

**1015. Antibiotic use and indications in a community sample of adults in Wisconsin**

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**Background.** There is significant inappropriate and overuse of antibiotics in the United States. We describe patterns of self-reported actual use of antibiotics and indications in Wisconsin adults.

**Methods.** The Survey of the Health of Wisconsin (SHOW) is an annual health study of a wide range of health determinants and outcomes among a population-based sample of residents with targeted recruitment of underrepresented minorities. In 2016, SHOW initiated WARRIOR (Winning the War on Antibiotic Resistance), an ancillary study that assessed actual antibiotic use and indications among adults. Antibiotics were grouped by pharmacologic class, and indications were grouped into clinical categories. Descriptive statistics and logistic regression were used to examine factors associated with antibiotic use.

**Results.** Overall, 756 adults [435 female and 321 male; mean (SD) age=54.2 (16.5)] were recruited, and 256 (33.5%) reported antibiotic use in the past year. Females (OR=1.87, 95% CI: 1.29, 2.70), people with current comorbidities or history of certain health conditions (OR=2.04, 95% CI: 1.23, 3.39), and people with a mental health or developmental condition (OR=1.93, 95% CI: 1.33, 2.81) were statistically significantly more likely to report antibiotic use. BMI (kg/m<sup>2</sup>) was slightly higher among antibiotic users (31.2) than nonusers (29.8; *P* = 0.064). Diabetes, heavy drinking, and smoking history were not correlated with antibiotic use.

Top antibiotic classes used were penicillins (31%), macrolides (12%), first-generation cephalosporins (9%), tetracyclines (8%), quinolones (7%), and nitroimidazoles (3%). Top indications reported were upper respiratory infection (URI; 32.3%), dental condition or procedure (21.0%), surgery (12.6%), lower respiratory infection (11%), urinary tract, bladder, or kidney infection (7%), skin or soft-tissue infection (6%), and insect bite or insect-borne infection (6%).

**Conclusion.** Antibiotic use varies among Wisconsin adults, and certain groups are more likely to have used antibiotics in the last year. The top two reported indications for antibiotics were categories with known high rates of inappropriate (e.g., URI) and prophylactic (i.e., dental) prescribing. Further studies are needed to determine specific opportunities to reduce antibiotic use in Wisconsin.

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**1016. Standardized Antimicrobial Administration Ratio (SAAR) and Clostridioides difficile Infection Standardized Infection Ratio (SIR): Are they connected? An Evaluation of 28 Hospitals**

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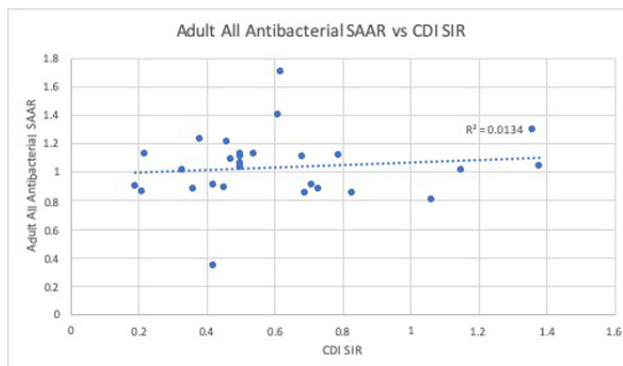
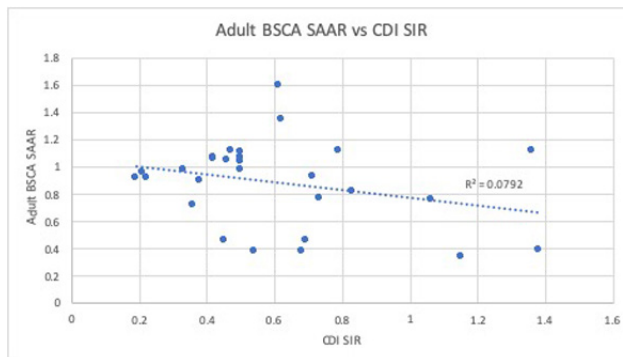
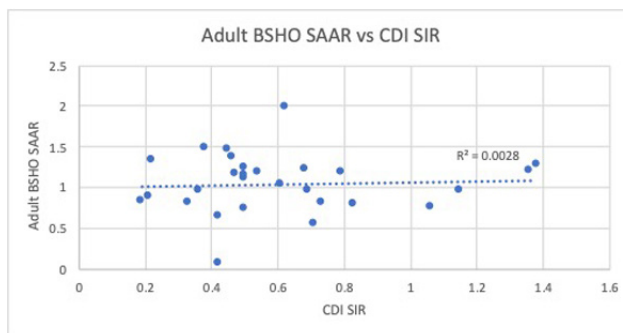
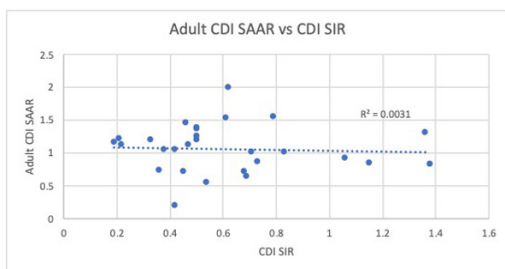
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**Background.** Clostridioides difficile infections (CDIs) are the most prevalent healthcare-associated infection in the U.S. Of all CDIs, most are related to healthcare exposures and are potentially preventable by reducing unnecessary antibiotic use and interrupting patient-to-patient transmission of CDI.

**Methods.** The adult SAARs for 4 antimicrobial agent categories were compared with the CDI SIR at 28 facilities with greater than 100 beds across the health system for the calendar year of 2018. The 4 adult antimicrobial agent categories chosen for comparison were: antibacterial agents posing the highest risk for CDI, broad-spectrum antibacterial agents predominantly used for hospital-onset infections (BSHO), broad-spectrum antibacterial agents predominantly used for community-acquired infections (BSCA) and all antibacterial agents.

**Results.** The 2018 aggregate CDI SIR for the 28 facilities was 0.609. The aggregate SAAR for the adult antimicrobial agent categories were 1.05 for the antibacterial agents posing the highest risk for CDI, 1.05 for BSHO, 0.88 for BSCA, and 1.03 for all antibacterial agents. No correlation was seen between any of the 4 adult SAAR antimicrobial agent categories and the facility CDI SIR (Figure 1-4).

**Conclusion.** While reducing unnecessary antibiotics is an important strategy in preventing CDIs, having a higher observed vs. predicted administration ratio in the four antimicrobial agent categories studied was not correlated with a higher CDI SIR, including the CDI SAAR category. Reduction of CDI is challenging requiring a multipronged approach to include infection control strategies, appropriate testing, and antimicrobial stewardship.



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**1017. Scratching the Surface with NHSN Data: Defining High Impact Stewardship Targets in Critical Care**

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**Background.** The National Healthcare Safety Network (NHSN) provides risk-adjusted Standardized Antimicrobial Administration Ratios (SAAR) as a benchmark for medical and surgical intensive care units (ICU). Antibiotic use (AU) data does not provide patient-level information (e.g., antibiotic appropriateness, indications, durations, etc.). However, we hypothesize that AU data can help define high impact stewardship targets, particularly in the context of critical care Clostridioides difficile rates.

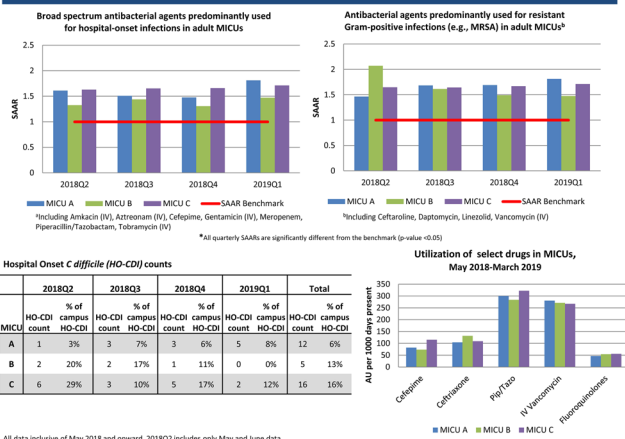
**Methods.** Units with high rates of AU and hospital-onset (HO) C. difficile were selected for review. A monthly AU and C. difficile dashboard was created for ICU providers, inclusive of data from May 2018 onwards. We also performed chart audits for indication, duration, and location of initiation for all medical intensive care unit (MICU) patients receiving piperacillin/tazobactam (P/T) or vancomycin (Van) during February 2019 per request of ICU stakeholders. Data were used to obtain stewardship buy-in from local MICU champions.

**Results.** AU data indicated that (1) all 3 MICUs consistently had SAARs >1 for broad-spectrum categories and (2) Van and P/T were the highest volume agents on these units (Figure 1). Chart audit of 135 MICU patients showed that 17 patients received P/T, 34 Van, and 84 (62%) both agents; median duration was 2 days for Van

and 3 days for P/T (Figure 2). Approximately half of initiations occurred in the emergency department (ED) (50% Van, 47% P/T); most common indications were “respiratory tract infection” and “severe sepsis/septic shock” for both P/T (77%) and Van (74%) (Figure 2). HO *C. difficile* in MICUs accounted for 6%, 13%, and 16% of total HO *C. difficile* cases in campuses A, B, and C, respectively during the time frame (Figure 1).

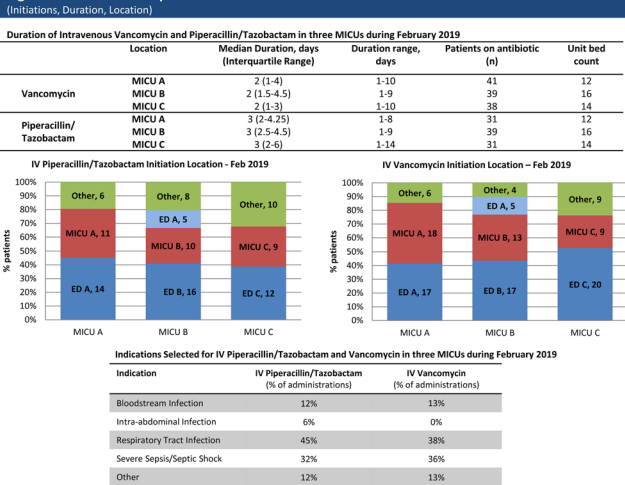
**Conclusion.** We feel that NHSN data scratches the surface of the deep-rooted challenges of ICU stewardship. However, it can identify AU trends and most frequently prescribed antibiotics in the context of unit-specific *C. difficile* rates. Intensive stewardship audit can further uncover areas for intervention, such as ED Van and P/T over-prescribing. We suggest presenting clinical stakeholders with a quarterly “stewardship dashboard” combining AU rates, patient-level data, and *C. difficile* rates to maximize the impact of stewardship endeavors.

Figure 1: AU/*C. difficile* MICU Dashboard



All data inclusive of May 2018 and onward. 2018Q2 includes only May and June data

Figure 2: MICU AU “Deeper Dive” Dashboard



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**1018. Using prediction modeling to inform risk-adjustment strategy for hospital antimicrobial use: Can we predict who gets an inpatient antimicrobial?**

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**Background.** Hospital antimicrobial stewardship program (ASP) assessments based on comparisons of antimicrobial use (AU) among multiple hospitals are difficult to interpret without risk-adjustment for patient case-mix. We aimed to determine whether variables of varying complexity, derived retrospectively from the electronic health record (EHR), were predictive of inpatient antimicrobial exposures.

**Methods.** We performed a retrospective study of EHR-derived data from adult and pediatric inpatients within the Duke University Health System from October 2015 to September 2017. We used Random Forests machine learning models on two antimicrobial exposure outcomes at the encounter level: binary (ever/never) exposure and days of therapy (DOT). Antimicrobial groups were defined by the NHSN AU Option 2017 baseline. Analyses were stratified by pediatric/adult, location type (ICU/ward), and antimicrobial group. Candidate variables were categorized into four tiers based on feasibility of measurement from the EHR. Tier 1 (easy) included demographics, season, location, while Tier 4 (hard) included all variables from Tier 1-3 and laboratory results, vital signs, and culture data. Data were split into 80/20 training and testing sets to measure model performance using area under the curve (AUC) for the binary outcomes and absolute error for DOT.

**Results.** The analysis dataset included 170,294 encounters and 204 candidate variables from three hospitals. A total of 80,190 (47%) encounters had antimicrobial exposure; 64,998 (38%) had 1-6 DOT, and 15,192 (9%) had 7 or greater DOT. Models strongly predicted the binary outcome, with AUCs ranging from 0.70 to 0.95 depending on the stratum (Figure A, B). The addition of more complex variables increased accuracy (Figure Model Tiers 1-4). Model performance varied based on location and antimicrobial group. Models for infrequently used groups performed better (Figure C, D). Models underestimated DOTs of encounters with extremely long lengths of stay.

**Conclusion.** Models utilizing EHR-derived variables strongly predicted antimicrobial exposure. Risk-adjustment strategies incorporating measures of patient mix may provide more informative benchmark comparisons for use in Antimicrobial Stewardship Program assessments.

