



Analysis of Patient Adherence to Filling Emergency Department Discharge Prescriptions for Empiric Treatment of Chlamydia

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ABSTRACT

Purpose: Sexually transmitted infections (STIs) represent an enormous public health burden in the United States. Emergency departments (EDs) are a significant source of medical care, particularly for vulnerable patient populations. Guidelines for the treatment of *Chlamydia trachomatis* have evolved and now recommend doxycycline 100 mg orally twice daily for 7 days as the primary regimen for adults. However, the single-dose azithromycin regimen can be given during the ED visit, while the new regimen has nonadherence hurdles. The purpose of this study will be determining the rate of ED discharge prescription pick ups of doxycycline for *Chlamydia trachomatis* infection at two discharge pharmacies.

Methods: This is a retrospective chart review of information contained in the electronic medical record (EMR) from August 1st, 2021 – July 31st, 2022. Adult patients who present to the two EDs in the healthcare system and those who received empiric antibiotic treatment for *Chlamydia trachomatis* infection prior to, or at, ED discharge will be included. Patients who are pregnant, less than 18 years old, those without a *Chlamydia trachomatis* nucleic acid amplification test during their ED visit, or patients whose antibiotic treatment prescription was sent to a pharmacy other than the two primary discharge pharmacies at the respective medical centers will be excluded. The primary outcome of this study will be determining the rate of emergency department (ED) discharge prescription pick ups of doxycycline for empiric treatment of *Chlamydia trachomatis* infection at two discharge pharmacies. The secondary outcomes will include the incidence of repeat positive tests between four weeks and 90 days, risk of repeat positive tests in those who do not fill doxycycline, number of positive and negative test results, rate of prescribing adherence to 2021 Centers for Disease Control and Prevention (CDC) Sexually Transmitted Infections Treatment Guidelines regimens for empiric treatment, and insurance status at the time of discharge fill.

Results: Seven hundred and thirty patients were pulled from the EMR. One hundred of the patients were excluded from the study as they did not receive empiric antibiotic treatment for *Chlamydia trachomatis* infection prior to, or at, ED discharge leaving 630 participants. Among this group, 369 patients were excluded as their discharge prescription was not sent to the discharge pharmacies within the medical system, leaving 261 individuals in the study. Per chart review, 215 of the patients picked up their doxycycline prescription (82.4%) and 46 (17.6%) patients failed to pick up their prescription. Additionally, 43 (16.5) of the patients who were prescribed empiric therapy had a positive *chlamydia trachomatis* test, while 209 (83.5%) of those had a negative test. This study also showed 188 (72%) patients received treatment according to the current CDC recommendations.

Conclusion: Majority of patients who received prescriptions from the in-hospital discharge pharmacy picked up their prescriptions.

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Abbreviations: NAAT, Nucleic Acid Amplification test; NHAMCS-ED, National Hospital Ambulatory Medical Care Survey-Emergency Department.

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1. Introduction

Sexually transmitted infections (STIs) represent a significant public health burden in the United States (US). The Centers for Disease Control and Prevention (CDC) recently published estimates of the prevalence and incidence of STIs among men and women in the US in 2018. This literature estimated that there were 67.6 million prevalent and 26.2 million incident STIs in the United States in 2018 [1]. From the CDC's

2018 data estimate, *Chlamydia trachomatis* was the most frequently reported bacterial STI in the US [1]. The authors of this study acknowledge that these numbers are assumed only to reflect urogenital infections and not extragenital infections due to limitations with case report data. As a result, these reported estimates likely underestimate the burden of chlamydia infections in the US.

Emergency departments (EDs) are a significant source of medical care, particularly for vulnerable patient populations [2]. A 2017 analysis of data from the National Hospital Ambulatory Medical Care Survey–Emergency Department (NHAMCS-ED) sample showed that, from 2008 to 2010 to 2011–2013, there was a 39% increase in visits to EDs that included an STI diagnosis [3]. Guidelines for treating *Chlamydia trachomatis* as a sexually transmitted infection have evolved over the decades [4].

Beginning with an update to the 2020 CDC Treatment Guidelines for Gonococcal Infections, the recommended treatment for *Chlamydia trachomatis* as a coinfection in non-pregnant patients changed to oral doxycycline 100 mg twice daily for seven days [5]. The most recent 2021 CDC Sexually Transmitted Infections Treatment Guidelines now recommend doxycycline 100 mg orally two times daily for seven days as the primary regimen for the treatment of chlamydia in adolescents and adults [6]. Azithromycin 1 g orally in a single dose is now listed as an alternative regimen for adolescents and adults. Azithromycin 1 g orally in a single dose is still listed as the recommended regimen in pregnant patients. However, whereas the complete single-dose azithromycin regimen can be given during the ED visit, the seven doxycycline regimen has nonadherence hurdles that must be overcome for successful treatment. Importantly, the patient must pick up the antibiotic prescription after discharge from the ED.

A 2018 retrospective observational analysis of patients discharged from an emergency department evaluated the nonadherence to filling discharge medication prescriptions at a 24-h discharge pharmacy onsite [7]. The study showed 11.5% of patients were nonadherent to their discharge medications. Antimicrobials were the most common medications that were never filled (31.1%).

Multiple studies have shown high incidences of unnecessary antimicrobial exposure due to treatment prior to a confirmatory culture diagnosis for STIs [8–10]. With the updated 2021 CDC guidelines now recommending doxycycline treatment for seven days over single-dose azithromycin for chlamydia, data regarding prescription filling adherence and the incidence of unnecessary treatment with doxycycline is essential to inform ED prescribing practices [6]. The purpose of this study is to determine the rate of ED discharge prescription pick ups of doxycycline for empiric treatment of *Chlamydia trachomatis* infection at two discharge pharmacies.

2. Methods

The study recruited patients from August 1, 2021, to July 31, 2022. Adult patients who presented to a large medical center ED and a standalone ED in the same health system who received empiric antibiotic treatment for *Chlamydia trachomatis* infection before or at ED discharge were included in this study. The study excluded pregnant patients, those less than 18 years old, and those without a *Chlamydia trachomatis* Nucleic Acid Amplification test (NAAT) during their ED visit. Additionally, patients whose antibiotic treatment was sent to a pharmacy other than the two discharge pharmacies of the ED.

A report within the electronic medical record will be created using the inclusion criteria. Once created, the report will be sampled at random for appropriate inclusion of patients using their medical record identification number.

A single trained and qualified person reviewed all records to ensure consistency and agreement measures. A data abstraction form was utilized to ensure consistency among all data. The abstracted data was checked at random by another investigator for consistency and accuracy. Neither the abstractor nor the other investigators were blinded

to the study objectives. Interobserver reliability will not be tested or measured, as there was only one data collector.

The primary outcome of this retrospective chart review is to determine the rate of ED discharge prescription pick ups of doxycycline for empiric treatment of *Chlamydia trachomatis* infection at two discharge pharmacies. Secondary outcomes include the incidence of a repeat positive *Chlamydia trachomatis* test at a subsequent visit between four weeks and 90 days after ED discharge, risk of positive repeat tests among patients who do not fill doxycycline, insurance status on file at the time of discharge prescription fills, incidences of positive and negative ED *Chlamydia trachomatis* test results collected before empiric treatment with azithromycin or doxycycline and lastly, the rate of ED prescribing adherence to 2021 CDC Sexually Transmitted Infections Treatment Guidelines regimens for empiric treatment of *Chlamydia trachomatis*. The study was Institutional-review board approved prior to initiation of data collection.

2.1. Statistical analysis

Descriptive statistics for all demographic and patient features will be described for those who fill doxycycline for empiric treatment of *Chlamydia trachomatis* and those who did not acquire antimicrobials. Secondly, the count and percentage of patients who present with repeat positive tests for *Chlamydia trachomatis* and find the association of variables associated with repeat positive tests between four weeks and 90 days after ED discharge. All available values for relevant variables were summarized. No patient was excluded for missing values for one or more variables. All unknown and not applicable counts and percentages will be presented in the results section where relevant.

3. Results

3.1. Demographics

A total of 730 patients were screened for eligibility among those who presented to the ED during the study period. All patients included in the initial screening were seen at VHMC or VHMV ED, received a *Chlamydia trachomatis* NAAT test during their visit, and did not include any pregnant patients. One hundred patients initially included were excluded as they did not receive any treatment for *Chlamydia trachomatis*, despite having a NAAT test during their visit. Additionally, 369 patients were excluded from the study as their prescription was not sent to one of the included discharge pharmacies, leaving 261 patients to be included in this retrospective chart review (Fig. 1).

The mean age of the participants included in this review was 30 years old but ranged from 17 to 73 years of age. There were 125 females and 136 males in this study. The two most common races in this study were those who identified as white ($n = 178$) and Black/African American ($n = 75$) (Table 1). Additionally, study demographics show majority of participants were Hispanic ($n = 136$). One hundred and three patients were seen at the MVE ED and 158 patients were seen at VHMC ED.

3.2. Primary outcome

Among the 261 patients who had a prescription for doxycycline sent to the discharge pharmacy or were treated with azithromycin before discharge, 215 patients picked up their antibiotic prescriptions, 36 did not pick up their medication, and 10 received azithromycin. The incidence of doxycycline prescription pick up was 82.4%. Table 2 displays the study outcomes.

3.3. Secondary outcomes

Several secondary outcomes were included in this study. First, the incidence of positive ED *Chlamydia trachomatis* test results collected

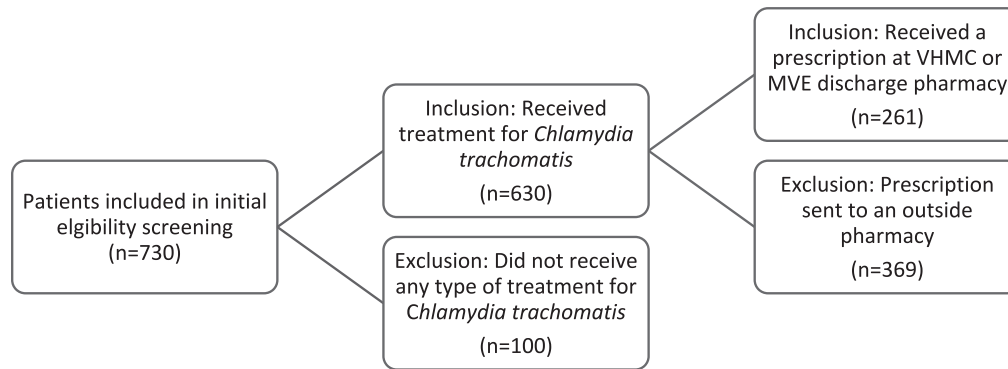


Fig. 1. Inclusion and Exclusion of Study Participants.

before empiric treatment with azithromycin or doxycycline. Forty-six (17.6%) of these tests were positive, while the other 215 were negative.

Assessment of ED prescribing adherence to 2021 CDC Sexually transmitted infection Treatment Guidelines showed that 188 (72%) patients received treatment according to the current CDC recommendations. The two most common excursions from guidelines were the administration of azithromycin, a second line agent, for empiric treatment of *Chlamydia trachomatis*. The second most frequent excursion was incorrect day supply given the charted diagnosis. Fifty-six (21.5%) patients received doxycycline for empiric treatment of uncomplicated *Chlamydia trachomatis* for duration of therapy greater than 7 days. Patients who received the diagnosis of urethritis, orchitis, epididymitis, and pelvic inflammatory disease also received the incorrect day supply based on guidelines.

The incidence of repeat positives test at subsequent visits between four weeks and 90 days after ED discharge was 0.8% ($n = 2$). Only 6 of the included patients had a repeat test on file. Of the 6 patients included in this outcome, 4 had a negative repeat test. Due to the limited number of patients who received a repeat test, the study was unable to assess the risk of repeat positives in this study.

In addition to assessing for repeat positives, the insurance status at the time of prescription fill was documented. Most patients included were found to be insured ($n = 158$), followed by those who were uninsured ($n = 95$), and then patients whose insurance status was unknown at the time of fill ($n = 8$).

Of the patients included in this study, 20 had a prior history of *Chlamydia trachomatis* infection and 14 participants had prior treatment for *Chlamydia trachomatis* based on chart review. Table 2 displays the study outcomes.

4. Discussion

The primary outcome to determine the rate of ED discharge prescription pick ups of doxycycline for empiric treatment of *Chlamydia*

trachomatis infection at two discharge pharmacies. The incidence of patients who picked up doxycycline at discharge pharmacies was higher than the national average with 82.4% of patients picking up their discharge prescription in this study. One potential reason the average in this study may be higher than the national average could be because the study only looked at the two hospital discharge pharmacies instead of all outpatient pharmacies due to the inability to obtain prescription fill history outside the hospital system.

Furthermore, 214 patients (81.2%) had a negative chlamydia test. Although it is important to provide empiric treatment to patients, this study highlights the benefits and difficulties of public health and antimicrobial stewardship. Regarding public health, it may be beneficial to assess for *Neisseria gonorrhea* as it is one of the eight most common STIs and is commonly empirically treated with chlamydia. This study did not assess for co-infections or other STIs. Knowledge of coinfections may provide additional details surrounding the benefits of empiric STI treatment in the ED and therefore, decrease the incidence of unnecessary empiric treatment.

Although STI treatment is not considered a medical emergency, this study highlights the role emergency departments provide in testing and treatment. Although empiric treatment of STIs serves as a means to protect the public and improve health, medical teams should consider ways to avoid unnecessary antibiotic treatment. Interprofessional teams could consider antimicrobial stewardship by educating those with negative results to discontinue antibiotic treatment. Additionally, teams could contact the patient and recommend discontinuation of

Table 2
Primary and secondary outcomes.

Outcomes	N (%) (N = 261)
Primary Outcome	
Doxycycline prescription picked Up	
Yes	215 (82.4)
No	36 (13.8)
Na (patient received azithromycin)	10 (3.8)
Secondary Outcomes	
ED <i>Chlamydia trachomatis</i> test results collected prior to empiric treatment with azithromycin or doxycycline	
Positive	46 (17.6)
Negative	215 (82.4)
Rate of ED prescribing adherence to 2021 CDC Sexually Transmitted Infections Treatment Guidelines	188 (72)
Prior history of <i>Chlamydia trachomatis</i> sexually transmitted infection	20 (7.7)
Prior treatment for <i>Chlamydia trachomatis</i> sexually transmitted infection	125 (47.9)
Repeat positive test at a subsequent visit between four weeks and 90 days after ED discharge	2 (0.8)
Insurance status on file at time of discharge prescription fills	
Insured	158 (60.5)
Uninsured	95 (36.4)
Unknown	8 (3.1)

Table 1
Baseline demographics.

Variable	n (%) (N = 261)
Age	30 (17–73)
Gender	
Female	125 (47.9)
Male	136 (52.1)
Race	
American Indian or Alaska Native	6 (2.3)
Black/African American	75 (28.7)
White	178 (68.2)
Refuse to Report/Unable to Answer	2 (0.8)
Ethnicity	
Hispanic	136 (52.1)
Non-Hispanic/Non-Latino	125 (47.9)

empiric antibiotic treatment due to negative test results. Lastly, medical teams could encourage delayed dispensing of empiric antibiotic treatment if the patient will not be lost to follow-up and has the means to receive notifications. Although labor some, such workflow may decrease the potential for doxycycline resistance, where appropriate.

4.1. Limitations

Several limitations of this study must be acknowledged. First, as a retrospective, single-center study this study relies on chart review which may lead to selection and recall biases. Secondly, there may be inconsistencies or incomplete documentation in the medical record. Additionally, this study could not control for re-infection or treatment failures with repeat positive test. Moreover, this study failed to assess for adherence to prescribed outpatient therapy. This study did not consider outside pharmacy prescription pick ups. Therefore, the study could not evaluate for differences in in-hospital discharge pharmacy versus community pharmacy prescription pick ups. Lastly, this study contained a small sample size which may lead to an inadequate population representation and potential confounders.

5. Conclusion

The rate of ED discharge prescription pick ups of doxycycline for empiric treatment of *Chlamydia trachomatis* infection at two hospital discharge pharmacies was 82.4% (215/261, 95% CI: 77.39–86.64).

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CRedit authorship contribution statement

Ashley Jackson: Writing – original draft, Formal analysis, Data curation. **Emily Kilber:** Writing – review & editing, Project administra-

tion, Conceptualization. **Clinton Peter:** Writing – review & editing, Resources, Methodology. **Bikash Bhattarai:** Writing – review & editing, Methodology, Formal analysis.

Declaration of Competing Interest

None.

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