	3.9 (0.28-7.5)	2.9 (0.0-6.5)	.67
Age of female teens seen in UC, y	15.66 (15.55-15.77)	15.65 (15.54-15.76)	.86
Age of male teens seen in UC, y	15.62 (15.52-15.72)	15.55 (15.45-15.65)	.14
No. of providers	18.6 (14.72-22.48)	14.0 (10.12-7.88)	.09
Female providers, %	61.4 (46.8-76.0)	51.6 (37.0-66.2)	.31

Abbreviations: CI, confidence interval; CT, *Chlamydia trachomatis*; UC, urgent care.

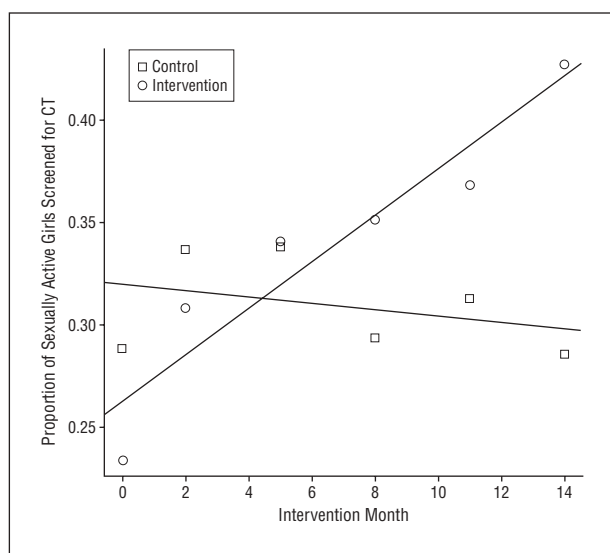


Figure 2. Mean *Chlamydia trachomatis* (CT) screening rates by group and plot of CT screening rates over time along with the fitted lines for each group.

In the control group, the estimated change was -0.0015 per month (95% confidence interval, -0.0053 to 0.0023). **Table 2** presents the predicted proportions of adolescent girls screened for CT obtained from the linear mixed-effects model in the 2 study groups over time. These predicted values are based on data from all points, thereby providing more accurate estimates than those based on rates from a single point (eg, Table 1).⁴² Therefore, differences between estimated proportions screened for CT at baseline from Table 1 and Table 2 reflect these 2 different approaches. All the 95% confidence intervals for differences in Table 2 cover the null value of zero, but the likelihood ratio test of the time \times group interaction (the difference of slopes between the intervention and control groups) is highly significant. That is, the change in the screening rates for the intervention group was significantly different from the change in the control group. Table 2 shows that between baseline and the fifth post-intervention period, the predicted proportions of girls screened for CT increased by 15.93% in the interven-

Table 2. Estimated Proportions of Adolescent Girls Screened for CT During UC Over Time

Period, mo	Predicted Mean		Difference (95% CI)
	Intervention	Control	
Baseline	0.2626	0.3195	-0.0570 (-0.1902 to 0.0763)
1-3	0.2853	0.3165	-0.0312 (-0.1620 to 0.0997)
4-6	0.3195	0.3119	0.0076 (-0.1212 to 0.1364)
7-9	0.3536	0.3073	0.0463 (-0.0828 to 0.1750)
10-12	0.3877	0.3027	0.0850 (-0.0455 to 0.2155)
13-15	0.4219	0.2982	0.1237 (-0.0106 to 0.2580)

Abbreviations: See Table 1.

tion group and decreased by 2.13% in the comparison clinics. The predicted proportion screened for CT in the final period was 42.19% in the intervention group and 29.82% in the control group. To illustrate the magnitude of this issue, in the final period, a total of 575 teens were actually screened for CT across all 5 intervention clinics. In the control group, a total of 418 were screened and a total of 1486 were estimated to be sexually active. Since actual analyses were based on clinic-specific mean proportions of teens screened in the intervention and control groups rather than totals for each group, these numbers yield different proportions than the mean proportions presented in the results.

One of the 5 intervention clinics that had originally agreed to participate did not implement the intervention as it was intended. That is, this site did not implement the policy of routine screening of teens for sexual activity and then facilitating the collection of the urine sample in the urgent care setting. When this clinic was removed from the analyses, the slope increased in the intervention group to 0.0140 per month (95% confidence interval, 0.010 to 0.018). With this facility excluded, the fifth postintervention CT screening rate for the intervention clinics was 47.99% (compared with 42.19% with this site included).

COMMENT

The CPI revised for the pediatric urgent care setting resulted in significant increases in the proportion of sexually active adolescent girls screened for CT. These improvements represented a significant improvement in proportions screened from baseline to the final posttest measurement period in the intervention clinics (compared with virtually no change in the control group). One of the main reasons this intervention was so successful in the most challenging urgent care setting is because the intervention method is flexible and responsive to the needs and inputs of each clinic site and therefore relatively easy to adopt. Improvements may have been even greater if it were not for 2 events. First, our prior intervention targeting well care may have contributed to higher baseline screening rates for both study and control clinic sites. Our research team worked in close collaboration with the HMO to disseminate the successful results and intervention methods of the CT screening study in the well-care context. The HMO, in turn, held several in-service train-

ing sessions on ways to improve CT screening for all pediatric clinics in the HMO (where we served as consultants). As the success of our well-care intervention gathered momentum, it contributed to a policy change at the HMO that added CT screening as a quality goal. With this change, CT screening served as a performance indicator for individual departments and screening rates were linked with financial incentives and sanctions. Though few clinics fully adopted all of the intervention components and methods, every pediatric department in this HMO did designate a pediatric clinician and a medical assistant as a "champion" to promote CT screening at their clinic. Second, one clinic did not implement the intervention as it was intended. This was because of significant labor and management issues that prevented the local ACTeam from being able to redesign their clinic system to improve CT screening rates during the study period. Such difficulties were not foreseen at the initiation of the study. When this clinic was excluded from the analysis, there was nearly a 50% increase in the proportion screened for CT.

Clinic ACTeams who made the greatest improvements redesigned their clinic systems in the following ways: (1) established a clinic protocol and explicitly stated that all adolescent clients will have confidential time with their health care providers; (2) provided teens, in a confidential setting, with a very brief handout with CT information, information about the confidential CT urine test, and a question that asked the teen if she had ever had sexual intercourse. The teen either marked the yes/no box next to this question or pointed to her answer; (3) developed a protocol to collect and record the adolescent's confidential contact number for those who were determined to be sexually active in the event of positive CT test results; (4) set up a system to routinely collect urine specimens from teens who reported that they had had sexual intercourse; (5) cued the clinician that there was a teen eligible for a CT screen (a typical cue was a precompleted laboratory request for CT test); (6) established a convenient and routine cold storage center for urine specimens to be sent to the laboratory; (7) designated a staff member and backup to transport the urine specimens to the laboratory either once or twice daily; (8) set up a confidential and comprehensive follow-up procedure to contact teens whose results were positive for CT and provided observed CT treatment, partner treatment, testing for other STIs, and counseling on how to prevent and reduce their risk of STIs and unintended pregnancies.

There are a few limitations to this study. These findings may be most readily generalizable to other large integrated health care delivery systems. Though this intervention was part of a large HMO system, each clinical practice site was conducted in 5 unique community settings with their own leadership, decision-making practices, and clinic culture; in this way, they functioned similarly to small and moderate-sized group practices. However, this HMO has an effective adolescent medicine leadership group, which successfully removed the copayment associated with such testing and treatment. This infrastructure support enabled teens to receive the test on the day of the visit without charge and prevented bills from being sent home to parents, thereby protecting adolescent confidentiality for this service.

To address the CT epidemic among our adolescent and young adult populations, attention needs to be given to the urgent care setting, the setting in which many adolescents and young adults, especially those at high risk for CT, interface with the health care system. Targeting interventions for this setting is challenging and will only be effective to the extent that as many of the steps involved in the CT screening process can be redirected to other support staff and the patients themselves. It will be important to also investigate the extent to which intervention effects can be sustained over time, especially in urgent care given the constraints in this setting. Intervention strategies also need to be comprehensive in their approach and thoughtful about each step in the screening process, from ensuring patient confidentiality and the sexual risk assessment to urine specimen collection, storage, and transport and procedures on what to do in the event the CT test result is positive, as it is not enough just to increase CT screening.⁴³ Regardless, it is necessary to pursue interventions to increase screening in urgent care settings within and beyond other HMO health care delivery models to reach the majority of at-risk teens who would otherwise likely remain undetected. In addition, this study focused on improving health care for teens who had some contact with the health care system and were insured. New strategies to provide basic information about CT, including how to prevent CT, other STIs/human immunodeficiency virus, and pregnancy, are greatly needed in nontraditional settings; however, this will require a paradigm shift since many adolescents and young adults do not routinely access well-care services where preventive care is traditionally provided. Offering CT screening during urgent care, as was done in this study, is one example of how to do "today's work today," which we interpret as meeting the health needs of adolescents when and where they seek care.

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