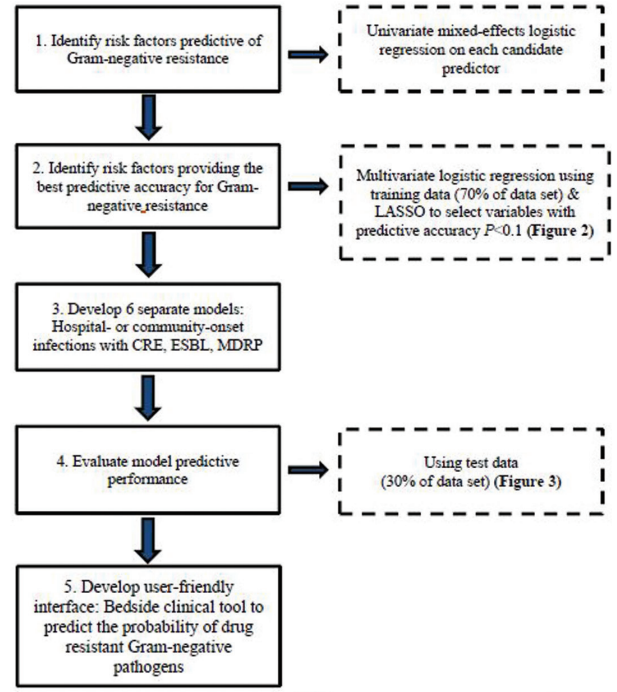
Figure 1. Model Development



CRE=carbapenem-resistant *Enterobacteriaceae*; ESBL=extended spectrum beta-lactamase-producing *Enterobacteriaceae*; LASSO=logistic regression that minimized the cross-validation misclassification error; MDRP=multiple drug-resistant *Pseudomonas*.

Figure 2. Independent Predictors of ≥1 Type of Resistant Infection Included in the Multivariate Analysis*

		CRE		ESBL		MDRP	
	Predictor	Hospital	Community	Hospital	Community	Hospital	Community
Other	Infection site†	✓	✓	✓	✓	✓	✓
	ICU / non-ICU	✓	×	✓	×	✓	×
	Hospital prevalence	✓	✓	✓	✓	✓	✓
Patient	Age	×	×	✓	✓	×	×
	Transfer	✓	✓	✓	✓	✓	✓
	Admission in prior 6 months	✓	✓	✓	✓	✓	✓
	Prior number of antibiotics‡	✓	×	✓	×	✓	×
	Infection in prior 3 months	×	✓	×	✓	✓	✓
Comorbidities	Cancer	×	×	✓	×	×	✓
	Cerebrovascular disease	✓	×	✓	×	×	×
	Chronic pulmonary disease	×	×	×	×	✓	✓
	Heart failure	×	×	✓	×	×	×
	Diabetes with complications	✓	×	✓	✓	×	×
	Diabetes without complications	×	✓	×	✓	×	✓
	Dialysis	✓	✓	✓	✓	✓	×
	Mild liver disease	✓	×	✓	×	×	×
	Myocardial infarction	✓	×	×	×	✓	✓
	Para/ hemiplegia	×	✓	×	✓	✓	✓
	Peripheral vascular disease	×	×	✓	×	×	×

CRE=carbapenem-resistant *Enterobacteriaceae*; ESBL=extended spectrum beta-lactamase-producing *Enterobacteriaceae*; ICU=intensive care unit; MDRP=multiple drug-resistant *Pseudomonas*

*Shaded cells=most important predictors across most models (those predictors incurring the highest level of risk in comparison with the reference value).
†Complicated urinary tract infection (cUTI), complicated intra-abdominal infection (cIAI), bloodstream infection (BSI), or hospital-acquired/ventilator-associated pneumonia (HAP/VAP).
‡Prior number of antibiotics was not included for community-acquired infection due to the difficulty of recovering accurate data.

Figure 3. Evaluation of Model Predictive Performance

	CRE		ESBL		MDRP	
Performance Metric	Hospital	Community	Hospital	Community	Hospital	Community
AUC for training data	0.90	0.79	0.87	0.71	0.94	0.84
AUC for test data	0.92	0.79	0.87	0.70	0.94	0.83
Correct prediction among top 10% scored subjects in test data, n/N (%)	145/3496 (4.1)	165/3607 (4.6)	627/3411 (18.4)	786/3624 (21.7)	405/3586 (11.3)	388/3628 (10.7)
Lift of top 10% scored subjects in test data*	7.8	3.8	6.4	2.6	7.9	5.0

AUC=area under the receiver-operating characteristic (ROC) curve; CRE=carbapenem-resistant *Enterobacteriaceae*; ESBL=extended spectrum beta-lactamase-producing *Enterobacteriaceae*; LASSO=logistic regression that minimized the cross-validation misclassification error; MDRP=multiple drug-resistant *Pseudomonas*.

*Lift defined as probability of a positive case given a top 10% score divided by the probability of a positive case in overall sample. This ratio evaluates how much a top score enriches for selecting positive cases compared with random sampling in the absence of a model. A higher lift indicates a stronger association between the predicted score and the outcome.

Disclosures. **T. P. Lodise Jr.**, Motif BioSciences: Board Member, Consulting fee. **N. G. Bonine**, Allergan: Employee, Salary. **J. M. Ye**, Allergan: Employee, Salary. **H. J. Folse**, Evidera: Employee, Salary. **P. Gillard**, Allergan: Employee, Salary.

1167. Trends in Multi-Drug-Resistant Gonorrhea, Gonococcal Isolate Surveillance Project, United States, 1987–2016

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Background. *Neisseria gonorrhoeae's* ability to develop resistance to antibiotics used for treatment and a limited development of new therapies have made this organism one of three urgent threat pathogens in the United States. We provide the first report of US trends in multi-drug-resistant (MDR) and extensively-drug-resistant (XDR) gonorrhea.

Methods. The Gonococcal Isolate Surveillance Project (GISP) monitors trends in antimicrobial susceptibility in *N. gonorrhoeae* in the United States. Antimicrobial susceptibility testing by agar dilution is performed on urethral isolates from male patients at participating STD clinics. Minimum inhibitory concentration (MIC) are used to identify isolates with resistance or reduced susceptibility using the following criteria: fluoroquinolones (ciprofloxacin [MIC ≥1.0 μg/mL]) and elevated MICs to cephalosporins (cefixime [MIC ≥0.25 μg/mL], ceftriaxone [MIC ≥0.25 μg/mL]) and macrolides (azithromycin [MIC ≥1.0 μg/mL before 2005 and ≥2.0 μg/mL 2005–2016]). In this analysis, MDR is defined as resistance or elevated MICs to ≥2 classes of antimicrobials; XDR as resistance or elevated MICs to ≥3 classes. This classification excludes penicillin and tetracycline due to their long history and high prevalence of gonococcal resistance.

Results. During 1987–2016, 159,445 isolates were collected through GISP. In 1998, the first MDR strains were identified. Although only 0.04% of isolates that year, these isolates showed elevated MICs to both cephalosporins and macrolides. By 2010, 1.0% of GISP isolates were MDR with elevated MICs or resistance to two of the cephalosporins, macrolides, or fluoroquinolones. In 2011, the proportion of isolates that were MDR peaked at 1.3%. In 2016, after minor fluctuations, 1.1% of GISP isolates were considered MDR. Only one occurrence of XDR, in 2011, has been seen in GISP. The strain was resistant to fluoroquinolones with elevated MICs to both cephalosporins and macrolides.

Conclusion. MDR and XDR gonorrhea have remained low over the past three decades; however, dual treatment with cephalosporins and macrolides is the last remaining recommended therapy for *N. gonorrhoeae*. Until new treatment options become available, a combination of surveillance and ensuring appropriate treatment are needed to delay further resistance.

Disclosures. **All authors:** No reported disclosures.

1168. Role of Extended-Spectrum Cephalosporin-Resistance in Recurrent Enterobacteriaceae Urinary Tract Infections

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Background. Recent data have shown an increase in bacterial resistance to first-line antibiotics used to treat community-onset urinary tract infections (UTIs). A better understanding of the clinical outcomes associated with drug-resistant UTIs in the community is needed. We sought to determine the association between community-onset extended-spectrum cephalosporin-resistant (ESC-R) Enterobacteriaceae (EB) UTI and the risk for recurrent UTI.

Methods. A retrospective cohort study was performed. All patients presenting to the Emergency Departments (EDs) or outpatient practices with EB UTIs between 2010 and 2013 were included. Exposed patients had ESC-R EB UTIs. Unexposed patients had ESC-susceptible EB UTIs and were matched to exposed subjects 1:1 on study year. Multivariable Cox proportional hazard regression analyses were performed to evaluate the association between ESC-R EB UTI and time to recurrent UTI within 12 months. Patients were censored at the time of first recurrent UTI or at the end of follow-up.

Results. A total of 302 patients with an index community-onset EB UTI were included, with 151 exposed and unexposed. Within 12 months of the index UTI, 163 (54%) patients experienced a recurrent UTI. The median time to recurrence was 69 days (interquartile range 25–183 days). On multivariable analyses, a UTI due to an ESC-R EB was associated with an increased hazard of recurrent UTI (hazard ratio [HR] 1.39, 95% confidence interval [CI] 1.01–1.91, $P = 0.04$). Other variables that were independently associated with an increased hazard of recurrent UTI included a history of UTI in the 6 months prior to the index UTI (HR 1.59, 95% CI 1.17–2.15, $P < 0.01$) and presence of a urinary catheter at the time of the index UTI diagnosis (HR 1.59, 95% CI 1.06–2.38, $P = 0.03$).

Conclusion. Community-onset UTI due to an ESC-R EB organism is associated with a significantly increased hazard of recurrent UTI within 12 months even after adjusting for baseline factors that predispose patients to UTI recurrence. This study raises the question of whether patients with an ESC-R EB organism may require modified treatment regimens. Further study is needed to better elucidate the cause of recurrence among these patients.

Disclosures. **All authors:** No reported disclosures.

1169. Surveillance of Antibiotic-Resistant Bacteria Reported Among Healthcare-Associated Infections, California, 2011–2017

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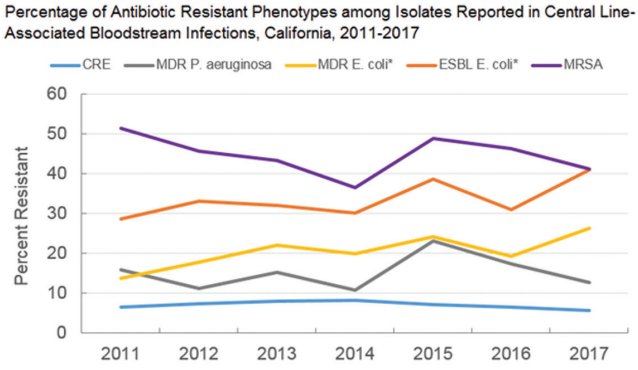
Background. Antibiotic-resistant healthcare-associated infections (HAI) threaten patient safety and public health. HAI reported by California hospitals to the National Healthcare Safety Network include pathogen and antibiotic susceptibility information. We analyzed HAI data to measure regional changes in antibiotic resistance (AR) over time among select bacteria.

Methods. We analyzed central line-associated bloodstream infection (CLABSI) data using log binomial regression models to estimate annual change in the proportion of pathogens resistant to carbapenems, extended-spectrum cephalosporins, methicillin/oxacillin, and multidrug (MDR) combinations for the reporting years 2011–2017. We aggregated HAI CLABSI, catheter-associated urinary tract infection (CAUTI), and surgical site infection (SSI) data in 2-year increments (i.e., 2014–2015, 2016–2017) to assess changes in percent resistance by county when data for 30 or more pathogens were available.

Results. Among CLABSI reported from 2011 to 2017, there were no significant changes in the proportion of carbapenem-resistant Enterobacteriaceae (CRE) (Figure 1; risk ratio [RR]: 0.97, 95% CI: 0.92, 1.03; $P = 0.32$), methicillin/oxacillin-resistant *S. aureus* (MRSA) isolates (RR: 0.98, 95% CI: 0.96, 1.00; $P = 0.06$) or *Pseudomonas aeruginosa* with an MDR phenotype (RR: 1.02, 95% CI: 0.95, 1.10; $P = 0.54$). The proportion of *E. coli* with MDR and extended-spectrum β-lactamase (ESBL) phenotypes increased by 7% (RR: 1.07, 95% CI: 1.02, 1.12; $P < 0.01$) and 4% (RR: 1.04, 95% CI: 1.01, 1.08; $P = 0.02$) per year, respectively. Percentages of AR among aggregated CAUTI, CLABSI and SSI pathogens varied by county and time period (Figures 2 and 3).

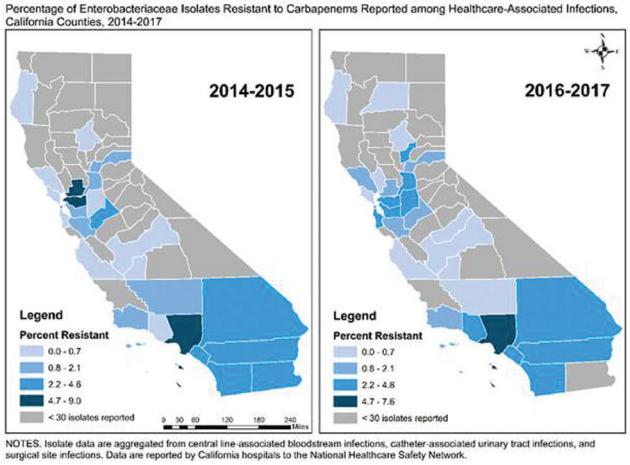
Conclusion. Increases in antibiotic resistant phenotypes among *E. coli*, and unchanged prevalence of MDR *Pseudomonas aeruginosa*, CRE, and MRSA among reported HAI underscore the need for continued infection prevention and antibiotic stewardship efforts in California. Local public health departments can use these analyses to target coordinated AR prevention initiatives with healthcare facilities in their regions.

Figure 1.



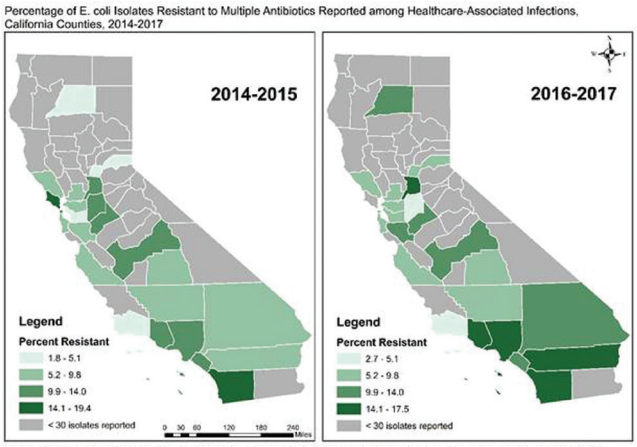
NOTES. *Statistically significant increases in antibiotic resistant phenotype from 2011-2017.

Figure 2.



NOTES. Isolate data are aggregated from central line-associated bloodstream infections, catheter-associated urinary tract infections, and surgical site infections. Data are reported by California hospitals to the National Healthcare Safety Network.

Figure 3.



NOTES. Isolate data are aggregated from central line-associated bloodstream infections, catheter-associated urinary tract infections, and surgical site infections. Data are reported by California hospitals to the National Healthcare Safety Network. Isolates tested intermediate or resistant to at least one drug from three or more of the following five categories: cephalosporins, fluoroquinolones, aminoglycosides, carbapenems, piperacillin group.

Disclosures. **All authors:** No reported disclosures.

1170. Applying Machine Learning Algorithms to Predict Multi-Drug-Resistant Bacterial Infections From Prior Drug Exposure

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Background. Multi-drug-resistant (MDR) infection in the acute care setting prolongs hospital stay and causes high mortality, especially in the pediatric population. Being able to predict MDR infection risk upon or during admission could help prevent and reduce morbidity and mortality in children requiring acute care in the future. This study aimed to develop and validate a predictive model for MDR infection in the pediatric population using machine learning (ML) analysis.

Methods. The study population included hospitalized pediatric patients diagnosed with MDR infection between January 1, 2010 and March 8, 2018. All positive cultures during that period were coded as growing either an MDR or non-MDR organism. ML was performed with random forest (RF) analysis to determine whether hospital drug exposure in the 90 days prior to culture was able to accurately classify cultures as positive for an MDR or non-MDR organism.

Results. During the study period, 7,551 positive cultures were defined as MDR out of a total of 26,913 cultures (28% of all positive cultures). When all cultures were included in the analysis, RF was modestly successful at classifying MDR vs. non-MDR organisms. Significant improvements in classification accuracy were obtained by subdividing cultures based on growth of individual species. RF was able to classify MDR *Enterococcus* with accuracy = 0.87, positive predictive value of 0.81, and negative predictive value of 0.88. Surprisingly, exposure to many nonantibiotic drugs were important in predicting antibiotic resistance, indicating either that these drugs altered risk directly, or were correlated with MDR risk indirectly.

Conclusion. Drugs without known antimicrobial activity were important predictors of MDR status. Nonantimicrobial drug exposure may be a marker for disease types or therapeutic interventions that place patients at higher risk of MDR infection. Monitoring antimicrobial and nonantimicrobial drug exposure may accurately identify patients at highest risk of MDR infection.

Disclosures. **All authors:** No reported disclosures.

1171. Impact on Mortality, Length of Stay, and Antibiotic Use in Allogenic and Autologous Stem Cell Transplant Patients Colonized With Carbapenemase-Producing Enterobacteriaceae

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Background. Carbapenemase producing Enterobacteriaceae (CPE) are increasingly impacting on patient management and hospital infection control practice. Stem cell transplant patients are among the most susceptible to invasive infections. Here we explored how this cohort are affected by CPE colonization.

Methods. All patients who underwent an autologous or allograft stem cell transplant (SCT) between September 15 and December 17 at a large tertiary hospital who were CPE positive on routine rectal screening were reviewed. Length of stay (LoS) post