Examination of the Treatment and Follow-up Care for Adolescents Who Test Positive for Chlamydia trachomatis Infection

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Objective: To document the comprehensive management of Chlamydia trachomatis infections in sexually active 14- to 19-year-old adolescents.

Design: A chart review of both paper and electronic records to examine documentation of treatment and follow-up of adolescents who tested positive for C. trachomatis infection.

Setting: Five pediatric clinics of a large northern California health maintenance organization.

Participants: Consecutive sample of 122 adolescent girls and boys aged 14 to 19 years who tested positive for C. trachomatis infection beginning May 1, 2001, for 20-month (4 sites) or 4-month (1 site) study periods.

Main Outcome Measures: Antibiotic treatment, counseling regarding safer sex, management of patients’ partners, screening for other sexually transmitted infections, and retesting for C. trachomatis infection.

Results: The median age of participants was 16.9 years. All but 4 teenagers (97%) were treated with appropriate antibiotics. During follow-up, safer-sex counseling was documented for 79% of the patients. Partner management was addressed for 52% of the patients. Only 36% of the patients were tested for other sexually transmitted infections, and 10% received C. trachomatis retesting during the Centers for Disease Control and Prevention–recommended time frame of 3 to 12 months after treatment. Significantly fewer boys than girls received safer-sex counseling (P = .02) and partner management (P = .02).

Conclusions: Most teenagers received appropriate antibiotics, but fewer received other recommended care. The current study highlights important “missed-opportunity” clinical encounters for counseling to address high-risk behaviors, management of partners, detection of other sexually transmitted infections, and retesting for reinfections. Systems to address these gaps in care should be incorporated into the clinical management of adolescents infected with C. trachomatis.

Arch Pediatr Adolesc Med. 2005;159:1162-1166
fication and treatment, screening for other STIs, and CT retesting.

**METHODS**

**PARTICIPANTS**

The study sample comprised girls and boys aged 14 to 19 years who were seen at a northern California health maintenance organization (HMO) and who were identified as having a urogenital CT infection. A central laboratory database was searched for all of the positive CT results obtained at 5 clinic sites beginning May 1, 2001, for a 20-month period to allow for a retrospective sample of all consecutive patients with CT infections. At 1 clinic site, data collection ended early at 4 months because the site clinicians implemented a universal CT follow-up protocol for their own quality improvement activities. During our study period, the clinics were participating in a larger intervention study designed to increase CT screening in sexually active adolescents seen for well care.3,17 The systems-level intervention was aimed to improve universal CT screening practices in well care, but it did not address treatment, follow-up, or urgent-care practices. Clinicians remained individually responsible for all of the treatment and follow-up activities.

In this setting, CT was detected by a nucleic acid amplification test (LCx; Abbott Laboratories, Abbott Park, Ill) applied to first-pass urine samples from both boys and girls, or by a nucleic acid probe (PACE2; Gen-Probe Inc, San Diego, Calif) applied to endocervical samples from girls. The HMO universally provided confidential care for adolescents with health issues involving STIs and reproductive health. The HMO routinely waived copays and provided full coverage for outpatient visits, STI laboratory testing, and medications for STI treatment and contraception. Prior to our study, the California Health and Safety Code §120382 (California Senate Bill 648, January 2001) enacted support for patient-delivered partner therapy, and it allowed clinicians to prescribe and dispense antibiotics for the partners of patients with CT infections.16 Accordingly, the HMO provided coverage for medications for the partners.

**PROCEDURES**

The first positive CT result identified for each patient during the study dates was defined as the index infection. Each patient case was reviewed for 1 year after the index infection and constituted 1 case, regardless of the number of positive CT results within the study period. The HMO clinical staff extracted data from both paper and electronic medical records, eliminating all of the Health Insurance Portability and Accountability Act patient identifiers before giving the data to the research team at the University of California, San Francisco. At no point did this research team have access to patient identifiers. The team subsequently coded and double entered the information into a database for descriptive and comparative analyses by sex using χ² analysis of proportions. The study was approved by the institutional review boards of both the University of California and the HMO.

**MEASURES**

Measures to assess patient treatment and follow-up were based on both the 2002 and 1998 CDC guidelines3,14 since the sample included patients diagnosed before and after the 2002 edition was published. These 2 editions are very similar, except that the timing of retesting is more specific in the 2002 edition, as discussed later. Records of the index visit (when the positive laboratory test was originally obtained) and all of the clinic visits 1 year there-
well-care and urgent-care visits. In well care, girls were screened more frequently than boys, i.e., the concurrent intervention study with dates overlapping our study found up to 65% of girls and 48% of boys being screened in well care.9,15 Prevalence rates of CT infection calculated from well care were 6% for girls and 4% for boys.9,17 The lower rates of screening and prevalence in boys are consistent with the fewer number of cases of CT infection in boys. In our sample, well-care visits were made by 37% of patients (10% with and 27% without reproductive concerns) whereas urgent-care visits were made by 61% of patients (10% with and 27% without reproductive concerns). Visit type was not recorded in 2% of the cases.

The patient age range was 14 to 19 years, with a median age of 16.9 years (median, 16.8 years for girls; 17.1 years for boys). The Health Insurance Portability and Accountability Act regulations did not allow access to ethnicity information about individual clients. However, a previous anonymous survey of adolescents seen in the pediatric departments demonstrated that 16% were African American, 17% were Asian American, 38% were white, 16% were Latino, and 11% were multiethnic.9

**TREATMENT AND FOLLOW-UP**

Table 1 summarizes treatment and follow-up rates. Significantly fewer boys than girls had documentation of safer-sex counseling (62% vs 83%, respectively; χ² = 5.795, P = .02) and partner management discussion (31% vs 57%, respectively; χ² = 5.763, P = .02). Rates of antibiotic treatment and other STI screening did not differ significantly by sex (P = .82 and .53, respectively).

In the 118 treated cases, the median time from the date of the index positive CT test to antibiotic treatment was 6 days, with 95% of patients receiving antibiotics within 20 days. In the 63 cases in which partner management was addressed, the median time from the date of the index positive CT test to discussion of partner management was 7 days, with 95% of cases being addressed within 33 days. Clinicians provided patient-delivered partner therapy in 34 cases.

In the 4 untreated cases, clinical staff unsuccessfully attempted to contact these patients. All 4 of the cases were referred to the public health department for further follow-up.

One of 35 patients tested positive for rapid plasma reagin. At least 5 patients tested positive for GC (true denominator unknown). We did not have access to human immunodeficiency virus results.

All of the patients in this sample who received CT retesting (Table 2) were treated with single-dose azithromycin, one of the CDC-recommended first-line antibiotics after which test of cure is not routinely recommended. Of the 69 patients who were not retested, 4 patients attended a clinic visit during the optimal retesting time frame (ie, 3-12 months after treatment) but were not retested, 16 patients had been instructed to return for further follow-up but did not return, and 49 patients had no documentation of intent to follow up.

The rates of antibiotic treatment, safer-sex counseling, partner management, other STI screening, and retesting at 3 to 12 months did not vary significantly according to the type of visit (ie, well-care vs urgent-care visit) (P = .92, .08, .17, .70, and .55, respectively) or reproductive concerns (ie, presence vs absence) (P = .63, .66, .52, .41, and .55, respectively).

**COMMENT**

Control of the CT epidemic in youth will require multilevel intervention: primary prevention such as knowledge and skills to avoid CT exposure; secondary prevention such as routine screening, identification, and treatment of infected individuals; and tertiary prevention such as management of partners and avoidance of repeat infections. The initial focus by national organizations to increase routine CT screening of susceptible patients relied on the premise that successful identification of infection would lead to effective treatment and prevention of further transmission and recurrence. To our knowledge, the current study is the first to examine the management of adolescents specifically, and to include comprehensive management beyond antibiotic treatment of the index patient.

The vast majority (97%) of adolescents with CT infection who were identified in this HMO setting did indeed receive appropriate antibiotics in a timely fashion (median, 6 days after the CT test). This high rate of treatment occurred consistently at all 5 of the clinic sites and is also consistent with a few previous studies18-21 describing antibiotic treatment rates of 76% to 98% in samples of adult and adolescent patients seen in STI clinics, primary care clinics, and emergency departments.

However, the current study demonstrates much lower rates of completion of the other important management components, namely, safer-sex counseling, partner management, laboratory evaluation for other STIs, and CT retesting. Male index patients fared more poorly than girls with regard to safer-sex counseling and partner management. The female partners of male index patients are potentially infected and untreated, and they may be at risk for subclinical pelvic inflammatory disease and its long-term sequelae of tubal factor infertility, ectopic pregnancy, and chronic pelvic pain.22 We also found a low
Table 2. Rates of Chlamydia trachomatis Retesting Following Antibiotic Treatment

<table>
<thead>
<tr>
<th>Timing of CT Retesting After Treatment</th>
<th>Total, No. (%) (N = 122)</th>
<th>Girls, No. (%) (n = 96)</th>
<th>Boys, No. (%) (n = 26)</th>
<th>Positive Results, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 wk</td>
<td>27 (22)</td>
<td>23 (24)</td>
<td>4 (15)</td>
<td>11</td>
</tr>
<tr>
<td>3 wk to &lt;3 mo</td>
<td>21 (17)</td>
<td>19 (20)</td>
<td>2 (8)</td>
<td>4</td>
</tr>
<tr>
<td>3-4 mo</td>
<td>5 (4)*</td>
<td>5 (5)</td>
<td>0 (0)</td>
<td>1</td>
</tr>
<tr>
<td>&gt;4 mo to 12 mo</td>
<td>8 (7)*</td>
<td>8 (8)</td>
<td>0 (0)</td>
<td>1</td>
</tr>
</tbody>
</table>

Abbreviation: CT, C trachomatis.
*A total of 12 distinct patients (10%) were retested at least once during the period of 3 to 12 months after treatment.

rate of screening for other STIs during follow-up. Coinfection with other STIs was found in 28% of patients with CT infections who were seen in genitourinary medicine clinics, and in 4% of patients with CT infections who were seen in community clinics in the United Kingdom.23 We found at least 6 positive cases in the subset of adolescents tested for other STIs that suggest a significant rate of concurrent STI infections among adolescents with CT infections.

The timing of CT retesting was also a departure from published recommendations. More patients received retesting during the first 3 weeks after treatment (ie, time of false positives) than during the remainder of the year after treatment. Adolescents have been described as having reinfection rates ranging from 7% to 38%,24-28 with reinfection being associated with resumption of sexual activity with untreated partners.25

Limitations of our study include dependence on chart records, unknown generalizability to adolescents seen in other settings, and a small sample size. For example, any chart documentation of counseling regarding safer sex practices (including a check box on preprinted forms) qualified as evidence of counseling, but it could not provide detailed information about the content or extent of counseling. Our described rate of partner management reflects clinician effort, but it may overestimate actual follow-through by patients and partners. Reluctance of patients to notify their past partners despite discussion by the health care staff has been documented.26 This particular HMO setting featured several characteristics that supported comprehensive management of CT infections. As detailed in the “Methods” section, the system of confidential care for adolescents and the comprehensive benefits may have minimized barriers that might exist in other settings. These particular clinics had also participated in a systems-level intervention to increase CT screening by clinicians.9 The intervention may have increased clinician awareness regarding CT management in general. Therefore, this setting may represent a “best possible scenario,” and these low rates of follow-up care may actually be higher than rates that exist in other health care settings.

An adolescent identified with a CT infection is, by definition, known to engage in risky behavior. The current study highlights “missed-opportunity” clinical encounters that could be used to target this subset of adolescents. Even in our setting of a concurrent screening intervention, successful identification of adolescents with CT infections was insufficient to ensure subsequent follow-up care. Future efforts could include: (1) a systems-level implementation of “clinician packets” containing antibiotics and a preprinted checklist of management components to complete; (2) automatic scheduling of patients for a 3- to 4-month follow-up appointment for retesting, with automatic notification to clinicians if patients fail or cancel appointments; (3) training of support staff to assist clinicians in follow-up activities; and (4) partnerships with public health departments (if available) for patient and partner tracking. Adolescents with CT infections are known to be at increased risk for other STIs, further transmission, and repeat infection. Repeat infection with CT, especially when such infection leads to acute or subclinical pelvic inflammatory disease, is associated with escalating risk for long-term infertility.28 The high rate of antibiotic treatment in this study demonstrates successful contact with these youths and engagement in follow-up care. Therefore, the opportunity exists to more fully deliver the spectrum of management and prevention services available to an adolescent with CT infection.

Accepted for Publication: June 23, 2005.

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Author Contributions: Drs Hwang and Tebb had full access to the data in the study, and they take responsibility for the integrity of the data and the accuracy of the data analysis.

Funding/Support: This study was supported by grant RO1 HS010537-04 from the Agency for Healthcare Research and Quality, Rockville, Md, by the National Institute of Child Health and Human Development, Bethesda, Md, by the Centers for Disease Control and Prevention, Atlanta, Ga, and by the Garfield Memorial Fund from Kaiser Permanente, Oakland, Calif. Drs Hwang and Shafer were supported in part by Leadership in Adolescent Health grant MC00003 from the Maternal and Child Health Bureau, Rockville, and Dr Pantell was supported in part by grant 5D5HP00054-05 from the Bureau of Health Professions, Rockville.

Acknowledgment: We would like to thank Charles J. Wibbelsman, MD, and Ann C. Tipton, MD, the pediatric clinic chiefs, and all of the pediatric health care staff at Kaiser Permanente of northern California for their enthusiastic support in making this work possible. We thank our research assistants, Samantha Pecson, BS, Meaghan
Pai-Dhungat, BS, and Jody Williams, MA, for their strong administrative work and skillful data management.

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