

of antibiotic treatment days in patients with ASB/ASC before and after implementation of the targeted antimicrobial stewardship interventions

Results: 189 patients were identified upon retrospective chart review in the pre-group and 110 patients were included in the post-group. Baseline characteristics were well-matched between groups, except that the pre-group had a higher percentage of patients coming from nursing facilities while the post-group had a significantly higher percentage of patients with positive urine cultures. Antibiotic treatment days were significantly lower in the post- versus pre-group 0 (IQR 0–3) vs. 3 (IQR 1–7), $p < 0.001$. Incidence of ASB/ASC treatment was also significantly lower in the post- versus pre-group 45.5 vs 72.5%, $p < 0.001$. There was no statistical difference between the two groups in 30-day mortality, 30-day hospital readmission, and hospital length of stay. There was one case of *Clostridium difficile* infection among patients being inappropriately managed with antibiotics in each group

Conclusion: A multifaceted antimicrobial stewardship interventions successfully reduced antimicrobial treatment days in patients with ASB/ASC, as well as overall incidence of inappropriate treatment of ASB/ASC without increasing mortality or readmission rate

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173. Identification of Inappropriate Antibiotic Orders During a Pharmacy-Supported Antimicrobial Stewardship Program in the Primary Care Setting: A Retrospective Analysis.

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Session: P-6. Antimicrobial Stewardship: Program Development and Implementation

Background: In Florida, the number of antibiotic prescriptions has increased from 710–779 prescription/1000 population in 2012 to 748–839 prescription/1000 population in 2017. Antimicrobial stewardship in the outpatient setting is a suggested solution to combat antibiotic misuse in ambulatory practices.

Methods: This was a retrospective review of oral antimicrobial orders generated by primary care providers. The research protocol received approval from Memorial Healthcare System's Institutional Review Board prior to any research related analysis being conducted. Orders from January 1–December 31, 2018 were reviewed for appropriateness by pharmacy based on IDSA guidelines. Appropriateness was assessed based on the need to prescribe the antibiotic for indication, selection, dose and duration of therapy. Descriptive statistics were used to analyze data.

Results: Of 2995 orders, 50.2% were inappropriate. The most common infections associated with inappropriate antibiotic use were upper/lower respiratory tract infections (URTIs) (65%) and LRTIs (61%), oral cavity infections (61%), and skin/soft tissue infections (SSTI) (54%). Inappropriately-prescribed antibiotics were penicillin (62%), cephalosporins (56%), quinolones (50%), macrolides (49%), and sulfamethoxazole/trimethoprim (46%). Penicillin use for URTIs were inappropriate (406 orders) for the following reasons: duration of therapy only 116/137 (85%); dose and duration 36/58 (62%), drug and dose 12/58 (21%) and all three (drug, dose, duration) 85/93 (91%).

Conclusion: Implementation of a pharmacist-driven antibiotic stewardship program in the primary care setting identified a significant proportion of orders that were inappropriate for type of antibiotic, dose, and duration of therapy in the management of patients with URTIs. These results serve as an avenue to implement the audit feedback process to promote appropriate use of antibiotics. A process improvement plan will include sharing of the findings, educating primary care physicians per IDSA guidelines and continuous review of prescribing trends. A programmatic evaluation will continue on an on-going basis to decrease the number of inappropriately prescribed antibiotics.

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174. Impact of Cascade Reporting of Antimicrobial Susceptibility on Antimicrobial Consumption at a Veterans Affairs Medical Center

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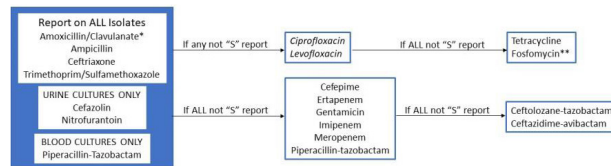
Session: P-6. Antimicrobial Stewardship: Program Development and Implementation

Background: Cascade reporting (CR) is a strategy of reporting antimicrobial susceptibility test results in which secondary agents are only reported if an organism is

resistant to primary, narrow spectrum agents within a drug class. A multidisciplinary team developed CR algorithms for Gram-negative bacteria based on the local antibiotic and infectious diseases practice guidelines.

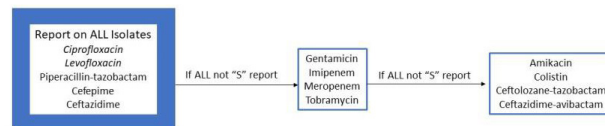
Methods: CR was implemented at a 399-bed tertiary care VAMC in March 2018. In a quasi-experimental study, antimicrobial use data across 8 inpatient units were extracted from the CDC's NHSN AU module from April 2017 – March 2019 (12 months pre- and post-implementation of CR), reported as antimicrobial days of therapy (DOT) per 1000 days present (DP). T-tests and linear mixed models accounting for seasonal and random unit effects were used to compare antimicrobial use pre- and post-CR implementation.

Figure 1A. Cascade reporting algorithm for antimicrobial susceptibility reporting for Enterobacteriaceae



*Suppress results for amoxicillin/clavulanate for ESBL Isolates resistant to ceftriaxone
**Report only for urine isolates of *E. coli* only
Italics = do not report on CSF isolates

Figure 1B. Cascade reporting algorithm for antimicrobial susceptibility reporting for *Pseudomonas aeruginosa*



Italics = not reported on CSF isolates

Results: Following CR implementation, mean monthly meropenem ($p=0.005$) and piperacillin/tazobactam ($p=0.002$) use decreased, while cefepime use increased ($p < 0.001$). The slope of ciprofloxacin use decreased by 2.16 DOTs/1,000 DP per month ($SE=0.25$, $p < 0.001$). The slope of cefepime use increased by 1.51 ($SE=0.59$, $p=0.011$) and 1.06 ($SE=.32$, $p=0.002$) DOTs/1000 DP per month, respectively. There were no significant changes in the slope of amoxicillin/clavulanate, levofloxacin, or meropenem consumption. Rates of *Clostridioides difficile* infection did not significantly change.

Figure 2A. Average monthly use of oral antibiotics across all units in average days of therapy (DOTs) per 1000 days present. CR = Cascade reporting. *For Cefepime and moxifloxacin medians were reported as data was not normally distributed.

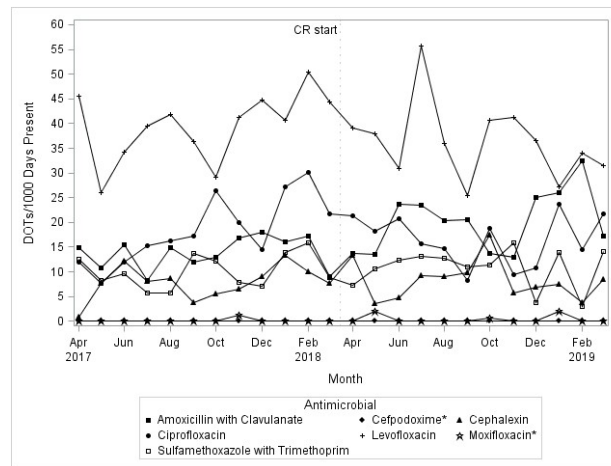


Figure 2B. Average monthly use of intravenous antibiotics across all units in average days of therapy (DOTs) per 1000 days present. CR = Cascade reporting.

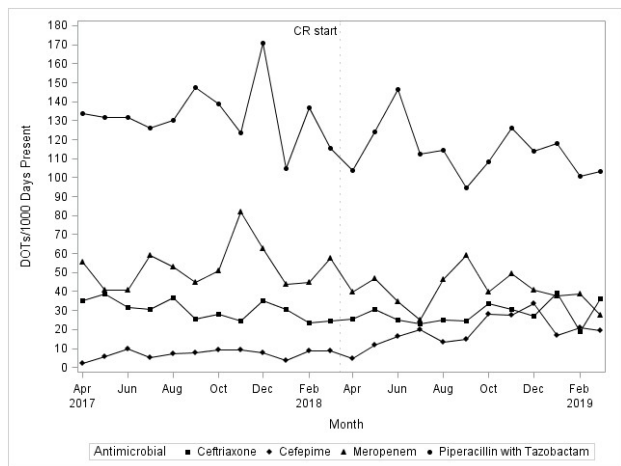


Table 1. Slope of Antimicrobial Utilization Pre and Post-Cascade Reporting Implementation.

Antimicrobial	Pre-CR Slope (SE)	Post-CR Slope (SE)	Change in Slope (SE)	Change in Slope p-value
Oral Antimicrobials				
Amoxicillin/Clavulanate ^{a,d}	0.12 (0.19)	0.69 (0.28)	0.57 (0.31)	0.064
Cefepime ^{a,e}	1.12 (0.01)	0.92 (0.00)	0.82 (0.00)	<0.001
Cephalexin ^{a,d}	0.45 (0.32)	-0.10 (0.34)	-0.55 (0.26)	0.039
Ciprofloxacin ^{a,f}	1.70 (0.23)	-0.49 (0.06)	-2.16 (0.25)	<0.001
Levofloxacin ^{a,g}	0.66 (0.85)	-0.94 (0.56)	-1.60 (1.19)	0.181
Moxifloxacin ^{h,i}	0.95 (0.00)	0.89 (0.00)	0.93 (0.00)	<0.001
TMP/SMX ^{a,d}	0.20 (0.33)	-0.09 (0.29)	-0.29 (0.29)	0.313
IV Antibiotics				
Ceftriaxone ^{a,d}	-0.81 (0.49)	0.70 (0.43)	1.51 (0.59)	0.011
Cefepime ^{a,d}	0.19 (0.45)	1.25 (0.53)	1.06 (0.32)	0.002
Meropenem ^{a,d}	-0.48 (0.87)	-1.60 (0.75)	-1.13 (0.91)	0.219
Piperacillin/Tazobactam ^{a,d}	-1.76 (0.87)	-0.58 (1.42)	1.17 (0.85)	0.169

Table 1. Slope of Antimicrobial Utilization Pre and Post-Cascade Reporting Implementation. ^aMonthly seasonal cycle (n=12); ^bQuarterly seasonal cycle (n=4); ^cARH(1) residual covariance structure; AR(1) residual covariance structure; ^dRandom effect on intercept only; ^eVariance components covariance structure; ^fZero-inflated Poisson model (results presented as exp(β) of Poisson count model). CR = Cascade reporting, TMP/SMX = trimethoprim/sulfamethoxazole

Conclusion: After implementation of CR, the slope of ciprofloxacin use decreased and mean monthly meropenem use decreased. CR is a valuable tool that can be employed by ASPs to encourage optimal use of antibiotics.

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175. Impact of Infectious Diseases Pharmacist Interventions on Appropriateness of Antibiotics Prescribed at Hospital Discharge

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Session: P-6. Antimicrobial Stewardship: Program Development and Implementation

Background: Hospital discharge is an important opportunity for antimicrobial stewardship. Despite inpatient stewardship efforts, antibiotics ordered at discharge are frequently prescribed inappropriately. Discharge antibiotic therapy may be too broad or narrow in spectrum, inappropriately dosed, or for an unnecessarily long duration. The purpose of this study was to assess the inappropriateness of antimicrobial prescribing on discharge and to measure the effect of infectious diseases pharmacist (IDP) intervention on antibiotics prescribed at discharge from the inpatient setting.

Methods: Analyses were completed before and after implementation of an IDP intervention at hospital discharge. IDPs were alerted to patients discharged on antimicrobial therapy for community-acquired pneumonia (CAP), skin and soft tissue infections (SSTIs), and urinary tract infections (UTIs). IDPs reviewed patient and laboratory data and made recommendations for modifications of antibiotics prior to patients leaving the hospital. Prescribing algorithms were created and used to standardize the assessment of discharge antibiotics using local antibiograms and IDSA guidelines. The primary outcome was the composite of appropriateness including antibiotic dose, duration, and spectrum. Secondary outcomes included appropriateness of the individual components of the primary outcome as well as the mean total duration of antibiotic therapy per disease state.

Results: A total of 77 patients were assessed during the study period occurring December 2019 through February 2020. Intervention increased the rate of appropriate prescribing for the composite of antibiotic dose, duration, and spectrum from 48.1% at baseline to 84.4% (P < 0.05). By subset, intervention increased the proportion of patients receiving antibiotics of appropriate duration from 59.7% at baseline to 85.7% (P < 0.001), and proportion of patients receiving antibiotics of appropriate spectrum from 90.9% at baseline to 100% (P < 0.05). The mean duration of therapy for CAP decreased by 0.6 days (6.8 vs 7.4 days, P < 0.05).

Conclusion: IDP intervention improved appropriateness of prescribing consistent with guideline recommendations and local antibiogram data.

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176. Impact of pharmacist electronic communication on the appropriateness of antimicrobial therapy at renewal time

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Session: P-6. Antimicrobial Stewardship: Program Development and Implementation

Background: Inappropriate antibiotic use increases the risk of antimicrobial resistance and adverse events. Our institution adopts all elements recommended by the CDC to improve antimicrobial stewardship (AMS). Compliance with such elements requires education, coaching and decision support tools. The objective of the study intervention is to engage prescribers to critically evaluate and improve antibiotic utilization through renewal communication in the electronic medical record (EMR).

Methods: This is a single center study with a retrospective phase and prospective phase. During the intervention period from October 1st, 2019 to January 1st, 2020 the pharmacist monitored targeted antibiotics and initiated an AMS EMR note. Prescribers were then requested to evaluate the appropriateness of therapy utilizing pre-defined criteria developed in agreement with the infectious disease (ID) service at 48 hours, in-line with the EMR time-out alert. Adults receiving vancomycin (VAN), piperacillin/tazobactam (TAZ), cefepime (CEF) or meropenem (MPN) for at least 48 hours were included. The historical group included patients on the targeted antibiotics between July 1st, 2019 and September 30th, 2019. The primary outcome was median days of therapy (DOT). Secondary outcomes were median DOT per antibiotic, percentage of ID consults and percentage of antibiotic optimization. Statistical analyses were conducted using T-test and chi-square test for continuous and categorical variables respectively.

Results: A total of 81 and 72 patients were included in the intervention and historical groups respectively. No statistical difference in the primary outcome of median DOT was observed (4.5 vs 4, p=0.5). However, Non-significant numerical reductions in DOT were observed for VAN (3 vs 3.5, p=0.5), CEF (3 vs 4, p=0.6) and TAZ (3 vs 4, p=0.3), but not for MPN (6 vs 5, p=0.6). The intervention resulted in more ID consults when prescribing targeted antibiotics (59.3% vs 41.6%, p=0.03). In the intervention group, antibiotic treatment was optimized in 87.7% of patient, in which 39.6% were treatment de-escalation and discontinuation.

Conclusion: Pharmacist clinical guidance through the electronic medical record can provide a powerful educational tool to promote adherence to antimicrobials best practice

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177. Implementation of Pharmacist-Driven Penicillin Allergy Evaluation and Testing with a Focus on Bypassing Penicillin Skin Testing at an Academic Medical Center

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Session: P-6. Antimicrobial Stewardship: Program Development and Implementation

Background: Penicillin allergies are reported by approximately 10% of the US population; however, studies reveal that >90% of those patients can tolerate penicillins. Penicillin allergies are associated with negative health outcomes, both clinical and financial, due to reduced efficacy and increased adverse effects of alternative antibiotics. Patient interview, penicillin skin testing (PST) and/or an oral graded challenge can be used to evaluate penicillin allergies. Different facilities use various algorithms for testing. The objective of this project was to determine whether a pharmacist-driven penicillin allergy evaluation and testing protocol which largely bypasses PST could safely de-label patients.

Methods: Adult patients (≥18 years) admitted with a penicillin allergy were evaluated for eligibility between September 2019 and June 2020. Pregnant patients, critically-ill patients, and patients receiving test-invalidating medication were excluded. Patients were evaluated and tested using institutional protocols, which allowed for the majority of patients to be challenged without PST. Allergies were removed with standardized documentation, and patients were given a pamphlet and counseled to discourage relabeling. Data collected included but were not limited to, the number of patients challenged and de-labeled, number of patients who were relabeled, and number of patients whose change in allergy status resulted in change of therapy.

Results: Forty-eight patients were interviewed and evaluated. One patient was evaluated by PST and oral graded challenge while 27 patients underwent an oral graded challenge only. Twenty patients were de-labeled as a result of patient interview. One patient failed oral challenge with minor itching that did not require any treatment, while 27 patients passed. Forty-seven allergies were removed or modified. Two patients who were de-labeled were relabeled with no record of a new reaction. Of de-labeled patients, 50% received a penicillin following removal of the allergy.

Conclusion: Penicillin allergies can be evaluated and removed using a pharmacy-driven algorithm that prioritizes direct challenges when appropriate. Risks of a reaction are low, and removal leads to change in treatment in a significant portion of patients.

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