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Presumptive and Follow-up Treatment for Gonorrhea and Chlamydia Among Patients Attending Public Health Department Clinics in Virginia, 2016

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Abstract

Background: Presumptive antibiotic treatment is common for suspected chlamydia (CT) and gonorrhea (GC) infections before laboratory confirmation to prevent complications, reduce loss-to-follow-up, and interrupt transmission. We assessed this practice in sexually transmitted disease (STD) and family planning clinics.

Methods: We performed a retrospective analysis of data from clinics in Virginia in 2016 using administrative data merged with electronic laboratory reporting data. After stratifying by patient and clinic characteristics, we calculated how often patients with positive CT/GC tests were treated presumptively or during a follow-up visit, and how many patients with negative tests were treated presumptively.

Results: Of 63,889 patient visits with valid laboratory results from 131 clinics, 13% tested positive for CT or GC. Overall, presumptive treatment was given to 45.2% of persons with positive tests and 10.1% of persons with negative tests. Among the 9443 patients presumptively treated, 40.7% had positive test results. Presumptive treatment was more common in STD clinics compared with family planning clinics (22% vs. 4%) and for males with positive tests compared to females (65% vs. 24%); smaller variations were observed across age, race/ethnicity, and diagnosis categories. Twenty-six percent of patients with positive tests who were not treated presumptively had no treatment recorded within 30 days.

Conclusions: Presumptive treatment for CT/GC was commonly used in this clinic population. It improved treatment coverage and reduced time to treatment, though some uninfected persons were treated. The impact of presumptive treatment on partner notification and treatment requires further study.

Chlamydia (CT) and gonorrhea (GC) are among the most frequently occurring reportable infections in the United States with an estimated combined incidence of 3.68 million cases in 2008, and are associated with significant costs to the health care system.[1,2] Presumptive

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antibiotic treatment, before laboratory confirmation, is recommended for suspected CT and GC infections including patients with symptoms, partners of infected persons (who may have incubating infections that test negative), and others at high risk of infection.[3] Results for CT/GC screening tests are generally not available on the day of the clinical visit, so presumptive treatment avoids delays and assures treatment when adequate follow-up is questionable.[3] Conversely, asymptomatic patients without known risk of infection may be less likely to be treated presumptively, and possibly also less likely to return promptly for follow-up treatment due to a lack of perceived urgency. Such delays in treatment may lead to the development of complications or further transmission of infection.[4]

In the absence of rapid point-of-care tests or other standardized clinical tools for diagnosis, presumptive treatment decisions are dependent on individual clinician or clinic discretion. However, the appropriate use of presumptive CT/GC treatment by clinicians may be quite low.[5] Several recent studies have described the frequency and appropriateness of presumptive treatment for CT/GC, but most have focused on emergency department settings.[6–11] We found only one recent study that examined presumptive treatment in the health department setting.[12] It is possible that the potential benefits and drawbacks of presumptive treatment for CT/GC are quite different in public health clinics than in other clinical settings. In addition, most of these previous studies focused more on the prevalence of over-treatment rather than on the consequences of undertreatment (ie, when patients not treated presumptively do not return for treatment). The implications of presumptive treatment in terms of treatment delays and partner notification are seldom assessed.

The purpose of our study was to describe the prevalence and appropriateness of presumptive treatment for CT/GC among public health department sexually transmitted disease (STD) and family planning (FP) clinics in Virginia stratified by both patient and clinic characteristics. Additionally, we sought to characterize variations in eventual treatment outcomes among infected individuals who were not presumptively treated.

MATERIALS AND METHODS

We performed a retrospective cross-sectional analysis of data from patient visits with valid CT/GC laboratory test results (nucleic acid amplification test or culture) who attended local health department clinics in Virginia in 2016. We did not exclude repeat testing visits from the same patient. These health department clinics did not use electronic medical records. Therefore, we extracted basic information on patient clinic visits from a statewide financial management data system. This financial system was used by the majority of health department clinics in Virginia in 2016, and captured information on patient demographics (sex, age, race, ethnicity) and clinic visit information including all procedures performed at each visit (ie, collection of specimens for laboratory testing and any medications administered). This system also used a specific procedure code for visits when patients indicated that they were a contact to a diagnosed STD case (includes patients referred either directly by their sex partners or by disease intervention specialists). Information on patient chief complaints and symptoms were not available from this database. These patient visit data were merged (using unique client identifiers) with electronic laboratory reporting data from the state public health laboratory, which conducted all CT/GC nucleic

acid amplification test and culture testing for the health department clinics using the aforementioned financial system during this time.

We defined presumptive treatment as an appropriate treatment regimen, based on the eventual diagnosis and CDC's 2015 treatment recommendations, that was administered on the same day as specimen collection for CT/GC laboratory testing.[3] We calculated how often patients with positive CT/GC tests were treated on the same day as the initial testing visit or during a follow-up visit within 1 to 30 days of the specimen collection date. We also calculated how many patients with negative tests were treated presumptively.

All analyses were stratified by patient and clinic characteristics. We calculated the crude and adjusted prevalence ratio (aPR) of appropriate presumptive and follow-up treatment using log binomial regression. We included the following variables in multivariate regression analyses to adjust for potential confounding: sex, race/ethnicity, age, STD contact status, CT/GC diagnosis, clinic type (STD or FP), and clinic volume (dichotomized a priori based on the mean plus standard deviation of the annual patient visits per clinic, equivalent to 1360 visits per year). For CT- and/or GC-positive patients who were not presumptively treated on the same day as specimen collection, we assessed variations in time to follow-up treatment by these same characteristics. All analyses were performed using SAS software version 9.4 (SAS Institute, Cary, NC). This was a secondary analysis of routinely collected surveillance data. It was considered a non-research activity and approved for exemption from review by the Virginia Department of Health Institutional Review Board.

RESULTS

Of 63,889 patient visits (hereafter referred to simply as patients) with valid laboratory results from 131 local health department clinics, 13% had a positive CT or GC test result; 17% (6753 of 38,762) of the STD clinic patients and 7% (1750 of 25,127) of the FP clinic patients. Overall, 45% (3843 of 8503) of patients with positive tests were treated presumptively (ie, on the same date of specimen collection for CT/GC laboratory testing), whereas 10% (5600 of 55,386) of patients with negative tests were treated presumptively. Among the 9443 patients presumptively treated, 41% (3843) had positive test results.

The frequency of presumptive treatment varied by clinic type. Presumptive treatment for persons with positive tests was significantly more common among patients diagnosed in STD clinics compared with FP clinics (54.4% vs. 9.8%, $\chi^2 = 1039$, $P < 0.001$), as was presumptive treatment for persons with negative tests (15.2% vs. 3.2%). Therefore, all subsequent analyses were stratified by clinic type (Tables 1–2). Presumptive treatment for patients with positive tests was more common among males than females in both STD clinics (65.5% vs. 33.9%; aPR, 1.9; 95% confidence interval [CI], 1.8–2.02) and FP clinics (27.3% vs. 8.7%; aPR, 2.1; 95% CI, 1.5–2.9). We observed smaller variations across age, race/ethnicity, and diagnosis categories.

Presumptive treatment remained approximately twice as common for men across all ages and GC/CT test result outcomes (Table 3). Men attending STD clinics who tested positive for GC only had the highest frequency of presumptive treatment (68.9%), followed by men

testing positive for both CTand GC (66.0%), and then CT only (64.3%). Older men (≥40 years) who tested positive for GC in STD clinics were the subgroup most likely to be treated presumptively (78.2%). Relatively few men attended FP clinics, but those who tested positive for CT only were the most likely to be treated presumptively (29.0%). Presumptive treatment among women showed smaller variations across positive test result categories, although presumptive treatment appeared to occur slightly more frequently for younger women in both STD and FP clinics (≤19 years and 20–29 years). Gram stain results were not available for this analysis, but health department clinics in Virginia had very limited capacity to perform gram stains during this study period.

Patients who were presumptively treated received treatment for their infection(s) an average of 9.9 (SD, 5.2) days earlier than patients who were treated based on test results regardless of clinic type. There were no notable variations in the average days to treatment when stratified by patient characteristics (data not shown). For the 4660 patients with positive tests who were not presumptively treated, 31.9% received appropriate treatment within 7 days, 63.8% within 14 days, and 73.6% within 30 days. Thus, 26.4% of patients with positive tests who were not presumptively treated remained without evidence of treatment after 30 days; 31.0% of males and 23.4% of females in STD clinics, and 73.8% of males and 22.6% of females in FP clinics.

Appropriate follow-up treatment within 30 days varied by patient characteristics (Tables 1–2). Patients younger than 19 years had lower levels of appropriate follow-up treatment within 30 days than those in any other age group in both STD clinics and FP clinics. While comprised of relatively small numbers, men with positive tests who attended FP clinics were the least likely to receive appropriate treatment within 30 days. Fifty-nine of 110 men with positive tests had no record of treatment within 30 days (aPR, 0.7; 95% CI, 0.6–0.8). Patients diagnosed at larger volume (≥1360 visits per year) STD clinics were treated presumptively more frequently (57.1% vs. 48.8%), but were equally likely to have been treated within 30 days (87.8% vs. 87.5%). In contrast, patients diagnosed at larger volume FP clinics were slightly less likely to be treated presumptively (8.1% vs. 11.0%), and they remained less likely to have a record of treatment within 30 days (71.4% vs. 81.2%; aPR, 0.96; 95% CI, 0.9–1.0).

A subanalysis of 13 of the largest volume clinics found that test positivity ranged from 10% to 22%. Of patients with positive test results, 51% were treated presumptively (range, 28–62%), and 13% of patients with negative test results were treated presumptively (range, 6–19%). In STD clinics, 57% of patients with positive tests were presumptively treated compared to only 8% in FP clinics (16% and 3% of patients with negative tests were presumptively treated in these two settings respectively). After stratifying by clinic type, the frequency of presumptive treatment was not correlated with patient volume, clinic geographic region, or CT/GC test positivity rate (data not shown).

DISCUSSION

The average CT/GC positivity rate in our clinic population, based on patient visits, was 13% (17% in STD clinics, 7% in FP clinics). We found that just over half (54%) of all persons

with positive CT/GC test results were treated presumptively with an appropriate antibiotic therapy in STD clinics, which is on the lower end of the range reported by previous studies conducted in emergency departments (54%–68%).[6,9,10] Only 10% of persons testing positive in FP clinics were presumptively treated, possibly reflecting differences in the characteristics of patients presenting to these settings. Similar to previous research, we found that men were more likely than women to be treated presumptively for CT/GC in both STD and FP clinics, possibly because of a propensity for infected men to present with symptoms.[9–11,13]

Although only 10% of the patients with negative laboratory tests for CT/GC were treated presumptively in our study (15% in STD clinics, 3% in FP clinics), our estimate of the number of people presumptively treated for CT/GC who ended up having negative test results was 66% (57% in STD clinics, 81% in FP clinics), similar to the 68% observed in the other recent study of presumptive treatment in a public STD clinic in Florida.[12] We chose not to focus on overtreatment in this analysis, as it was impossible to determine based on the data available. For example, our “over-treated” category would include patients treated for recent STD exposure who tested negative but had incubating infections. Furthermore, as only CT/GC test results were available, we were not able to account for other symptomatic urogenital infections such as atypical urethritis which may be treated with the same antibiotics as CT. A study in a Washington, DC, STD clinic found 31.2% of men had atypical urethritis.[14] This may partly explain why males were treated presumptively more often than females in our study.

There is some concern that presumptive treatment for CT/GC may result in over-treatment and potentially lead to antibiotic resistance, adverse effects, and waste of limited health department resources. Although presumptive treatment for CT/GC in this clinic population resulted in some apparent over-treatment, it may be warranted as untreated patients did not always return quickly, or at all, for follow-up treatment, thus increasing the risk of under-treatment, potential for medical complications, and further transmission of infection. Among infected patients not presumptively treated, 26% remained untreated after 30 days (23% of females and 33% of males). Our findings are comparable to previous studies, in which 20% of STD clinic patients[15] and 8% to 32% of ED patients remained untreated.[8]

We believe that the threat of antibiotic resistance due specifically to presumptive treatment is small, particularly when applied to public health department settings which dispense only a fraction of these very common antibiotics. One recent ecological study did not find an association between population-level prescribing rates of clinically relevant antibiotics and *Neisseria gonorrhoeae* antimicrobial drug susceptibility.[16] There is limited evidence suggesting that frequent azithromycin use might play a role in decreasing susceptibility to azithromycin (as measured by an increase in minimum inhibitory concentrations),[17] but the same has not been demonstrated for ceftriaxone. Overall, evidence for an association between antimicrobial drug use and gonococcal susceptibility is lacking at this time, and while this is an important consideration in the provision of presumptive treatment, more research is needed.

The financial cost of presumptive treatment in Virginia's health department clinics was just US $2 per patient for dual therapy with ceftriaxone and azithromycin in 2016. The cost of treating uninfected patients is far outweighed by the benefit from prompt treatment and the reduced need for follow-up clinic visits. Indeed, several previous studies have suggested that mass treatment may be an economically and medically feasible approach in selected clinic settings.[5,18,19]

Further research is needed to see if presumptive treatment reduces the likelihood of partner notification. Patients may be less likely to tell a partner about a presumed infection than a diagnosed infection. Bowen[20] reported that patients treated presumptively were less likely to receive their test results than patients who were not treated presumptively at an STD clinic (46% vs. 83%).

This study has some limitations. The lack of information about patient symptoms and exposure (ie, sexual history) status in our administrative dataset is a major limitation of this study, as we were missing key information about provider rationale in deciding whether to treat presumptively. All procedures performed during the clinic visits were captured by this data system, but results of physical examinations and other medical observations were not. Similarly, we defined presumptive treatment as treatment administered on the same day as specimen collection for CT/GC laboratory testing, not based on actual clinician documentation. In terms of our measurement of under-treatment, we did not look beyond a 30 day window after testing, and it is possible that patients received treatment at other (non–health department) facilities. However, we believe this scenario to be unlikely, as treatment services were provided at no cost for patients who returned to health department clinics. The main exception might be clients who subsequently developed symptoms prompting immediate medical care.

The emergence of reliable rapid assays for CT/GC screening would dramatically change the current presumptive treatment dynamic for many patients, although it would not influence presumptive treatment decisions for recently exposed partners who may be incubating infections. Some such rapid tests already exist, but long test completion times (about 90 minutes) and high costs still limit their utility in acute care settings.[21–24] As new more efficient rapid tests are developed, our ability to accurately diagnose and treat STDs in real time will be greatly improved. Until then, we need to carefully consider both the positive and negative implications of presumptive treatment for sexually transmitted infections in various clinical settings, especially considering the high fraction of patients visiting health department clinics in this study that appear to have gone untreated. Promoting presumptive treatment for CT/GC at the time of testing may help reduce this occurrence among clinic populations with a high likelihood of loss to follow-up.

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Disclaimer:

The findings and conclusions are those of the authors alone and do not necessarily represent the views of the Centers for Disease Control and Prevention or of the Virginia Department of Health.

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TABLE 1A.

Presumptive and Follow-Up Treatment Among Patients Tested for CT and GC in STD Clinics, 2016

		Tested Negative for CT/GC			Tested Positive for CT and/or GC						
	All Patients	Total Negative	Treated at Initial Visit		Total Positive	Treated at Initial Visit*		Treated Within 1–30 Days*		Not Treated Within 30 Days	
Patient and Clinic Characteristics	**N**	**N**	**N**	**(%)**	**N**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**
Sex											
Female	18,202	15,819	1591	(10.1)	2383	807	(33.9)	1208	(50.7)	368	(15.4)
Male	20,560	16,190	3267	(20.2)	4370	2864	(65.5)	1039	(23.8)	467	(10.7)
Age											
≤ 19	4396	3136	509	(16.2)	1260	611	(48.5)	433	(34.4)	216	(17.1)
20–29	20,752	16,526	2646	(16.0)	4226	2332	(55.2)	1424	(33.7)	470	(11.1)
30–39	8233	7281	1071	(14.7)	952	542	(56.9)	292	(30.7)	118	(12.4)
≥ 40	5381	5066	632	(12.5)	315	186	(59.0)	98	(31.1)	31	(9.8)
Race/ethnicity											
Black†	23,935	19,327	3157	(16.3)	4608	2524	(54.8)	1504	(32.6)	580	(12.6)
White†	10,379	8963	1155	(12.9)	1416	743	(52.5)	496	(35.0)	177	(12.5)
Asian†	482	424	50	(11.8)	58	28	(48.3)	20	(34.5)	10	(17.2)
Other†	1407	1168	157	(13.4)	239	127	(53.1)	84	(35.1)	28	(11.7)
Hispanic	2478	2056	335	(16.3)	422	248	(58.8)	140	(33.2)	34	(8.1)
Unknown	81	71	4	(5.6)	10	1	(10.0)	3	(30.0)	6	(60.0)
STD contact‡											
Yes	2299	1723	497	(28.8)	576	433	(75.2)	95	(16.5)	48	(8.3)
No	36,463	30,286	4361	(14.4)	6177	3238	(52.4)	2152	(34.8)	787	(12.7)
Clinic volume§											
Low volume	14346	12,106	1589	(13.1)	2240	1093	(48.8)	874	(39.0)	273	(12.2)
High volume	24,416	19,903	3269	(16.4)	4513	2578	(57.1)	1373	(30.4)	562	(12.5)
Diagnosis											
CT only	4698	—	—	—	4698	2497	(53.2)	1656	(35.2)	545	(11.6)
GC only	1444	—	—	—	1444	842	(58.3)	399	(27.6)	203	(14.1)
CT/GC coinfection	611	—	—	—	611	332	(54.3)	192	(31.4)	87	(14.2)
Overall	38,762	32,009	4858	(15.2)	6753	3671	(54.4)	2247	(33.3)	835	(12.4)

*Only includes patients who received appropriate and complete treatment as defined by the CDC's 2015 STD Treatment Guidelines (ie, excludes partial or inappropriate treatment regimens).

[†] Non-Hispanic.

[‡] Administrative flag indicating the patient was a contact to a case.

[§] Dichotomized a priori based on the mean and standard deviation of the number of annual visits per clinic (<1360 or ≥1360 visits/year).

TABLE 1B.

Presumptive and Follow-Up Treatment Among Patients Tested for CT and GC in FP Clinics, 2016

		Tested Negative for CT/GC			Tested Positive for CT and/or GC						
	All Patients	Total Negative	Treated at Initial Visit		Total Positive	Treated at Initial Visit*		Treated Within 1–30 Days*		Not Treated Within 30 Days	
Patient and Clinic Characteristics	**N**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**(%)**	**n**	**(%)**
Sex											
Female	24,649	23,009	705	(3.1)	1640	142	(8.7)	1160	(70.7)	338	(20.6)
Male	478	368	37	(10.1)	110	30	(27.3)	21	(19.1)	59	(53.6)
Age											
≤ 19	6261	5598	92	(1.6)	663	56	(8.4)	412	(62.1)	195	(29.4)
20–29	12,562	11,652	387	(3.3)	910	102	(11.2)	643	(70.7)	165	(18.1)
30–39	5014	4854	217	(4.5)	160	14	(8.8)	115	(71.9)	31	(19.4)
≥ 40	1290	1273	46	(3.6)	17	0	(0.0)	11	(64.7)	6	(35.3)
Race/ethnicity											
Black†	9193	8226	326	(4.0)	967	88	(9.1)	656	(67.8)	223	(23.1)
White†	10,002	9502	200	(2.1)	500	54	(10.8)	344	(68.8)	102	(20.4)
Asian†	208	198	6	(3.0)	10	1	(10.0)	5	(50.0)	4	(40.0)
Other†	646	600	19	(3.2)	46	6	(13.0)	30	(65.2)	10	(21.7)
Hispanic	5060	4835	190	(3.9)	225	23	(10.2)	144	(64.0)	58	(25.8)
Unknown	18	16	1	(6.3)	2	0	(0.0)	2	(100.0)	0	(0.0)
STD contact‡											
Yes	43	27	5	(18.5)	16	9	(56.3)	5	(31.3)	2	(12.5)
No	25,084	23,350	737	(3.2)	1734	163	(9.4)	1176	(67.8)	395	(22.8)
Clinic volume§											
Low volume	16,444	15,389	478	(3.1)	1055	116	(11.0)	741	(70.2)	198	(18.8)
High volume	8683	7988	264	(3.3)	695	56	(8.1)	440	(63.3)	199	(28.6)
Diagnosis											
CT only	1498	—	—	—	1498	150	(10.0)	1006	(67.2)	342	(22.8)
GC only	162	—	—	—	162	16	(9.9)	110	(67.9)	36	(22.2)
CT/GC coinfection	90	—	—	—	90	6	(6.7)	65	(72.2)	19	(21.1)
Overall	25,127	23,377	742	(3.2)	1750	172	(9.8)	1181	(67.5)	397	(22.7)

*Only includes patients who received appropriate and complete treatment as defined by the CDC's 2015 STD Treatment Guidelines (ie, excludes partial or inappropriate treatment regimens).

[†]Non-Hispanic.

[‡]Administrative flag indicating the patient was a contact to a case.

[§]Dichotomized a priori based on the mean and standard deviation of the number of annual visits per clinic (<1360 or ≥1360 visits/year).

TABLE 2A.

Log Binomial Regression Analysis of Appropriate Presumptive and Follow-Up Treatment Among STD Clinic Patients With Positive Laboratory Test Results for GC and/or CT, 2016

	Initial Visit				Within 30 Days of Initial Visit			
	Crude PR		Adjusted PR*		Crude PR		Adjusted PR*	
Patient Characteristic	**(95% CI)**		**(95% CI)**		**(95% CI)**		**(95% CI)**	
Sex								
Male	1.94	(1.82–2.06)	1.89	(1.78–2.01)	1.06	(1.04–1.08)	1.05	(1.03–1.07)
Female	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Age, y								
≤ 19	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
20–29	1.14	(1.07–1.21)	1.00	(0.95–1.06)	1.07	(1.04–1.10)	1.06	(1.03–1.09)
30–39	1.17	(1.08–1.27)	1.00	(0.93–1.07)	1.06	(1.02–1.09)	1.05	(1.02–1.09)
≥ 40	1.22	(1.09–1.36)	0.98	(0.89–1.07)	1.09	(1.04–1.14)	1.08	(1.04–1.13)
Race/ethnicity								
Black†	1.04	(0.99–1.10)	0.92	(0.88–0.97)	1.00	(0.98–1.02)	0.99	(0.97–1.02)
White†	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Asian†	0.92	(0.70–1.21)	0.98	(0.77–1.25)	0.95	(0.84–1.07)	0.97	(0.87–1.09)
Other†	1.01	(0.80–1.15)	0.96	(0.86–1.06)	1.01	(0.96–1.06)	1.01	(0.96–1.06)
Hispanic	1.12	(1.02–1.23)	1.00	(0.93–1.08)	1.05	(1.02–1.09)	1.03	(1.00–1.06)
STD contact‡								
Yes	1.43	(1.36–1.51)	1.33	(1.27–1.39)	1.05	(1.02–1.08)	1.03	(1.01–1.06)
No	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Clinic volume§								
Low volume	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
High volume	1.17	(1.11–1.23)	1.20	(1.15–1.26)	1.00	(0.98–1.02)	1.00	(0.98–1.02)
Diagnosis								
CT only	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
GC only	1.10	(1.04–1.15)	1.02	(0.98–1.07)	0.97	(0.95–1.00)	0.96	(0.94–0.99)
CT/GC coinfection	1.02	(0.95–1.10)	1.00	(0.93–1.07)	0.97	(0.94–1.00)	0.97	(0.94–1.00)

*Adjusted for all other characteristics shown in this table.

†Non-Hispanic.

[‡]Administrative flag indicating the patient was a contact to a case.

[§]Dichotomized a priori based on the mean and standard deviation of the number of annual visits per clinic (<1360 or ≥1360 visits/year).

TABLE 2B.

Log Binomial Regression Analysis of Appropriate Presumptive and Follow-Up Treatment Among FP Clinic Patients With Positive Laboratory Test Results for GC and/or CT, 2016

	Initial Visit				Within 30 Days of Initial Visit			
	Crude PR		Adjusted PR*		Crude PR		Adjusted PR*	
Patient Characteristics	**(95% CI)**		**(95% CI)**		**(95% CI)**		**(95% CI)**	
Sex								
Male	3.15	(2.23–4.44)	2.09	(1.52–2.88)	0.58	(0.48–0.72)	0.72	(0.63–0.82)
Female	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Age, y								
≤ 19	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
20–29	1.33	(0.97–1.81)	1.05	(0.83–1.33)	1.16	(1.09–1.23)	1.11	(1.06–1.16)
30–39	1.04	(0.59–1.81)	0.96	(0.63–1.46)	1.14	(1.04–1.25)	1.09	(1.01–1.18)
≥ 40	—	—	—	—	0.92	(0.64–1.31)	1.02	(0.79–1.30)
Race/ethnicity								
Black†	0.84	(0.61–1.16)	0.98	(0.76–1.27)	0.97	(0.91–1.02)	0.99	(0.95–1.04)
White†	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Asian†	0.93	(0.14–6.05)	1.11	(0.26–4.78)	0.75	(0.45–1.25)	0.86	(0.60–1.24)
Other†	1.21	(0.55–2.65)	0.96	(0.50–1.82)	0.98	(0.84–1.15)	1.04	(0.93–1.17)
Hispanic	0.95	(0.60–1.50)	1.09	(0.75–1.59)	0.93	(0.85–1.02)	0.99	(0.92–1.07)
STD contact‡								
Yes	5.98	(3.79–9.44)	3.16	(1.87–5.35)	1.13	(0.94–1.37)	1.08	(0.95–1.21)
No	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
Clinic volume§								
Low volume	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
High volume	0.73	(0.54–0.99)	0.83	(0.65–1.06)	0.88	(0.83–0.93)	0.96	(0.91–1.00)
Diagnosis								
CT only	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)	1.00	(*reference*)
GC only	0.99	(0.60–1.61)	1.04	(0.71–1.52)	1.01	(0.92–1.10)	1.02	(0.95–1.09)
CT/GC coinfection	0.67	(0.30–1.46)	0.71	(0.42–1.20)	1.02	(0.92–1.14)	1.02	(0.93–1.11)

*Adjusted for all other characteristics shown in this table.

†Non-Hispanic.

‡Administrative flag indicating the patient was a contact to a case.

§Dichotomized a priori based on the mean and standard deviation of the number of annual visits per clinic (<1360 or ≥1360 visits/year).

TABLE 3A.

Presumptive Treatment Stratified by Test Result Among Patients Tested for CT and GC in Health Department STD Clinics, 2016

	CT/GC Negative			CT Positive			GC Positive			CT and GC Positive		
	Total Negative	Treated at Initial Visit		Total Positive	Treated at Initial Visit*		Total Positive	Treated at Initial Visit*		Total Positive	Treated at Initial Visit*	
Patient Sex and Age	**N**	**N**	**(%)**	**N**	**n**	**(%)**	**n**	**N**	**(%)**	**N**	**N**	**(%)**
Females, age, y												
≤ 19	1972	271	(13.7)	534	195	(36.5)	73	18	(24.7)	69	18	(26.1)
20–29	8341	878	(10.5)	1057	375	(35.5)	233	75	(32.2)	115	37	(32.2)
30–39	3336	288	(8.6)	158	47	(29.7)	72	22	(30.6)	15	5	(33.3)
≥ 40	2170	154	(7.1)	35	7	(20.0)	19	6	(31.6)	3	2	(66.7)
All females	15,819	1,591	(10.1)	1784	624	(35.0)	397	121	(30.5)	202	62	(30.7)
Males, age, y												
≤ 19	1164	238	(20.4)	416	268	(64.4)	97	68	(70.1)	71	44	(62.0)
20–29	8185	1,768	(21.6)	1972	1283	(65.1)	590	389	(65.9)	259	173	(66.8)
30–39	3945	783	(19.8)	420	266	(63.3)	227	160	(70.5)	60	42	(70.0)
≥ 40	2896	478	(16.5)	106	56	(52.8)	133	104	(78.2)	19	11	(57.9)
All males	16,190	3,267	(20.2)	2914	1873	(64.3)	1047	721	(68.9)	409	270	(66.0)
Overall	32,009	4,858	(15.2)	4698	2497	(53.2)	1444	842	(58.3)	611	332	(54.3)

*Only includes patients who received an appropriate and complete treatment regimen as defined by the CDC's 2015 STD Treatment Guidelines.

TABLE 3B.

Presumptive Treatment Stratified by Test Result Among Patients Tested for CT and GC in Health Department FP Clinics, 2016

	CT/GC Negative			CT Positive			GC Positive			CT and GC Positive		
	Total Negative	Treated at Initial Visit		Total Positive	Treated at Initial Visit*		Total Positive	Treated at Initial Visit*		Total Positive	Treated at Initial Visit*	
Patient Sex and Age	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**	**N**	**n**	**(%)**
Females, age, y												
≤ 19	5527	87	(1.6)	563	42	(7.5)	43	6	(14.0)	39	3	(7.7)
20–29	11,452	362	(3.2)	707	71	(10.0)	82	7	(8.5)	41	1	(2.4)
30–39	4789	211	(4.4)	127	10	(7.9)	21	1	(4.8)	4	1	(25.0)
≥ 40	1241	45	(3.6)	8	0	(0.0)	4	0	(0.0)	1	0	(0.0)
All females	23,009	705	(3.1)	1405	123	(8.8)	150	14	(9.3)	85	5	(5.9)
Males, age, y												
≤ 19	71	5	(7.0)	17	5	(29.4)	0	0	—	1	0	(0.0)
20–29	200	25	(12.5)	69	21	(30.4)	7	1	(14.3)	4	1	(25.0)
30–39	65	6	(9.2)	5	1	(20.0)	3	1	(33.3)	0	0	—
≥ 40	32	1	(3.1)	2	0	(0.0)	2	0	(0.0)	0	0	—
All males	368	37	(10.1)	93	27	(29.0)	12	2	(16.7)	5	1	(20.0)
Overall	23,377	742	(3.2)	1498	150	(10.0)	162	16	(9.9)	90	6	(6.7)

*Only includes patients who received an appropriate and complete treatment regimen as defined by the CDC's 2015 STD Treatment Guidelines.