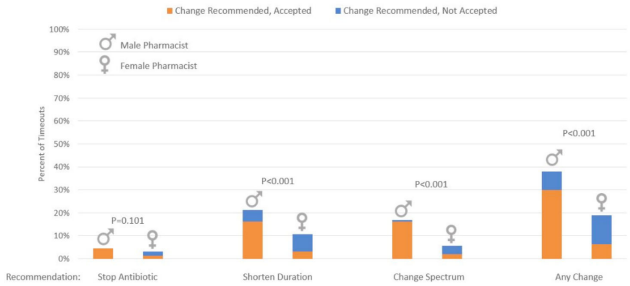
Figure 1. Patient Characteristics

Patient Characteristics	All Timeouts (N=295)	Male Pharmacists (n=137)	Female Pharmacists (n=158)	P-value[a]
Age (years), mean (SD)	64 (16)	67 (15)	62 (17)	0.01
Female Sex, N (%)	152 (51%)	65 (48%)	87 (55%)	.19
Charlson Comorbidity Index, median (IQR)	5 (2, 8)	5 (2, 8)	6 (3, 8)	.15
qSOFA score at 0-24h[b], median (IQR)	1 (0-2)	1 (0-2)	1 (0-2)	.71
Length of hospital stay (days), median (IQR)	4 (3, 7)	5 (3, 7)	4 (3, 6)	.27
Infectious disease treated, N (%)				
Urinary Tract Infection	83 (28%)	35 (26%)	48 (30%)	.39
Pneumonia	84 (28%)	46 (33%)	38 (24%)	
Skin and soft tissue	42 (14%)	16 (12%)	26 (16%)	
Bacteremia, Osteomyelitis, Other	49 (17%)	23 (17%)	26 (16%)	
Intra-abdominal or CDI	37 (13%)	17 (12%)	20 (13%)	
Infectious diseases consultation during hospitalization, N (%)	72 (24%)	32 (23%)	40 (25%)	.70
Had an antibiotic prescribed on discharge, N (%)	256 (87%)	110 (80%)	146 (92%)	<0.001
Antibiotic discharge duration (days); median (IQR)	5 (3, 10)	5 (3, 9)	6 (3-10)	.19

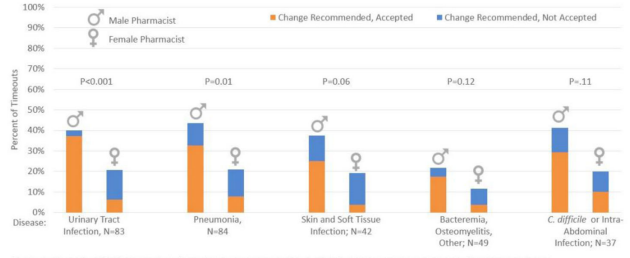
Figure shows patient characteristics of antibiotic timeouts conducted by male vs. female pharmacists.
[a] Differences in patient characteristics between men and women pharmacists were evaluated using Pearson's chi squared or t-tests, as appropriate. P<0.05 considered significant.
[b] Quick sequential organ failure assessment score (qSOFA) identifies patients outside of the intensive care unit who have a high predicted risk of sepsis-related mortality
Abbreviations: SD, standard deviation; CDI, *Clostridioides difficile* infection

Figure 2. Antibiotic Timeouts with Change Recommended and Accepted, by Type of Recommendation N=295 Timeouts



The percentage of antibiotic timeouts performed by male vs. female pharmacists that had a change recommended but not accepted vs. recommended AND accepted are shown. P-values, calculated using chi-squared tests, are shown for the overall success (percent where recommendation was accepted) of antibiotic timeouts by gender.

Figure 3. Antibiotic Timeouts Recommendations and Acceptance, By Disease N=295 Timeouts



The percentage of antibiotic timeouts performed by male vs. female pharmacists that had a change recommended but not accepted vs. recommended AND accepted are shown by disease state. P-values, calculated using chi-squared tests, are shown for the overall success (percent where recommendation was accepted) of antibiotic timeouts by gender. Abbreviations: *C. difficile*, *Clostridioides difficile*

of 137 versus 30 (19%) 158 (P **Conclusions:** In this discharge antibiotic intervention, timeouts conducted by women were less likely to result in an antibiotic change than those conducted by men. The difference in effectiveness resulted both from female pharmacists being less likely to recommend a change and from hospitalists being less likely to accept recommendations from a female pharmacist. These findings suggest that gender bias may play a role acceptance of antibiotic stewardship recommendations, which could affect antibiotic use, pharmacist job satisfaction, and patient outcomes.

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Presentation Type:
Poster Presentation - Oral Presentation
Subject Category: Antibiotic Stewardship

Identifying symptoms/illnesses and situations that predispose outpatients to use antibiotics in two healthcare systems

Lindsey Laytner; Larissa Grigoryan; Barbara Trautner; Osvaldo Alquicira; Juanita Salinas; Michael Hansen; Roger Zoorob and Fareed M. Khan

Background: Taking antibiotics outside the guidance of a clinician (nonprescription use) is a potential safety issue and runs counter to antibiotic stewardship efforts. We identified the symptoms and illnesses and situations that may predispose patients to take antibiotics, and we compared these findings between patients attending public primary care clinics and private emergency departments. **Methods:** A cross-sectional survey was conducted between January 2020 and March 2021 in 6 primary care clinics and 2 emergency departments in the United States. We queried patients about 5 symptoms and illnesses (Fig. 1) and 14 situations (Fig. 2) to investigate whether these would lead the patients to take antibiotics without a prescription. We used the χ^2 test to compare the symptoms and illnesses and situations between the respondents from public and private healthcare systems. We set the *P* value for significance at <.025. **Results:** In total, the survey had 564 respondents (median age, 49.7 years; range, 19–92), and 72% were female. Most respondents identified as either Hispanic or Latina/Latino (46.6%) or African American or Black (33%), followed by White (15.8%), and other (4.6%). Most respondents had visited public clinics (72%). The most common insurance status for our respondents included Medicaid or county financial assistance program (56.6%), followed by private insurance or Medicare (36.7%) and self-pay (6.7%). In public primary care clinics, only 23% had private insurance or Medicare compared to 72.9% in private emergency departments. Of those surveyed, 69% agreed that antibiotics would improve the recovery from sinus infections, followed by bronchitis (64%), sore throat (64%), cold/flu (61.4%), and diarrhea (31.5%). The proportions of respondents who believed that antibiotics would improve the recovery from diarrhea (36.2% vs 19.4%; $P = .004$) and sore throat (59.9% vs 48.4%; $P < .001$) were significantly higher among public versus private outpatient respondents. We did not find significant differences for cold/flu, sinus infection, or bronchitis between these 2 healthcare systems (Fig. 1). In 11 of the 14 situations, patients in public clinics were more likely to report a likelihood of using nonprescription antibiotics than the patients visiting the private emergency rooms (Fig. 2). **Conclusions:** Future stewardship interventions should be aware of the symptoms and illnesses and situations that may

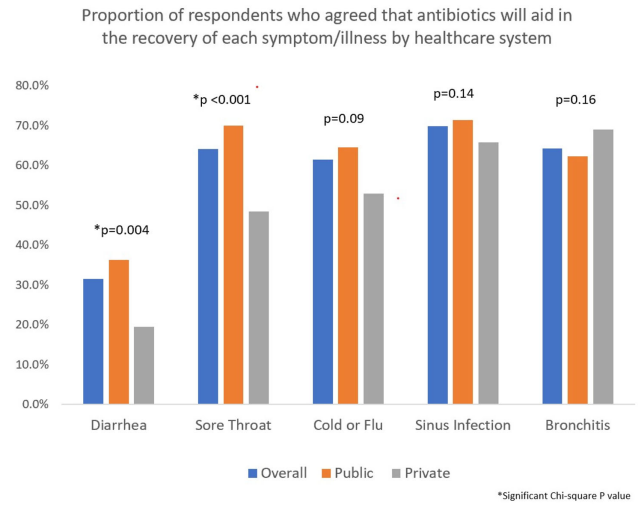

Fig. 1.

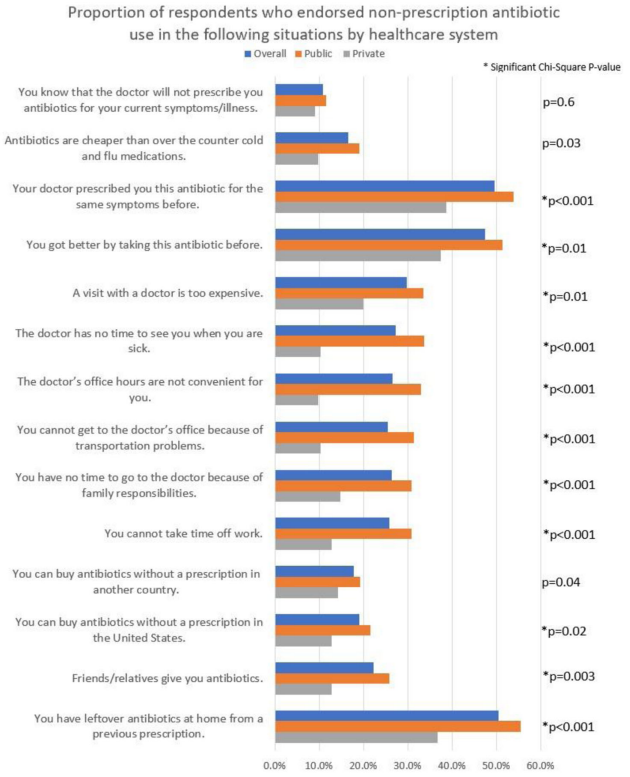

Fig. 2.

influence outpatients to take nonprescription antibiotics. Addressing modifiable factors (eg, leftover antibiotics, antibiotics given by friends or family, and antibiotics available without a prescription in stores or markets) may also curtail these unsafe practices and reduce antibiotic resistance.

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Presentation Type:
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Subject Category: Antibiotic Stewardship

Using machine learning to predict antibiotic resistance to support optimal empiric treatment of urinary tract infections

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Background: Antibiotic resistance is pervasive in the Veterans' Affairs (VA) healthcare system, with rates of fluoroquinolone and trimethoprim–sulfamethoxazole (TMP/SMX) resistance approaching 30% in *E. coli* urinary isolates. The efficacy of antimicrobial treatment is critically dependent on the susceptibility of the infecting pathogen; however, prescription decisions are often made empirically in practice. We analyzed susceptibility profiles of enteric gram-negative rods (Enterobacterales) from clinical urine cultures collected from ambulatory patients receiving care in VA clinics and emergency departments. Our goals were (1) to develop a predictive model to support choice of empiric antibiotics pending results of susceptibility testing and (2) to examine the relationship between past antibiotic exposures and susceptibility profiles to enhance understanding of antibiotic selective pressure. **Methods:** We obtained 265,076 positive cultures from 157,422 unique patients from 2015 to 2020. We trained random forest multinomial classifiers to estimate the risk of a positive urine culture isolate being resistant to the multinomial outcome: fluoroquinolone, TMP–SMX, cephalosporin, or any combination of these 3 agents. Data sources evaluated for model generation included demographics, comorbidities, trend and seasonal terms, treatment history for multiple antimicrobial treatments summarized using number of prescriptions in weekly intervals, and sample history summarized by number of resistant and susceptible cultures in weekly intervals. Using 5-fold cross validation, we assess the performance of the clinical prediction using the area under the receiver operating characteristic curve (AUC) for each multinomial outcome. In addition to prediction, we modeled the direct effect of treatment on resistance using multinomial group lasso (MGL). This method allows variable selection in variable groupings, such as all variables related to the fluoroquinolone treatment history, which allowed us to assess the effect of a patient's complete course of treatment on resistance. **Results:** In cross-validation analysis, our random forest model was best at predicting outcomes with fluoroquinolone resistant phenotypes compared to non–fluoroquinolone-resistant phenotypes (Table 1). From MGL, we found that having a prescription for fluoroquinolone treatment 4–8 weeks prior to a urinalysis was positively associated with fluoroquinolone resistance and negatively associated with fluoroquinolone susceptible phenotypes (Fig. 1). **Conclusions:** Our results show that a patient's sample and treatment history are highly predictive of a future resistance. Fluoroquinolone treatment is especially associated with increased risk of fluoroquinolone single- and multidrug resistances. A history of either fluoroquinolone or trimethoprim-sulfamethoxazole (TMP-SMX) treatment is a stronger indicator of a future resistant phenotype than cephalosporin or penicillin.

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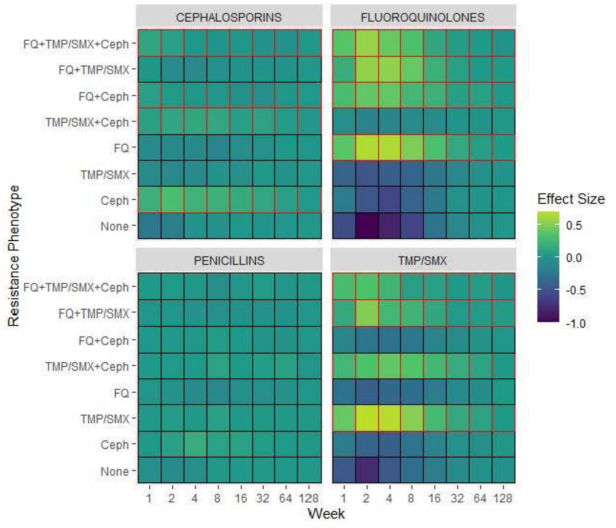

Figure 1. Effect size of antibiotic treatment history by weekly interval (e.g. where 2 refers to the interval between 1 and 2) on each multinomial outcome. A red outline specifies resistance to the specified antibiotic exposure.

Resistance Phenotype	Avg. AUC (SD)
FQ & TMP/SMX & Ceph	0.824 (.001)
FQ & TMP/SMX	0.797 (.003)
FQ & Ceph	0.781 (.005)
FQ	0.784 (.003)
TMP/SMX & Ceph	0.716 (.004)
TMP/SMX	0.736 (.005)
Ceph	0.691 (.006)
None	0.759 (.003)

Table 1. Discriminatory performance (AUC) from 5-fold cross-validation of each resistance phenotype versus the others from the multinomial random forest prediction