

Figure 1.

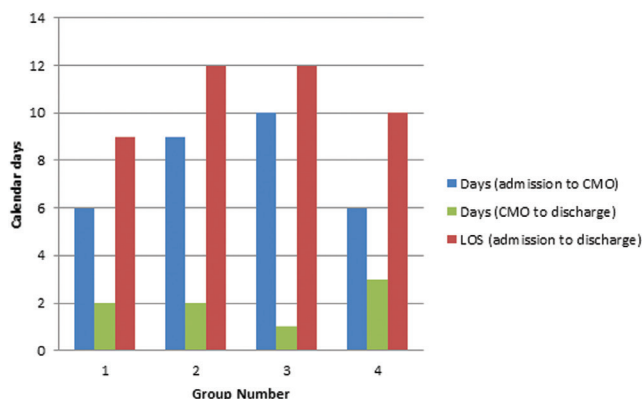


Table 1. Predictors of Length of Stay.

Characteristics	Estimate (95% CI)	P value
Age	-0.07 (-0.16, 0.02)	0.14
Male gender	0.15 (-1.14, 1.43)	0.82
Cancer type		
Lung	0.25 (-1.66, 2.17)	0.80
Gastrointestinal	0.28 (-1.64, 2.20)	0.78
Solid tumor, other	2.24 (0.47, 4.00)	0.01
Liquid tumor	Reference	
Rothman index <sup>a</sup>	0.06 (0.03, 0.09)	<0.0001
Antibiotic density <sup>b</sup>	1.17 (1.10, 1.25)	<0.0001

<sup>a</sup>Marker for clinical severity.

<sup>b</sup>The use of oral and IV antibiotics by calendar days.

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### 255. Evaluation of Antibiotic Prescribing at University-Affiliated Dental Clinics

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Session: 52. Antimicrobial Stewardship: Special Populations

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**Background.** Dentists prescribe 10% of outpatient antibiotics, yet aside from guidelines for infective endocarditis prophylaxis and against prosthetic joint infection prophylaxis, little is known about appropriate antibiotic use in dentistry. We aimed to describe antibiotic prescribing in dentistry to identify targets for improving prescribing.

**Methods.** We performed a cross-sectional study of patients receiving antibiotics between October 1, 2014 and September 30, 2016 at one of three University of Utah (UU) Dentistry clinics. Antibiotic prescriptions entered through the dental practice management software (Dentrix) were pulled from the UU data warehouse and linked with medical records. We assessed antibiotic prescribing rates, most commonly prescribed agents, frequency of documented  $\beta$ -lactam allergies, and duration of therapy. Prescriptions were categorized as for prophylaxis based on administration directions or antibiotics administered as one-time doses in the clinic. Finally, we measured the frequency of cardiac indications for preprocedure antibiotic prophylaxis and indicators that may be drivers of unnecessary antibiotic use (e.g., prosthetic joint).

**Results.** A total of 1,718 antibiotic prescriptions occurred in the study period, with a prescribing rate of 48/1,000 dental visits. Penicillins were the most commonly prescribed class [81% (1,399/1,718)]. Six percent (96/1,718) of prescriptions were consistent with infection prophylaxis. Thirty percent (29/96) of those receiving prophylaxis had a cardiac indication for dental prophylaxis, and 23% (22/96) had prosthetic joints. Mean nonprophylactic antibiotic duration was 8 days (standard deviation 3.9 days). Ten percent (180/1,718) of prescriptions were in patients with a documented  $\beta$ -lactam allergy. The majority of these patients [62% (111/180)] received clindamycin.

**Conclusion.** The majority of prescriptions evaluated were not consistent with preprocedure prophylaxis. Prophylaxis was frequently prescribed in patients without prophylactic indications. While improving prophylactic use of antibiotics for dental

procedures is an important antibiotic stewardship target, a better understanding of the use of treatment courses could have more significant implications for dental antibiotic stewardship efforts.

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### 256. A Cross-Disciplinary Educational Approach: Antibiotic Prescribing Practices and the Use of Prophylactic Antibiotics Prior to Dental Procedures

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**Background.** Antibiotics are frequently prescribed for prophylaxis prior to dental procedures. Little is known about the influences and beliefs among medical and dental practitioners regarding prophylactic antibiotic prescription prior to dental procedures among patients with prosthetic joints and those at risk for endocarditis.

**Methods.** A cross-sectional electronic survey was designed and distributed among medical practitioners (physicians, APRNs and PAs in Primary Care, Cardiology, and Orthopedics), and dentists. The survey addressed the frequency of prophylactic antibiotic prescribing, factors influencing prophylactic antibiotic use, perceived responsibility for antibiotic prescribing and interest in further antibiotic-related education.

**Results.** Among 336 survey recipients, 156 responded (response rate 46%), including 84 dentists and 72 medical practitioners. A higher proportion of dentists reported  $\geq 1$  prophylactic antibiotic prescriptions in the prior year compared with medical providers (79% vs. 58%). Most dentists (68%) believed that the dentist was responsible for prescribing the prophylactic antibiotic, whereas medical practitioners attributed this responsibility to the dentist (35%), the medical or surgical specialist (26%), or the primary care physician (38%). Dentists were more likely than medical practitioners to identify the following as indications for prophylactic antibiotics: poorly controlled diabetes mellitus (26% vs. 3%,  $P = 0.000$ ), chronic kidney disease (8% vs. 0%,  $P = 0.041$ ), cardiac transplant with valvopathy (61% vs. 40%,  $P = 0.023$ ), and previous endocarditis (85% vs. 65%  $P = 0.005$ ). Most medical providers (65%) and dentists (74%) reported interest in more education on prescribing antibiotics, with educational modules either online modules or email communications (58% and 54% of interested providers, respectively).

**Conclusion.** Medical providers and dentists frequently prescribe antibiotics prior to dental procedures. Beliefs regarding the responsibility and indications for prescribing varied by group and may not be consistent with published guidelines. Additional education, particularly through online or email, would be an opportunity to address the needs of these prescribers.

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### 257. A Whole of Country Analysis of Antimicrobial Stewardship Resources, Activities, and Barriers for Children in Hospitals in Australia

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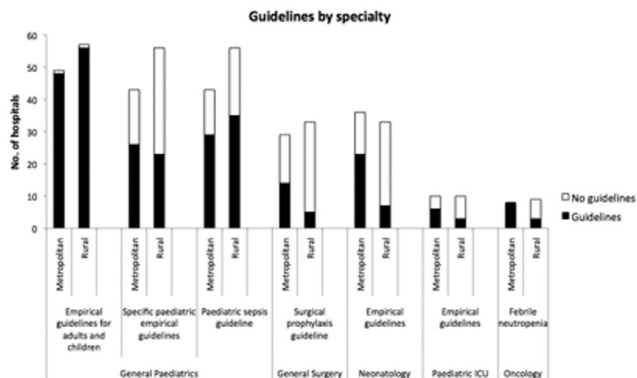
**Background.** We aimed to assess antimicrobial stewardship (AMS) resources and activities for children in hospitals throughout Australia, to identify gaps in services.

**Methods.** Every public hospital in Australia with paediatric beds was identified via the Australian Institute of Health and Welfare. The director of pharmacy or most senior paediatrician was asked to complete an online evaluation in 2017 regarding their AMS resources and activities. For analysis, tertiary (7) and major metropolitan hospitals (50) were combined (metropolitan) and compared with hospitals in regional (42) and rural towns (7) combined (rural).

**Results.** We identified 106 hospitals and received 106 (100%) responses. Paediatric bed numbers ranged from 3 to 360. In metropolitan hospitals, 17 (35%) had a paediatric AMS team or representation, compared with 5 (9%) for rural ( $P = 0.001$ ). There was an AMS pharmacist in 42 (86%) metropolitan hospitals compared with 37 (65%) rural ( $P = 0.1$ ) although the majority of these were not paediatric. Fifty-one (48%) hospitals had locally adapted empirical antibiotic prescribing guidelines (metropolitan 28 (57%) vs. rural 23 (40%)( $P = 0.06$ )), although fewer had specialty-specific guidelines (figure). One hundred two (96%) hospitals had restrictions on broad-spectrum antimicrobials, but formal approval systems were fewer: metropolitan 44 (90%) vs. rural 35 (66%) ( $P = 0.004$ ). Auditing methods differed but were mostly ad hoc, with results fed back in an untargeted way with only 22 (34%) providing direct physician feedback. There was a paucity of AMS education: only 25 (24%) provided education for senior medical staff, and 24 (23%) had no education for any staff (metropolitan 8 (17%)

vs. rural 16 (29%) ( $P = 0.1$ ). The commonest perceived barriers to successful AMS for all hospitals were lack of dedicated infectious diseases and microbiology services (64 (60%)), lack of dedicated pharmacy resources (62 (59%)), and a lack of education for clinicians in antibiotic use (53 (50%)).

**Conclusion.** Australian hospitals have implemented some AMS activities for children, but most lack resources—this was much more evident in regional/rural than metropolitan hospitals. Barriers to successful AMS include a lack of infectious diseases and pharmacy resources and education, which need to be addressed in workforce planning.



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### 258. Variation in Antibiotic Use Among Neonates Hospitalized in United States Academically Affiliated Centers

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**Background.** Antibiotics are often necessary in high-risk patients such as neonates. However, exposure to broad-spectrum antibiotics has been associated with adverse neonatal outcomes. Variation in antibiotic use across neonatal intensive care units has been demonstrated on a regional level, but little is known about United States nationwide antibiotic use among hospitalized neonates. Prior studies have measured antibiotic use rates (AUR; antibiotic therapy days as a portion of days present) rather than antibiotic days of therapy per 1,000 patient-days (DOT/1,000 patient-days), the preferred metric in antimicrobial stewardship practice.

**Methods.** Hospitals participating in the Vizient (formerly University HealthSystem Consortium) Clinical Database/Resource Manager with >100 neonatal discharges from January to December 2016 were identified. Facility-level clinical outcomes, diagnoses, and antibiotic utilization data from 118 hospitals were included. The primary antibiotic utilization metric was DOT per 1,000 patient-days; AUR and antibiotic spectrum index (ASI) per antibiotic day were also evaluated according to previously published methods.

**Results.** The number of neonatal discharges per facility in 2016 ranged from 228 to 15,773 (median 2,578, interquartile range [IQR] 1,314–3,927). Of the 118 hospitals, 94 (80%) provided care to neonates with birthweight less than 1,500 g, 77 (65%) performed major surgical procedures, 32 (27%) performed cardiac surgery, and 19 (16%) performed extracorporeal membrane oxygenation. Across all hospitals, there was 71-fold variation in antibiotic DOT/1,000 patient-days with range from 7.9 to 560.7 (median 271.1; IQR 181.7–347.5) and 85-fold variation in AUR with range from 0.4% to 34.1% of days present (median 16.7%; IQR 10.7%–20.8%). The ASI per antibiotic day ranged from 2.0 to 7.4 (median 6.2; IQR 5.8–6.5).

**Conclusion.** There is substantial variation in antibiotic use among neonates hospitalized in academically affiliated United States centers. Variation in days of exposure is greater than variation in spectrum of activity per day of therapy. Understanding sources of variation in antibiotic use at the facility level will be important to provide informative benchmarking of neonatal antimicrobial management.

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### 259. A Retrospective Cross-Sectional Comparison of the Neonatal Gut Microbiota After Antimicrobial Exposure: Implications for Stewardship

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**Background.** The development of the infant gut microbiota influences the maturation of the host immune system and has been implicated in both short- and long-term health outcomes. In a healthy infant, the initial stages of gut microbiota development are characterized by the progressive acquisition and proliferation of anaerobes. In the neonatal intensive care unit (NICU), infants are often exposed to antibiotics which disturb the normal development of the gut microbiota. In this

retrospective cross-sectional study, we aimed to evaluate the effects of three different antibiotic regimens on the gut microbiota of infants in the NICU, focusing on the effect on anaerobe colonization.

**Methods.** From November 1, 2014 to April 30, 2015, stool swabs were collected from NICU patients at The Hospital for Sick Children. Infants were included in the study if they received any dose or duration of the following antibiotics: ampicillin and tobramycin (AT), ampicillin and cefotaxime (AC), or ampicillin, tobramycin, and metronidazole (ATM). DNA was extracted from stool swabs and subject to Illumina sequencing of the V4 hypervariable region of the 16S rRNA gene. Infants were stratified by gestational age (term or preterm). The first samples taken within 1 week after antibiotic exposure were analyzed for diversity measures, taxonomic composition, and anaerobe relative abundance.

**Results.** A total of 64 NICU infants were included in the study, 46 (71.9%) received AT, 7 (10.9%) received AC, and 11 (17.2%) received ATM. Term infants received either AT (19/46; 41.3%) or AC (7/7; 100%), whereas preterm infants received either AT (27/46; 58.7%) or ATM (11/11; 100%). Shannon diversity was not statistically significant between term infants receiving AT and AC or preterm infants receiving AT and ATM. However, the relative abundance of anaerobes was significantly decreased after exposure to ATM in comparison to preterm infants receiving AT ( $P < 0.005$ ).

**Conclusion.** Within 1 week after ATM therapy, the relative abundance of gut anaerobes in preterm infants were significantly decreased in comparison to preterm infants receiving a course of AT. Therefore, limiting the use of ATM in preterm infants may protect the developing gut microbiota.

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### 260. Effect of Antibiotic Indications on Clinician Documentation and Pharmacy Workflow in Hospitalized Children

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**Background.** Documentation of antibiotic indication at the time of order entry is mandated by the Centers for Disease Control and Prevention. We evaluated the effect of this mandate on the accuracy of clinician documentation and pharmacy work flow in hospitalized children.

**Methods.** Documentation of indication at our institution was required beginning March 30, 2017. All patients  $\leq 18$  years old that received  $\geq 1$  dose of intravenous (IV) vancomycin (VAN) or IV/intramuscular ceftriaxone (CTX) during a 1 month pre-intervention period and three post-intervention study periods (at 0, 3, and 6 months following implementation) were included. Patients were only included once per study period. Data included timing of antibiotic administration, indication for use, infection at body site requiring potential dose modification, dose modification, and agreement between order and progress note.

**Results.** Median age of patients was 4.2 years. Most common indications for VAN (total: 789) were sepsis syndrome (26%,  $N = 204$ ), febrile neutropenia (12%,  $N = 95$ ), and suspected catheter-related bloodstream infection (10%,  $N = 77$ ) and for CTX (total: 1,071) were sepsis syndrome (12%,  $N = 127$ ), perforated appendicitis (12%,  $N = 125$ ), and urinary tract infection (10%,  $N = 107$ ).

**Table:** Changes in Workflow and Documentation Pre/Postintervention

	Baseline	Period 2	Period 3	Period 4	P
CTX	N = 202	N = 173	N = 142	N = 142	
Median time to administration (minutes)	70	53	47	60	<0.01
Order-progress note agreement	–	46% (79/173)	33% (47/142)	44% (62/142)	
Infection with potential dose modification	31% (62/202)	49% (84/173)	45% (64/142)	51% (72/142)	<0.01
Dose modified	6% (12/202)	17% (29/173)	15% (21/142)	15% (21/142)	0.01
VAN	N = 107	N = 111	N = 113	N = 109	
Median time to administration (minutes)	73	83	78	84	0.49
Order-progress note agreement	–	45% (50/111)	50% (56/113)	43% (47/109)	
Infection with potential dose modification	42% (45/107)	50% (56/111)	50% (56/113)	58% (63/109)	0.14
Dose modified	28% (30/107)	27% (30/111)	17% (19/113)	38% (41/109)	0.01

**Conclusion.** Agreement between orders and progress notes was less than 50% during the postintervention period for both antibiotics. Median time to administration decreased for CTX, but not VAN. Antibiotic modifications were more common in the postintervention periods.

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