

Table 1: Metrics and outcomes at baseline and during successive PDSA cycles

	Baseline, n (%) (Jun 11, 2019 – Oct 31, 2019)	PDSA Cycle 1, n (%) (Nov 11, 2019 – Dec 11, 2019)	PDSA Cycle 2, n (%) (Dec 12, 2019 – Jan 11, 2020)
Documented penicillin allergy	96	16	24
Nursing intervention (%)	0 (0)	4 (25)	19 (80)
Eligibility for intervention by pharmacists (%)	--	3/4 (75)	11/19 (58)
Intervention by pharmacists (%)	--	1/3 (33)	9/11 (82)
Eligibility for review by allergists after pharmacists' review (%)	--	1/1 (100)	7/9 (77)
Intervention by allergists	--	0	0
Penicillin allergy de-labeled per protocol (%)	2 (2%)	0 (0)	9/19 (47.4)
Eligible for cephalosporin use (%)	--	1/4 (25)	7/19 (37)

Conclusion: Various factors contribute to penicillin allergy mislabeling. Our comprehensive algorithm addresses nuances of penicillin allergic reactions and increased accurate penicillin allergy labeling in 47.4% of the cases. Beta-lactam use also increased to 37% through our pilot project while maintaining patient safety. A multi-disciplinary and patient-centered approach aligned with institutional workflows is necessary to improve patient outcomes.

Disclosures: All Authors: No reported disclosures

154. Development of an Electronic Algorithm to Target Outpatient Antimicrobial Stewardship Efforts for Adults with Acute Pharyngitis

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

Background: Although most antibiotic use occurs in outpatients, antibiotic stewardship programs (ASPs) have primarily focused on inpatients. A major challenge for outpatient ASPs is lack of accurate and accessible electronic data to target interventions. We developed and validated an electronic algorithm to identify inappropriate antibiotic use for adult outpatients with acute pharyngitis.

Methods: In the University of Pennsylvania Health System, we used ICD-10 diagnostic codes to identify patient encounters for acute pharyngitis at outpatient practices between 3/15/17 – 3/14/18. Exclusion criteria included immunocompromising conditions, comorbidities, and concurrent infections that might require antibiotic use. We randomly selected 300 eligible subjects. Inappropriate antibiotic use based on chart review served as the basis for assessment of the electronic algorithm which was constructed using only data in the electronic health record (EHR). Criteria for appropriate prescribing, choice of antibiotic, and duration included positive streptococcal testing, use of penicillin/amoxicillin (absent b-lactam allergy), and 10 days maximum duration of therapy.

Results: Of 300 subjects, median age was 42, 75% were female, 64% were seen by internal medicine (vs. family medicine), and 69% were seen by a physician (vs. advanced practice provider). On chart review, 127 (42%) subjects received an antibiotic, of which 29 had a positive streptococcal test and 4 had another appropriate indication. Thus, 74% (94/127) of patients received antibiotics inappropriately. Of the 29 patients who received appropriate prescribing, 27 (93%) received an appropriate antibiotic. Finally, of the 29 patients who were appropriately treated, 29 (100%)

received the correct duration. Test characteristics of the EHR algorithm (compared to chart review) are noted in the Table.

Conclusion: Inappropriate antibiotic prescribing for acute pharyngitis is common. An electronic algorithm for identifying inappropriate prescribing, antibiotic choice, and duration is highly accurate. This algorithm could be used to efficiently assess prescribing among practices and individual clinicians. The impact of interventions based on this algorithm should be tested in future work.

Test Characteristics of Electronic Algorithm for Inappropriate Prescribing, Agent, and Duration

Test Characteristic	Value
Inappropriate Prescribing	
Sensitivity	100% (94/94)
Specificity	97% (200/206)
Positive Predictive Value	94% (94/100)
Negative Predictive Value	100% (200/200)
Inappropriate Agent	
Sensitivity	100% (2/2)
Specificity	100% (25/25)
Positive Predictive Value	100% (2/2)
Negative Predictive Value	100% (25/25)
Inappropriate Duration	
Sensitivity	NA (0/0)
Specificity	100% (27/27)
Positive Predictive Value	NA (0/0)
Negative Predictive Value	100% (27/27)

Disclosures: All Authors: No reported disclosures

155. Development of antibiotic classification for measuring antibiotic usage in Korean hospitals using a modified Delphi method

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

Background: In 2019, the project about developing a system for measure and benchmark antibiotic usage in each hospital was launched. As the basic work for the project, we developed 'antibiotic classification for measuring antibiotic usage in Korean hospitals' using a modified Delphi method.

Consensual definition of antibiotic components according to the antibiotic classification in Korean hospitals.

Consensual definition of antibiotic components according to the antibiotic classification in Korean hospitals

	CVR	Mean ± SD
Broad-spectrum antibacterial agents predominantly used for hospital-onset infections, for adult		
Amikacin (IV)	0.750	3.25 ± 0.71
Tobramycin (IV)	0.750	3.00 ± 0.53
Cefepime	1.000	4.00 ± 0.00
Ceftazidime	1.000	4.00 ± 0.00
Imipenem	1.000	4.00 ± 0.00
Meropenem	1.000	4.00 ± 0.00
Doripenem	1.000	4.00 ± 0.00
Piperaclonazobactam	1.000	4.00 ± 0.00
Other 4 th generation cephalosporins	1.000	3.75 ± 0.46
Broad-spectrum antibacterial agents predominantly used for community-acquired infections, for adult		
Ceftriaxone	1.000	3.75 ± 0.46
Cefazolin	0.750	3.75 ± 0.46
Cefepime	1.000	4.00 ± 0.00
Cefepidime	1.000	3.75 ± 0.46
Ceftriaxone	1.000	4.00 ± 0.00
Ertapenem	1.000	3.88 ± 0.35
Gentamicin	1.000	3.75 ± 0.46
Levofloxacin	1.000	3.88 ± 0.35
Moxifloxacin	1.000	3.88 ± 0.35
Ciprofloxacin	1.000	3.88 ± 0.35
Other fluorquinolones	0.750	3.63 ± 0.74
Other 1 st generation cephalosporins	0.750	3.13 ± 0.64
Antibacterial agents predominantly used for resistant gram-positive infections, for adult		
Linezolid	1.000	4.00 ± 0.00
Vancomycin (IV)	1.000	4.00 ± 0.00
Trovanam	1.000	4.00 ± 0.00
Narrow-spectrum beta-lactam agents, for adult		
Amoxicillin	1.000	4.00 ± 0.00
Amoxicillin/clavulanate	1.000	3.88 ± 0.35
Ampicillin	1.000	3.88 ± 0.35
Ampicillin/sulbactam	1.000	3.88 ± 0.35
Nafcillin	1.000	3.88 ± 0.35
Cefadroxil	1.000	3.75 ± 0.46
Cefazolin	1.000	3.88 ± 0.35
Cephalexin	1.000	3.75 ± 0.46
Cefuroxime	1.000	3.63 ± 0.52
Cefositin	1.000	3.63 ± 0.52
Cefaclor	0.750	3.63 ± 0.74
Cefprozil	0.750	3.63 ± 0.74
Other 1 st generation cephalosporins	0.750	3.50 ± 0.76
Other 2 nd generation cephalosporins	0.750	3.13 ± 0.92
Antibacterial agents predominantly used for extensive antibiotic resistant gram-negative bacteria, for adult		
Colistin (IV)	1.000	4.00 ± 0.00
Tigecycline	1.000	3.88 ± 0.35
Ceftolozan-tazobactam	1.000	3.75 ± 0.46

Methods: The study consisted of two series of modified Delphi studies and was performed from July to August 2019. The study 'antibiotic classification in Korean hospitals' was performed first and followed by the study 'antibiotic components according to the antibiotic classification in Korean hospitals'. Each Delphi study included two rounds of surveys in order to gather opinions and refine the information related to each study. We recruited a total of 12 panels including infectious diseases physicians (10), professor of preventive medicine (1), and the researcher of Health Insurance Review & Assessment Service (1). The questions for the Round 1 survey in each study were adopted from the antibiotic classification of the NHSN.

Results: As for the first study, the response rate of each round was 58.3% (7/12) and 75.0% (9/12), respectively. Most of the subjects of the NHSN's antibiotic classification for adults were accepted except 'antibacterial agents posing the highest risk for *Clostridioides difficile* infection' (CVR = -1.000). On the contrary, all subjects for children were rejected. Finally, a total of 6 classifications were accepted. They were i) broad-spectrum antibacterial agents predominantly for hospital-onset infections, for adult (CVR = 1.000), ii) broad-spectrum antibacterial agents predominantly used for community-acquired infections, for adult (CVR = 1.000), iii) antibacterial agents predominantly used for resistant gram-positive infections, for adult (CVR = 1.000), iv) narrow-spectrum beta-lactam agents, for adult (CVR = 1.000), v) antibacterial agents predominantly used for extensive antibiotic resistant gram-negative bacteria, for adult (CVR = 1.000), and vi) total antibacterial agent (CVR = 1.000).

Conclusion: this study provides antibiotic classification for measuring antibiotic usage in Korean hospitals. This classification may guide to develop a system for measuring of antibiotic usage in each Korean hospital.

Disclosures: All Authors: No reported disclosures

156. Evaluating Antibiotic Use and Developing a Tool to Optimize Prescribing in a Pediatric HIV Clinic in Eswatini

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

Background: Antibiotic resistance is an emerging global health issue, fueled by inadequate surveillance systems and the absence of antimicrobial stewardship. In resource-limited settings, antimicrobial use is often based on clinical evaluation rather than microbiologic evidence, making treatment guidelines and the education of healthcare providers paramount to ensuring appropriate antimicrobial prescribing. In a human immunodeficiency virus (HIV) clinic for children and their families in Eswatini, we sought to understand the use of antibiotics and identify specific areas for improvement.

Methods: We performed a retrospective patient chart review as part of a quality improvement (QI) initiative to assess antimicrobial use before and after implementation of a standardized antimicrobial guide. For each prescribing period, 100 random patient encounters were selected for review to observe if the indication for antibiotics, duration, and dose were consistent with World Health Organization (WHO) guidelines. Two physicians reviewed each encounter to determine the appropriateness of antibiotic use using a structured abstraction tool, with a third resolving discrepancies. Results were analyzed using a chi-square test of proportions and a structured survey was performed to assess perceptions of the guide.

Results: After the implementation of an antimicrobial guide, there was a significant decrease in the proportion of clinic visits with an antibiotic prescribed ($p < 0.001$). Incorrect indication for antimicrobial use decreased from 20.4% in the initial period, to 10.31% and 10.2% but did not reach significance ($p = .0621$) in the subsequent

periods after implementation. Incorrect dose/duration decreased from 10.47% in the initial period to 7.37% and 3.1% in the subsequent periods, but this was also not significant ($p = 0.139$). All prescribers who completed the survey used the antimicrobial guide and felt that it positively impacted their prescribing patterns.

Conclusion: Our study found that an antibiotic guide reduced and improved the prescription of antimicrobials. Antimicrobial stewardship is a global problem and this data demonstrates that practical solutions can have a lasting impact on antimicrobial prescribing in low resource settings.

Disclosures: All Authors: No reported disclosures

157. A Multidisciplinary Approach to Carbapenem Stewardship at a Large Community Hospital in Brooklyn, New York

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

Background: Carbapenem-resistant gram-negative organisms are a continuously mounting threat, underscoring the need for effective antimicrobial stewardship interventions to improve the use of carbapenems. We sought to implement several multidisciplinary antimicrobial stewardship interventions beginning in January 2019 in an effort to reduce unnecessary meropenem use and the incidence of carbapenem-resistant gram-negatives.

Methods: Prospective audit and feedback was utilized daily in combination with weekly stewardship rounds between an Infectious Diseases pharmacist and physician in the Intensive Care Units. A second Infectious Diseases physician attended weekly interdisciplinary rounds on meropenem high-use units. Meropenem Days of Therapy (DOT) per 1,000 patient days and the incidence of meropenem resistant *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* were compared by the chi-square test of proportions.

Results: Between 2018 and 2019 the institution's meropenem DOT per 1,000 patient days decreased 33%, from 57 to 38 days per 1,000 patient days (difference, 19 days per 1,000 patient days; $p < 0.001$). In the hospital antibiogram, the meropenem susceptibility of *Pseudomonas aeruginosa* over the same time period increased from 71% to 77% of isolates (difference, 6%; $p = 0.009$). A non-significant decrease in the susceptibility of meropenem to *Klebsiella pneumoniae* was also observed from 92 to 90% (difference, 2%; $p = 0.1658$).

Conclusion: These data support the need for antimicrobial stewardship efforts targeting broad-spectrum antimicrobials such as meropenem. In the setting of a sustained decrease in meropenem use over 12 months, we observed a significant improvement in the percent susceptibility rate of *Pseudomonas aeruginosa* to meropenem for the first time in five years.

Disclosures: All Authors: No reported disclosures

158. A multi-site, prospective study of antimicrobial prescribing practices in three low- or middle-income country hospitals

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

Background: Antimicrobial stewardship programs (ASPs) are being developed internationally to mitigate the misuse of antimicrobials. An understanding of current practices and prescribing patterns is necessary to determine targets to develop context-specific ASPs in low- and middle-income country (LMIC) hospitals.

Methods: We conducted a prospective study of patients admitted to the adult medical wards at three LMIC tertiary care centers in 2018-2019: a 1,800-bed public hospital in Galle, Sri Lanka; a 991-bed public hospital in Eldoret, Kenya; and a 630-bed private hospital in Moshi, Tanzania. Information regarding antimicrobial therapy received during hospitalization, indications for antimicrobial therapy, and duration of antimicrobial use were extracted from the medical record.

Results: In total, 3150 patients were enrolled: 1297 in Sri Lanka, 750 in Kenya, and 1103 in Tanzania. Antimicrobial use prevalence varied between the three sites, with 56.0% of patients receiving antimicrobials during hospitalization in Sri Lanka, 56.5% in Kenya, and 35.4% in Tanzania. Third-generation cephalosporins were used most frequently in Kenya (70.0%) and Tanzania (73.1%), whereas amoxicillin/clavulanic acid was used most frequently in Sri Lanka (48.4%). Lower respiratory tract infection was the most common indication for antimicrobial use in all three locations: 37.4% in Sri Lanka, 27.8% in Kenya, and 49.2% in Tanzania. No clear indication for antimicrobial use was documented among 11.6% patients receiving antimicrobials in Sri Lanka, 32.8% in Kenya, and 10.5% in Tanzania. In Tanzania, 8.6% of the patients had documentation of input from the