2019 SIGoVA Antimicrobial Stewardship Research Symposium
June 14th, 2019
Presentation Abstracts

Contents

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Impact of Cascade Reporting of Antimicrobial Susceptibility on the Consumption of Fluoroquinolone Antibiotics at a Veterans Affairs Medical Center

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Background*:* Fluoroquinolone (FQ) antibiotics are associated with adverse effects including *Clostridioides difficile* diarrhea, tendinopathy, and aortic aneurysm rupture. However, they remain one of the most commonly prescribed and inappropriately used antibiotics in the United States, prompting the CDC to recommend that antimicrobial stewardship programs (ASPs) target FQ prescribing. Selective and cascade reporting (CSR) of antimicrobial susceptibilities is a core strategy that ASPs can deploy to reduce inappropriate antimicrobial use. The Richmond Veterans Affairs Medical Center (VAMC) developed cascade reporting algorithms to refine the use of FQ.

Methods: The study setting was a 399-bed tertiary care VAMC in Richmond, VA. A quasi-experimental study was conducted from October 2017 – September 2018. Selective reporting algorithms were developed by genus of bacteria based on the local antibiogram, practice guidelines for infectious diseases, and the input of a multidisciplinary team including members of the ASP, Infectious Diseases physicians, and the microbiology laboratory (Figure 1). Aggregated facility-wide antimicrobial use data were extracted from the CDC's NHSN AU module, reported as antimicrobial days of therapy (DOT) per 1000 days present (DP) for 6 months pre- and post-implementation of CSR. A *t* test was used to determine if mean FQ consumption changed after implementation of CSR, and effect size was calculated using the Cohen's *d* formula using JMP Pro 12 [SAS Institute, Cary, NC, USA].

Results: After initiation of CSR, mean ciprofloxacin and levofloxacin use decreased by 29% and 10% with an effect size of -0.711 ($p < 0.05$) and -0.264 ($p=0.422$), respectively (Figure 2). Mean use of amoxicillin/clavulanate (A/C) and trimethoprim/sulfamethoxazole (TMP/SMX) increased by 28% and 2% with an effect size of 0.577 and 0.043, respectively, but this was not statistically significant.

Conclusions: Implementing CSR was associated with a statistically significant reduction in mean ciprofloxacin use. Levofloxacin use also decreased, although not significantly. There was a corresponding increase in the consumption of A/C and TMP/SMX, although not statistically significant. This suggests that CSR is a viable strategy to reduce the consumption of FQs, though more research is needed to determine if this reduction is appropriate.

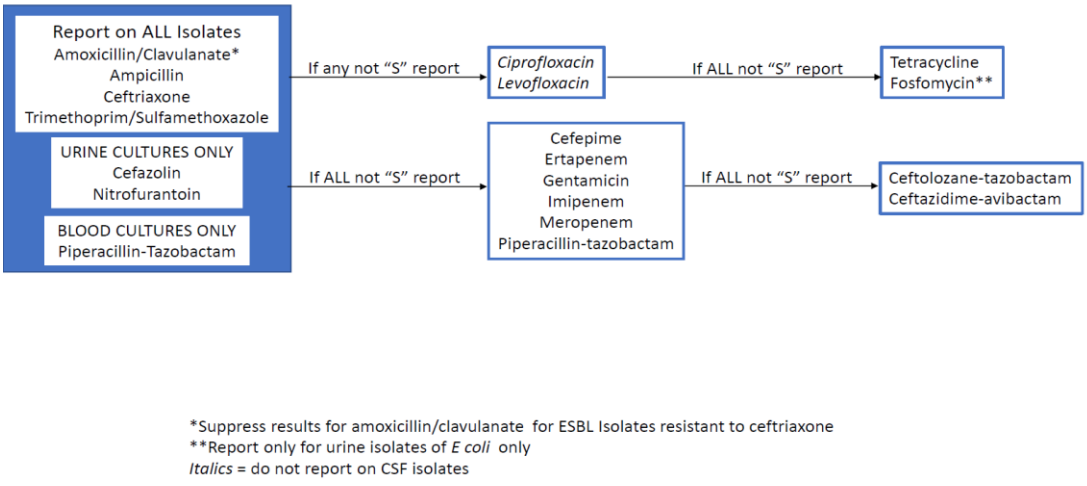

Figure 1. Algorithm used for selective and cascade reporting for genus of bacteria within the *Enterobacteriaceae* family.

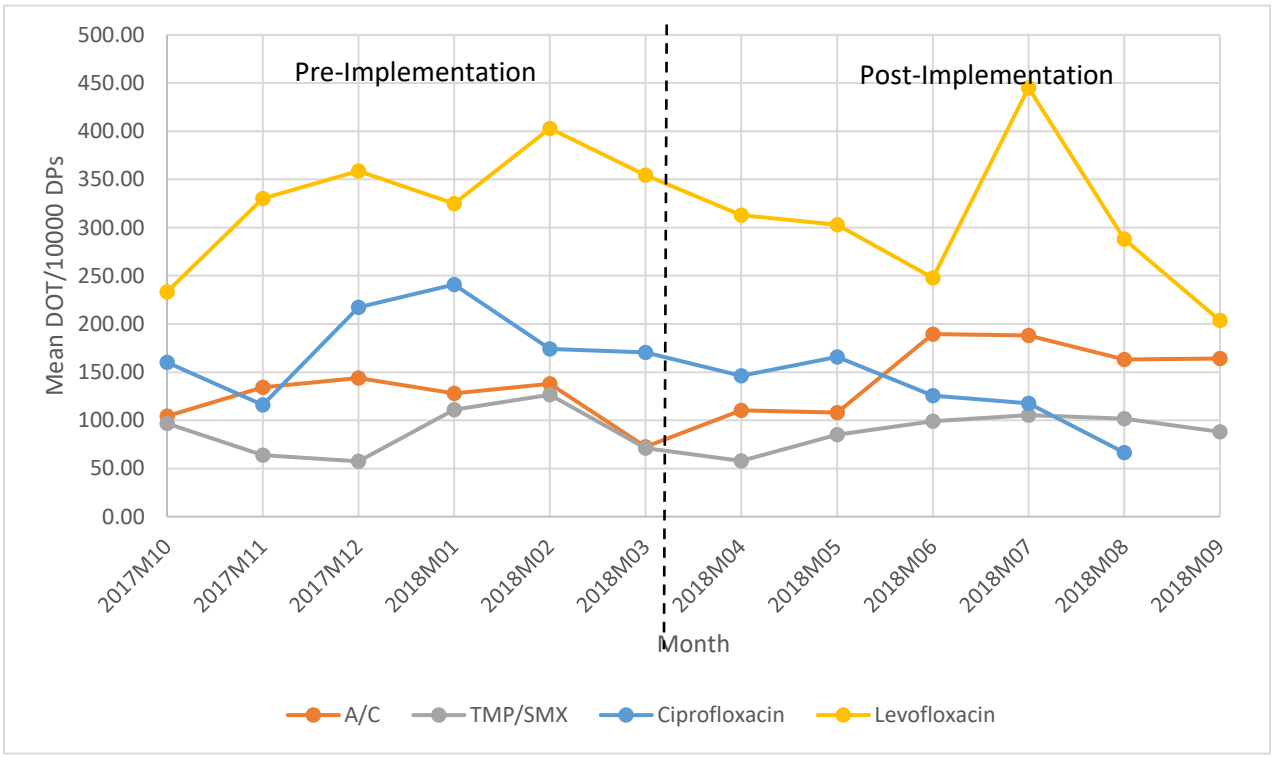

Figure 2. Antibiotic use pre-and post-implementation of selective and cascade reporting.

Key: Reported as monthly mean DOT/1000DPs. FQ=fluoroquinolone use (combined ciprofloxacin and levofloxacin), A/C = amoxicillin/clavulanate, TMP/SMX = trimethoprim/sulfamethoxazole.

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Implementation and Impact of Real-time Audit and Feedback on All Positive Blood Cultures at an Academic Veterans Affairs Medical Center

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Background: Bacteremia is a major cause of morbidity and mortality worldwide. Antimicrobial stewardship programs (ASP) may enhance the management of bacteremia. The Hunter Holmes McGuire Veteran's Affairs Medical Center (VAMC) has utilized the electronic medical record (EMR) to trigger a real-time blood culture alert for all positive blood cultures, to which the ASP responds via an e-consult Monday through Friday, 7 AM through 5 PM. The objective of this study was to determine the impact of real-time audit and feedback for all positive blood cultures and assess implementation.

Methods: The study setting was a 399-bed tertiary care VAMC in Richmond, VA. A retrospective chart review of all ASP blood culture alert notes between February 2016 - October 2017 was performed, to include demographics, ASP interventions, microorganism, reaction time to positive blood culture alert, care setting, and frequency of subsequent ID consultation. An ASP intervention was deemed unique if it was not already planned by the primary service based on progress note review. ANOVA was used to assess differences in reaction time across days of the week of blood culture positivity.

Results: A total of 302 patients were included; mean age was 69 years, and 96% were male. The ASP recommended a unique intervention in 208 (69%) patients. A total of 371 interventions were recommended, a mean of 1.22 interventions per patient (Figure 1). A total of 39 (13%) patients were outpatient at time of alert; 19 (50%) were recommended for admission. The most common organisms were coagulase negative Staphylococci (104/302, 34%), Escherichia coli (47/302, 15%), and Staphylococcus aureus (33/302, 11%). 216 (72%) of alert notes were written ≤ 24 hours from blood culture positivity. Formal ID consultation was ultimately performed in 125 (41.4%) patients. Mean reaction time for the ASP was 20.8 hours and varied significantly depending on day of the week cultures became positive (range 0.25 – 122 hours, $p < 0.001$, Figure 2).

Conclusions: Real-time audit and feedback of all positive blood cultures by the ASP resulted in stewardship interventions for nearly 70% of patients. It provides a means to ensure rapid identification and triage of patients with positive blood cultures in the outpatient setting. The absence of weekend coverage significantly decreased the response time. These data will inform local program optimization.

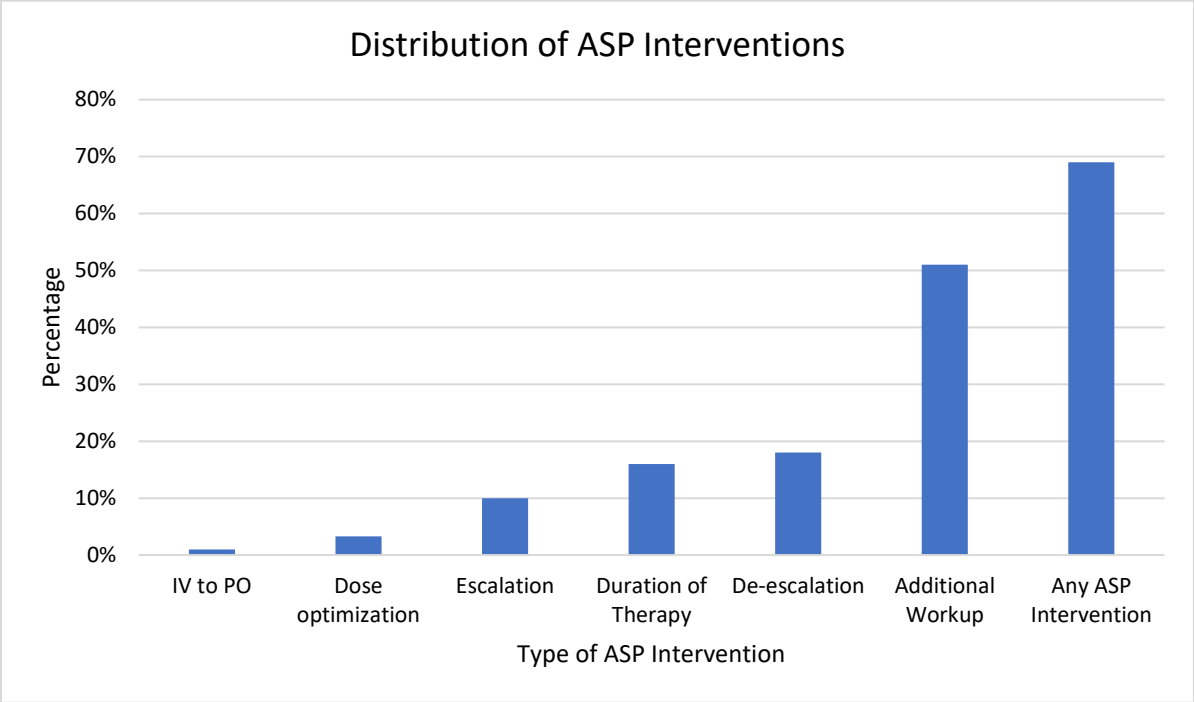

Figure 1

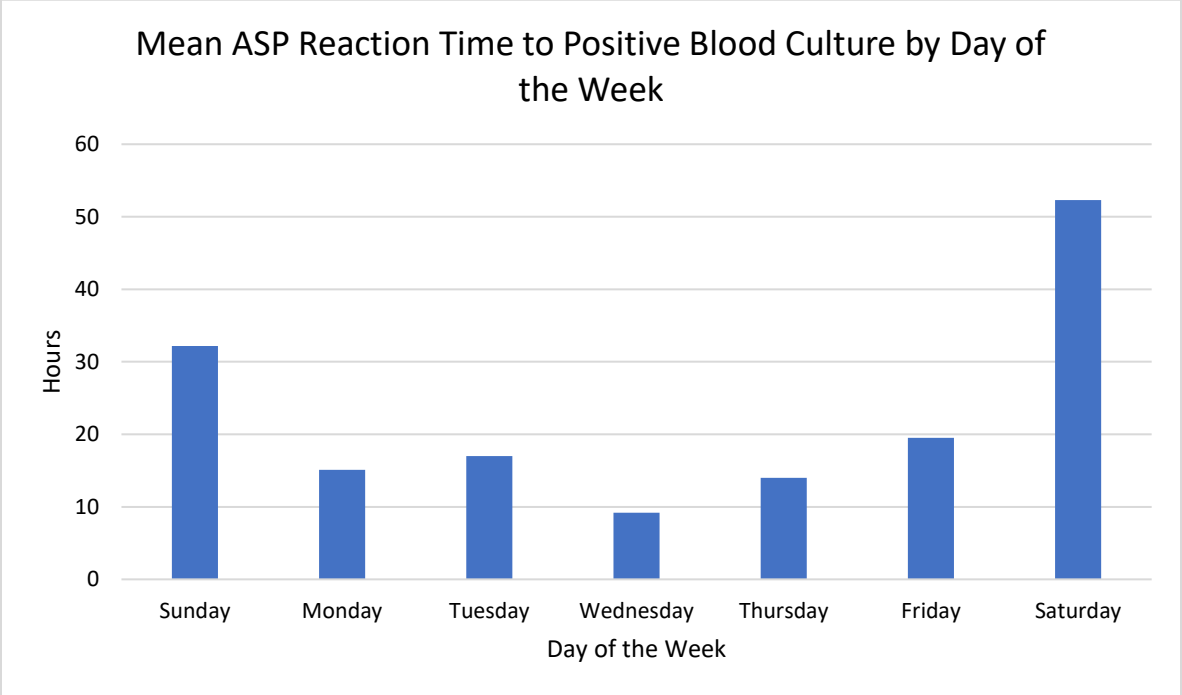

Figure 2

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Implementation of a Survey to Assess *Candida auris* Laboratory Testing Capacity in Virginia

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Background: *Candida auris* (*C. auris*) is a deadly fungus that has limited treatment options. As of November 2018, *C. auris* cases must be reported to the Virginia Department of Health (VDH). A case is confirmed when an approved laboratory test verifies the presence of *C. auris*. With the relatively recent appearance of this organism, and the complexity of the verification tests, *C. auris* can often be misidentified as a different *Candida* species (Table 1). Laboratories are required to forward confirmed or suspected *C. auris* isolates to the Virginia state public health laboratory. In order to identify gaps in *C. auris* reporting and isolate forwarding, and aid in future case confirmation, VDH conducted a survey among all sentinel laboratories in Virginia to assess their capacity to test *C. auris*.

Methods: In November of 2018, VDH sent a survey to the 49 sentinel laboratories across Virginia. The survey was administered through REDCap, and was sent to the managers of each laboratory. Questions were asked about mycology testing, including but not limited to: what methods they use to test for yeast, what *Candida* species they can identify, if they conduct antifungal susceptibility testing (AFST), and if they can identify *C. auris* using an approved method.

Results: A total of 75% of sentinel laboratories (n=37) completed the survey. From those laboratories, 29/37 (78%) were able to perform mycology identification on any specimen source, sterile or non-sterile. From those laboratories, 9/29 (31%) have the ability to identify *C. auris* using an approved method. Many are able to provide AFST in house (n=13), while some provide AFST through a reference laboratory (n=7), and others do not provide AFST at all (n=9).

Conclusions: This survey provided definitive knowledge of Virginia sentinel laboratories ability to correctly identify *C. auris*. Knowing which testing methods are used at each facility has allowed VDH to provide tailored recommendations for reporting purposes, including reminders to send commonly misidentified organisms to the state laboratory in Virginia for further definitive testing. This information will help investigators conclude if a *C. auris* isolate has been verified using the correct method, will potentially decrease misidentification of *C. auris*, and lead to faster and more accurate investigations designed to prevent the spread of this public health threat.

Table 1. Summary of common misidentifications based on the identification method used (adapted from CDC)

Identification Method	Organism *C. auris* can be misidentified as
bioMérieux VITEK MS MALDI-TOF*	*Candida haemulonii*
Vitek 2 YST**	*Candida haemulonii, Candida duobushaemulonii*
API 20C	*Rhodotorula glutinis* (characteristic red color not present), *Candida sake*
BD Phoenix	*Candida haemulonii, Candida catenulata*
MicroScan	*Candida parapsilosis, Candida famata, Candida guilliermondii, Candida lusitaniae*
RapID Yeast Plus	*Candida parapsilosis*

*Vitek MS can confirm *C. auris* if you have the research use only library (Saramis Version 4.14 database and Saccharomycetaceae update); however, *C. auris* can be misidentified as *C. haemulonii* and should be sent to DCLS for identification/confirmation.
** Vitek 2 software version 8.01 contains identification algorithms for *C. auris*; however, misidentification has been reported for some clades (e.g., South African and East Asian). It is recommended to send isolates to DCLS for identification/confirmation until more data are available.

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Implementation of an Antibiotic Timeout Process

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Background: A number of state and federal agencies, along with professional societies, have developed antimicrobial stewardship best practice standards. An antibiotic time out (ATO) is one of the measured best practices and provides an opportunity for clinicians to intentionally pause and review the appropriateness of active antibiotic orders. It is known that up to 50% of antibiotics prescribed in the hospital are unnecessary and inappropriate. Antibiotics are often started empirically but are not de-escalated or discontinued in a timely manner. Misuse of antibiotics not only increases the risk of adverse drug events and preventable *C. difficile* infections, but promotes the spread of multi-drug resistant organisms.

Methods: Current documentation of antibiotic rationale is inconsistent and often incomplete. If an assessment does occur, the documentation is not available in a discrete, reportable, or actionable format. The team's intent was to design a non-invasive workflow that guides providers to proactively assess antibiotics and record the ATO in conjunction with their daily workflow.

Results: Providers can document an ATO within progress notes using a smart data element (SDE), which files the assessment in discrete, reportable fields. A change in active antibiotic orders during the ATO window of 48-72 hours is also filed as a reportable field.

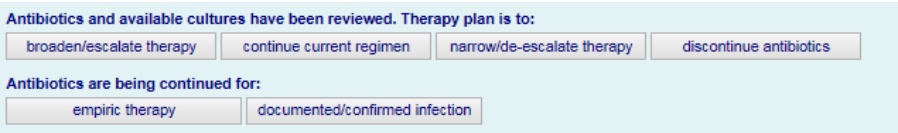

Figure 1: Example of a smart data element found within a physician note template

A best practice alert will fire if an ATO is not recorded in the appropriate time frame. In order to reduce white noise and create an actionable alert, the alert was structured to only fire to the provider responsible for the antibiotics.

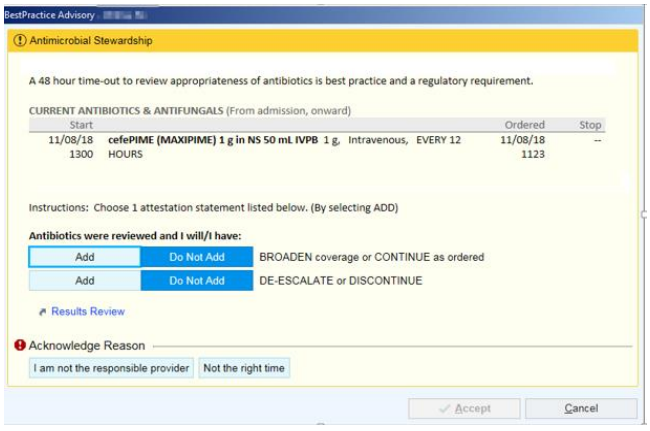

Figure 2: Example of an ATO best practice alert

Conclusions: A non-invasive workflow to guide providers to perform an ATO will not only meet best practice standards but also supplement other critical components of an antimicrobial stewardship program. A reduction in inpatient

antibiotic days of therapy (DOT) and early de-escalation or discontinuation of antibiotics have been recognized following the time of ATO implementation. It is difficult to determine the sole cause of a recognized reduction in antibiotic DOT as many initiatives are occurring simultaneously.

Levofloxacin for Antibacterial Prophylaxis in Pediatric Patients with Acute Myeloid Leukemia or Undergoing Hematopoietic Stem Cell Transplantation

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1. VCU Health System, Department of Pharmacy, Richmond, VA
2. VCU Health System, Department of Pediatrics, Richmond, VA

Background: Pediatric patients receiving intensive chemotherapy for acute myeloid leukemia (AML) or hematopoietic stem cell transplant (HSCT) are at high-risk of developing serious bacterial infections. Prior studies evaluating fluoroquinolone prophylaxis in pediatrics have provided inconclusive evidence. In 2015, our institution adopted the use of levofloxacin for antibacterial prophylaxis during neutropenia in pediatric patients with AML or undergoing HSCT.

Methods: This study was a single-center, retrospective medical record review designed to assess the frequency of bacteremia with levofloxacin prophylaxis compared to historical controls that used other, clinician-directed antibacterial prophylaxis. The primary outcome of the study was microbiologically documented bacteremia. Secondary outcomes included febrile neutropenia, clinically documented infection, duration of neutropenia, treatment antibiotic exposure days, C. difficile infection, and infection-related mortality.

Results: Of the 60 patients included, 24 patients with 32 hospital admissions received levofloxacin and 36 patients with 48 hospital admissions received clinician-directed prophylaxis. There was no difference found in the frequency of bacteremia between levofloxacin and clinician-directed prophylaxis (15.6% vs. 10.4%, p=0.49). There was no difference in the incidence of febrile neutropenia, clinically documented infection, treatment antibiotic exposure days, or 30-day infection-related mortality between the two groups. The levofloxacin group had a longer mean duration of neutropenia compared to clinician-directed prophylaxis (26.8 days vs. 16.4 days, p=0.01).

Conclusions: There was no difference in bacteremia between levofloxacin prophylaxis and clinician-directed prophylaxis in pediatric patients with AML or undergoing HSCT. Levofloxacin prophylaxis is an appropriate alternative for the prevention of serious bacterial infections in this patient population, although further studies are required to confirm these results.

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Incidence of Acute Kidney Injury in Oncology Patients Receiving Piperacillin/Tazobactam and Vancomycin

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Background: Acute kidney injury (AKI) occurs in approximately 5-20% of all hospitalized patients and is associated with an increase in morbidity and mortality. When evaluating this incidence in hospitalized patients, specifically oncology patients, the 1-year risk was found to be 17.5%. Cancer itself is a risk factor for developing an AKI, but additional risk factors for AKI in the oncology population include advanced age (>65 years old), congestive heart failure, chronic kidney disease, hypovolemia, distant metastases, multiple myeloma, liver cancer, nephrectomy for renal cell carcinoma, chemotherapy regimens for lymphoma, and induction chemotherapy for acute leukemia. Due to its broad-spectrum coverage of microbes, such as Pseudomonas aeruginosa and methicillin-resistant Staphylococcus aureus (MRSA), concomitant use of piperacillin/tazobactam and vancomycin as empiric antimicrobial therapy is common. Both vancomycin and piperacillin/tazobactam have independently been associated with rates of AKI ranging from 14-37%. Several of these studies have reported baseline characteristics of comorbid conditions, including types of cancer, but none have addressed the oncology population specifically. The purpose of this study is to evaluate the incidence of AKI with concomitant piperacillin/tazobactam and vancomycin in patients admitted to the medicine-oncology service.

Methods: This study was a retrospective medical record review of patients admitted to the medicine-oncology service from July 1, 2016 through June 30, 2018. Eligible patients were identified through a query in the Cerner information database for patients receiving piperacillin/tazobactam and vancomycin during the pre-specified date range. Patients were included if they were 18 years of age or older, have received piperacillin/tazobactam and vancomycin for at least 48 hours, and have a serum creatinine measurement within 24 hours of admission. Patients were excluded if they received dialysis on admission, had a history of a kidney transplant, were a prisoner, pregnant, duplicate patient, or developed an AKI prior to study drug initiation.
The primary outcome was the incidence of AKI defined by the Kidney Disease: Improving Global Outcomes (KDIGO) criteria. Secondary outcomes included time to onset of AKI, stage of AKI, duration of AKI, resolution of AKI by discharge, and identification of risk factors for AKI. Outcomes were analyzed using descriptive statistics, chi-squared or Fisher's exact, student's t-test, and odds ratios.

Results: A total of 270 patients were identified in Cerner with 138 patients meeting inclusion criteria. The incidence of AKI was 28%. The average time to onset of AKI was five days with the majority of patients having a stage 1 AKI (61%). The average duration of AKI was 6.58 days with 39% resolution at hospital discharge. Average age of patients who developed an AKI was 55 years old versus 60 years old in those who did not (p=0.03). In patients who developed an AKI, 87% had solid tumors and 13% had hematologic malignancies. Administration of intravenous contrast and loop diuretics, increased days of piperacillin/tazobactam, vancomycin, and combination therapy, intraabdominal infections, and peak vancomycin trough >20 µg/mL were all independently associated with a significantly higher incidence of AKI.

Conclusion: The incidence of AKI in medicine-oncology patients receiving piperacillin-tazobactam and vancomycin for at least 48 hours was higher than the approximate 22% incidence rate reported from previously published studies in non-critically ill patients. Concomitant administration of nephrotoxic medications, especially IV contrast and loop diuretics should be used judiciously as both were found to increase the odds of patients developing an AKI. Though adults older than 65 with cancer are at an increased risk of developing AKIs, younger patients in this study were at increased risk.

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Characterizing the Change Between IV Piggyback and IV Push Antibiotic Administration

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Background: Current literature has associated quicker, appropriate empiric antibiotic administration with improved outcomes. In order to streamline timely antibiotic administration, VCU Health System stocks pre-filled, intravenous piggyback (IVPB) antibiotics in the emergency department (ED). However, due to recent shortages of several IVPB antibiotics, many health systems have moved from ready-to-use IVPB antibiotics infused over 30-60 minutes to IV push (IVP) antibiotics pushed over 3-5 minutes. This study looks to assess the impact of this formulation change on time to antibiotic administration and adverse events.

Methods: This was a retrospective, observational study that evaluated cefepime administration in the ED in 2017 compared to 2018. Patients were included if they were at least 18 years of age, and received cefepime as IVPB from January-June 2017 or IVP from January-June 2018. The primary outcome was to evaluate the impact of changing from IVPB to IVP on timing to first dose antibiotics. Secondary outcomes include evaluating: duration of treatment, mortality, direct cost difference between IVPB and IVP, and documented adverse events.

Results: Median time from order to first antibiotic administration was shorter with IVP compared to IVPB (42.5 minutes vs. 58 minutes, P=<0.001). Time from order to second antibiotic administration was also shorter with IVP compared to IVPB (61 minutes vs. 74 minutes, P=0.006). There was no statistically significant difference in treatment characteristics or documented adverse events with IVP compared to IVPB (2% versus 0.6%, P= 0.464). IVP antibiotics was also associated with cost savings.

Conclusion: The change from IVPB to IVP on the time from antibiotic order to administration was associated with a significantly shorter time to first and second antibiotic administration, no difference in adverse events, and greater cost savings.

Evaluation of Antifungal Prophylaxis Strategy for Allogeneic Hematopoietic Cell Transplant Patients

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Background: Allogeneic hematopoietic cell transplant (HCT) patients are at increased risk for invasive mold infections (IMI). The reported 1-year incidence of IMI in allogeneic HCT patients varies widely, ranging from as low as 1.6% to over 10%. Primary antifungal prophylaxis is often used in allogeneic HCT patients to reduce the risk of IMI. However, current guidelines for preventing infection in allogeneic HCT patients do not provide specific recommendations for prophylaxis of IMI. The aim of this study is to determine the incidence and outcomes of IMI in allogeneic HCT patients at Virginia Commonwealth University (VCU) Health System who received primary antifungal prophylaxis.

Methods: The medical records of patients who underwent allogeneic HCT between January 1, 2013 and December 31, 2017 were retrospectively reviewed. Patients 18 years of age or older were included if they received intravenous micafungin 50 mg daily during pre-engraftment, with the intention of switching to oral fluconazole after engraftment, for primary antifungal prophylaxis. The primary outcome was the incidence rate of proven or probable IMI.

Results: A total of 200 patients were included, with median age of 55 years. The most common underlying diagnoses were acute myeloid leukemia (28%) and myelodysplastic syndrome (15.5%). The majority of patients had matched unrelated donors (45.5%) or matched related donors (33%). The incidence rate of proven or probable IMI was 33 cases per 100 patient-years, with a 1-year cumulative incidence of 24%. Median time to proven or probable IMI was 94 days post-transplant (IQR 23-178). IMI-related mortality, defined as death within the first 12 weeks after IMI diagnosis, occurred in 27 (56.3%) of the 48 patients diagnosed with proven or probable IMI. Compared to patients who did not develop IMI, overall survival was significantly lower in patients diagnosed with proven or probable IMI (P<0.001). No risk factors associated with IMI diagnosis were identified.

Conclusions: The incidence rate of proven or probable IMI in allogeneic HCT patients at VCU Health System was higher than expected based on previous literature. Primary antifungal prophylaxis with agents providing more robust anti-mold coverage should be considered for future patients undergoing allogeneic HCT at VCU Health System.

Impact of a Pharmacist-Driven Inactivated Herpes Zoster Virus Vaccine Administration Pilot Program on Vaccination Rates within a HIV/Infectious Diseases Clinic at an Academic Medical Center

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1. Virginia Commonwealth University Health System, Richmond, VA

Background/Purpose: Herpes Zoster Virus (HZV) is a debilitating disease with increased incidence in the immunocompromised population. In 2017, a two-dose, inactivated HZV vaccine (iHZVv) was approved for adults and is the preferred vaccine by the Advisory Committee on Immunization Practices. HIV-positive patients have a 3- fold higher risk of developing HZV and the inactivated vaccine is safe and results in immunogenicity when evaluated in patients with variable CD4 counts.

Purpose: To determine whether an iHZVv administration pilot program within a HIV/ID clinic increases completion of the two-dose vaccine series when compared to standard of care.

Methods: Patients were screened for a pharmacist-driven vaccine administration quality improvement pilot program and compared to historical provider-directed iHZVv education (standard of care; pre-intervention group) at the scheduled clinic appointment. HIV-positive adult, non-pregnant, patients with virologic suppression (undetectable viral load ≥ 6 months) and without immunosuppression (CD4 counts ≥ 200 cells/mm3) were included. Pilot patients (post-intervention group) were eligible [intention to treat (ITT)] or enrolled [modified (m)-ITT] to receive nursing administered iHZVv if pharmacy insurance benefits approved the vaccine (at no copay) and consent was granted. Outcomes included completion of the two-dose vaccine series within 6 months of "initial" appointment or if incomplete vaccine administration (one dose only) resulted.

Results: 129 patients were included [pre-intervention (n=84) and post-intervention (ITT, N=35; mITT, N=23]. Completion of the two-dose series increased in the post-intervention group compared to historic standard of care, respectively (ITT 62.86%, m-ITT 95.65% vs. 22.62%, p<0.0001). No difference in completion of only one dose resulted. In those who completed the two-dose series, completion within 6 months of the "initial" appointment was increased in the post-intervention compared to the pre-intervention group, respectively (90.91% vs. 47.37%, p<0.0047) with no difference in completion within the 2-to-6-month window.
Conclusions: The pharmacist-driven iHZVv administration program resulted in increased completion of the twodose series. However, revenue generated did not justify the cost of a pharmacist salary for the allocated time commitment.

Evaluation of the Management of Purulent and Non-purulent Skin and Soft tissue Infections in the Inpatient Setting at the Richmond Veterans Affairs Medical Center

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Background: Skin and soft tissue infections (SSTIs) accounted for 10% of all infectious diseases related hospitalizations across the US from 1998-2006. Treatment of SSTIs is widely variable and antimicrobial management is often inappropriate. Compliance with treatment guidelines is an important outcome measure for Antimicrobial Stewardship Programs (ASP). The objective of this study was to evaluate the appropriateness of antibiotics for the treatment of purulent and non-purulent SSTIs at the Richmond VAMC.

Methods: The Richmond VAMC (a 399-bed tertiary care center) participated in a multi-site retrospective chart evaluation in collaboration with the Antimicrobial Stewardship Taskforce, Salt Lake City IDEAS Group and VA Pharmacy Benefits Management/VA Center for Medication Safety to assess the SSTI antibiotic prescribing practices for SSTIs from June 1, 2016 to May 31, 2017. Data collection included demographics, comorbidities, antibacterial choice and duration, and clinical outcomes relevant to management of SSTI. Inclusion criteria: aged ≥18 years, received inpatient care in an acute care unit, ICD-10 code of L02 (cutaneous abscess, furuncle or carbuncle) or L03 (cellulitis and lymphangitis), received systemic antibacterial treatment >2 total calendar days (including after hospitalization). Infections were classified as a purulent SSTI based on chart review documenting: abscess, nodule, boil, carbuncle, furuncle, felon, purulence, purulent cellulitis/drainage/exudate/SSTI, fluctuance, fluid accumulation/collection, or pus/pustule. Associations were estimated or assessed using Spearman rank correlations, Wilcoxon signed rank test, logistic regression, and Fisher's exact test. SAS version 9.4 (Cary, NC) was used for all analyses.

Results: A total of 114 patients were identified, 43 meeting inclusion criteria. Forty patients (93%) received guideline discordant choice of antibiotic therapy, 25 patients (58%) received IDSA guideline discordant duration of therapy, and 25 patients (58%) received both guideline discordant choice and duration of therapy (Table 1). There were no significant differences between patients with purulent and non-purulent SSTI in terms of inappropriate antibiotic choices (82% vs. 97%, p-value = 0.1560) and inappropriate length of therapy (45% vs. 63%, p-value = 0.4805) (Table 1). Length of stay (LOS) was significantly associated with body mass index (BMI) (r = -0.31, 95% CI: -0.56, 0.00, p-value = 0.0491). Minocycline, Cephalexin and Vancomycin had the highest total DOT among all patients (Figure 1). Total DOT were higher in patients with non-purulent SSTIs

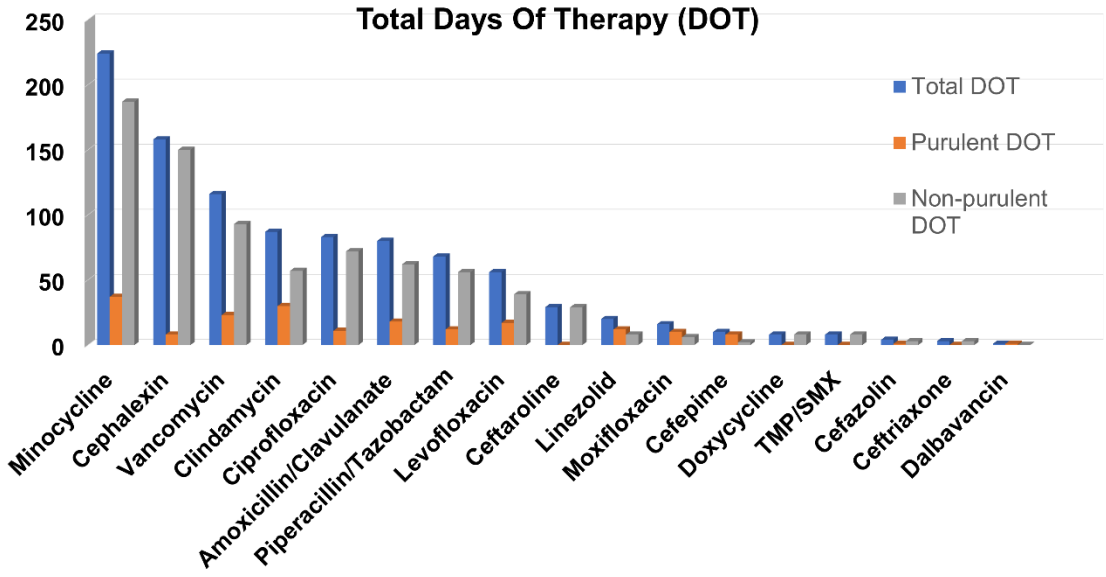
Conclusions: Most patients (93%) at our VAMC receive guideline discordant choice of antibiotic therapy for SSTIs. Despite guidelines emphasizing a distinction between treatment of purulent vs non-purulent SSTIs, providers at our facility do not seem to use these categories to guide antibiotic therapy. Optimization of treatment of SSTIs represents a key opportunity for ASPs.

Table 1

Data Summaries for Continuous and Categorical Outcomes

	Purulent SSTI				Non-Purulent SSTI			
	N	Median	Min/Max		N	Median	Min/Max	p value
Total length of antibiotic therapy	11	9	1 ,16		32	10	5, 65	0.1978
Days of therapy for all antibiotics	11	21	5, 26		32	20.5	6, 134	0.4105
Length of hospital stay (in days)	10	3	2, 3		31	3	1, 12	0.3476
	N	Frequency	%		N	Frequency	%	
Inappropriate Antibiotic Choice	11	9	82%		32	31	97%	0.1560
Inappropriate Length of Therapy	11	5	45%		32	20	63%	0.4805
Inappropriate Antibiotic Choice AND Length of Therapy	11	5	45%		32	20	63%	0.4805

Figure 1



2019 SIGoVA Antimicrobial Stewardship Research Symposium
June 14th, 2019
Presentation Abstracts

Relative Carbapenem Use for a Burn ICU at an Academic Medical Center

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Background: Anti-pseudomonal carbapenems are an important target for Antimicrobial Stewardship Programs (ASPs). We evaluated the impact of formulary restriction and preauthorization (FRPA) on relative carbapenem use for a burn unit at a large, urban academic medical center using interrupted time series analysis. Our burn unit includes pediatric and adult patients. Virginia Commonwealth University Health System (VCUHS) is an 865 bed urban, academic medical center that has had an ASP in place for approximately 20 years. Our facility implemented a formulary restriction and preauthorization (FRPA) protocol for meropenem (our formulary carbapenem) for both medical and surgical inpatient units fully in February 2018.

Methods: Antimicrobial use data for piperacillin/tazobactam (PT), meropenem, and cefepime were aggregated by month and reported as antimicrobial days of therapy (DOT) per 1000 patient days (PD) from August 2012-August 2018 for the Burn unit. We used the previously described Proportion of Carbapenem Consumption metric (PoCC) to evaluate relative carbapenem use. Interrupted time series (ITS) analysis, which consists of an ordinary least squares regression modeling PoCC as a function of time trend (# of months since the beginning of the analysis period) and a binary ITS variable indicating the date meropenem orders became subject to FRPA at our institution, was utilized. Analysis was completed using SAS software version 9.4 (© 2013, SAS Institute, Cary, NC).

Results: The PoCC within the Burn unit decreased by 81% and ITS analysis suggests that 67% of change was attributable to FRPA implementation. However, this did not achieve statistical significance.

	Pre-Intervention		Post-Intervention			
Ward	**Mean Meropenem use (DOT^/1000PDs^^)[1]**	**Mean PoCC**	**Mean Meropenem use (DOT^/1000PDs^^)**	**Mean PoCC**	**PoCC ITS***	**p-ITS**
Burn Unit	29.8	0.21	5.41	0.04	-0.14	0.13

Table 1: PoCC and DOT for Burn unit following Meropenem Restriction

[1] ^DOT = Days of Therapy; ^^PDs = Patient Days; *PoCC = [(meropenem DOT/1000 PDs)/ (meropenem DOT/1000 PDs + cefepime DOT/1000 PDs + piperacillin-tazobactam DOT/1000 PDs)]; *absolute change in mean PoCC corrected for ITS analysis.

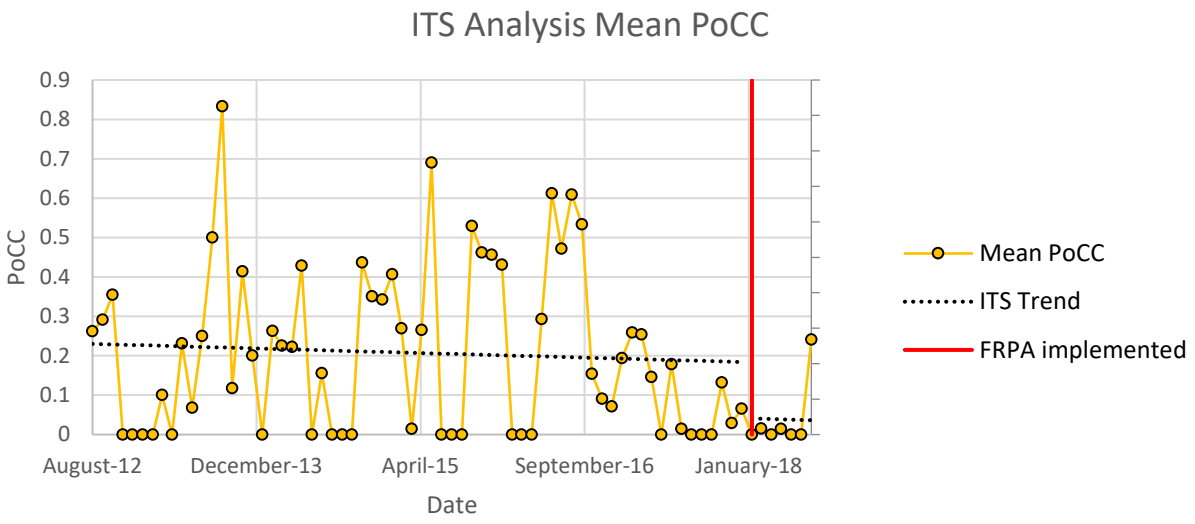

Figure 1: Mean PoCC from Aug. 2012-Aug. 2018 with superimposed ITS trend.

Conclusion: This is the first description of the PoCC metric applied specifically to a Burn unit. The value of the PoCC metric is that it contextualizes carbapenem use and may thus be more tangible to frontline providers. ASPs may utilize the PoCC to identify wards within the hospital that may be overutilizing carbapenems. Relative carbapenem consumption was already declining before FRPA for meropenem was put into place at our hospital. We saw a dramatic (albeit non-significant) decline in the PoCC following restriction. We believe these data may be of interest to other ASPs considering carbapenem restriction and who work with patients who have suffered burn injury.

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Impact of Pharmacist-led Education on the Outpatient Treatment of Acute Upper Respiratory Tract Infections

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Background: Upper respiratory tract infections (URTIs) are the most common acute illnesses evaluated in the outpatient setting, accounting for 44% of outpatient antibiotic prescriptions in the United States each year. Up to 90% of URTIs are caused by viral pathogens, and the Centers for Disease Control and Prevention (CDC) has reported that at least 30% of outpatient antibiotic prescriptions are unnecessary. Guidelines developed by The National Institute for Heath and Care Excellence (NICE) and The Infectious Diseases Society of America (IDSA) support a "delayed antibiotic prescribing" strategy for URTIs, and the White House has launched a national campaign to reduce inappropriate outpatient antibiotic use by 50% by 2020. The objective of this study is to evaluate the impact of pharmacist-led education on the outpatient treatment of acute URTIs.

Methods: This is a multi-site, retrospective chart review of ambulatory patients aged 18 years and older who were prescribed a targeted antibiotic for the treatment of an URTI. This study compared the prescribing performance of providers pre and post pharmacist-led education (November 2017, November 2018). Information collected included the date of visit, practice site, ordering physician, patient name, patient identification number, diagnosis, confounding diagnoses, and antibiotic prescribed. Patient charts were analyzed for signs and symptoms of a bacterial infection in accordance with IDSA guidelines in order to determine the appropriateness of antimicrobial therapy. The primary endpoint of this study was the percent of target antibiotics filled that were inappropriately prescribed for URTIs. Providers were also instructed to complete a survey regarding thoughts and attitudes towards antimicrobial prescribing for URTIs.

Results: In November 2017, 30.5% of antibiotics were considered inappropriately prescribed for URTIs. However, in November 2018, 18.1% of antibiotics were considered inappropriate after the completion of pharmacist education ($p = 0.06$). Survey results showed that 39.4% of providers most commonly prescribe antibiotics for sinusitis. 63.3% of providers are against the development of an electronic alert
to guide treatment decisions. 45.5% of providers believe that their prescribing practice for URTIs is already appropriate, and 66.67% of providers believe that the biggest barrier to appropriate antimicrobial prescribing for URTIs is patient pressure.

Conclusion: Pharmacist-led education on the outpatient treatment of URTIs led to a 12.4% absolute reduction in the amount of inappropriate outpatient antibiotics prescribed for URTIs. Though not statistically significant, the results of this study indicate that a pharmacist's education and influence can create positive outcomes in antimicrobial stewardship initiatives. However, most providers would not prefer the creation of an electronic notification to guide therapy decisions, possibly due to the development of alert fatigue. Additionally, more effort directed towards patient education concerning antibiotic use for URTIs may assist providers in prescribing fewer antibiotics for URTIs.

The Effect of an Updated Emergency Department Urine Culture Follow Up Protocol on Antimicrobial Interventions

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Background: Antibiotics are inappropriately prescribed to a large percentage of patients that visit the emergency department each year. This has led to complications such as an increased incidence of *C. difficile* infection and antimicrobial resistance. The Centers for Disease Control and Prevention reports that there are at least 2 million people infected by multi-drug resistant organisms yearly. The current rise in multi-drug resistant organisms is the biggest threat to health care today. The purpose of this study was to determine whether an updated emergency department urine culture protocol would increase the number of antibiotic interventions made during urine culture follow up. The primary objective was to compare the number of interventions between the previous and updated protocols, whether it be to modify or discontinue an antibiotic. The secondary objectives were to determine if the duration of antibiotic therapy or the number of readmissions within 96 hours were different between each group.

Methods: All urine cultures taken from individuals 18 years and older in the emergency department of Lynchburg General Hospital were reviewed and included for data analysis with the exception of admitted patients. A pharmacist, with input from infectious disease physicians, developed an updated emergency department urine culture follow up protocol following the 2010 Infectious Disease Society of America guidelines. This study duration was eight weeks in total. The previous protocol was used to determine urine culture interventions during the first 4 weeks and the updated protocol was used thereafter.

Results: Urine cultures from 510 patients were reviewed. The nurse performed 12/251 interventions using the previous protocol and the pharmacist performed 30/259 interventions (4.8% vs. 11.6%, p=0.005) using the updated protocol. During utilization of the previous and updated protocols 18 and 7 patients were readmitted within 96 hours, respectively (p=0.018). No difference was seen in duration of antibiotic treatment between groups.

Conclusion: An updated urine culture protocol in the emergency department resulted in more antibiotic interventions and a decrease in re-admissions within 96 hours. This new process allows for targeted expansion of antimicrobial stewardship in the emergency department.

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Use of a Novel Metric for Inter-Facility Comparison of Antimicrobial Consumption across Academic Medical Centers

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Introduction: Antimicrobial consumption is a key outcome metric for Antimicrobial Stewardship Programs (ASP). However, many ASP do not have access to comparator data to contextualize use. The Vizient network is a nationwide peer-to-peer health care information platform that includes over 95% of U.S. academic medical centers. We describe the relative use of key antibiotic at Virginia Commonwealth University Health System (VCUHS), an 865-bed tertiary care hospital in Richmond, Virginia, relative to similar institutions in the Vizient Network.

Methods: Data were collected between 2015 and 2017 from VCUHS and seven similar academic, Vizient member hospitals based on geography, size, and patient complexity. For key gram negative antibiotics for each hospital we calculated the days of therapy per 1000 patient-days (DOT/1000 PD) by year, as well as the average DOT/1000 PD by antimicrobial across all 8 hospitals by year. We created a Standardized Antimicrobial Use Ratio (SAUR) by dividing VCUHS antimicrobial consumption for a given antimicrobial by the average consumption across all 8 hospitals for each year. An SAUR > 1 indicates increased antimicrobial utilization compared to peers. Conversely, and SAUR < 1 indicates decreased antimicrobial utilization compared to peers.

Results: The VCUHS SAUR was elevated in all comparisons for piperacillin-tazobactam, meropenem, levofloxacin, and colistin (colistimethate).

Conclusion: Our analysis identified elevated use of multiple key gram negative antibiotics relative to similar peer institutions and will be used to inform our local antimicrobial stewardship efforts. Although not risk adjusted, these data provide a quick, practical way to assess relative antimicrobial consumption for Vizient member hospitals. More research is needed to determine if an elevated SAUR corresponds to inappropriate use of antibiotics.