Adherence to Centers for Disease Control and Prevention Gonococcal Treatment Guidelines Among Chicago Health Care Providers, 2011–2012

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Background: Expansion of antimicrobial resistance in Neisseria gonorrhoeae requires rapid adaptation of treatment guidelines and responsive provider practice. We evaluated patient factors associated with provider adherence to the Centers for Disease Control and Prevention gonococcal treatment recommendations among Chicago providers in 2011 to 2012.

Methods: Laboratory-confirmed cases of uncomplicated urogenital gonorrhea were classified via surveillance data as originating from Chicago Department of Public Health (CDPH) or non-CDPH providers. Recommended treatment was determined according to the Centers for Disease Control and Prevention sexually transmitted disease treatment guidelines: April 2011–July 2012 (period 1) and August–December 2012 (period 2, after August 2012 revision). Multivariable log-binomial regression identified factors associated with recommended treatment over time, stratified by provider type.

Results: April 2011 through December 2012, 16,646 laboratory-confirmed gonorrhea cases were identified, of which 9597 (57.7%) had treatment information: 2169 CDPH cases and 7428 non-CDPH cases. Documented recommended treatment increased for CDPH (period 1: 71.3%, period 2: 80.8%; P < 0.01) and non-CDPH providers (period 1: 63.5%, period 2: 68.9%; P < 0.01). Among CDPH cases, statistically significant factors associated with recommended treatment were male sex (adjusted prevalence rate ratio [aPRR], 1.16) white versus black race (aPRR, 0.68), same-day treatment (aPRR, 1.07), and period 2 (aPRR, 1.11). Among non-CDPH cases, statistically significant factors were as follows: male sex (aPRR, 1.10), other versus black race (aPRR, 0.91), same-day treatment (aPRR, 1.31), greater number of within-facility reported cases (aPRRs ranging from 1.22 to 1.41), and at least 50% within-facility missing treatment data (aPRR, 0.84).

Conclusions: Recommended treatment improved over time, yet remains suboptimal. Efforts to reduce variability and improve provider adherence to recommended treatment are urgently needed.

Gonorrhea is the second most commonly reported notifiable communicable disease in the United States, with more than 300,000 cases annually,1 and an estimated annual incidence of more than 800,000 cases.2 Gonorrhea is a major cause of pelvic inflammatory disease, infertility, ectopic pregnancy, and chronic pelvic pain3 and can facilitate the transmission and acquisition of HIV infection.4–6 Over time, Neisseria gonorrhoeae has developed decreasing susceptibility to the several classes of antibiotics, thus reducing the options for treatment.

Since 1986, the Centers for Disease Control and Prevention (CDC) has conducted surveillance of antimicrobial resistance through the Gonococcal Isolate Surveillance Project.7 Increases in fluoroquinolone-resistant N. gonorrhoeae led to changes in national guidelines that now limit the recommended treatment to a single class of drug, cephalosporins.8 Currently, for uncomplicated gonorrhea, CDC recommends combination therapy with ceftriaxone 250 mg intramuscularly and either azithromycin 1 g orally as a single dose or doxycycline 100 mg orally twice daily for 7 days.3 If cefixime is used as an alternative agent, then the patient should return in 1 week for a test of cure at the site of infection.9 Efficacious treatment and limiting the spread of resistance rely on surveillance to monitor treatment practices and providers’ adherence to treatment recommendations. We evaluated the trends in provider adherence to recommended treatment of gonorrhea according to CDC treatment guidelines and identified associated patient and provider factors among health care providers at private and public health clinics in Chicago, Illinois, from April 2011 through December 2012.

METHODS

This study was determined to be exempt from human subjects review by institutional review boards of the Chicago Department of Public Health (CDPH) and by the University of Illinois at Chicago. This was an analysis of retrospective data collected on laboratory-confirmed gonorrhea cases reported to the CDPH from April 1, 2011, through December 31, 2012. We assessed treatment trends 16 months before the release of the CDC treatment guidelines (period 1: April 2011 through July 2012) and after the release of the August 2012 treatment updates (period 2: August through December 2012).10

According to the Illinois State law, medical providers are required to report gonorrhea cases to the CDPH sexually transmitted disease (STD) surveillance unit.10 Cases reported by CDPH clinics (93.4% from STD specialty clinics) were defined as CDPH providers, whereas cases reported by other providers (community health centers [CHCs], hospitals, primary physicians, etc) were defined as non-CDPH providers. The CDPH STD/HIV Division operates 5 high-volume STD specialty clinics located throughout the city, serving a varied clientele (with regard to sex, race, ethnicity, and sexual orientation). Combined, CDPH STD clinics recorded more than 23,000 annual patient visits in 2011 and approximately 22,000 in 2012.

Gonorrhea and chlamydia are reported through a Web-based surveillance system called Illinois National Electronic Disease Surveillance System (I-NEDSS). I-NEDSS contains positive

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TABLE 1. Distribution of Case Characteristics by Provider Type

| Variables* | Non-CDPH Providers (n = 7428), n (%) | CDPH STD Clinics (n = 2169), n (%) |
|------------|-------------------------------------|----------------------------------|
| Age, y     |                                    |                                  |
| Median (IQR) | 21.0 (18–26)                       | 23.0 (20–29)                     |
| 13–19      | 2823 (38.0)                         | 465 (21.4)                       |
| 20–24      | 2439 (32.8)                         | 784 (36.2)                       |
| 25–29      | 1041 (14.0)                         | 442 (20.4)                       |
| 30–39      | 755 (10.2)                          | 314 (14.5)                       |
| 40–49      | 278 (3.7)                           | 122 (5.6)                        |
| ≥50        | 92 (1.2)                            | 42 (1.9)                         |
| Sex        |                                    |                                  |
| Female     | 4135 (55.7)                         | 522 (24.1)                       |
| Male       | 3284 (44.3)                         | 1643 (75.9)                      |
| Race/Ethnicity |                                  |                                  |
| Non-Hispanic black | 5582 (75.8) | 1923 (88.7)                     |
| Non-Hispanic white | 557 (7.6)   | 87 (4.0)                        |
| Hispanic   | 374 (5.1)                           | 87 (4.0)                         |
| Non-Hispanic other | 853 (11.6) | 72 (3.3)                        |
| Observation period |                            |                                  |
| April 2011 through July 2012 | 5388 (72.5) | 1705 (78.6)                     |
| August 2012 through December 2012 | 2040 (27.5) | 464 (21.4)                      |
| Time to treatment, median (IQR), d | 0.0 (0–6)             | 0.0 (0–0)                        |
| Time from diagnosis date to treatment date, d |                                   |                                  |
| 0 (same-day treatment) | 3612 (51.7) | 1676 (78.6)                     |
| 1–6        | 1610 (23.1)                         | 43 (2.0)                         |
| 7–13       | 1089 (15.6)                         | 101 (4.7)                        |
| 14–20      | 302 (4.3)                           | 126 (5.9)                        |
| 21–27      | 115 (1.7)                           | 62 (2.9)                         |
| ≥28        | 253 (3.6)                           | 125 (5.9)                        |
| Provider setting |                                  |                                  |
| Hospital, Medical Center | 3080 (41.5) |                                  |
| CHC        | 2147 (28.9)                         |                                  |
| Private provider | 996 (13.4)          |                                  |
| Family planning, obstetrics and gynecology | 609 (8.2)  |                                  |
| Jail, prison | 274 (3.7)                          |                                  |
| School, university health clinic | 168 (2.3)   |                                  |
| ED, urgent care, immediate care | 78 (1.1)   |                                  |
| Non-CDPH public health clinic | 23 (0.3)      |                                  |
| Veterans’ Administration | 8 (0.1)          |                                  |
| HIV care clinic | 7 (0.1)                 |                                  |
| Online testing service | 6 (0.1)         |                                  |
| Outreach | 5 (0.1)                             |                                  |
| Other | 16 (0.2)                             |                                  |
| Missing | 11 (0.2)                             |                                  |
| FQHC   |                                    |                                  |
| No       | 6059 (81.7)                         |                                  |
| Yes      | 1360 (18.3)                         |                                  |
| No. gonorrhea cases reported over observation period at originating test facility |                     |
| <10      | 1803 (24.3)                         |                                  |
| 10–50    | 2425 (32.7)                         |                                  |
| 50–100   | 1370 (18.4)                         |                                  |
| ≥100     | 1830 (24.6)                         |                                  |

*Not all cells sum to n due to missing data.

IQR indicates interquartile range.

results of laboratory tests and morbidity reports provided by health care providers. If the test result for gonorrhea was reported as “positive,” “detected,” or “reactive,” the case was included in our analysis. Cases represented patients presenting with symptoms, suspected contact with an infected partner or for screening purposes, and submitted urine, urethral swab, or cervical swab specimens for nucleic acid amplification testing. In addition to test results and date of test, for each case, we obtained data regarding sex, age, race/ethnicity, and provider source. For cases reported by CDPH clinics, treatment data were extracted from the CDPH electronic medical record and matched to data extracted from I-NEDSS by patient's name, date of birth, and date of visit. For non-CDPH cases, all data were abstracted from I-NEDSS only.

Cases with treatment data were reviewed and categorized as recommended or nonrecommended based on the following criteria: treatment received from April 2011 through July 2012 (period 1, baseline) was defined as recommended if cases received an intramuscular (IM) injection of ceftriaxone 250 mg or oral cefixime 400 mg plus azithromycin 1 g (single dose) or doxycycline 100 mg (twice a day for 7 days). For cases treated between August 2012 through December 2012 (period 2), recommended therapy was defined as the combination of the injectable ceftriaxone 250 mg IM plus either azithromycin 1 g (single dose) or doxycycline 100 mg (twice a day for 7 days). Any other treatments were defined as nonrecommended treatment for analysis of factors associated with recommended therapy. We provide descriptive information for alternative recommended and not recommended treatments. There were 23 cases in which doses of doxycycline or azithromycin were not specified, and treatment was classified as not recommended due to inability to infer otherwise. Overall, 42% of cases had missing treatment information, and these cases were excluded from analysis.

Statistical Analysis

Data were analyzed using Stata/SE version 13.1 (StataCorp, College Station, TX). Categorical variables were summarized with frequency distributions. Data were stratified by non-CDPH or CDPH providers for all analyses due to significant differences in the rate of outcome, distributions of patient demographics, and numerous provider settings within non-CDPH cases. χ² Test was used to test for statistical significance in bivariate comparisons. Multivariable log binomial regression was performed to determine the patient factors associated with recommended treatment, expressed as a prevalence rate ratio (PRR). For analysis of CDPH cases, 95% confidence intervals (CIs) were estimated using robust variance. For non-CDPH cases, cluster-based variance estimation was used to allow for intragroup (i.e., within-facility) correlation. The level of significance was set as P < 0.05 (2 sided).

RESULTS

From April 2011 through December 2012, a total of 16,646 laboratory-confirmed gonococcal cases were identified. Treatment information was available for 57.7% (9597) of cases: 89.3% (2,169) of cases treated by CDPH providers and 52.2% (7,428) of cases treated by non-CDPH providers. Compared with those with available treatment data (Supplemental Table 1, http://links.lww.com/OLQ/A108), missing data were more likely among non-CDPH cases, 98% of which were CHCs. Demographic characteristics of cases with treatment information are presented in Table 1. Cases reported by non-CDPH
providers were most frequently aged 13 to 19 years (38.0% vs. 21.4% CDPH cases) and majority female (55.7%), whereas CDPH cases were primarily male (75.9%) and aged 20 to 24 years (36.2% CDPH cases vs. 32.8% non-CDPH). For both provider types, case race/ethnicity was most commonly non-Hispanic black (75.8% non-CDPH cases vs. 88.7% CDPH cases). Hospitals (41.5%), CHCs (28.9%), and private practitioners (13.4%) were the most common practice setting for non-CDPH cases. Nearly one-fourth (24.3%) of gonorrhea cases originated from test facilities reporting less than 10 cases of gonorrhea over the observation period.

TABLE 2. Recommended, Alternative, and Not Recommended Treatment Regimens by Provider Type and Period*

|                      | CDPH Provider | Non-CDPH |
|----------------------|---------------|----------|
|                      | Period 1      | Period 2  | Period 1      | Period 2  |
|                      | (n = 1705), n (%) | (n = 464 (n (%) | (n = 5388), n (%) | (n = 2040), n (%) |
| Recommended adequate† | 1215 (71.3) | 375 (80.8) | 3421 (63.5) | 1405 (68.9) |
| DT: Ceftriaxone + Azithro or Doxy | 1046 (61.3) | 375 (80.8) | 2980 (55.3) | 1400 (59.2) |
| DT: Cefpodoxime + Azithro or Doxy | 137 (8.0) | 375 (80.8) | 57 (1.1) | 375 (80.8) |
| DT: cefixime + Azithro or Doxy | 30 (1.8) | 375 (80.8) | 284 (5.3) | 375 (80.8) |
| DT: Other treatment both | 2 (0.1) | 375 (80.8) | 100 (1.9) | 375 (80.8) |
| Acceptable alternative | 66 (3.9) | 375 (80.8) | 200 (3.7) | 375 (80.8) |
| DT: Cefixime + Azithro or Doxy | 66 (3.9) | 375 (80.8) | 192 (3.6) | 375 (80.8) |
| ST: Azithromycin 2 g PO | 0 (0.0) | 375 (80.8) | 8 (0.1) | 375 (80.8) |
| IV therapy | 0 (0.0) | 375 (80.8) | 2 (0.2) | 375 (80.8) |
| Any adequate (recommended or acceptable regimen) | 1281 (75.1) | 378 (81.5) | 3621 (67.2) | 1504 (73.7) |
| Not recommended | 424 (24.9) | 378 (81.5) | 1767 (32.8) | 536 (26.3) |
| DT: Cefpodoxime + Azithro or Doxy | 9 (0.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| DT: doses not specified | 243 (14.3) | 31 (6.7) | 1,190 (26.1) | 400 (21.0) |
| ST: Ceftriaxone 250 mg IM | 0 (0.0) | 31 (6.7) | 9 (0.2) | 31 (6.7) |
| ST: Ceftriaxone 1 g IM | 9 (0.5) | 1 (0.2) | 144 (3.3) | 9 (0.2) |
| ST: Cefixime 400 mg PO | 32 (1.9) | 0 (0.0) | 18 (0.7) | 0 (0.0) |
| ST: Cefpodoxime 400 mg PO | 3 (0.2) | 0 (0.0) | 116 (2.6) | 0 (0.0) |
| DT: Ceftriaxone 125 mg IM + other‡ | 127 (7.3) | 51 (11.0) | 280 (5.1) | 88 (5.2) |
| ST: C. trachomatis treatment only§ | 1 (0.1) | 1 (0.2) | 10 (0.4) | 1 (0.1) |
| Other, not sufficient | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |

†Adequate treatment indicates that drug and dose were administered according to CDC STD treatment guidelines.
§“C. trachomatis treatment only” indicates treatment with only orally administered azithromycin in 1-g dose, or only doxycycline regimen of 7 to 14 days.
‡Ceftriaxone 125 mg IM administered alone, or in conjunction with azithromycin or doxycycline.

Trends in Recommended Treatment by Provider Type

Recommended treatment increased over time (Table 2) for both CDPH (period 1: 71.3%, period 2: 80.8%; P < 0.01) and non-CDPH providers (period 1: 63.5%, period 2: 68.9%; P < 0.01). Adherence to guidelines showed relatively stable increase over time at CDPH clinics, peaking at 88% in June 2012 (Fig. 1). Recommended treatment among non-CDPH providers also increased steadily over time, with no obvious inflection point after the update in August 2012, and peaked in November 2012 at 74%. Among non-CDPH cases, the increase over time in recommended treatment was observed for most provider settings (Fig. 2).
Patterns in Recommended and Nonrecommended Treatment Regimens

Among CDPH cases, recommended treatment was primarily dual therapy via ceftriaxone plus azithromycin or doxycycline (Table 2). As an acceptable alternative, azithromycin 2 g as a single oral dose was provided infrequently, decreasing from 3.9% in period 1 to 0.2% (a single case) in period 2. Similarly, the use of dual therapy with cefixime plus azithromycin or doxycycline as a recommended treatment in period 1 decreased from 1.8% to 0.4% (2 cases) as an acceptable alternative in period 2. These patterns were similar among non-CDPH cases, although acceptable alternative treatments were somewhat more common, used for 4% of cases over the observation period.

Nonrecommended treatment among CDPH cases decreased from 24.9% of cases in period 1 to 18.5% in period 2. In period 1, inadequate treatments were primarily single therapy with cefixime 250 mg IM (14.3%), treatment of *Chlamydia trachomatis* only (7.3%), and single therapy with cefpodoxime 400 mg orally (1.9%). Among non-CDPH cases, inadequate treatment in period 1 was due primarily to single therapy with cefixime 250 mg IM (26.1%), followed by cefixime 125 mg IM (6%) and treatment of *C. trachomatis* only (5.2%).

Factors Associated with Recommended Treatment

Among CDPH cases (Table 3), recommended treatment was highest for patients 50 years or older (76.2%) and lowest for patients aged 13 to 19 years (70.3%), although differences by age were not statistically significant. Recommended treatment was higher for male (76.0%) than for female (65.1%) cases, and this remained statistically significant in adjusted analyses (adjusted PRR [aPRR], 1.17; 95% CI, 1.09–1.25). Recommended treatment was highest for non-Hispanic black cases (74.5%) and Non-Hispanic other cases (73.6%), and substantially lower for non-Hispanic white cases (50.6%). In adjusted analyses, non-Hispanic white cases remained 32% less likely than non-Hispanic black cases to receive recommended treatment (aPRR, 0.68; 95% CI, 0.55–0.84). Same-day treatment was associated with a small but significant increase in recommended treatment (aPRR, 1.07; 95% CI, 1.00–1.15). The increase in recommended treatment in period 2 compared with period 1 remained significant (aPRR, 1.11; 95% CI, 1.05–1.17).

Among non-CDPH cases (Table 4), recommended treatment was highest for the 25- to 29-year-old age group (70.7%) and lowest for those 50 years and older (60.9%), although differences by age were no longer significant in multivariable analysis. Overall, recommended treatment was just 57.9% for female patients compared with 73.8% for male patients, highest for non-Hispanic whites (70.6%), and lowest for Non-Hispanic other cases (56.0%). In multivariable regression, men remained 10% more likely to be treated with recommended regimens (aPRR, 1.10; 95% CI, 1.05–1.16). For both CDPH and non-CDPH cases, the likelihood of recommended treatment remained lower for non-Hispanic white cases compared with non-Hispanic black cases (aPRR, 0.91; 95% CI, 0.84–0.98); other racial/ethnic comparisons were not significant. The likelihood of recommended treatment increased for cases reported by test facilities with at least 10 reported cases of gonorrhea and was 16% lower for those test facilities with at least 50% missing treatment data for reported cases (aPRR, 0.84; 95% CI, 0.76–0.92). Compared with period 1, the increase in recommended treatment was not statistically significant.

**DISCUSSION**

During a period of rapid change in guidelines, the proportion of cases with documented recommended treatment of uncomplicated urogenital gonorrhea increased substantially for cases originating from CDPH and non-CDPH providers. Although by the end of 2012 rates were similar, recommended treatment was generally higher for CDPH providers than for non-CDPH providers. We also identified patient demographic factors that were
TABLE 4. Patient Factors Associated With Recommended Treatment Among Cases Seen by Non-CDPH Providers

| Age, y | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|--------|-----------------------|----------------------|-------------------|-----------------------|
| 13–19  | 1737 (61.5)           | 1086 (38.5)          | 1.08 (1.01–1.16)  | 1.02 (0.98–1.07)      |
| 20–24  | 1631 (66.9)           | 808 (33.1)           | 1.15 (1.06–1.25)  | 1.04 (0.99–1.11)      |
| 25–29  | 736 (70.7)            | 305 (29.3)           | 1.03 (0.92–1.15)  | 0.98 (0.92–1.05)      |
| 30–39  | 480 (63.6)            | 275 (36.4)           | 1.09 (0.92–1.28)  | 0.98 (0.91–1.06)      |
| 40–49  | 186 (66.9)            | 92 (33.1)            | 0.99 (0.80–1.22)  | 0.95 (0.84–1.06)      |
| ≥50    | 56 (60.9)             | 36 (39.1)            | 1.28 (1.19–1.37)  | 1.10 (1.05–1.16)      |

| Sex    | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|--------|-----------------------|----------------------|-------------------|-----------------------|
| Female | 2396 (57.9)           | 1739 (42.1)          | 1.43 (1.36–1.51)  | 1.31 (1.17–1.46)      |
| Male   | 2425 (73.8)           | 859 (26.2)           | 1.28 (1.19–1.37)  | 1.10 (1.05–1.16)      |

| Race/Ethnicity | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|---------------|-----------------------|----------------------|-------------------|-----------------------|
| Non-Hispanic black | 3679 (65.9)           | 1903 (34.1)          | 1.07 (0.87–1.31)  | 1.01 (0.94–1.09)      |
| Non-Hispanic white | 393 (70.6)            | 164 (29.4)           | 0.98 (0.85–1.12)  | 0.96 (0.89–1.03)      |
| Hispanic      | 241 (64.4)            | 133 (35.6)           | 0.85 (0.77–0.94)  | 0.91 (0.84–0.98)      |
| Non-Hispanic other | 478 (56.0)           | 375 (44.0)           | Ref               | Ref                   |

| Same-day treatment | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|--------------------|-----------------------|----------------------|-------------------|-----------------------|
| No                 | 1775 (52.7)           | 1594 (47.3)          | 1.43 (1.30–1.56)  | 1.31 (1.17–1.46)      |
| Yes                | 2712 (75.1)           | 900 (24.9)           | Ref               | Ref                   |

| No. gonorrhea cases reported over observation period at originating test facility | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|---------------------------------------------------------------------------|-----------------------|----------------------|-------------------|-----------------------|
| <10                          | 906 (50.3)            | 897 (49.8)           | 1.07 (0.87–1.31)  | 1.01 (0.94–1.09)      |
| 10–50                | 1563 (64.5)           | 862 (35.5)           | 1.28 (1.15–1.43)  | 1.24 (1.13–1.36)      |
| 50–100              | 895 (65.3)            | 475 (34.7)           | 1.30 (1.09–1.55)  | 1.22 (1.04–1.42)      |
| ≥100                | 1462 (79.9)           | 368 (20.1)           | 1.59 (1.36–1.86)  | 1.41 (1.26–1.56)      |

| Percent of cases with missing treatment data at originating test facility | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|---------------------------------------------------------------------------|-----------------------|----------------------|-------------------|-----------------------|
| <50%                          | 3852 (68.4)           | 1778 (31.6)          | 1.22 (1.04–1.42)  | 1.22 (1.04–1.42)      |
| ≥50%                          | 974 (54.2)            | 824 (45.8)           | 0.79 (0.68–0.92)  | 0.84 (0.76–0.92)      |

| Observation period | Yes (n = 4826), n (%) | No (n = 2602), n (%) | Crude PRR (95% CI) | Adjusted PRR (95% CI) |
|--------------------|-----------------------|----------------------|-------------------|-----------------------|
| April 2011 through July 2012 | 3421 (63.5)           | 1967 (36.5)          | Ref               | Ref                   |
| August through December 2012  | 1405 (68.9)           | 635 (31.1)           | 1.09 (1.00–1.18)  | 1.01 (0.95–1.08)      |

*All comparisons of patient factors by recommended treatment outcome were statistically significant at the $P < 0.01$ level by χ² test.

Ref indicates reference.

associated with treatment practices, and these differed for CDPH and non-CDPH providers.

Recommended treatment was higher for cases originating from CDPH providers than from non-CDPH providers (73% vs. 65%, overall). This is not surprising given that 94% of CDPH cases originated in STD specialty clinics. It is of note, though, that recommended treatment was still suboptimal for CDPH cases, largely as a result of single therapy. Although a standard measure for evaluating STD treatment practices is lacking, Healthy People Initiative 2010 cites that a goal of higher than 90% of providers prescribe CDC recommended STD treatments as a target. Using STD Surveillance Network data from 6 states, Kerani et al. reported ceftriaxone usage ranging from 45% to 95% for treatment of gonorrhea cases. In contrast to our findings, previous studies have reported higher levels of recommended treatment among public and nonpublic health clinics to CDC STD treatment guidelines. The higher recommended treatment rates from studies of nonpublic providers may have been due to differences in distribution of sex, younger age distributions, or screening practices, or, as in the study by Magid et al. due to guideline-concordant electronic order to facilitate recommended treatment.

Using an interrupted time-series analysis approach, Dowell et al. identified a 21.5% decline in fluoroquinolone use within 2 weeks of released revisions in 5 US cities: public health clinics reached almost complete recommended treatment (90%–100%), whereas primary care facilities (8.6%) and emergency departments, urgent care clinics, and hospitals (2.7%) demonstrated substantially lower and more gradual responses to updated guidelines. In our analysis, the provider setting encompassing emergency department (ED), urgent care, and immediate care had the lowest rate of recommended treatment. This is in keeping with findings by Lechtenberg et al. for California and Dowell et al. nationally. For EDs serving high-risk populations and difficulty ensuring follow-up, a lower threshold for empiric treatment may be warranted. Among the provider group comprised by CHCs and other public providers, those that were FQHCs had recommended treatment rates approximately half that of non-FQHCs (Fig. 2), which could be partially explained by underreporting of treatment information. Our findings underline the need for stronger collaboration between local health departments and non-CDPH providers to assist these providers with improving their fulfillment to public health reporting requirements and adherence to CDC treatment recommendations.

In multivariable-adjusted analyses, we did not observe any statistically significant association between age and recommended treatment. For CDPH and non-CDPH providers, male patients were more likely to receive recommended treatment. Men are more likely than women to have symptomatic urogenital gonococcal infection. Because results of laboratory testing are available after the patient has completed the clinical encounter, asymptomatic infection or nonspecific symptoms in women may be a barrier to recommended treatment. Indeed, same-day treatment was associated with increased rate of recommended treatment, by 7% and 31% for CDPH and non-CDPH providers, respectively. Among
CDPH cases, white patients were 32% less likely than non-Hispanic black patients to receive recommended treatment. This is in keeping with analysis of national surveillance data by Kerani et al., who found that black patients were statistically significantly 4% more likely to be treated with ceftriaxone than white patients. We observed treatment by race was differential for CDPH and non-CDPH cases; this may be due to increased clinician suspicion among blacks, stemming from differential risk assessment, presentation (screening vs. symptoms), or variability in clinician threshold for empiric treatment based on assumptions of who is at risk for gonorrhea. Efforts to reduce variability and improve provision of recommended treatment may include addressing clinicians’ variability in risk assessment, barriers to risk assessment, and recommendations for how to incorporate patient risk with treatment decisions. Of note, clinicians at CDPH STD clinics perform on-site Gram staining for men (and at the clinician’s discretion in women with high index of suspicion for gonorrhea), which allows administration of recommended treatment at the point of care. Comparing 2 periods, Bartelsman et al. found that same-day treatment for women attending an STI clinic was 66% when routine Gram staining for all high-risk patients was implemented compared with 46.5% when Gram staining only for high-risk patients with urogenital complaint; the period with routine Gram staining was associated with reduced costs. Although Gram staining has much lower accuracy in women than men and is likely infeasible for most non-CDPH providers, the possibility may be worth exploring for providers working in hospital systems with on-site laboratories and high-risk patient populations.

Based on our results, we need to verify the extent to which CDPH clients are not receiving recommended treatment, and whether this is due to errors in recording. Because we analyzed provider type at the group level, we cannot determine whether differential treatment occurs at the individual provider level. As such, we need to investigate patient barriers (e.g., follow-up) and individual-level provider reasons (e.g., treatment of other conditions, other medical factors, availability of recommended treatment) why cases are not receiving recommended therapy. Although we could find no studies comparing acceptability of the routes of administration for gonorrhea, some clinicians may find it easier to convince patients to accept oral antibiotics than IM injection. Because dual therapy including cefixime contributed to approximately 5% of non-CDPH treatments, whether assessment of treatment outcome at 1 week is being done needs to be evaluated. Integrating treatment recommendations in electronic systems that support treatment decisions will facilitate increased adherence to guidelines. Additionally, and especially in settings where electronic assists are not possible, communications from local health departments may be effective. The evaluation by Dowell et al. found that in metropolitan areas where the public health departments used stronger communication methods (e.g., press release) and distance (e.g., webinars, hotlines), in-person communication (e.g., in-services, regional society meetings) should be evaluated. While such efforts may be resource intensive, over the 21-month observation period, only 18 non-CDPH facilities each reported ≥100 laboratory-confirmed cases of gonorrhea, accounting for 3,136 (42%) of all non-CDPH cases (including cases with missing data), with recommended treatment ranging from 26–93%. As we observed, the likelihood of recommended treatment was generally greater for test facilities reporting a greater number of gonorrhea cases. Targeting more intense support to a restricted number of high volume facilities with lower recommended treatment rates may be an efficient approach to improving adherence to guidelines.

Limitations

By using retrospective documentation rather than directly observed practice, we have incomplete reporting. This led to underrepresentation of cases of other race (70% were missing treatment information), and nearly all cases from online-testing services, Veteran’s Administration (VA), and outreach services (missing treatment data ranged from 81–97% in these settings). It is possible the missing data for VA and outreach services is extremely high due to lack of follow-up; conversely, the nearly complete missing data also suggests these providers face barriers to recording treatment. We observed that cases from facilities with a greater proportion of missing treatment data were less likely to receive recommended treatment. If cases with missing treatment data are less likely to receive recommended treatment, then our estimates may considerably overestimate non-CDPH provider adherence to guidelines, given the magnitude of missing treatment data. Data abstraction included electronic medical review of all cases reported by CDPH providers, which was not possible for non-CDPH cases. This differential ascertainment may have led to more complete and more accurate classification of treatment data for CDPH cases. Given the increasing utility and cost-effectiveness of online testing services, procedures need to be in place to follow-up and document treatment. Spielberg et al. conducted testing of self-collected samples for gonorrhea, chlamydia, and trichomoniasis submitted via mail, with internet-based provision of results, and integrated this with electronic medical records and electronic prescribing. Though the initial costs of integrating results with electronic health records were high, investment in these approaches may be cost-effective as this testing strategy grows.

We focused our analysis on CDC recommended therapy for uncomplicated urogenital infection; therefore we cannot generalize results to treatment of complicated infection, or rectal or pharyngeal infections. Assessing adherence to recommended treatment of extragenital infections may have more importance for stemming antibiotic resistance emergence and spread, and should be a focus area for surveillance. Errors in clinician recording may lead to misclassification. For example, not recording whether a treatment was given or not specifying the doses, lead to classification as nonrecommended treatment in this analysis. In addition, clinical information (such as patients’ allergies, pregnancy status, diagnosis of complicated infection, and previous treatment outcomes) which could influence treatment decisions was not documented in NEDSS. Although data were de-duplicated by patient name, date of birth, and date of visit, there may still have been individuals with repeated observation of the same infection.

CONCLUSIONS

We observed substantial adherence to CDC urogenital gonococcal treatment recommendations among public and nonpublic providers following guidelines revisions in August 2012. The increase in adherence for public and nonpublic providers within 4 months of guideline dissemination is encouraging. Investigation of reasons for nonrecommended treatment and interventions and resources to improve guideline concordance, especially among nonpublic health providers, is urgently needed.

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