hours of a systemic antibiotic were included. Patients with neutropenia or polymicrobial infections were excluded. The primary outcome was the proportion of patients who received a modification of therapy within 24 hours of final culture results. Secondary outcomes included modification at any point in therapy, time to modification of therapy, time to de-escalation, and days of therapy of broad-spectrum antibiotics.

Results. There was a total of 88 patients who met inclusion criteria, 37 patients pre-ATO and 51 patients post-ATO. The primary outcome of modification of therapy within 24 hours of final culture results was not significantly different for patients in the pre-ATO and post-ATO groups (19% vs. 20%, P = 0.94, respectively). The secondary outcome of modification of therapy at any point in therapy was not significantly different between the two groups (62% vs. 66%, *P* = 0.67). Of the 47 patients who received a modification of therapy, the mean time to modification was significantly shorter in the post-ATO group (52.8 hours vs. 45.26 hours, *P* < 0.05,). All other secondary outcomes were not significantly different between study groups.

Conclusion. The ATO alert was not associated with a higher rate of antibiotic modification within 24 hours of culture results in patients with GNB, although there was a significant reduction in the time to antibiotic modification. Further efforts are needed to improve the time to modification and optimize antibiotic prescribing practices.

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1034. Automating Assessments of Vancomycin Appropriateness

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Background. Assessing appropriateness of hospital antibiotic use is typically a labor-intensive task for antimicrobial stewardship teams and relies heavily on clinician judgement rather than a systematic process. Vancomycin is a frequently used agent that is a common stewardship target. We developed an algorithm to automatically classify the appropriateness of vancomycin days of therapy (DOTs) based upon electronic health record data.

Methods. We constructed a retrospective cohort of Oregon Health and Science University (OHSU) Hospital and Doernbecher Children's Hospital patients admitted August 1, 2017 to July 31, 2018 receiving vancomycin. Data were collected on demographic, encounter, pharmacy, microbiology, and surgery data. An electronic algorithm was applied to classify vancomycin DOTs as appropriate, inappropriate, or indeterminate. Inappropriate use was defined as any case in which there was an opportunity for de-escalation as identified using microbiology data, ICD-10 codes, and procedure codes.

Results. We included 4,231 encounters; 493 (12%) were pediatric patients. Our algorithm automatically classified 59%, 3%, and 38% of encounters as having either appropriate, inappropriate, or indeterminate DOTs, respectively. Forty-four percent of all encounters received no more than a 24-hour course of vancomycin and were considered appropriate empiric therapy; half of these were attributed to surgical prophylaxis. Nine percent of all encounters had vancomycin administered within 3 days of a blood, sputum or tissue culture in which either a methicillin-resistant *Staphylococcus* species or an ampicillin-resistant, vancomycin-susceptible *Enterococcus* species was isolated and were classified as appropriate. Six percent of all encounters had cultures in which only Gram-negatives, fungi, or yeast were isolated and were therefore considered appropriate in the empiric period (≤48 hours) but inappropriate thereafter.

Conclusion. Automated assessments of antibiotic appropriateness could facilitate more informed antimicrobial stewardship initiatives and serve as a valuable stewardship metric. Characterization of indeterminate vancomycin use may inform increased automated classification. Further effort is needed to validate these assessments.

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1035. Implementation of an Antimicrobial Stewardship Program-Led, Multifactorial Pneumonia Diagnosis and Treatment Bundle

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Background. Pneumonia remains a leading cause of hospitalization and accounts for significant antibiotic use. This study aims to evaluate the impact of bundled antimicrobial stewardship program (ASP) interventions, including procalcitonin and surveillance cultures, on broad-spectrum antimicrobial use in patients with suspected pneumonia.

Methods. This is a pre-post, quasi-experimental study conducted at Michigan Medicine. During the intervention period, an ASP member reviewed adult patients admitted to 3-floor medical services with antibiotics initiated for suspected pneumonia. The ASP member (1) recommended the use of procalcitonin when clinically appropriate, (2) used institutional guidelines to guide empiric antibiotic selection based on risk for drug-resistant pathogens, and (3) ordered a methicillin-resistant *Staphylococcus aureus* (MRSA) surveillance culture in patients receiving empiric anti-MRSA therapy. The primary endpoint was anti-MRSA and anti-pseudomonal (PSA) antibiotic use measured as days of therapy (DOT) per 1000 days-present on the services of interest. Antibiotic use and clinical data were extracted from an electronic database. Pneumonia diagnosis codes were used to identify the study population.

Results. A total of 549 patients were included: 310 in the pre-intervention (December 1/2017 - 3/31/2018) and 239 in the intervention (December 1/2018 - 3/31/2019) periods. Baseline demographics were similar between groups (Table 1). Less than 15% of patients had a microbiological diagnosis via respiratory culture in both study periods (Table 2). Respiratory cultures were ordered less commonly in the intervention period; however, the rate of culture positivity was higher (28% vs. 48%, *P* < 0.01). Process measures improved in the intervention period with an increase in the proportion of patients with MRSA surveillance cultures (13% vs. 39%, *P* < 0.01) and procalcitonin monitoring (77% vs. 83%, *P* = 0.07). Compared with the pre-intervention period, anti-MRSA antibiotic use decreased from 172 to 158 DOT per 1000 days-present (Δ -8%) and the use of anti-PSA antibiotics decreased from 348 to 316 DOT per 1000 days present (Δ -9%).

Conclusion. The implementation of an ASP-led pneumonia bundle led to reductions in anti-MRSA and anti-PSA antibiotic use.

Table 1: Baseline Demographics

Variable	PRE-INTERVENTION (N=310)	INTERVENTION (N=239)	P-value
Age (median, IQR)	66 (55-78)	66 (54-76)	0.58
Male n (%)	159 (51)	131 (55)	0.44
Race n (%)			
Caucasian	247 (80)	172 (72)	0.04
Other or unknown	63 (20)	67 (28)	0.04
Ethnicity n (%)			
Non-Hispanic or unknown	301 (97)	233 (97)	>0.99
Hispanic	9 (3)	6 (3)	>0.99
Body Mass Index (median, IQR)	26.7 (22.3-32.4)	27.1 (22.8-31.8)	0.87
Charlson Comorbidity Index (mean±SD)	4.56 ± 3.98	4.44 ± 3.97	0.72

Table 2: Respiratory Culture and Diagnostic Characteristics

Variable	PRE-INTERVENTION (N=310)	INTERVENTION (N=239)	P-value
No Microbiological Diagnosis n (%)	275 (89)	205 (86)	0.36
Negative Respiratory Cultures n (%)	88 (32)	37 (18)	<0.01
No Cultures Ordered n (%)	187 (68)	168 (82)	<0.01
Microbiological Diagnosis n (%)	35 (11)	34 (14)	0.36
Positive Respiratory Cultures (of those with cultures ordered) n (%)	35/123 (28)	34/71 (48)	<0.01
MRSA Surveillance Culture Ordered n (%)	41 (13)	93 (39)	<0.01
Positive MRSA Screen n (%)	2 (5)	3 (3)	0.64
Procalcitonin Ordered n (%)	238 (77)	199 (83)	0.07

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1036. Clinical impact of an antibiotic time out initiative at an academic medical center

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Background. The Infectious Diseases Society of America's guideline for implementing antibiotic (abx) stewardship recommends routine review of abx use. Several studies demonstrate antibiotic time out (ATO) programs result in de-escalation, but there is limited evidence of improved outcomes. The aim of this study was to evaluate the clinical impact of ATO.

Methods. This retrospective study included hospitalized patients at The Ohio State University Wexner Medical Center receiving abx and a documented ATO from 7/1/2017 to 6/30/2018. ATO patients were matched by infection type to abx-treated patients lacking an ATO note. Patients were excluded if they were identified as a protected population, were in the ICU at the time of ATO, had an ATO within 48 hours of discharge, cystic fibrosis, or febrile neutropenia. The primary objective was to evaluate abx optimization in patients with documented ATO vs. those without ATO. Abx optimization was defined as the selection of ideal abx based on guidelines, culture and susceptibility results, or expert opinion when undefined. Secondary outcomes included vancomycin-associated acute kidney injury (VAN-AKI), infection-related length of stay (LOS), all-cause 30-day readmission or mortality, abx days, and nosocomial *C. difficile* infection (CDI) rates. The Student t-test/Fisher's exact test and Wilcoxon-rank sum were utilized as appropriate.

Results. One hundred ATO patients were compared with 100 non-ATO patients. Baseline characteristics and infection types were similar between groups. ATO resulted in improved optimization of abx selection ($P = 0.05$) and duration ($P < 0.01$), and reduced piperacillin/tazobactam (P/T) and vancomycin (VAN) utilization. No difference was observed in VAN-AKI (22 vs. 20%, $P = 0.73$), 30-day readmission (28 vs. 27%, $P = 0.87$), mortality (5 vs. 5%, $P = 1$), or CDI rates (6 vs. 5%, $p = 0.76$) in the ATO vs. non-ATO group. However, inpatient abx days (12 vs. 8, $P = 0.004$) and infection-related LOS (10 vs. 8, $P = 0.0006$) were shorter in the non-ATO group.

Conclusion. ATO improved optimization of abx selection and duration, and reduced P/T and VAN use. Despite this, clinical outcomes were not improved.

1037. A Pharmacist-Driven 48 Hour Antibiotic Time Out Pilot at a Large Academic Medical Center

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Background. The Centers for Disease Control and Prevention published The Core Elements of Hospital Antibiotic Stewardship Programs in 2014, which recommended that all clinicians perform an antibiotic time out (ATO) after 48 hours. The best methods to operationalize these recommendations remain unclear. Given our information technology barriers, we developed a targeted, pharmacist-driven, 48 hour ATO pilot.

Methods. This pre-post intervention pilot study included hospitalized adults admitted to one of the four wards between 5/1/18 and 6/30/18. Patients who received ≥48 hours of broad-spectrum intravenous antibiotics (vancomycin, piperacillin–tazobactam, cefepime, a carbapenem, or a fluoroquinolone) were prospectively identified via TheraDoc (Premier Inc., Charlotte, NC). An infectious diseases (ID) trained pharmacist reviewed patients on a daily basis during June. The primary outcome was days of therapy (DOT), which was assessed with Spearman's rank-order correlation. All *P*-values were from 2-sided tests, and results were deemed statistically significant at $P < 0.05$.

Results. A total of 151 unique patients were identified during the study period. The most common antibiotic indications were skin and soft-tissue infection (31.1%), urinary tract infection (22.5%), and intraabdominal infection (22.5%). An ID physician was consulted on 59% of patients. The pharmacist reviewed an average of 7 patients (3 unique) each day during the intervention month. A total of 27 recommendations were made with 15 (56%) being accepted. The most common recommendations were to de-escalate therapy ($n = 8$), stop antibiotics ($n = 6$), and add a stop date to the antibiotic order ($n = 4$). DOT in the pre- and post-intervention period did not differ ($P = 0.28$).

Conclusion. A month-long, targeted, pharmacist-driven, 48 hour ATO pilot was unable to demonstrate a reduction in DOT. Furthermore, only 56% of pharmacist recommendations were accepted despite targeting low-acuity infections, which may have limited our ability to observe a reduction in DOT. Larger studies are warranted to further evaluate how ATOs influence DOT over time.

1038. Impact of an Electronic Antibiotic Timeout on the Utilization of Frequently Prescribed Antibiotics in Hospitalized Patients

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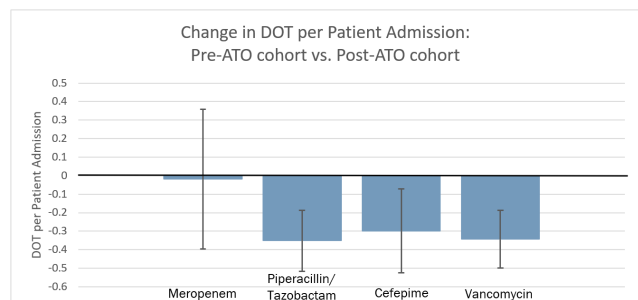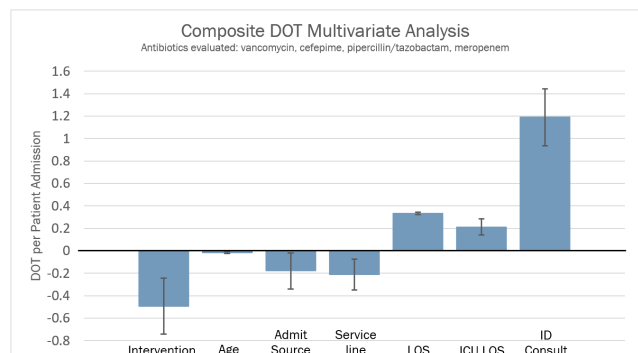[4]Houston Methodist, HOUSTON, Texas,

Background. Methods to operationalize antibiotic timeouts (ATO) among hospitalized patients are often constrained by the high volume of antibiotic orders that surpass the capabilities of the antimicrobial stewardship program (ASP) to intervene. Houston Methodist Hospital implemented a streamlined electronic ATO process that alerted providers to evaluate the need for continued antibiotics on day 4 of predefined anti-infective therapy. Unresolved alerts were reviewed by clinical pharmacists the following day. The objective of this study was to determine the impact of this electronic ATO on frequently prescribed antibiotics.

Methods. This was a quasi-experimental study in a 924-bed quaternary care hospital comparing days of therapy (DOT) in patients admitted prior to (February 2017 – January 2018) and after implementing an ATO process (March 2018 – February 2019). Antibiotics evaluated included vancomycin, cefepime, piperacillin/tazobactam, and meropenem. ATO alert logic was simulated retrospectively to capture the pre-ATO cohort. The primary outcome was mean composite DOT per patient admission. Secondary outcomes included total hospitalization cost, Clostridioides difficile infection (CDI) and multidrug-resistant organism (MDRO) rates.

Results. A total of 8,458 patients met ATO alert criteria for inclusion in the pre-ATO timeframe and 6,901 patients with an ATO alert in the post-ATO group; 2,642 (38%) prompted a pharmacists' review. The average composite DOT was 11.5 per admission in the pre-ATO cohort compared with 11.1 in the post-ATO cohort ($P = 0.02$). After multivariate linear regression, the ATO was significantly associated with a decrease of 0.5 DOT per patient admission ($P < 0.001$). Other factors associated with a reduction in DOT included age ($P < 0.001$), service line ($P = 0.003$), and admission source ($P = 0.031$). Mean hospital costs per admission were significantly reduced in the post-ATO group: $67,613 vs. $66,615 ($P = 0.01$). There was no difference in rates of CDI and MDRO.

Conclusion. Implementation of our electronic ATO process demonstrated significant reductions in overall DOT for frequently prescribed antibiotics and decreased total hospital costs across a diverse patient population. This process provides a real-world strategy to operationalize a large-scale ATO as an adjunct to an ASP.

Composite DOT Multivariate Analysis
Antibiotics evaluated: vancomycin, cefepime, pipercillin/tazobactam, meropenem

Change in DOT per Patient Admission:
Pre-ATO cohort vs. Post-ATO cohort

1039. Forty-eight-hour Antibiotic Time-out: Impact on Antibiotic Duration and Clinical Outcomes

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Background. A core element of the Centers for Disease Control and Prevention Antimicrobial Stewardship standard for the inpatient setting includes a 48-hour antibiotic time-out (ATO) process to reassess antibiotic indication. We implemented an automated alert in the electronic health record (EHR) that identifies patients that have received >=48hours of antibiotic therapy. The alert requires the clinician (physician or