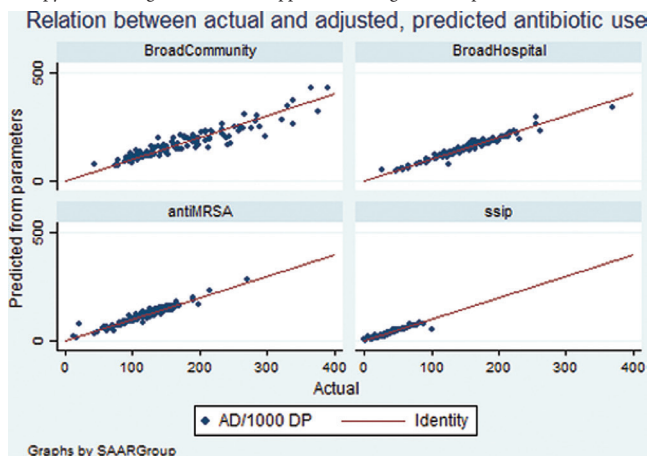


rational policy planning. We developed a mathematical model to describe antimicrobial use and demonstrate how it could be used in a model-driven decision support system.

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 stop 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.



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685. Working Together to Define Antibiotic Appropriateness: Point Prevalence Survey in 47 Intensive Care Units from 12 US Hospitals, Partnership for Quality Care, March 2017

Kavita K. Trivedi, MD¹; Belinda Ostrowsky, MD, MPH, FIDSA, FSHEA²; Lilian M. Abbo, MD³; Arjun Srinivasan, MD, FSHEA⁴; Rachel Bartash, MD⁵; Fred Cassera, RPh⁶; Jorge Fleisher, MD⁷; David W. Kubiak, PharmD, BCPS (AQ ID)⁸; Alyssa R. Letourneau, MD, MPH⁹; Priya Nori, MD¹⁰; Stephen Parodi, MD, FIDSA¹¹; Laura Aragon, PharmD, BCPS-AQ ID¹²; Eliza Dollard, PharmD¹²; Christina Gagliardo, MD¹³; Monica Ghitan, MD, FIDSA¹⁴; Amber Giles, PharmD¹²; Suri Mayer, PharmD⁶; Jennifer Quevedo, PharmD¹⁵; Gunter Rieg, MD¹⁶; Galina Shteyman, PharmD, BCPS¹⁷; Jaclyn Vargas, MD¹⁸; Shannon Kelley, MPA¹⁹ and Phyllis Silver, MD¹⁹; ¹Trivedi Consults, LLC, Berkeley, California, ²Department of Medicine, Division of Infectious Diseases, Montefiore Medical Center, Bronx, New York, ³Infectious Disease, University of Miami-Jackson Memorial Hospital, Miami, Florida, ⁴Centers for Disease Control and Prevention, Atlanta, Georgia, ⁵Infectious Diseases, Montefiore Medical Center/Albert Einstein College of Medicine, Bronx, New York, ⁶Maimonides Medical Center, Brooklyn, New York, ⁷Infectious Diseases, Saint Elizabeth's Medical Center/ Tufts University, Brighton, Massachusetts, ⁸Division of Infectious Diseases, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, ⁹Medicine, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts, ¹⁰Infectious Diseases, Montefiore Medical Center, Bronx, New York, ¹¹The Permanente Medical Group, Vallejo, California, ¹²Pharmacy, Jackson Memorial Hospital, Miami, Florida, ¹³Pediatrics, Maimonides Infants & Children's Hospital of Brooklyn, Brooklyn, New York, ¹⁴Division of Infectious Diseases, Maimonides Medical Center, Brooklyn, New York, ¹⁵University of Miami Hospital, Miami, Florida, ¹⁶Kaiser Permanente, Harbor City, California, ¹⁷Park Nicollet Methodist Hospital, Health Partners, St. Louis Park, Minnesota, ¹⁸Los Angeles County + University of Southern California Medical Center, Los Angeles, California, ¹⁹Partnership for Quality Care, New York City, New York

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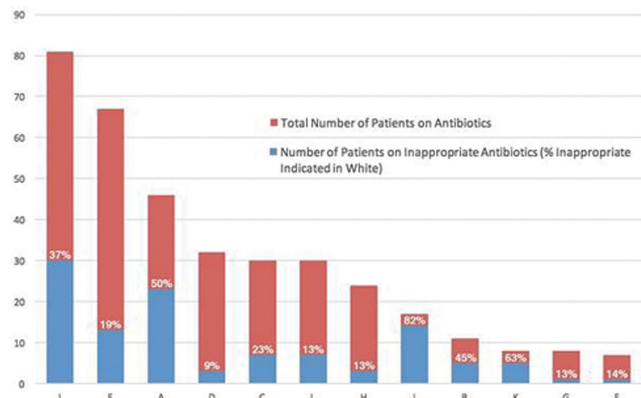
Background. A national assessment of antibiotic appropriateness in intensive care units (ICUs) with benchmarking was performed to assist antibiotic stewardship programs (ASPs) identify improvement opportunities.

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, underscoring 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.

Figure. Antibiotic Appropriateness Assessment in 47 ICUs from U.S. Hospitals (A-L) on March 1, 2017, The Partnership for Quality Care



ICU Type	Number of Units	Number of Participating Hospitals	Number of Patients Assessed	Number (Percent) of Patients with Inappropriate Antibiotic Regimens
Surgical	10	7	80	19 (24)
Medical	9	8	97	32 (33)
Cardiac/Surgical	6	6	30	12 (40)
Neonatal	5	5	28	4 (14)
Neurological	4	3	30	11 (37)
Medical/Surgical	3	3	26	7 (27)
Pediatric	4	4	33	18 (55)
Telemetry/Cardiac	4	4	23	5 (22)
Trauma	1	1	8	1 (13)
Burn	1	1	6	3 (50)

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686. Broad-Spectrum Antibiotic Use at Choice, Change, and Completion Throughout VA: Patterns of Initiation and De-escalation

Matthew Goetz, MD^{1,2,3}; Christopher J. Graber, MD, MPH, FIDSA^{4,5}; Makoto Jones, MD, MS⁶; Karl Madaras-Kelly, PharmD, M.P.H.⁷; Matthew Samore, MD, FSHEA⁸; Peter Glassman, MBBS, MSc^{2,9} and The Veterans Affairs Antimicrobial Use Learning Collaborative; ¹Department of Medicine, Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, California, ²David Geffen School of Medicine, University of California at Los Angeles, Los Angeles, California, ³Infectious Diseases, VA Greater Los Angeles Healthcare System, Los Angeles, California, ⁴Infectious Diseases Section, VA Greater Los Angeles Healthcare System, Los Angeles, California, ⁵David Geffen School of Medicine at the University of California, Los Angeles, Los Angeles, California, ⁶Internal Medicine, VA Salt Lake City Health Care System, Salt

Lake City, Utah, ⁷Clinical Pharmacy, College of Pharmacy, Idaho State University and VA Medical Center, Boise, Idaho, ⁸University of Utah School of Medicine, Division of Epidemiology, Salt Lake City, Utah, ⁹VA Greater Los Angeles Health Care System, Los Angeles, California, Los Angeles, California

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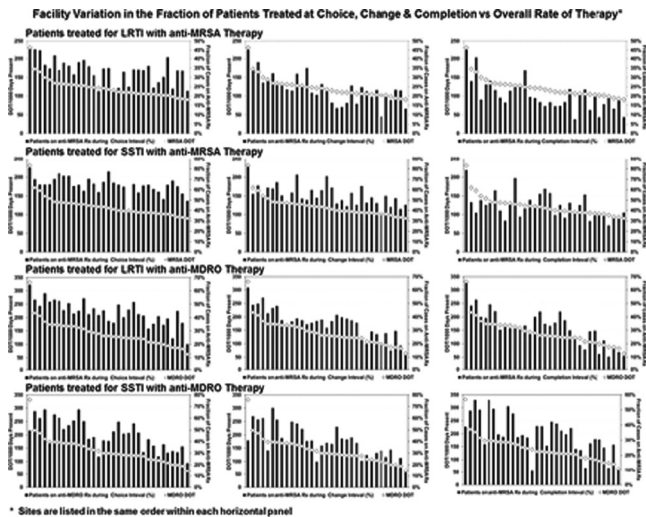
Background. Antimicrobial stewardship programs seek to reduce initiation of unwarranted therapy, promote de-escalation and prevent excessive duration. The CDC Antibiotic Use option provides ward-level reports of antibiotic use and risk-adjusted Standardized Antibiotic Administration Ratios for pre-specified antibiotics groups that allow for inter-facility comparison, but do not provide the indication for use or temporal patterns that allow de-escalation assessments.

Methods. We characterized antibiotic use on days 0–2 (Choice), 3–4 (Change) and 5–6 (Completion) of therapy (CCC) for pneumonia (LRTI), skin-soft-tissue infections (SSTI) and urinary tract infection (UTI). We then explored the relationship between total MRSA or multi-drug-resistant GNR (MDRO) antibiotic use and use over CCC intervals for LRTI and SSTI for patients in acute non-ICU settings in 33 high-complexity VA facilities. Data were from 2016 and extracted from the VA Corporate Data Warehouse.

Results. The mean rates of anti-MRSA and anti-MDRO therapy were 108 and 123 Days of Therapy (DOT)/1000 days present, respectively. The table shows the fraction (mean, range) of patients with SSTI or LRTI receiving anti-MRSA or anti-MDRO therapy at the CCC intervals and the change in use (i.e., de-escalation) over the treatment course.

Diagnosis	Therapy	Fraction of patients on therapy			Difference from Choice to	
		Choice	Change	Completion	Change	Completion
LRTI	Anti-MRSA	34%	26%	24%	8%	11%
		(22–47%)	(9–45%)	(8–45%)	(–10–26%)	(1–26%)
SSTI	Anti-MRSA	65%	56%	47%	9%	18%
		(39–81%)	(37–83%)	(26–79%)	(1–21%)	(–7–43%)
LRTI	Anti-MDRO	46%	39%	37%	7%	8%
		(20–64%)	(14–62%)	(10–66%)	(–1–18%)	(–4–27%)
SSTI	Anti-MDRO	47%	42%	36%	6%	11%
		(21–67%)	(13–69%)	(9–57%)	(–5–16%)	(0–25%)

Among the facilities there was a 0.55–0.86 correlation between overall use of MRSA or anti-pseudomonal antibiotics and the fraction of patients on therapy at each of the CCC metrics for LRTI or SSTIs.



Conclusion. Syndrome-specific CCC metrics show substantial variations in the rates of de-escalation of antimicrobial use over treatment courses. Insights provided by these metrics will allow facilities to identify specific areas for improvement by targeting syndrome-specific initial choices of therapy or antibiotic de-escalation.

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687. Predictors of Total Antibiotic Use among a National Network of Academic Hospitals

Haley K. Holmer, MPH¹; Jessina C. McGregor, PhD^{1,2}; Miriam R. Elman, MPH²; Samuel Hohmann, PhD³; Kristi Kuper, PharmD, BCPS³ and Amy Pakyz, PharmD, MS, PhD⁴; ¹Department of Epidemiology, Oregon Health & Science University / Portland State University, School of Public Health, Portland, Oregon, ²Department of Pharmacy Practice, Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, Oregon, ³Vizient, Inc., Chicago, Illinois, ⁴Department of Pharmacotherapy & Outcomes Science, Virginia Commonwealth University, Richmond, Virginia

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Background. The Centers for Disease Control and Prevention National Healthcare Safety Network (NHSN) provides hospitals a mechanism to report antibiotic use (AU) data to benchmark against peer institutions and direct antibiotic stewardship efforts. Differences in patient populations need to be adjusted for to ensure unbiased comparisons across hospitals. Our objective was to identify predictors of total AU across a nationwide network of hospitals.

Methods. Data from 126 academic hospitals were extracted from the Vizient Clinical Data Base Resource Manager for adult inpatients (age ≥ 18 years) in 2015. AU was expressed as total antibiotic days of therapy/patient-days. We constructed a negative binomial regression model to explore potential predictors of AU including age, race, sex, case mix index, hospital bed size, length of stay, geographic region, transfer cases, service line, and illness severity. A backwards stepwise approach based on likelihood ratio test was used to identify significant ($P < 0.05$) predictors and construct the final, parsimonious model. We calculated dispersion-based R^2 to assess the percent variability explained by the full and final models.

Results. A total of 3,076,394 total admissions, representing 17,544,763 patient days, were included. Factors identified as significant predictors in the final model are shown in the Table. The percent variance explained by the full and final models was 90.3% and 89.6%, respectively.

Table: Independent predictors of total facility antibiotic use per patient days

	Relative Risk	95% Confidence Interval
Case Mix Index	1.36	1.16, 1.60
Region		
West	Ref	–
Midwest	1.05	0.92, 1.20
Northeast	0.92	0.81, 1.04
South	1.07	0.94, 1.23
Transfer cases	0.31	0.15, 0.63
Surgery service line	0.45	0.25, 0.81
Major illness severity	3.24	1.04, 10.09

Conclusion. The current NHSN AU risk adjustment metric, the standardized antimicrobial administration ratio (SAAR), has been developed separately for different antibiotic groupings and adjusts for a limited set of facility characteristics. Further work is needed to assess if the independent predictors identified in this model can improve upon the performance of existing SAAR metrics and aid in directing stewardship strategies.

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688. Antibiotic Utilization in the Dental Clinic over 7 Years; Room for Improvement

Maggie Collison, MD¹; Kalpana Gupta, MD, MPH^{1,2}; George Koch, DMD^{3,4}; William O'Brien, MS^{2,5}; Donald Smith, RPH² and Judith Strymish, MD^{2,6}; ¹Boston University School of Medicine, Boston, Massachusetts, ²VA Boston Healthcare System, West Roxbury, Massachusetts, ³VA Boston Health Care System, Boston, Massachusetts, ⁴Harvard School of Dental Medicine, Boston, Massachusetts, ⁵Center for Healthcare Organization & Implementation Research, Boston, MA, ⁶Harvard Medical School, Boston, Massachusetts

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Background. At least 30% of antibiotic courses prescribed in the outpatient setting are unnecessary, meaning that no antibiotic is needed at all. Specialty areas such as dental clinic are a common place for antibiotic use and a potential for antibiotic overuse. The duration and indications for antibiotic use in dental clinics have not been clearly defined, except in the setting of endocarditis prophylaxis. Antibiotics are often used and sometimes indicated for endodontic, periodontal, implant and surgical procedures. Our goal was to measure antibiotic usage and duration in the dental clinic at a large VA hospital.

Methods. Outpatient antibiotic prescriptions from 2010–2016 for VA Boston were extracted from the VA data warehouse. Prescriptions were classified by date, antibiotic, and duration. Dental clinic visits and associated CPT codes were extracted for visits within 7 days +/- prescription.

Results. Of 119,193 dental visits during the study period, 3.7% (4,358) were associated with a unique antibiotic prescription. CPT diagnoses included periodontal (17.1%), endodontic (5.1%), surgical (36.5%) and implant (26.2%) procedures. The antibiotics prescribed included amoxicillin (62.0%), clindamycin (17.7%), penicillin (10.5%), macrolides (4.3%), augmentin (3.4%), and in less than 1% other classes including fluoroquinolones (0.2%). Mean days of antibiotics were 7.6 +/- SD 5.2 days (7.4 +/- SD 4.0 days for the above CPT codes). Duration did not vary by diagnostic code or by antibiotic class. There were no temporal trends over time.

Conclusion. The majority of antibiotic use in dental clinic was for diagnostic codes that may warrant antibiotic use. The spectrum of activity of agents is in keeping with guidelines. However, the duration of antibiotics is longer than what might be anticipated for prophylaxis of dental procedures or treatment of dental infections. Limitations include lack of manual chart review to identify specific indication and potential for missing prescriptions by non-dental providers. Surveillance and stewardship activities can optimize antibiotic use in dental clinic.

Disclosures. All authors: No reported disclosures.