were initiated. Statistical analysis was performed on the annual number of dispenses and opportunities with a mixed-effects Poisson regression with random effects for facility, unit and year and fixed effects for intervention type and unit type. Interactions were not included in the model based on interaction plots and significance tests. Poisson assumptions were verified with Pearson residual plots. **Results:** HH performance rates overall and compared to the baseline are shown in Table 2. More than 8 million opportunities were achieved in all 58 units combined. An intervention strategy with multiple complementary components (ie, clinical support provided by the AHHMS vendor plus hospital-initiated unit level interventions) yielded significantly better HH performance than all other categories (>20% increase, $P < .00001$). Somewhat surprisingly, vendor clinical support or hospital-initiated, unit-level interventions alone with the AHHMS yielded a slight decrease in HH performance relative to AHHMS only ($P < .00001$). **Conclusions:** AHHMS is a useful tool in understanding HH performance and identifying unit-based initiatives that need attention. Implementation of an AHHMS by itself or with limited complementary behavior-change strategies does not drive improvement. Support provided by the vendor and hospital-initiated, complementary strategies were not sufficient additions to the AHHMS individually, but in combination they resulted in the greatest improvements in HH performance. These findings illustrate the value of a partnership between the hospital and the AHHMS vendor.

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Presentation Type:
Poster Presentation

Using Machine Learning to Detect Hospital-Specific Risk Factors of Surgical Site Infections

Jakub Kozák, Datlowe; Lenka Vraná, Datlowe; Petra Vavřinová, Hospital Jihlava

Background: Identification of healthcare-associated infections (HAIs) is just a first step in the surveillance of HAIs. The other part is the analysis and interpretation of collected data, which should help to set up effective preventive measures targeted where they are needed the most. General risk factors of HAIs are mostly well known, but how do the environment and processes of each hospital affect risks of HAI? Can advanced methods of data analytics reveal hidden hospital-specific risk factors of surgical site infections (SSIs)? **Methods:** We analyzed data from electronic health records stored in the clinical information system of Hospital Jihlava, Czech Republic, with 650 beds and 7,500 surgeries performed annually. For each inpatient stay with a surgical procedure, we automatically observed almost 1,500 features that could lead to a higher incidence of SSIs. These features consist of patient demographic data, information from structured data (eg, patient diagnoses, departments, specific rooms, operating theaters, surgeons and other hospital staff participating in the surgery), and information extracted from clinical notes using natural language processing (eg, procedures, invasive devices, and comorbidities). We used a model based on survival analysis to reveal the risk factors that can increase the probability of SSI during the inpatient stay or outpatient care after discharge. **Results:** We automatically evaluated risk factors weekly for 4 months (July 2019–October 2019). We detected 16 distinct significant risk factors during this period—between 2 and 6 active risk factors each week. For example, patients visiting a specific department were up to 5 times more likely to develop an HAI than the rest of the patients ($P < .001$). Some of the risk factors revealed were significant only within a short time, and some of them occurred perpetually. When a feature became significant, it was considered an early warning of a problem that should be addressed by the infection prevention and control team. Trends in risk factors coefficients can also help in assessing the performance of the launched preventive measures. **Conclusions:** Advanced data analytics can effectively uncover hospital-specific risk factors affecting surgical site infections. Such systems can automatically deliver results that can be further explored and used as a basis for targeted preventive measures.

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A Collaborative Public Health and Veterinary Facility Approach to an NDM-5 *Escherichia coli* Outbreak

Jane M. Gould, Healthcare-Associated Infections/Antimicrobial Resistance Program, Division of Disease Control, Philadelphia Department of Public Health; Healthcare Associated Infection Prevention/Antimicrobial Stewardship Program, Bureau of Epidemiology, Pennsylvania Department of Health; Stephen D. Cole, University of Pennsylvania School of Veterinary Medicine, Matthew J. Ryan Veterinary Hospital; Susy Rettig, Healthcare-Associated Infections/Antimicrobial Resistance Program, Division of Disease Control, Philadelphia Department of Public Health; Kristin Privette, Healthcare-Associated Infections/Antimicrobial Resistance Program, Division of Disease Control, Philadelphia Department of Public Health; Tiina Peritz, Healthcare-Associated Infections/Antimicrobial Resistance Program, Division of Disease Control, Philadelphia Department of Public Health; Susan Coffin, Healthcare-Associated Infections/Antimicrobial Resistance Program, Division of Disease Control, Philadelphia Department of Public Health; Division of Pediatric Infectious Diseases, The Children's Hospital of Philadelphia; Betsy Schroeder, Division of Infectious Disease Epidemiology, Bureau of Epidemiology, Pennsylvania Department of Health; Donna Oakley, University of Pennsylvania School of Veterinary Medicine, Matthew J. Ryan Veterinary Hospital; Shelley C. Rankin, University of Pennsylvania School of Veterinary Medicine, Matthew J. Ryan Veterinary Hospital

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Background: Carbapenem-resistant *Enterobacteriaceae* (CRE) are an important cause of healthcare-associated infections (HAIs) in human hospitals. The Philadelphia Department of Public Health (PDPH) made CRE reportable in April 2018. In May 2019, the Matthew J. Ryan Veterinary Hospital (MJRVH) reported an NDM-5 *Escherichia coli* cluster in companion animals to the PDPH. In total, 15 infected animals (14 dogs and 1 cat) were reported between July 2018 and June 2019, with no new infections after June 2019. Limited literature is available on the prevalence of CRE in companion animals, and recommendations for dealing with CRE infections currently target human healthcare settings. **Methods:** A collaborative containment response included assessing interspecies transmission to veterinary staff and a comprehensive evaluation of the infection control program at MJRVH. MJRVH notified all owners of affected animals verbally and via notification letters with PDPH recommendations for CRE colonization screening of high-risk individuals. CRE screening of exposed high-risk employees was conducted by the University of Pennsylvania Occupational Health service and PDPH. Human rectal swabs were analyzed at the Antibiotic Resistance Laboratory Network (ARLN) Maryland Laboratory. PDPH were invited to conduct an onsite infection control assessment and to suggest improvements. **Results:** No pet owners self-identified in high-risk groups to be screened. In total, 10 high-risk staff were screened, and no colonized individuals were detected. Recommendations made by the PDPH to MJRVH included improvement of infection prevention and control policies (eg, consolidation of the infection control manual and identification of lead staff member), improvement in hand hygiene (HH) compliance (eg, increasing amount of HH supplies), improvement of environment of care (eg, decluttering and evaluation of mulched animal relief area), and improvement of respiratory care processes (eg, standardization of care policies). MJRVH made substantial improvements across recommendation areas including revision of infection control manual, creation of a full-time infection preventionist position, individual alcohol hand sanitizers for patient cages, and environmental decluttering and decontamination. PDPH and MJRVH maintained frequent communication about infection control improvements. **Conclusions:** No positive transmission to high-risk staff members suggest that, like in human healthcare facilities, transmission of CRE to caretakers may not be a common event. Stronger communication and collaboration is required from Departments of Public Health (DPH) to the veterinary profession regarding the reporting requirements of emerging pathogens such as CRE. Veterinary facilities should view DPH as a valuable resource for recommendations to fill in gaps that exist in infection control "best practices," particularly for novel pathogens in veterinary settings.

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Poster Presentation

A Descriptive Analysis of Outpatient Antimicrobial Use for Urinary Tract Infections in Virginia

Hasti Mazdeyasna, Virginia Commonwealth University School of Medicine; Shaina Bernard, Virginia Department of Health; Le Kang, VCU Health; Emily Godbout, Children's Hospital of Richmond at VCUHS; Kimberly Lee, VCU Medical Center; Amy Pakyz, Virginia Commonwealth University; Andrew Noda, Virginia Commonwealth University Health System; Jihye Kim, VCU Health; John Daniel Markley, Virginia Commonwealth University Medical Center/Hunter Holmes McGuire VA Medical Center; Michelle Elizabeth Doll, Virginia Commonwealth University; Gonzalo Bearman, Virginia Commonwealth University VCUHS Epidemiology and Infection Control Michael Stevens, Virginia Commonwealth University School of Medicine

Background: Data regarding outpatient antibiotic prescribing for urinary tract infections (UTIs) are limited, and they have never been formally summarized in Virginia. **Objective:** We describe outpatient antibiotic prescribing trends for UTIs based on gender, age, geographic region, insurance payer and *International Classification of Disease, Tenth Revision* (ICD-10) codes in Virginia. **Methods:** We used the Virginia All-Payer Claims Database (APCD), administered by Virginia Health Information (VHI), which holds data for Medicare, Medicaid, and private insurance. The study cohort included Virginia residents who had a primary diagnosis of UTI, had an antibiotic claim 0–3 days after the date of the diagnosis and who were seen in an outpatient facility in Virginia between January 1, 2016, and December 31,

Table 1. Select Antimicrobials Prescribed by Gender and Diagnosis Type

Characteristic	TMP-SMX	Cephalosporins	Fluoroquinolones	Tetracyclines	Nitrofurantoin
Gender					
Female	529	4,173	6,155	224	681
Male	108	718	1,473	94	74
Diagnosis					
Cystitis	619	4,844	7,533	290	742
Urethritis	2	15	36	28	2
Acute pyelonephritis	16	32	59	0	11