Antibiotic Selection for suspected *Neisseria gonorrhoeae* infection among Penicillin Allergic Patients in the Emergency Department

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Abstract

Background: While penicillin (PCN) allergies are commonly reported, their cross-reactivity with beta-lactam antibiotics is minimal. First line treatment of gonorrheal infections includes a cephalosporin (CPH). In an emergency department (ED) environment, physicians must consider potential allergies when selecting antibiotics for a patient with symptoms concerning for sexually transmitted infection (STI).

Methods: A retrospective chart review of adult patients with symptoms concerning for STI presenting to an urban ED from January 2014 through June 2019 was performed. Chart discovery was performed using search terms of "STI", "STD", "urethritis", "vaginitis", and "gonorrhea". Information abstracted included patient symptoms, type of care provider, antibiotics prescribed or administered in the ED. The primary outcome was prevalence of allergy to PCN and CPH in patients evaluated for STI symptoms and secondary outcomes included prescribed antibiotic treatments. Chi-square and Fischer-exact tests were utilized to examine for statistical significance, with *p* values <0.05 as statistically significant.

Results: A total of 603 patients met the inclusion criteria, of which 31 reported allergies to PCN, and another 3 reported allergies to CPH. Patients reporting PCN allergy were found to be less likely to receive a CPH antibiotic (p=0.0035). Patients reporting a non-anaphylactic allergy to PCN received a CPH at a rate of 92.3%. Attending physicians in particular were less likely to prescribe a CPH antibiotic to a patient reporting allergy compared with both resident physicians and PAs (p=0.00019). Patients reporting a PCN allergy were more likely to receive alternative antibiotics beyond CPH or azithromycin (p=0.046); the most frequently given antibiotics were metronidazole, doxycycline, and levofloxacin.

Conclusion: Patients with PCN allergies represent a recurring challenge for ED physicians when faced with antibiotic selection for STI symptoms concerning for gonorrheal infection. Those with PCN allergies are significantly less likely to receive a CPH antibiotic, though these remain the only universal treatment for gonorrheal infections. These findings highlight the significant need for further physician education on allergies and antibiotic selection.

Background

- Little cross-reactivity exists between penicillins and cephalosporins, but slight risk of serious allergic reaction exists for patients with penicillin allergies who are given cephalosporins[1]
- Emergency Departments (ED) represent a clinical environment in which decisions about allergies and antibiotics are made without aid of allergy testing[2]
- Sexually transmitted infection (STI) complaints in EDs grew 38.6% between the periods of 2008-2010 and 2011-2013[3]
- CDC guidelines for the common STI gonorrhea recommend use of ceftriaxone, but there is no consensus treatment guideline for patients with confirmed penicillin or cephalosporin allergy[4,5,6]
- No such concern of allergic cross reactivity exists in management of chlamydial infections, which are often co-treated empirically with azithromycin in patients with STI symptoms[4]
- ED care providers must balance reported allergies, current STI symptoms, and inability to see patients in follow-up to decide on treatment plans

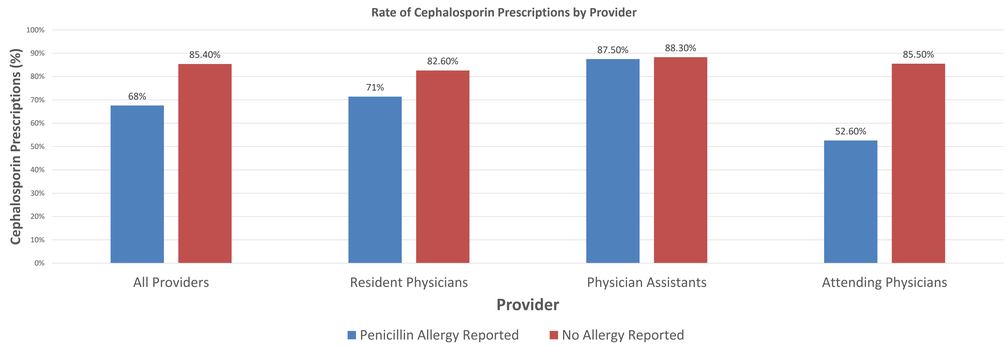
Materials and Methods

- Retrospective chart review of patients presenting with symptoms concerning for sexually transmitted infection that were treated in the Robert Wood Johnson University Hospital Emergency Department
- All patients over the age of 21 who were evaluated for, diagnosed with, or treated for a gonorrheal infection were included
- Patients aged 18-21 were excluded due to possible treatment within a designated Pediatric Emergency Department
- Chart discovery was performed with a billing-related search database of all patient visits to the emergency department between January 2014 and June 2019
- Charts were screened using search terminology: "STI", "STD", "urethritis", "vaginitis", and "gonorrhea"
- Data abstracted included patient demographic data, as well as objective information about each patient visit including ICD codes, reported allergies, antibiotic prescriptions, and role of the provider who worked most closely with the patient (resident physician, physician assistant, or attending physician)

Results

- 603 patients met criteria for presentation to ED with symptoms concerning for STI or gonorrheal infection
- 31 of 603 (5.1%) patients reported allergy to a penicillin antibiotic, 3 of 603 reported allergy to a cephalosporin
- No difference in mean age for penicillin allergy (31.4) and no reported allergy (30.9) groups
- Patients reporting penicillin allergy received antibiotics overall at a similar rate as those without allergy (Allergy – 96.8% vs. No allergy – 93.0%)
- Patients reporting penicillin allergy were LESS likely to receive a cephalosporin antibiotic compared to those reporting no allergy (Allergy – 67.7% vs. No Allergy – 85.4%, p =0.0081)
- Patients with penicillin allergy were more likely to receive an antibiotic that was neither a cephalosporin nor azithromycin (Allergy – 48.4% vs. No Allergy – 30.8%, p = 0.048)
- Most prescribed antibiotics beyond cephalosporins and azithromycin were metronidazole (7), doxycycline (4), and levofloxacin (2)

	Penicillin Allergy Reported (n=31)	No Allergy Reported (n=569)	p-value
Any Antibiotics given (%)	30 (96.8)	522 (91.7)	
Cephalosporin given (%)	21 (67.7)	486 (85.4)	p = 0.0081
Azithromycin given (%)	26 (83.9)	450 (79.1)	
Other antibiotics given (%)	15 (48.4)	175 (30.8)	p = 0.048
# Tested for G/C (%)	30 (80.6)	474 (83.3)	
Azithromycin given without a cephalosporin (%)	6 (19.4)	3 (0.527)	p <0.00001
Azithromycin ONLY (%)	3 (9.68)	3 (0.527)	p = 0.0023
Azithromycin given WITH a non-cephalosporin antibiotic (%)	3 (9.68)	0	p =0.0001
# Patients returning to ED within 1 month for same symptoms	3 (9.68)	50 (8.79)	



Limitations

- Single center, retrospective study
- Limited to details documented in patient medical record; could be missing specifics of some provider-patient discussions
- Only a select number of search terms were utilized to find patient records meeting inclusion criteria
- Exclusion of patients age 18 - 21 years old due to possibility of treatment in a Pediatric ED; important given the large volume of young patients with STI complaints

Discussion

- STIs remain a common complaint in the emergency department[3]
- No consensus guidelines are established for treating gonorrheal infections in patients who cannot receive cephalosporin antibiotics[4,5,6]
- About 5.6% of patients with STI symptoms report an allergy to penicillin or cephalosporins
- Patients with penicillin allergies are less likely to receive a cephalosporin antibiotic when presenting to the ED with STI symptoms; this finding is most prominent among attending physicians compared to resident physicians and physician assistants

Conclusions

- Overall, this study raises the concern that patients reporting penicillin allergies may be undertreated when presenting with STI symptoms
- Highlights the need for further education in areas of allergy and antibiotic selection, particularly for conditions (such as gonorrheal infections) in which there are limited alternative antibiotic regimens available

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