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Original Contribution

Suspected gonorrhea and chlamydia: Incidence and utilization of empiric antibiotics in a health system emergency department☆

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ABSTRACT

Background: In the ED, patients are treated empirically for suspected gonorrhea and/or chlamydia (GC). Limited studies have evaluated the treatment of sexually transmitted diseases (STDs) in conjunction with predictor variables. This study will allow providers to better identify patients with potential GC to streamline antibiotic treatment.

Objectives: The primary objective was to determine the incidence of positive assay in patients that underwent GC screening. The secondary objectives included the proportion of patients assayed that received empiric therapy and the predictive value of risk factors to identify positive assays.

Methods: This retrospective cohort study included adult patients who presented to the health-system EDs and underwent GC screening. Subjects were excluded if they were victims of sexual assault, left AMA or eloped.

Results: A total of 490 assayed patients were included, of which 84 (17%) were found to be positive for GC assay. Of the 278 patients treated empirically, 74% had a negative assay. Of the entire sample ($n = 490$), risk factors found to predict a positive assay ($p < 0.05$) included male, women <25 years of age, concomitant bacterial vaginosis, pelvic inflammatory disease or trichomonas, penile discharge, inconsistent condom use, previous/coexisting STDs, and uninsured.

Conclusions: Compared to previous reports, this study found a higher incidence of positive GC assays for patients with suspected infection. This is the first study to evaluate GC testing in both men and women in the ED, and risk factors not previously reported by the CDC were identified.

1. Introduction

Approximately 80–90% of women with chlamydia, up to 80% of women with gonorrhea, and 40% of men with gonorrhea are asymptomatic on presentation [1,2]. In the emergency department (ED), patients are often treated empirically for suspected gonorrhea and chlamydia (GC) due to the extended time required to receive test results and the lack of patient follow up when positive results are received [2,3].

Recently, concern has been raised around antibiotic resistance patterns of *Neisseria gonorrhoeae*. According to the Centers for Disease Control and Prevention (CDC), gonorrhea has increasing resistance to multiple medications. Gonorrhea isolates more than quadrupled their resistance rate to azithromycin over the course of one year from 0.6 to 2.5% [1]. The CDC reported that resistance to ceftriaxone ranges from 0.1 to 0.4% [1]. Despite these resistance patterns, to date, the CDC states there have been no reported cases of treatment failure to cephalosporins in the US [4].

Due to concerns of antibiotic resistance, research has been completed to address overtreatment, undertreatment, and follow-up treatment success of GC. Levitt et al. conducted a prospective study of 1260 patients where 6.4% tested positive, and 38% of those patients were not treated empirically. Of the positive women who were untreated, 65% did not follow up for treatment. Conversely, of the 34% of women treated empirically, 88% were negative for gonorrhea or chlamydia [3].

Predictors of sexually transmitted diseases (STDs) have also been identified [5,6]. Women <20 years old were shown to be more likely to acquire gonorrhea, while men with a new or casual partner were at higher risk of gonorrheal infection [5]. Lack of condom use for both men and women increased the risk for gonorrhea, and even with signs of an infection, the individuals continued to be sexually active. Number of lifetime partners had no effect on the acquisition of gonorrhea, but number of casual or new partners in men increased the risk for gonorrhea [5]. The prevalence of co-infection of gonorrhea and

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chlamydia in women was found to be 46% in women between the ages of 15–19 [6].

Specific risk factors outlined by the CDC include sexually active women <25 years of age or women over the age of 25 who have a new sexual partner, more than one sexual partners, inconsistent condom use, previous or coexisting STDs, exchanging sex for money or drugs and recent travel out of the U.S. with sexual contact [7,8] Risk factors specifically for men include those who have sex with men (MSM), including number of lifetime partners, rate of partner exchange, and frequency of unprotected sex, or those with concomitant substance abuse [9]. Additional risk factors of note are penile discharge and patients without insurance [10].

To date, there have been limited studies evaluating the treatment of STDs in correlation with specific risk factors in a clinical setting. The significance of this information would allow for providers to better identify patients with potential GC in order to streamline antibiotic treatment with the goal to decrease antibiotic utilization and potential resistance. Therefore, the aim of this study was to determine the incidence of positive assays among patients who receive GC screening in the ED. Secondary objectives included determining the proportion of patients treated empirically with antibiotics and identifying predictors of positive assays.

2. Materials and methods

This retrospective, single-system, cohort chart review evaluated the incidence of positive chlamydia and gonorrhea assays among patients who receive GC screening in the ED. This study was performed at a health system consisting of a level 1 trauma tertiary-care hospital-based ED (HBED) in a downtown urban area and three free-standing EDs (FSED) located in suburban settings with an estimated 113,000 combined ED visits annually. All adult patients who presented to an ED in the system between January 1, 2016 and December 31, 2016 and underwent GC testing using BD ProbeTec ET™ *Chlamydia trachomatis* and *Neisseria gonorrhoeae* amplified DNA (GC) assays were identified via microbiology records [11]. Once the source population was identified, a random number generator in excel was used to randomly select patients for inclusion. Patients were assigned a random number, and then sorted in numerical order. A convenience sample of 499 patients was used for evaluation due to time constraints. This study was approved by the Institutional Review Board and the requirement of informed consent was waived. Patients were excluded if they were victims of sexual assault, left against medical advice (AMA) or eloped from the ED.

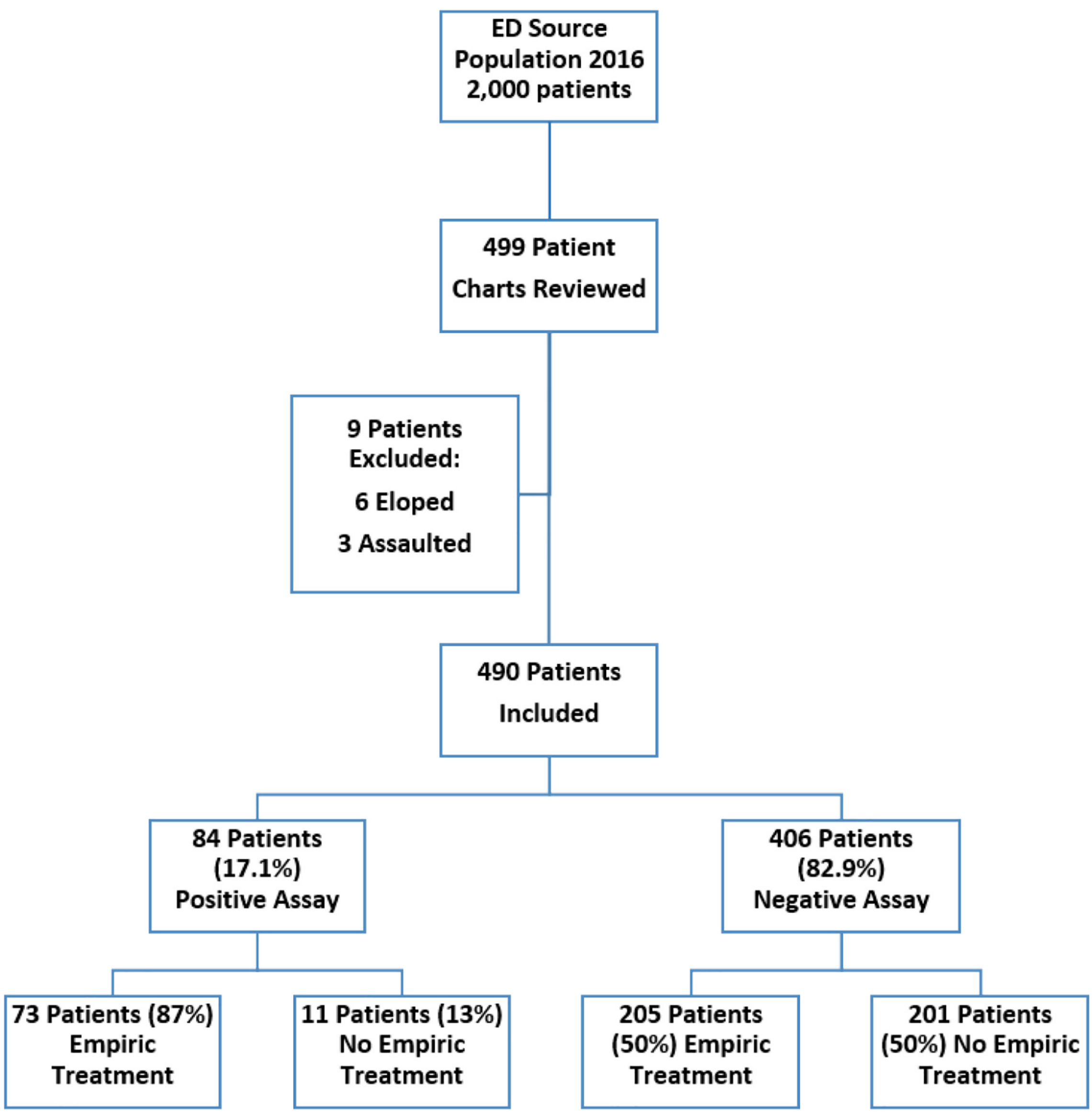

Fig. 1. Flow chart of patient inclusion. Approximately 25% of the source population was randomly selected for inclusion.

Table 1
Demographics.

	Total population N = 490	Negative assay N = 406	Positive assay N = 84	p-Value
Age	28 (8.1)	24.81 (6.90)	28.12 (8.24)	<0.001
Gender				<0.001
Female	375 (77)	339 (83.5)	36 (43)	
Male	115 (23)	67 (16.5)	48 (57)	
Race				<0.001
Caucasian	204 (42)	192 (47)	12 (14)	
African American	269 (55)	203 (50)	66 (80)	
Other	16 (3)	11 (3)	5 (6)	
Without insurance	46 (9)	28 (7)	18 (21)	<0.001
ED location				<0.001
Hospital-based	291 (59)	226 (56)	65 (77)	
Freestanding	199 (41)	180 (44)	19 (23)	
Drug allergies				0.22
NKDA	479 (98)	395 (97)	84 (100)	
Allergy change antibiotic selection	11 (2)	11 (3)	0 (0)	
Antibiotic selection				<0.001
None	212 (43)	201 (49)	11 (13)	
Azithro 1 g/Ceftriax	233 (47)	169 (42)	64 (76)	
Azithro 2 g	9 (2)	8 (2)	1 (1)	
Ceftriax	6 (1)	6 (1)	0 (0)	
Ceftriax/Doxy	15 (3)	11 (3)	4 (5)	
Other	15 (3)	11 (3)	4 (5)	
Culture collection site				<0.001
Urine	12 (2)	9 (2)	3 (4)	
Cervix	375 (77)	339 (84)	36 (43)	
Urethra	101 (21)	57 (14)	44 (53)	
Pregnancy	11 (2)	8 (2)	3 (8)	0.09
HIV	2 (0.4)	1 (0.2)	1 (1)	0.31
Empiric antibiotic treatment	278 (57)	205 (50)	73 (87)	<0.001

Categorical variables presented as n(%) and analyzed by Chi square or Fishers Exact as appropriate. Continuous variables presented as mean (SD) and analyzed by t-test. Level of significance $p < 0.05$ (two-sided). NKDA: no known drug allergies; HIV: human immunodeficiency virus; Azithro: Azithromycin oral; Ceftriax: Ceftriaxone 250 mg intramuscular; Doxy: Doxycycline 100 mg oral twice daily for 7 days.

Table 2
Demographics by ED location.

	Total population N = 490	Outlying ED N = 199	HBED N = 291	p-Value
Age	28 (8.1)	27.7 (8.2)	27.4 (8.1)	0.679
Gender				0.003
Female	375 (77)	166 (83)	209 (72)	
Male	115 (23)	33 (17)	82 (28)	
Race				<0.001
Caucasian	204 (42)	126 (63)	78 (27)	
African American	269 (55)	70 (35)	199 (69)	
Other	16 (3)	3 (2)	13 (4)	
Without insurance	46 (9)	15 (7)	31 (11)	0.246
Drug allergies				1.000
NKDA	479 (98)	195 (98)	284 (98)	
Allergy change antibiotic selection	11 (2)	4 (2)	7 (2)	
Antibiotic selection				<0.001
None	212 (43)	117 (59)	95 (33)	
Azithro 1 g/Ceftriax	233 (47)	64 (32)	169 (58)	
Azithro 2 g	9 (2)	1 (0.5)	8 (3)	
Ceftriax	6 (1)	1 (0.5)	5 (2)	
Ceftriax/Doxy	15 (3)	6 (3)	9 (3)	
Other	15 (3)	10 (5)	5 (2)	
Culture collection site				0.006
Urine	12 (2)	5 (2)	7 (2)	
Cervix	375 (77)	166 (84)	209 (72)	
Urethra	101 (21)	27 (14)	74 (26)	
Pregnancy	11 (2)	6 (4)	5 (2)	0.549
HIV	2 (0.4)	0 (0)	2 (1)	0.517
Positive assay	84 (17)	19 (9)	65 (22)	<0.001
Empiric antibiotic treatment	278 (57)	82 (41)	196 (67)	<0.001

Categorical variables presented as n(%) and analyzed by Chi square or Fishers Exact as appropriate. Continuous variables presented as mean (SD) and analyzed by t-test. Level of significance $p < 0.05$ (two-sided). NKDA: no known drug allergies; HIV: human immunodeficiency virus; Azithro: Azithromycin oral; Ceftriax: Ceftriaxone 250 mg intramuscular; Doxy: Doxycycline 100 mg oral twice daily for 7 days.

2.1. Data collection

Baseline demographics (age, sex, race, ED location, antibiotic drug allergies, empiric antibiotics administered, and pregnancy status) were collected in addition to the following data: sexual orientation, increased risk of infection, additional risk factors, concomitant trichomonas, concomitant bacterial vaginosis (BV), health insurance, penile discharge, and diagnosis of pelvic inflammatory disease (PID). Definition of increased risk of infection was any woman >25 years of age with a new sex partner within the past month, more than one sex partner, with a sex partner who has concurrent partners, or a sex partner with concurrent STD [5,7,12]. Additional risk factors were defined as any person with any of the following: inconsistent condom use, previous STD within the past 12 months, coexisting STDs, exchanging sex for money or drugs and recent travel out of the U.S. with sexual contacts [7,12]. Coexisting STDs at the time of arrival to the ED included only those positive for trichomonas.

2.2. Outcomes

The primary outcome was incidence of positive assay in patients that underwent the GC screening in the ED. Patients were considered to have a positive GC assay if the Method Other Than Acceleration (MOTA) score was either low positive (2000–9999) or positive (10,000 or greater). The secondary outcomes included the proportion of patients cultured that received empiric treatment and the predictive value of risk factors to identify positive assays. The decision to empirically treat and selection of antibiotics was based on physician discretion. Subgroup analyses were performed on the patients from the HBED excluding patients who were pregnant.

2.3. Statistical analysis

Categorical data were presented as frequency and proportions, and analyzed by chi-square or Fisher's exact test as appropriate. Odds ratios and 95% confidence intervals are reported to examine the relationship between presence of GC and risk factors. Risk factors found to be significant ($p < 0.05$) in the univariate analysis for the prediction of positive GC assay were selected for inclusion in a multivariate logistic regression analysis. Logistic regression analysis using elimination based on the probability of the Wald statistic was used to identify effects of risk factors on the likelihood that patients have a positive assay. Statistical analysis was performed using IBM SPSS statistics version 24.0 and the level of significance set at p value < 0.05, two-sided. A statistician aided in the data analysis.

Table 3
Infection.

	Not treated with empiric antibiotics N = 212	Treated with empiric antibiotics N = 278	p-Value
Gonorrhea	4 (2)	46 (16)	<0.001
Chlamydia	9 (4)	36 (13)	0.001
Gonorrhea and Chlamydia	2 (1)	9 (3)	0.12

Presented as n(%) and analyzed by Chi square or Fishers Exact as appropriate. Level of significance $p < 0.05$ (two-sided).

Table 4
Predictors of positive assay.

Predictor	Negative assay	Positive assay	OR (95% CI)	p-Value
Male gender	67/406 (16)	48/84 (57)	6.75 (4.10, 11.18)	<0.001
Sexual orientation MSM	4/37 (11)	1/33 (3)	0.26 (0.03, 2.43)	0.36
Women age <25	140/339 (41)	29/36 (81)	5.9 (2.51, 13.82)	<0.001
Men age <25 yr	25/67 (37)	23/48 (48)	1.55 (0.73, 3.28)	0.26
Women age >25 yr with increased infection risk	11/168 (6)	1/7 (14)	2.38 (0.26, 21.54)	0.40
Additional risk factors	131/406 (32)	45/84 (54)	2.42 (1.50, 3.90)	<0.001
Inconsistent condom use	86/406 (22)	33/84 (39)	2.30 (1.40, 3.79)	0.001
Previous STDs	57/406 (14)	20/84 (24)	1.91 (1.07, 3.40)	0.02
HIV	1/406 (0.2)	1/84 (1)	4.88 (0.30, 78.80)	0.31
Concomitant trichomoniasis	35/348 (10)	8/38 (21)	2.38 (1.01, 5.60)	0.05
Concomitant BV	69/324 (21)	13/31 (42)	2.70 (1.25, 5.71)	0.01
Without insurance	28/406 (7)	18/84 (21)	3.7 (1.9, 7.0)	<0.001
Penile discharge	17/67 (25)	38/48 (79)	11.18 (4.6, 27.15)	<0.001
PID	16/339 (5)	8/36 (22)	5.77 (2.27, 14.65)	0.001

Presented as n/n (%) and analyzed by Chi square or Fishers Exact as appropriate. Level of significance $p < 0.05$ (two-sided). STDs: sexual transmitted diseases; HIV: human immunodeficiency virus; BV: bacterial vaginosis; PID: pelvic inflammatory disease.

3. Results

Over 2000 patients seen in the ED between the dates of January 1, 2016 and December 31, 2016 were screened for STDs. A convenience sample of 499 patients were randomly included in the study with nine patients excluded, including six who eloped from the ED and three who were victims of sexual assault (Fig. 1). The majority of patients were African American (55%), female (77%), and seen in the HBED (59%) (Table 1). Of the 490 patients in the sample, 84 (17%) patients were found to have a positive assay for gonorrhea or chlamydia. Patients with a positive assay were significantly older in age (28.1 ± 8.2 vs. 24.8 ± 6.9 years), African American (80% vs. 50%), males (57% vs. 16.5%), without health insurance (21% vs. 7%), and were seen in the HBED (77% vs. 56%) compared to those with a negative assay, respectively (Table 1).

Patient demographics varied between those seen at the FSEDs and HBED (Table 2). The majority of patients seen at the FSEDs were female (83%), Caucasian (63% $p \le 0.001$), with insurance (93%). Patients seen at the HBED were female (72%), African American (69% $p \le 0.001$), with insurance (89%). Patients seen at the HBED were more likely to have a positive assay than patients seen at the FSEDs (22% vs 9%, respectively) ($p \le 0.001$). Regardless of assay results, patients at the HBED and FSED received empiric antibiotic treatment 67% vs 41% of the time, respectively ($p \le 0.001$). Empiric antibiotic treatment was given to 62% of the negative assay patients at the HBED compared to 36% of the negative assay patients seen at the FSEDs ($p \le 0.001$). Patients seen at the HBED and FSEDs with positive assays received empiric treatment at 86% and 89%, respectively.

Of the 278 patients who were treated empirically, 205 patients (74%) had a negative assay for gonorrhea or chlamydia. Of the 84 patients who were positive for gonorrhea or chlamydia, 73 patients (87%) were treated empirically (Table 1). Patients with a positive assay received significantly more empiric antibiotic treatment than those with a negative assay ($p < 0.001$). There were 11 patients with a co-infection of gonorrhea and chlamydia, and nine (82%) of those patients were treated empirically with antibiotics (Table 3). Additionally, patients who were positive for gonorrhea or chlamydia received empiric antibiotics 92% and 80% of the time, respectively (Table 3).

Univariate analyses of risk factors for the prediction of positive GC assay are presented in Table 4. Male sex, women <25 years of age, additional risk factors, inconsistent condom use, previous STDs, concomitant trichomonas, BV, and PID, penile discharge, and patients without health insurance were all significant in the prediction of a positive assay ($p < 0.05$).

Regression analysis was performed to determine the effects of sex, additional risk factors, inconsistent condom use, previous STDs, and health insurance on the likelihood of a positive assay in the total study sample (Table 5). The regression model was statistically significant $\chi^2(3) = 73.2$, $p < 0.001$. Of the six predictor variables included (male gender, additional risk factors, inconsistent condom use, previous STDs, and health insurance), three were significant (male gender, previous STDs, and health insurance). Males were more likely to have a positive assay than females [OR 6.92 (95% CI: 4.08–11.73)]. Patients with a history of previous STDs and those without health insurance were also more likely to have a positive assay, [OR 2.68 (95% CI: 1.40–5.12) and OR 3.44 (95% CI: 1.66–7.12, respectively)].

Regression analysis was performed to determine the effects of sex specific risk factors in the female and male subsets individually (Tables 6 and 7). The regression model in the female subset was significant $\chi^2(3) = 36.6$, $p < 0.001$ (Table 6). Of the seven predictor variables included in the model (women <25 years old, BV, PID, additional risk factor, inconsistent condom use, previous STDs, and health insurance), three were significant (women <25 years old, BV, and PID). Females were more likely to have a positive assay if they were <25 years of age, had the presence of concomitant BV, and PID, [OR 9.13 (95% CI: 3.08–27.05), OR 2.87 (95% CI: 1.27–6.49) and OR 3.51 (95% CI: 1.16–10.65), respectively].

The regression analysis performed to determine the effects of sex specific risk factors in the male subset was significant $\chi^2(2) = 49.8$, $p < 0.001$ (Table 7). Of the five predictor variables included in the model (penile discharge, additional risk factor, inconsistent condom use, previous STDs, and health insurance) two were significant (health insurance and penile discharge). Men without health insurance or with penile

Table 5
Logistic regression total sample (n = 490).

	OR (95% CI)	p-Value
Male gender	6.92 (4.08, 11.73)	<0.001
Previous STDs	2.68 (1.40, 5.12)	0.003
Without insurance	3.44 (1.66, 7.12)	0.001

Significant adjusted Odds Ratio (OR) and 95% Confidence Interval (95% CI) presented for risk factors based on Wald Chi-Square of the regression model. Level of significance $p < 0.05$ (two-sided). STDs: sexually transmitted diseases.

Table 6
Logistic regression female subset (n = 375).

	OR (95% CI)	p-Value
Women age < 25 yr	9.13 (3.08, 27.05)	<0.001
BV	2.87 (1.27, 6.49)	0.011
PID	3.51 (1.16, 10.65)	0.027

Significant adjusted Odds Ratio (OR) and 95% Confidence Interval (95% CI) presented for risk factors based on Wald Chi-Square of the regression model. Level of significance $p < 0.05$ (two-sided). BV: bacterial vaginosis; PID: pelvic inflammatory disease.

Table 7
Logistic regression male subset (n = 115).

	OR (95% CI)	p-Value
Insurance	14.50 (3.30, 63.74)	<0.001
Penile discharge	17.51 (5.96, 51.40)	<0.001

Significant adjusted Odds Ratio (OR) and 95% Confidence Interval (95% CI) presented for risk factors based on Wald Chi-Square of the regression model. Level of significance p < 0.05 (two-sided).

discharge were more likely to have a positive assay [OR 14.50 (95% CI: 3.30–63.74) and OR 17.51 (95% CI: 5.96–51.40), respectively].

Additionally, a univariate analysis of risk factors for the prediction of positive GC assay for main hospital ED patients is presented in Table 8. Male sex, women <25 years of age, PID, penile discharge, and patients without health insurance were considered statistically significant in the prediction of a positive assay ($p < 0.05$).

4. Discussion

This retrospective cohort chart review describes the incidence of positive GC assay and the proportion of patients treated with empiric antibiotics in patients seen in the health system's EDs. The study revealed that this patient sample had a higher incidence for gonorrhea and chlamydia compared to a previous study with 17% compared to 6.4%, respectively [3]. The proportion of negative assay patients who were treated empirically for gonorrhea or chlamydia were similar to another study, at 74% and 88.3%, respectively [3].

This study demonstrated differences in sample populations between those seen at the HBED and FSEDs, and its potential impact on assay results and empiric treatment. A higher incidence of positive assay (22% HBED vs 9% FSED p ≤0.001) at the HBED may lead physicians to be more inclined to starting empiric treatment. This is represented by the higher rate of negative assay patients given empiric treatment at the HBED compared to the FSEDs (62% vs 36%, respectively).

Schwebke et al. raised concerns about follow-up in patients with a positive STD result. The authors showed that 30% of patients with a positive STD did not return to clinic within 30 days and identified the potential issues for those patients with lack of follow-up [13]. Currently at the research facility, attempts of contact through telephone and letters are made to patients with positive assays that are not empirically treated during the ED visit. Being able to identify patients in need of empiric treatment will not only decrease antibiotic resistance, but improve patient outcomes. Verifying risk factors outlined by the CDC and identifying additional high risk patients will help develop a target population for treatment.

Results from this study are in agreement with risk factors outlined by the CDC, including women <25 years of age, additional risk factors including inconsistent condom use and previous or coexisting STDs including concomitant trichomonas [7]. Other risk factors per the CDC not in agreement with results of this study included older women who have a new sexual partner or multiple sexual partners, exchanging sex for money or drugs and recent travel out of the U.S. with sexual contact. This discrepancy could be attributed to the retrospective chart review design of the study as there was limited documentation for these risk factors. Additional risk factors found in this study not previously described were penile discharge and patients without insurance. When comparing patients in the entire health system versus the HBED (excluding pregnancy and outlying EDs), the statistical difference remained except for concomitant BV or trichomonas.

Finally, the retrospective nature of this study led to a review of physician prescribing habits. It was observed that 9 (2%) patient received azithromycin 2 g oral as single agent treatment for gonorrhea and chlamydia. The 2015 CDC STD Treatment Guidelines recommend combination gentamicin 240 mg IM and azithromycin 2 g oral as alternative treatment of gonorrhea in the event of allergy or adverse reaction [7]. Education was provided to the ED physicians regarding the treatment recommendation for gonorrhea and chlamydia.

4.1. Limitations

The primary limitation is use of a retrospective design, leading to opportunity for missing and incomplete data, which could have led to variations in results. We attempted to reconcile this limitation by including health system data from FSED's covering a radius of 12 miles from the HBED [14,15]. This increased the number of patients available to include in the study, which would minimize the impact of missing or incomplete data. The study sample was the largest of its kind as evidenced in the literature and first to evaluate predictors of a positive assay in a clinical setting. Additionally, including patients from the FSEDs provided a more diverse sample population. As mentioned previously, the design could have led to limited documentation of risk factors. Condom use was not well documented in all charts and trichomonas was not tested in all men.

There are several additional limitations to this study. Some patients could have a false positive or negative based on the specificity and sensitivity of the gonorrhea and chlamydia assays. The assay used has a 96% sensitivity and 98.8% specificity for gonorrhea and 90.7% sensitivity and 96.6% specificity for chlamydia. Of note, patients with a urine specimen have a higher incidence of false negatives than those whose specimen is collected via the cervix or urethra. Urine samples have a 13–17% rate of false negatives [11]. Only 2% (n = 12) of our sample population had urine as the specimen collection source, therefore this limitation

Table 8
Predictors of positive assay hospital-based ED (n = 291).

Predictor	Negative assay	Positive assay	OR (95% CI)	p-Value
Male gender	45/223 (20)	37/63 (59)	5.63 (3.09, 10.24)	<0.001
Sexual orientation MSM	2/22 (9)	0 (0)	0 (0)	0.22
Women age < 25 yr	76/178 (43)	20/26 (77)	4.47 (1.71, 11.68)	0.001
Men age < 25 yr	16/45 (36)	17/37 (46)	1.54 (0.63, 3.75)	0.34
Women age >25 yr with increased infection risk	5/86 (6)	1/6 (17)	3.24 (0.31, 33.28)	0.34
Additional risk factors	90/223 (40)	31/63 (49)	1.43 (0.82, 2.51)	0.21
Inconsistent condom use	55/223 (25)	21/63 (33)	1.53 (0.83, 2.80)	0.17
Previous STDs	47/223 (21)	15/63 (24)	1.17 (0.60, 2.27)	0.64
HIV	1/223 (0.4)	1/63 (1.6)	3.58 (0.22, 58.07)	0.39
Concomitant trichomoniasis	31/185 (17)	7/27 (26)	1.73 (0.67, 4.44)	0.28
Concomitant BV	44/171 (26)	9/21 (43)	2.16 (0.85, 5.48)	0.10
Without insurance	15/223 (7)	16/63 (25)	0.21 (0.10, 0.46)	<0.001
Penile discharge	14/45 (31)	30/37 (81)	9.49 (3.36, 26.76)	<0.001
PID	10/178 (6)	5/26 (19)	4.00 (1.25, 12.83)	0.03

Presented as n/n (%) and analyzed by Chi square or Fishers Exact as appropriate. Level of significance p < 0.05 (two-sided). STDs: sexual transmitted diseases; HIV: human immunodeficiency virus; BV: bacterial vaginosis; PID: pelvic inflammatory disease.

would not likely have affected the results. Antibiotic treatment and selection was left to the discretion of the physician. Decision to treat and antibiotic selection may have varied based on the treating physician. Finally, patient allergies may also have impacted empiric treatment for patients with suspected STDs. It was discovered while completing the chart review that some patients were offered empiric antibiotics, but refused.

5. Conclusion

According to this evaluation within a health-system ED setting, we found a higher incidence of positive GC assays for those patients with suspected infection than previously reported in the literature. Additionally, the majority of those patients found to have a positive assay received empiric therapy. This analysis is in agreement with the majority of risk factors outlined by the CDC. Furthermore, additional risk factors not reported by the CDC were identified, including men presenting with penile discharge and patients without health insurance. Further prospective research is needed to validate these findings. To our knowledge, this is the first study to evaluate STDs in both men and women in the ED population, and risk factors not previously reported by the CDC were identified.

Declaration of interest

Authors of this article have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

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References

[1] Kirkcaldy RD, Harvey A, Papp JR, et al. *Neisseria gonorrhoeae* antimicrobial susceptibility surveillance — the gonococcal isolate surveillance project, 27 sites, United States, 2014. Surveillance Summaries July 15, 2016;65(7):1–19.
[2] Handsfield HH, Lipman TO, Harnisch JP, et al. Asymptomatic gonorrhea in men — diagnosis, natural course, prevalence and significance. N Engl J Med 1974;290:117–23.
[3] Levitt MA, Johnson S, Engelstad L, et al. Clinical management of chlamydia and gonorrhea infection in a county teaching emergency department—concerns in overtreatment, undertreatment, and follow-up treatment success. J Emerg Med 2003 Jul;25(1):7–11.
[4] Antibiotic-resistant gonorrhea basic information. Centers for Disease Control and Prevention Website; March 28, 2018https://www.cdc.gov/std/gonorrhea/arg/basic.htm (Updated March 28, 2018. Accessed July 13, 2018).
[5] Upchurch DM, Brady WE, Reichart CA, et al. Behavioral contributions to acquisition of gonorrhea in patients attending an inner city sexually transmitted disease clinic. J Infect Dis 1990 May;161(5):938–41.
[6] Dicker LW, Mosure DJ, Berman SM, et al. Gonorrhea prevalence and coinfection with chlamydia in women in the United States, 2000. Sex Transm Dis 2003 May;30(5):472–6.
[7] Gonococcal infections. Centers for Disease Control and Prevention Website; June 4, 2015http://www.cdc.gov/std/tg2015/gonorrhea.htm (Updated July 27, 2016. Accessed July 13, 2018).
[8] Chlamydial infections. Centers for Disease Control and Prevention Website; June 4, 2016http://www.cdc.gov/std/tg2015/chlamydia.htm (Updated June 4, 2015. Accessed August 25, 2017).
[9] STDs in men who have sex with men. Centers for Disease Control and Prevention Website; November 17, 2015http://www.cdc.gov/std/stats14/msm.htm (Updated June 4, 2015. Accessed August 25, 2016).
[10] Jenkins WD, Zahnd W, Kovach R, et al. Chlamydia and gonorrhea screening in United States emergency departments. J Emerg Med 2013 Feb;44(2):558–67.
[11] BD ProbeTec ET *Chlamydia trachomatis* and *Neisseria gonorrhoeae* amplified DNA assays [Package Insert]. Sparks, MD: Becton, Dickson, and Company; 2015.
[12] LeFevre ML. USPSTF: screening for chlamydia and gonorrhea. Ann Intern Med 2014;161:902–10.
[13] Schwebke JR, Sadler R, Sutton JM, et al. Positive screening tests for gonorrhea and chlamydial infection fail to lead consistently to treatment of patients attending a sexually transmitted disease clinic. Sex Transm Dis 1997 Apr;24(4):181–4.
[14] Simon EL, Dark C, Kovacs M. Variation in hospital admission rates between a tertiary care and two freestanding emergency departments. Am J Emerg Med 2017 Oct;29.
[15] Simon EL, Griffin PL, Jouriles NJ. The impact of two freestanding emergency departments on a tertiary care center. J Emerg Med 2012 Dec;43(6):1127–31.