

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

Background. The aim of this study was to analyze the effect of discontinuation of antimicrobial stewardship programs (ASP) activity on the antibiotic usage pattern.

Methods. An interrupted time series analysis assessing the trends in antibiotic use and incidence of antimicrobial resistance in major pathogens was conducted between March 2017 and April 2019 in an 859-bed university-affiliated hospital in Korea, where all ASP activities were discontinued in February 2018. The major activity of the ASP was a restrictive measure for designated antibiotics. We defined antibiotics as medication with the Anatomical Therapeutic Chemical class J01, and the antibiotic consumption was measured as days of therapy (DOT), which was then standardized per 1,000 patient-days.

Results. The use of antibiotics against multidrug-resistant pathogens increased immediately after the discontinuation of restrictive antibiotic program (41.01 and 150.99 days of therapy [DOT]/1,000 patient-days in the general ward [GW] and intensive care unit [ICU], respectively). In addition, there were positive changes for the GW and ICU (4.20 and 31.57 DOT/1,000 patient-days per month, respectively). The use of broad-spectrum antibiotics in patients in the ICU significantly decreased (-674.26 DOT/1,000 patient-days). For non-broad-spectrum antibiotics, there were positive changes for the GW and ICU (18.17 and 22.69 DOT/1,000 patient-days per month, respectively).

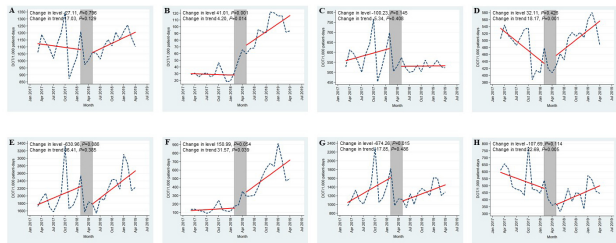


Fig. 4. Changing trends in antibiotic use among inpatients over time. A) Total antibiotics in general ward; B) Antibiotics against multidrug-resistant pathogens in general ward; C) Broad-spectrum antibiotics in general ward; D) Non-broad-spectrum antibiotics in general ward; E) Total antibiotics in intensive care unit; F) Antibiotics against multidrug-resistant pathogens in intensive care unit; G) Broad-spectrum antibiotics in intensive care unit; H) Non-broad-spectrum antibiotics in intensive care unit

Conclusion. In conclusion, after discontinuation of ASP, antibiotic usage patterns rapidly returned to the patterns prior to ASP implementation.

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143. Antibiotic Use for Common Infections in British Columbia and Ontario: A Review of Outpatient Prescribing to Seniors from 2000 – 2018

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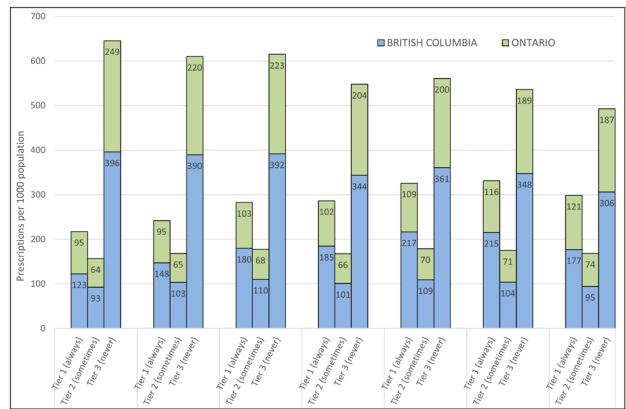
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Background. Antimicrobials remain among the most prescribed medications in Canada, with over 90% prescribed in outpatient settings. Older adults (aged ≥65 years) prescribed antimicrobials are particularly vulnerable to adverse drug events and antimicrobial resistance. This study compared annual rates of indication-associated, outpatient prescribing to seniors across two Canadian provinces.

Methods. All outpatient, oral antimicrobials dispensed to older adults (≥65 years) were identified from administrative health databases, from 2000 to 2018. Antimicrobials were limited to outpatient use only and linked to an indication using a 3-tiered diagnostic hierarchy. When possible, a record of dispensation was matched to a tier 1 indication (*always* require antibiotics) first. In the absence of a tier 1 indication, priority was given to tier 2 (*sometimes* require antibiotics), then 3 (*never* require antibiotics). Prescription rates were calculated per 1000 population, and trends were examined overall, by drug class, and patient demographics.

Results. Our study included over 18 million individuals (aged ≥65 years) with a total of 23,773,552 antibiotic prescriptions issued to seniors, for common infections. In both provinces, prescribing for tier 1 diagnoses increased over the study period (BC: 44%; ON: 28%). Urinary tract infections accounted for most prescriptions within this tier (ON: 89 prescriptions/1000, BC: 129 prescriptions/1000 population by 2018). Pneumonia-associated prescribing increased by roughly 10% in both provinces. In any given study year, for both provinces, tier 3 diagnosis was the most common reason for antibiotic use, accounting for 50% of all indication-associated antibiotic prescribing. As diagnoses within this tier do not warrant prescribing all antibiotics issued are therefore *inappropriate* prescriptions.

Figure 1. Rates of indication-associated antibiotic use in Canadian seniors, from 2000 to 2018.



Conclusion. Elevated prescribing to seniors continues across Canadian out-patient settings. Antibiotic prescribing remains an issue of high concern with 50% of all antimicrobials prescribed to seniors, for common infections, used inappropriately.

Disclosures. All Authors: No reported disclosures

144. Antifungal Use Trends in Hospitalized Adults in the United States, 2016-2020

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Background. Surveillance of antimicrobial use is a cornerstone of antimicrobial stewardship, though antifungal (AF) use is less frequently characterized. AFs are a major driver of inpatient costs and their use both reflects and drives changes in fungal susceptibility patterns. We report on trends in AF use in a large sample of United States hospitals over time including predictors of AF use.

Methods. We performed a retrospective analysis of adult inpatient visits between 2016 and 2020 at hospitals contributing data to the Vizient Clinical Database/Clinical Resource Manager (www.vizientinc.com). Inpatient use of systemically administered AFs was investigated as a function of study quarter, diagnosis code, and underlying immunosuppressive condition. Changes in AF use were modeled using logistic and negative binomial regression.

Results. We examined over 23 million admissions across 470 hospitals, 43% of which were classified as teaching hospitals and 54% of which performed solid organ transplants. During the study period, 4.03% (951,284/23,565,493) of admissions were billed for one or more of the study AFs. Among admissions receiving AFs, 86% received an azole, with the most frequently used agent being fluconazole, which accounted for 46% of total AF days. Likelihood of AF receipt during admission increased by quarter (OR 1.012, p< 0.001), controlling for length of stay, presence of fungal infection, hematologic malignancy (HM), or solid organ transplant (SOT). Odds of any receipt and days of therapy (DOT) of fluconazole, isavuconazole, posaconazole, and echinocandins increased over the study period while those of voriconazole, itraconazole, and flucytosine decreased; odds of receipt of amphotericin products increased while DOT decreased; flucytosine receipt odds increased while DOT did not change. Only 30% of admissions with AF use were associated with a documented fungal infection, with 93% of these episodes documented as candidiasis. Admissions associated with SOT or HM represented 2% and 3% of all patient-days, but 11% and 25% of total AF days, respectively.

Antifungal Utilization

Table 2: AF Utilization Over Study Period					
Antifungal	All Patients DOT/1000 PD	Among Patients Receiving Any AF			
		Any Receipt, Effect of Quarter*	Days of Use, Effect of Quarter*		
		OR	p	IRR	p
Any Antifungal	66.5	N/A			
Any Triazole	47.6	0.983	<0.001	0.998	<0.001
Fluconazole	30.6	0.991	<0.001	0.997	<0.001
Itraconazole	1.0	0.976	<0.001	0.955	<0.001
Voriconazole	6.4	0.976	<0.001	0.979	<0.001
Posaconazole	6.5	1.013	<0.001	1.009	<0.001
Isavuconazole	3.0	1.042	<0.001	1.043	<0.001
Echinocandins	14.5	1.012	<0.001	1.007	<0.001
Amphotericin	3.9	1.003	0.032	0.992	<0.001
Flucytosine	0.6	0.99	0.001	1.000	0.93

DOT/1000PD=days of therapy per 1000 patient-days; *adjusted for fungal infection diagnosis, solid organ transplant, hematologic malignancy, and length of stay; bold represents increases

Conclusion. AF use increased significantly over the study period, with changes across agents and classes. Most AF use occurred in the absence of administratively documented infection and was more common among SOT and HM patients.

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145. Comparing Antibiotic Use Across Inpatient Facilities with Different Antibiotic Stewardship Typologies using Machine Learning and Joint Modeling Approach

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Background. Hospital antibiotic stewardship programs (ASP) aim to promote the appropriate use of antimicrobials (including antibiotics) and play a critical role in controlling antibiotic costs and antibiotic-resistant bacterial infection risk, and improving patient outcomes. However, unlike other health care quality improvement intervention programs, the ASP implementation strategies vary among healthcare facilities, and little is known about whether different types of ASP implementation will lead to the shifting of antibiotic drug use from one class to another.

Methods. We proposed an analytical framework using unsupervised machine learning and joint model approach to 1) develop a typology of ASP strategies in facilities from the Veterans Health Administration, America's largest integrated health care system; and 2) simultaneously evaluate the impacts of different ASP types on the annual antibiotic use rates across multiple drug classes. The unsupervised machine learning method was used to leverage the structural components in the surveys conducted by the Veteran Affairs (VA) Healthcare Analysis and Information group and the Consolidated Framework for Implementation Research experts from Boston University, and reveal the underlying ASP patterns in the VA facilities in 2016.

Results. We identified 4 groups in the VA facilities in terms of enthusiasm and implementation level of antibiotic control in our ASP typology. We found the facilities with high implementation level and high enthusiasm in ASP and those with high implementation level but low enthusiasm had statistically significant 30% (p-value=0.002) and 22% (p-value=0.031) lower antibiotic use rates in broad-spectrum agents used for community infections, respectively than those with low implementation level and low enthusiasm. However, the facilities with high implementation and high enthusiasm also marginally increased antibiotic use rates in beta-lactam antibiotics (p-value=0.096).

Conclusion. The developed analytical framework in the study provided an approach to the granular assessment of the impact of the healthcare intervention programs and might be informative for future health service policy development.

Disclosures. Matthew B. Goetz, MD, Nothing to disclose

146. Predictors of Long Duration Antibiotic Therapy for Urinary Tract Infections and Community-Acquired Pneumonia in Pediatric Ambulatory Care Settings

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Background. Significant variation exists in the duration of antibiotic therapy for children in ambulatory care settings. Understanding drivers of variation for common conditions such as community-acquired pneumonia (CAP) and urinary tract infection (UTI) is important to informing antimicrobial stewardship interventions.

Methods. A retrospective observational study was conducted of patients with CAP and UTI seen in outpatient clinics or discharged from the emergency room (ER) of a tertiary care children's hospital network from 2016 - 2019. Diagnoses CAP and UTI were identified via ICD-10 coding. Only oral medications ordered for ≥ 3 and < 28 days were included. Multivariable logistic regression was performed to identify predictors of long antibiotic duration (defined as ≥ 10 days). Potential non-clinical drivers of longer duration included race, ethnicity, sex, primary language, and insurance status.

Results. A total of 2,104 prescriptions for CAP from 442 prescribers and 1,070 prescriptions for UTI from 314 prescribers were included. Antibiotic durations were ≥ 10 days in 59.9% and 47.6% of prescriptions for CAP and UTI, respectively. Long duration of therapy was more common in children discharged from the ER when compared to clinics for both CAP (OR 1.795, 95% CI: 1.107 - 2.929), and UTI (OR 5.149, 95% CI: 1.933 - 16.373). The proportion of patients with long duration of therapy increased with younger age for both diagnoses and decreased overall in the final year of the study. Race, gender, ethnicity, and primary language were not associated with prolonged duration of therapy. However, patients with Medicaid insurance were more likely to receive long duration of therapy for CAP (OR 1.337, 95% CI: 1.062 - 1.682) and UTI (1.654, 95%, CI: 1.181 - 2.325).

Predictors of Antibiotic Duration ≥ 10 days		
Predictor	UTI OR (95% CI)	CAP OR (95% CI)
Convenient Care vs. Clinic	2.245 (0.765 - 7.657)	0.875 (0.511 - 1.507)
Emergency Medicine vs. Clinic	5.149 (1.933 - 16.373)	1.795 (1.107 - 2.929)
Age: Infant vs. Adolescent	4.997 (2.968 - 8.589)	7.821 (5.122 - 12.104)
Age: Toddler vs. Adolescent	4.334 (2.719 - 7.069)	3.037 (2.181 - 4.257)
Age: Child vs. Adolescent	2.320 (1.460 - 3.769)	1.500 (1.067 - 2.122)
Race: White vs. Asian	2.011 (0.992 - 4.139)	0.995 (0.650 - 1.522)
Race: Black vs. Asian	1.369 (0.660 - 2.866)	1.515 (0.970 - 2.362)
Race: Other vs. Asian	1.449 (0.657 - 3.239)	0.948 (0.583 - 1.536)
Sex: Male vs. Female	1.306 (0.910 - 1.880)	1.049 (0.869 - 1.265)
Language: Non-English vs. English	0.801 (0.588 - 1.090)	1.024 (0.800 - 1.313)
Ethnicity: Non-Hispanic/Latino vs. Hispanic/Latino	1.315 (0.776 - 2.232)	0.838 (0.597 - 1.175)
Insurance Status: Medicaid vs. Non-Medicaid	1.654 (1.181 - 2.325)	1.337 (1.062 - 1.682)
Year: 2017 vs. 2016	0.805 (0.559 - 1.156)	0.893 (0.679 - 1.173)
Year: 2018 vs. 2016	0.579 (0.401 - 0.834)	1.233 (0.94 - 1.620)
Year: 2019 vs. 2016	0.550 (0.377 - 0.801)	0.733 (0.565 - 0.950)

Conclusion. In pediatric patients in ambulatory care settings, younger age, care in the ER, and being insured through Medicaid were independently associated with prolonged duration of therapy for both UTI and CAP.

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147. Antibiotic Prescribing: Shorter is Also Better in the Emergency Department

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appropriate vs inappropriate prescribing

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Background. Published information suggests room for improvement in antibiotics prescribed on discharge from the emergency department (ED). The objective of this study was to evaluate antibiotic prescribing in the ED for uncomplicated infections of the lower respiratory tract (LRTI), urinary tract (UTI), and skin and skin structure (SSTI).

Methods. IRB-approved retrospective cross-sectional study of patients discharged from the ED from January to June 2019 at 6 locations. Inclusion: ≥ 18 years old and uncomplicated LRTI, UTI, or SSTI. Exclusion: hospital admission. Appropriate prescribing was defined having all three of the following correct per local and national guidelines: antibiotic selection, dose, and duration. Correct duration: 5 days for LRTI and SSTI; 3 days for trimethoprim-sulfamethoxazole (TMP-SMX), 5 days for nitrofurantoin (NFT), and 7 days for beta-lactams for UTIs. Endpoints within 7 days: antibiotic escalation, readmission to ED or hospital, any outpatient contact, and report of adverse drug event (ADE). Endpoints within 90 days: *Clostridioides difficile* infection (CDI). Descriptive and bivariable statistics were performed.

Results. Inappropriate prescribing: 77% (304) vs. appropriate 23% (89). Infection type: 47.8% SSTI, 30% UTI, and 22.1% LRTI. SSTI was associated with the greatest proportion of inappropriate prescribing at 89.4% (Figure 1). Comparisons for inappropriate vs. appropriate groups: 15.8% vs. 22.5% for beta-lactam allergy and 23.4% vs. 19.1% for cultures drawn in ED. Most common antibiotics for inappropriate vs. appropriate: first generation cephalosporin at 70.1% vs. 7.3% (p< 0.05), TMP-SMX at 14.3% vs. 12.2% (p=0.75), and NFT at 7.8% vs. 65.9% (p< 0.05). Prescriptions considered inappropriate were primarily driven by excess duration (Figure 2). Endpoints for inappropriate vs. appropriate groups: antibiotic escalation at 6.6% (2.8% were due to cultures drawn in the ED) vs. 1.1% (p=0.06), readmission at 8.6% vs. 9.0% (p=0.9), any outpatient contact at 18.4% vs. 19.1% (p=0.89), and report of ADE at 1.3% vs. 1.1%. No CDI in either group.

Figure 1. Appropriateness of Discharge Prescriptions by Infection Type, N = 393

