rational policy planning. We developed a mathematical model to describe antimicrobial use and demonstrate how it could be used in a model-driven decision support system.

Methods. We developed a discrete-time Markov chain model to describe antimicrobial use as a function of the following parameters: Choice decisions to start antibiotics on admission or after, Change decisions to step antibiotics, and Completion decisions to discharge patients whether they were on or off antimicrobials. Partial derivatives were used to predict the extent to which antimicrobial use would respond to changes in each parameter. We used Veterans Affairs Bar Code Medication Administration data from 2010 to estimate parameters, as well as antimicrobial use using National Healthcare Safety Network (NHSN) definitions. Categories of anti-methicillin-resistant Staphylococcus aureus (MRSA), broad community, broad hospital, and surgical site infection prophylaxis (SSIP) from NHSN were also used. Because of certain assumptions made when estimating parameters, we used non-linear regression to adjust them using data from year 2010. We then applied our model to predict antimicrobial use from 2013 parameters and compared with actual use with Pearson’s correlation coefficient.

Results. Correlation of predicted and actual antimicrobial use was 0.97, 0.99, 0.95, and 0.92 (using NHSN category order above; Figure 1). As a conservative estimate, the correlation of yearly changes between predicted and actual antimicrobial use for all categories was 0.75. For >99% of all combinations of medical center, antimicrobial category, and year, decreasing the probability of starting antimicrobials had the most impact on measured antimicrobial use.

Conclusion. Our mathematical model is highly predictive of antimicrobial use and can be used to anticipate how much changes in decision points might lead to changes in antimicrobial use. Given the parameter space that most VA medical centers occupy, not starting antimicrobials appears to have greatest impact on use.

Background. A national assessment of antibiotic appropriateness in intensive care units (ICUs) with benchmarking was performed to assist antibiotic stewardship programs (ASPs) identify improvement opportunities.

Methods. A Centers for Disease Control and Prevention tool was adapted by an expert panel from the Partnership for Quality Care (PQC), a coalition dedicated to high quality care in US hospitals, to validate appropriate antibiotic use measurement via a point prevalence survey on a single day. Data were collected by ASP personnel at each hospital, de-identified and submitted in aggregate to PQC for benchmarking. Hospitals identified reasons for inappropriate antibiotic use by category and antibiotics misused.

Results. Forty-seven ICUs from 12 PQC hospitals participated: California (2), Florida (2), Massachusetts (3), Minnesota (1), and New York (4). Most hospitals identified as teaching (83%) with 252-1550 bed size (median: 563) and 20-270 licensed ICU beds (median: 70). All hospitals reported a formal ASP. On March 1, 2017, 362 (54%) of 667 patients in participating ICUs were on antibiotics (range: 8-81 patients); 1 patient was not assessed. Of the remaining 361 antibiotic regimens, 112 (31%) were identified as inappropriate from among all 12 hospitals (range: 9-82%) (figure). The table displays inappropriate antibiotic use by ICU type. Reasons for inappropriate use included unnecessarily broad spectrum of activity (29%), duration longer than necessary (21%), and treatment of a non-infectious syndrome (19%). The antibiotic most commonly misused was vancomycin in 7 (58%) hospitals.

Conclusion. Up to 80% of antibiotic use in some ICUs is inappropriate, under-scoring the need for ASP interventions, standardized assessment tools and benchmarking. Strategies should focus on de-escalation of broad-spectrum antibiotics and reducing duration of therapy.