antibiotic guidelines were developed during the pandemic period. AU rates were monitored quarterly to determine the effects of the AS interventions to prescribing practices.

Results. Total and specific AU rates were higher (up to 34% and 80%, respectively) in our index hospital compared to other non-teaching hospitals nationally prior to the pandemic. Total antibiotic utilization increased by only 5.5% in the 2nd quarter 2020, peak of AU during the pandemic. Total, vancomycin, piperacillin-tazobactam and quinolone utilization rates decreased by 19%, 41%, 38%, and 52%, respectively, at 1st quarter 2021 compared to 4th quarter 2019. Steeper decreases were noted with implementation of educational activities. Ceftriaxone use remained high and was 50% greater than comparator hospitals at 1st quarter 2021.

Conclusion. Although problematic during the COVID-19 pandemic, AS can have significant impact on provider prescribing practices and decrease total and specific antibiotic utilization rates. The use of ceftriaxone, an antibiotic commonly used for empiric bacterial coverage for community acquired pneumonia, presents as a continuing challenge.

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150. Improved Susceptibility of *Pseudomonas aeruginosa* to Cefepime (CEF) at a Veterans Tertiary Care Hospital, over a 7-Year Period (2011-2017): The Impact of Antibiotic Rotation/Cycling and Reversal of Drug Resistance in *P. aeruginosa*

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Session: P-09. Antimicrobial Stewardship: Trends in Antimicrobial Prescribing

Background. Background: *Pseudomonas aeruginosa* continues to be an important cause of nosocomial infections associated with a high morbidity and mortality. Despite the availability of ceftazidime-avibactam (CAZ-AVI) and ceftolozone-tazobactam (CFT-TAZO), CEF continues to be an empiric agent of choice in several institutions. **Aim:** To evaluate the prevalence and trend in susceptibilities of *P. aeruginosa* to CEF over a 7-year period, identify possible correlation with the use of CAZ, AZT, PTZ, CIP, and CAR, (DOT/1000 patient days), as a quality improvement (QI) measure for optimizing CEF use, introduce antibiotic cycling as a tool to avoid emergence of drug-resistance in *P. aeruriginosa*.

Methods. A retrospective review of antimicrobial susceptibility data of all isolates of *P. aeruginosa*, (inpatient and outpatient) at the Detroit VAMC pre and post implementation of antibiotic cycling, over a 7-year period (2011-2017) was performed. Susceptibility testing was performed by reference broth micro-dilution methods in a central laboratory. Data analysis was performed using Pearson correlation coefficient score. Being a QI project, clinical data were not reviewed.

Results. A total of 977 isolates were identified during the study period. (drug usage are in DOT/1000 PD); CAZ and AZT use surged during 2013-14 from 5 to 8 dropping in 2015-17 to < 3; PTZ usage increased to 100 during 2011-14 but dropped to 38 in 2015-17 (drug shortage); CAR use averaged at 10 until 2016 and dropped to 8 in 2017; CIP use dropped by 50% from 30 in 2012 to 15 in 2017; *P. aeruginosa* susceptible to CEF decreased from 88% in 2012 to 81% in 2014 mirroring the increased use of CEF, AZT, CAZ, and CIP; AG use was very low at < 5. With restrictions on the use of AZT, CAZ, and CIP, from 2014-15, CEF susceptibility increased significantly to 95.5% in 2015. Drug shortage of PTZ in 2015 and increased use of CEF from 2015-17 led to a drop in susceptibility to (82%); *P. aeruginosa* susceptible to CAR and AG averaged at 88% and 97% respectively (2011-17). However, reintroduction PTZ, resulted in improved susceptibility of *P. aeuruginosa* to CEF by 40% within a year.

Conclusion. Judicious antimicrobial use and antibiotic rotation play a significant role in reversing drug resistance in *P. aeuruginosa*.

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151. Association Between Outpatient Antibiotic Prescribing, Antimicrobial Resistance, and Initial Presentation to Inpatient Setting for Urinary Tract Infections Among Older Adults in New York State

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Session: P-09. Antimicrobial Stewardship: Trends in Antimicrobial Prescribing

Background. Antibiotic prescribing (AP) and resistance (AR) may influence severity of illness in urinary tract infection (UTI). Limited data exist assessing the relationship between county-level AP and AR on initial presentation to hospital for UTI. This study evaluated the association between county-level AP and AR on UTI severity of illness among hospitalized patients in New York State.

Methods. Retrospective, cross-sectional analysis, combining data from New York State Statewide Planning and Research Cooperative System (SPARCS) and previously published data on countywide antimicrobial resistance and antimicrobial prescribing. Inclusion criteria: female patients admitted to a New York inpatient setting in 2017, UTI (CCS 159), Medicare insurance. Exclusion criteria: missing countywide prescribing or resistance. All-patient refined (APR) clinical severity ≥ 3 was the primary outcome. Counties were classified as prescribing above or below the median prescribing proportion, and above or below the median prevalence of E. coli resistance for TMP-SMX and NTF. Countywide prescribing practices, antimicrobial resistance, patient factors, and location factors were evaluated for association with APR clinical severity ≥ 3 using chi-squared and logistic regression.

Results. 8,024 patients met study criteria. Baseline characteristics are presented in Table 1. 3,597 (44.8%) had an APR severity of ≥ 3. Factors associated with APR severity ≥ 3 include age group (P < 0.001), ethnicity (P = 0.013), hospital county (P < 0.001), first line prescribing ≥ 45.4% (P = 0.049), E. coli TMP-SMX resistance ≥ 29.0% (P < 0.001) via chi-squared test. In the logistic regression analysis counties with higher first line prescribing was associated with decreased odds for severe infection (aOR: 0.83 [0.72 – 0.97]). Additional factors associated with severe infection are presented in Table 2.

Table 1: Baseline Characteristics

	N (%)
Age Group	
50 to 69	1227 (15.3)
70 or Older	6797 (84.7)
White	4950 (61.7)
Hispanic, Multi-Racial, or Other	1605 (20.0)
County	
Albany	383 (4.8)
Bronx	886 (11)
Dutchess	274 (3.4)
Fulton	22 (0.3)
Kings	1259 (15.7)
Manhattan	1301 (16.2)
Orange	273 (3.4)
Putnam	81 (1)
Queens	1257 (15.7)
Richmond	376 (4.7)
Rockland	254 (3.2)
Suffolk	1459 (18.2)
Sullivan	55 (0.7)
Ulster	144 (1.8)
First Line Prescribing ≥ 45.4%	3290 (41.0)
E. coli resistance to TMP-SMX ≥ 29.0%	3402 (42.4)
E. coli resistance to NTF ≥ 2.0%	5989 (74.6)
APR severity ≥ 3	3597 (44.8)

Abbreviations: TMP-SMX: Trimethoprim-Sulfamethoxazole; NTF: Nitrofurantoin; APR: All-patient refined;

Table 2: Factors Associated with APR Severity

	P	aOR	95% C.I. aOR	
			Lower	Upper
Age ≥ 70	< .001	1.382	1.220	1.567
First line prescribing ≥ 45.4%	.017	.832	.716	.968
County Group*	< .001	1.325	1.133	1.550
E. coli TMP-SMX resistance ≥ 29.0%	< .001	.801	.712	.901
E. coli NTF resistance ≥ 2.0%	.081	1.122	.986	1.278
Hispanic	.042	.888	.792	.996

*County group: Albany, Bronx, Dutchess, Fulton, Manhattan, Orange, Putnam, and Sullivan County.

Conclusion. Prescribing patterns may have a significant influence on initial presentation to the hospital for urinary tract infections. Outpatient antimicrobial stewardship should endeavor to promote guideline driven prescribing. Further research is needed to corroborate the findings from this cross-sectional study.

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152. Use of Antimicrobials among Suspected COVID-19 Patients at Selected 12 Hospitals in Bangladesh: Findings from the First Wave of COVID-19 Pandemic

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Session: P-09. Antimicrobial Stewardship: Trends in Antimicrobial Prescribing

Background. Antimicrobials are empirically used in COVID-19 patients resulting in inappropriate stewardship and increased antimicrobial resistance. Our objective was to assess antimicrobial use among suspected COVID-19 in-patients while waiting for the COVID-19 test report.

Methods. From March to August 2020, we collected data from in-patients of 12 tertiary-level hospitals across Bangladesh. We identified suspected COVID-19 patients; collected information on antimicrobial received within 24 h before and on hospitalization; and tested nasopharyngeal swab for SARS-CoV-2 using rRT-PCR. We used descriptive statistics and a regression model for data analysis.

Results. Among 1188 suspected COVID-19 patients, the median age was 34 years (IQR:2–56), 69% were male, 40% had comorbidities, 53% required oxygen, and 1% required ICU or ventilation support after admission. Antibiotics were used in 92% of patients, 47% within 24 h before, and 89% on admission. Patients also received antiviral, mostly favipiravir (1%) and antiparasitic drugs particularly ivermectin (3%). Third-generation cephalosporin use was the highest (708;60%), followed by macrolide (481;40%), and the majority (853;78%) who took antibiotics were SARS-CoV-2 negative. On admission, 77% mild and 94% moderately ill patients received antibiotics. Before admission, 3% patients had two antibiotics, and on admission, 27% received two to four classes of antibiotics at the same time. According to WHO AWaRe classification, the Watch group antibiotics were mostly used before (43%) as well as on admission (80%). Reserve group antibiotic particularly linezolid was used in 1% patients includes mild cases on admission. Antibiotic use on admission was higher among

severely ill patients (AOR = 11.7;95%CI:4.5–30.1) and those who received antibiotics within 24 h before hospital admission (AOR = 1.6;95%CI:1.0–2.5).

Antimicrobials *	Suspected COVID-19 Patients (n = 1188) n(%)	Within 24 h before Admission			On Admission		
		SARS-CoV-2 Positive (n = 257) n(%)	SARS-CoV-2 Negative (n = 931) n(%)	p-Value	SARS-CoV-2 Positive (n = 257) n(%)	SARS-CoV-2 Negative (n = 931) n(%)	p-Value
Antibiotic							
Antibiotics used in total	1090 (91.7%)	562 (47.3%)			1057 (89.0%)		
Cephalosporin	761(64.1)	25(9.7)	161(17.3)	0.003	127(49.4)	600(64.4)	<0.001
First-generation	4(0.3)	1(0.4)	3(0.3)	0.870	0	0	
Second-generation	69(5.8)	5(2)	13(1.4)	0.523	7(2.7)	47(5.1)	0.113
Third-generation	708(59.6)	19(7.4)	145(15.6)	0.001	120(46.7)	554(59.5)	<0.001
Fourth-generation	1(0.1)	0	0	0	0	1(0.1)	0.599
Macrolide	481(40.5)	104(40.5)	223(24.0)	<0.001	85(33.1)	180(19.3)	<0.001
Penicillin	200(16.8)	6(2.3)	27(2.9)	0.625	38(14.8)	140(15.0)	0.920
Aminoglycoside	114(9.6)	1(0.4)	6(0.6)	0.636	7(2.7)	102(11.0)	<0.001
Quinolones	63(5.3)	3(1.2)	8(0.9)	0.648	11(4.3)	41(4.4)	0.932
Tetracycline	76 (6.4)	10(3.9)	14(1.5)	0.016	17(6.6)	39(4.2)	0.104
Carbapenems	45(3.8)	0	3(0.3)	0.362	11(4.3)	33(3.5)	0.580
Oxazolidinone	12(1.0)	0	0		3(1.2)	9(1.0)	0.776
Glycopeptides	10(0.8)	0	0		2(0.8)	8(0.9)	0.900
Nitroimidazoles	13(1.1)	0	1(0.1)	0.599	3(1.2)	9(1.0)	0.776
WHO AWaRe classification antibiotics							
Access	370 (31.1)	68 (5.7)			329 (27.7)		
Watch	1016 (85.5)	514 (43.3)			949 (79.9)		
Reserve	12 (1.0)	0			12 (1.0)		
Antiviral drug							
Antiviral used in total	16 (1.4)	0			16 (1.4)		
Acyclovir	3 (0.3)	0	0	-	0	3 (0.3)	0.362
Adefovir	1 (0.1)	0	0	-	0	1 (0.1)	0.599
Zidovudine	1 (0.1)	0	0	-	0	1 (0.1)	0.599
Valacyclovir	3 (0.3)	0	0	-	1 (0.4)	2 (0.2)	0.622
Favipiravir	8(0.7)	0	0	-	1 (0.4)	7 (0.7)	0.529
Antiparasitic drug							
Antiparasitic drug used in total	33(2.8)	3 (0.3)			30 (2.5)		
Ivermectin	33(2.8)	1 (0.4)	2(0.2)	0.622	9(3.5)	21(2.7)	0.260

*Multiple response

Antimicrobials used among suspected COVID-19 patients and SARS-CoV-2 positive and negative patients 24 h before and on hospital admission at 12 selected hospitals in Bangladesh, March–August 2020

Antimicrobials	Disease Severity				
	Mild (n = 436) n(%)	Moderate (n = 389) n(%)	Severe (n = 326) n(%)	Critical (n = 37) n(%)	Total (n = 1188) n(%)
Antibiotic	334(76.6)	367(94.3)	321(98.5)	35(94.6)	1057(89.0)
Cephalosporin	197(45.2)	259(66.6)	250(76.7)	21(56.8)	727(61.2)
First-generation	0	0	0	0	0
Second-generation	10(2.3)	30(7.7)	10(3.1)	4(10.8)	54(4.6)
Third-generation	187(42.9)	231(59.4)	239(73.3)	17(46.0)	674(56.7)
Fourth-generation	0(0)	0(0)	1(0.3)	0(0)	1(0.1)
Macrolide	88(20.2)	98(25.2)	74(22.7)	5(13.5)	265(22.3)
Penicilin	48(11)	59(15.2)	63(19.3)	8(21.6)	178(15.0)
Aminoglycoside	15(3.4)	37(9.5)	51(15.6)	6(16.2)	109(9.2)
Quinolones	27(6.2)	11(2.8)	13(4)	1(2.7)	52(4.4)
Tetracycline	18(4.1)	16(4.1)	16(4.9)	6(16.2)	56(4.7)
Carbapenems	17(3.9)	6(1.5)	18(5.5)	3(8.1)	44(3.7)
Oxazolidinones	4(0.9)	3(0.8)	2(0.6)	3(8.1)	12(1.0)
Glycopeptides	4(0.9)	2(0.5)	2(0.6)	2(5.4)	10(0.8)
Nitroimidazoles	9(2.1)	2(0.5)	0(0)	1(2.7)	12(1.0)
WHO AWaRe classification antibiotics					
Access	82(18.8)	106(27.2)	122(37.4)	19(51.3)	329(27.7)
Watch	287(65.8)	341(87.7)	293(89.9)	28(75.7)	949(79.9)
Reserve	4(0.9)	3(0.8)	2(0.6)	3(8.1)	12(1.0)
Antiviral drug					
Acyclovir	2 (0.5)	0	0	1 (2.7)	3 (0.2)
Adefovir	0	1 (0.3)	0	0	1 (0.1)
Zidovudine	1 (0.2)	0	0	0	1 (0.1)
Valacyclovir	3 (0.7)	0	0	0	3 (0.2)
Favipiravir	2 (0.5)	0	6 (1.8)	0	8 (0.7)
Antiparasitic drug					
Ivermectin	3(0.7)	6(1.5)	16(4.9)	5(13.5)	30(2.5)

Antimicrobials used on admission among suspected COVID-19 patients according to disease severity at 12 selected hospitals in Bangladesh, March–August 2020

Conclusion. Antimicrobial use was highly prevalent among suspected COVID-19 in-patients in Bangladesh. Initiating treatment with Watch group antibiotics like third-generation cephalosporin and azithromycin among mild to moderately ill patients were common. Promoting antimicrobial stewardship with monitoring is essential to prevent blanket antibiotic use, thereby mitigating antimicrobial resistance.

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153. Utilization of Post-Exposure Prophylaxis to Prevent Lyme Disease in a Large US Healthcare Database

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Session: P-09. Antimicrobial Stewardship: Trends in Antimicrobial Prescribing

Background. In the United States, at least 50,000 emergency department visits for tick bite and an estimated 476,000 Lyme disease diagnoses occur annually, with incidence of both high among children. The majority of these healthcare visits occur in the northeastern and midwestern states having high Lyme disease incidence and during the summer and fall months, corresponding to peak opportunities for exposure to blacklegged ticks. Post-exposure prophylaxis (PEP) with a single dose of doxycycline can effectively prevent Lyme disease after a tick bite that is high risk for transmission of Lyme disease. We describe characteristics of patients with dispensings of single-dose doxycycline in a large US-based system that includes patients enrolled in private and public health insurance plans.

Methods. Single-dose doxycycline (≤200 mg) dispensings during January 2009 – February 2020 were identified for patients enrolled in seven Data Partners that contributed electronic healthcare data to the Food and Drug Administration Sentinel Distributed Database, including large national insurers, an integrated delivery care network, a state Medicaid, and the 100% Medicare fee-for-service plan. We examined patient and PEP dispensing characteristics by patient age, state of residence, and month of dispensing.

Results. We identified 408,897 patients with PEP (n=474,414 total dispensings) with a mean age of 60 years at first dispensing. Overall, there were 21 patients per 10,000 eligible members with PEP dispensings. Dispensings were less common in children (< 1 and 4 patients per 10,000 eligible members aged < 8 and 8-18 years, respectively). Most dispensings (72%) occurred in states with high incidence of Lyme disease. Seasonality of dispensings was bimodal, with most occurring during April – July and October – November (71 – 83%, by year).

Conclusion. Lyme disease PEP was relatively common and mirrored geographic and seasonal trends observed for ED visits for tick bites and Lyme disease diagnoses. However, we observed more PEP among older adults, and few dispensings among children. Despite healthcare visits for tick bites and Lyme disease occurring disproportionately among pediatric age groups, PEP appears to be underutilized in children.

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154. Antibiotic Use During Three Separate Waves of the COVID-19 Pandemic at a Large Academic Medical Center in Detroit, MI

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Session: P-09. Antimicrobial Stewardship: Trends in Antimicrobial Prescribing

Background. Inpatient antibiotic use early on in the COVID-19 pandemic may have increased due to the inability to distinguish between bacterial and COVID-19 pneumonia. The purpose of this study was to determine the impact of COVID-19 on antimicrobial usage during three separate waves of the COVID-19 pandemic.

Methods. We conducted a retrospective review of patients admitted to Detroit Medical Center between 3/10/19 to 4/24/21. Median days of therapy per 1000 adjusted patient days (DOT/1000 pt days) was evaluated for all administered antibiotics included in our pneumonia guidelines during 4 separate time periods: pre-COVID (3/3/19-4/27/19); 1st wave (3/8/20-5/2/20); 2nd wave (12/6/21-1/30/21); and 3rd wave (3/7/21-4/24/21). Antibiotics included in our pneumonia guidelines include: amoxicillin, azithromycin, aztreonam, ceftriaxone, cefepime, ciprofloxacin, doxycycline, linezolid, meropenem, moxifloxacin, piperacillin-tazobactam, tobramycin, and vancomycin. The percent change in antibiotic use between the separate time periods was also evaluated.

Results. An increase in antibiotics was seen during the 1st wave compared to the pre-COVID period (2639 [IQR 2339-3439] DOT/1000 pt days vs. 2432 [IQR 2291-2499] DOT/1000 pt days, p=0.08). This corresponded to an increase of 8.5% during the 1st wave. This increase did not persist during the 2nd and 3rd waves of the pandemic, and the use decreased by 8% and 16%, respectively, compared to the pre-COVID period. There was an increased use of ceftriaxone (+6.5%, p=0.23), doxycycline (+46%, p=0.13), linezolid (+61%, p=0.014), cefepime (+50%, p=0.001), and meropenem (+29%, p=0.25) during the 1st wave compared to the pre-COVID period. Linezolid (+39%, p=0.013), cefepime (+47%, p=0.08) and tobramycin (+47%, p=0.05) use remained high during the 3rd wave compared to the pre-COVID period, but the use was lower when compared to the 1st and 2nd waves.