Table 1: Example themes and example quotes from CE participant surveys by UW CSiM, 2018-2022

| Example Themes | Example Quotes |
|---|---|
| **Strength in community** | • "Overall, I think TASP [ECHO] has exceeded its goals and has generated a vast network of professional collaboration on an important topic. Participating has been valuable to my practice, not to mention convenient. I look forward to attending many more calls and staying current on AMS [antimicrobial stewardship]."<br>• "We love participating in TASP [ECHO] because it is an extremely important networking opportunity which gives us a forum for ID [infectious diseases] questions…and to hear what other facilities are doing." |
| **Staff education** | • "UW TASP [ECHO] keeps me up to date on new antimicrobial stewardship guidelines that I share with providers in the rural critical access hospital setting during medical staff and P&T [pharmacy & therapeutic] meetings. One significant update this year was the CDC's [Centers for Disease Control and Prevention] new gonococcal treatment guidelines and discussions concerning increased resistance to azithromycin in general."<br>• "We have a PA [physician assistant] from our medical clinic who is scheduled out of patient care during the TASP [ECHO] session so that she can sit in weekly. She then takes the information back to our clinic medical staff via presentation at their monthly meeting." |
| **Change our use of antibiotics** | • "One specific example would be regarding us of peri-op antibiotics and the importance of accurate patient history regarding penicillin allergies and appropriate use of cefazolin."<br>• "Since we began participating in TASP [ECHO] in 2017, our Fluoroquinolone DOT [days of therapy]/1000 patient days has steadily declined. In fact, we have been at zero for this measure for the last 6 months!!"<br>• "At the beginning we updated our CAP [community acquired pneumonia] guidelines and order set for CPOE [computerized prescriber order entry]; most recently we developed sepsis orders with what we learned. Also, our use of quinolone antibiotics has dropped dramatically with interventions as a result of drug usage review in TASP [ECHO]." |
| **Peer support for COVID-19** | • "It helped me to realize that we were struggling with the same questions as others were. It was reassuring to know that vaccine refusal/policies were a shared topic…it has been extremely valuable to see how other CAHs [critical access hospitals] have handled the different [COVID-19] treatment options, especially in cases where some products are not as readily available as others." |

Abbreviations: Continuing Education (CE), University of Washington (UW), Center for Stewardship in Medicine (CSiM), Tele-Antimicrobial Stewardship Program (TASP), Extension for Community Healthcare Outcomes (ECHO)

to the theme and reported. **Results:** Data from three administrations of this survey were available: 2018-2019 (n=66); 2020-2021 (n=27); and 2021-2022 (n=30). These surveys were completed by a total of 95 individuals from 53 hospitals. Seven of these individuals completed a survey in each year, 14 completed a survey in two years, and 74 completed only one survey. Themes identified were COVID-19 support (including procedures and policies, being kept up-to-date, research summaries, and peer support), the antibiotic pocket guide developed by UW, strength in community, staff education, role of CSiM in developing/strengthening the AMS program at the facility, change in use of antibiotics, UW imprimatur, learning/growing as a healthcare provider, and importance for small, rural hospitals (see examples in Table 1). **Conclusions:** This qualitative analysis provides evidence from surveys of individuals participating in CE that UW TASP ECHO has had a meaningful impact in such domains as building a strong community among small, rural and critical access hospitals, educating staff, changing antibiotic use and providing peer support, among others.

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**Implementation of Outpatient Automated Stewardship Information System (OASIS©) Audit and Feedback in Two Healthcare Systems**

Christine MacBrayne, Children's Hospital Colorado; Amy Keith, Denver Health and Hospital Authority; Nicole Poole, Children's Hospital Colorado; Cory Hussain, Denver Health; Joshua Tucker, Denver Health Medical Center; Timothy Jenkins, Denver Health Medical Center; Theresa Morin, Denver Health and Hospital Authority and Holly Frost, Denver Health and Hospital Authority

**Background:** Combating antibiotic resistance, exacerbated by widespread unnecessary outpatient antibiotic prescriptions, necessitates innovative stewardship solutions. Audit and feedback reports are effective but often resource heavy. We introduced a free, open-source system, Outpatient Automated Stewardship Information System (OASIS©), for automating the creation and distribution of recurring audit and feedback reports to clinicians to improve antibiotic prescribing. **Methods:** We used mixed methods to evaluate implementation of OASIS© across 11 clinics at Denver Health and Hospital Authority (DHHA) and Children's Hospital Colorado (CHCO) from July 2022 to August 2023. Both sites host their own Epic® electronic healthcare and enterprise data warehouse systems. R statistical software was utilized to retrieve and process the data needed to create individual[HCM1] clinician audit and feedback reports with peer comparison. Reports were provided for 1) antibiotics prescribed for respiratory diagnoses, 2) antibiotics prescribed for respiratory diagnoses where antibiotics are never indicated, 3) first-line antibiotic prescribing for acute otitis media (AOM), and 4) five-day duration of antibiotics for children two years and older with AOM. Feedback reports for each metric were emailed to clinicians for three consecutive months. The primary outcome was adaptations needed to implement OASIS©. Secondary outcomes included fidelity (measured by email readership), time to set up and maintain the program, and barriers and facilitators to implementation (assessed by four qualitative interviews with OASIS© stakeholders). **Results:** The most significant adaptations made pertained to the automation of OASIS© reports for organizations not using R for data retrieval and reporting, setting up OASIS© specific email addresses, and validating clinician fidelity via read receipts. Fidelity was higher at DHHA (91-100%) compared to CHCO (10-30%). When interviewed, data analysts expressed that time for initial setup ranged from 1-6 hours. After reporting was automated, the estimated monthly time to send reports was 10 minutes. Views on setup complexity were split, but all recognized the readability of the reports and OASIS©'s value for improving prescribing behaviors. The greatest barriers to implementation included obtaining analytic resources for initial setup and the need to download additional R packages. No interviewee had prior experience creating audit and feedback reports. **Conclusions:** Implementing OASIS© requires addressing system diversity and knowledge gaps in outpatient informatics and antibiotic stewardship. Despite these challenges, the tool proved efficient and beneficial for monitoring and reporting antimicrobial prescribing. This free tool could likely be effectively disseminated to other health systems given the limited time and resources required for adaptations, setup, and monitoring. [HCM1]I

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**Characteristics, Treatment, and Outcomes of Invasive Group A Streptococcal Infections**

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**Background:** Group A Streptococcus (GAS; Streptococcus pyogenes) is an important human pathogen that can cause life-threatening invasive disease, ranging from skin/soft tissue infections to infective endocarditis. In the fall of 2022, the Center for Disease Control & Prevention (CDC) issued an alert due to a global increase in invasive GAS infections, particularly among children and adults with co-morbidities. An increase in invasive disease was observed at our five-hospital healthcare system in Southeast Michigan. The objective of this study was to describe characteristics of patients with invasive GAS and characterize treatment and outcomes of disease. **Methods:** This was a retrospective cross-sectional study of patients from June 2013 to August 2023 with positive blood cultures for GAS. Patients were identified using a data query for positive blood cultures for GAS through Microsoft SQL Server. Patients with age < 1 8 years, polymicrobial bacteremia, incomplete data, or who were enrolled in hospice and/or died within 48-hours of admission were excluded. Collected variables included: demographics, infection characteristics (syndrome, duration of bacteremia), microbiological characteristics (antimicrobial susceptibility testing; AST), antimicrobial treatment (empiric and final, antitoxin therapy), and clinical outcomes (length of hospital stay [LOS], treatment-associated adverse events, 30-day mortality and infection-related readmission). **Results:** 250 patients were included (Table 1). More than half were male with median age of 57.5 years. Diabetes mellitus



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Table 1 – Demographics and comorbidities of patients

| | N=250 |
|---|---|
| **Age at positive blood culture, median (IQR)** | 57.5 (42.5-69) |
| **Sex, n (%)** | |
| - Male | 128 (51) |
| - Female | 122 (49) |
| **Race, n (%)** | |
| - Caucasian | 150 (60.0) |
| - Black | 77 (30.8) |
| - Hispanic | 13 (5.2) |
| - Other (Arabic, Asian) | 4 (1.6) |
| - Unknown | 6 (2.4) |
| **Comorbidities, n (%)** | |
| - Diabetes mellitus | 95 (38) |
| - Chronic kidney disease | 58 (23.2) |
| - Persons with intravenous drug use | 32 (12.8) |
| - Persons with alcohol use disorder | 27 (10.8) |
| - Chronic hepatitis C infection | 27 (10.8) |
| - Persons experiencing homelessness | 23 (9.2) |
| - Prednisone ≥20mg ≥3 weeks | 16 (6.4) |
| - Cirrhotic liver disease | 14 (5.6) |
| - Immunosuppressant drugs | 15 (6) |
| - End stage renal disease | 11 (4.4) |
| - SOT or BMT | 6 (2.4) |
| - HIV with CD4< 200 | 5 (2) |
| - Chemotherapy within 30 days | 5 (2) |
| - Hematological malignancy (Leukemia/Lymphoma/multiple myeloma/myelodysplastic syndrome) | 5 (2) 4 (1.6) |
| **Infectious syndrome, n (%)** | |
| - Cellulitis | 143 (57.2) |
| - Pneumonia | 50 (20) |
| - Abscess | 35 (14) |
| - Septic arthritis | 25 (10) |
| - Toxic shock syndrome | 20 (8) |
| - Osteomyelitis | 21 (8.4) |
| - Necrotizing Fasciitis/Myositis | 18 (7.2) |
| - Endocarditis | 16 (6.4) |
| - None/unknown | 11 (4.4) |
| - Peritonitis | 8 (3.2) |
| - Otitis | 3 (1.2) |
| - Other | 28 (11.2) |

Table 2 - Microbiologic characteristics and treatment regimens

| | N=250 |
|---|---|
| **Clindamycin Susceptibility, n (%)** | |
| - Clindamycin Susceptible[1] | 171 (68.4) |
| - Clindamycin Resistant or inducible resistance | 79 (31.6) |
| **Empiric Antimicrobial Therapy Administered, n (%)** | |
| - Vancomycin | 202 (80.8) |
| - Cephalosporins | 144 (57.6) |
| - Beta Lactam/Beta-Lactamase Inhibitors | 74 (29.6) |
| - Clindamycin | 20 (8) |
| - Carbapenems | 8 (3.2) |
| - Penicillins | 7 (2.8) |
| - Fluoroquinolones | 5 (2) |
| - Linezolid | 4 (1.6) |
| - Other[2] | 69 (27.6) |
| **Final Antimicrobial Therapy Administered, n (%)** | |
| - Penicillins | 96 (38.4) |
| - Cephalosporins | 89 (35.6) |
| - Beta Lactam/Beta Lactamase Inhibitors | 43 (17.2) |
| - Clindamycin | 44 (17.6) |
| - Linezolid | 21 (8.4) |
| - Vancomycin | 18 (7.2) |
| - Carbapenems | 6 (2.4) |
| - Other[2] | 14 (5.6) |
| **Antitoxin Therapy Administered, n (%)** | |
| - Clindamycin | 135 (54) |
| - Linezolid | 33 (13.2) |
| - None | 82 (32.8) |
| **Mean Duration of Therapy, days** | 19.9 (range: 0-70) |
| **Mean Duration of Antitoxin Therapy, days** | 3.6 (range:0-30) |
| **IVIG administered, n (%)** | |
| - Yes | 8 (3.2) |
| - No | 245 (98) |

1 Susceptible MIC <0.25, Resistant MIC > 1
2 Macrolide, Trimethoprim-Sulfamethoxazole, Metronidazole, Aminoglycoside, Aztreonam, Tetracyclines

(38%) and chronic kidney disease (23%) were common comorbidities [Table 1]. Persons experiencing homelessness and persons who use injection drugs accounted for 9% and 13% of the cases, respectively. The most common infective syndrome accompanying bacteremia was cellulitis (57%). The majority of patients received vancomycin for empiric therapy (81%) and penicillin (38%) or cephalosporin (36%) for final regimen [Table 2]. A total of 79 GAS isolates (32%) were clindamycin resistant. Clindamycin was included in the empiric regimen of 20 (8%) patients, the final regimen in 44 (18%) of patients, and as antitoxin adjunct therapy in 135 (54%) of patients. A third (33%) of patients received no antitoxin. The average duration of antitoxin therapy was 3.6 days and antimicrobial therapy 19.9 days. The mean LOS was 11.4 days (Table 3). Thirty nine (16%) patients had treatment failure and 8 (3%) experienced C. difficile infection within 30 days of antimicrobial treatment. Thirty-day mortality was 11%; of these, 9% had in-hospital mortality. **Conclusions:** Invasive GAS infection confers significant morbidity and mortality, and ongoing

Table 3: Clinical outcomes of patients

| | N=250 |
|---|---|
| **Mean Length of Stay, days** | 11.4 (range: 3-80) |
| **Antimicrobial-related Adverse Effects, n (%)** | |
| - None | 194 (77.6) |
| - Thrombocytopenia | 46 (18.4) |
| - *Clostridiodes difficilie* Infection | 8 (3.2) |
| - Drug Rash | 3 (1.2) |
| - Acute Kidney Injury | 0 (0.0) |
| **Discharge Disposition, n (%)** | |
| - Home | 126 (50.4) |
| - Rehabilitation or Nursing Facility | 72 (28.8) |
| - Expired | 22 (8.8) |
| - Against Medical Advice | 14 (5.6) |
| - Long-Term Acute Care Hospital | 8 (3.2) |
| - Hospice | 7 (2.8) |
| **Readmission within 30 days for infection-related complication, n (%)** | |
| - Yes | 37 (14.8) |
| - No | 213 (85.2) |
| **Clinical Outcome within 30 days, n (%)** | |
| - Cured | 140 (56) |
| - Relapsed/Treatment Failure | 39 (15.6) |
| - Expired | 28 (11.2) |
| - Unknown | 43 (17.2 |

research is needed to determine the best treatment regimens in the era of increasing clindamycin resistance.

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**Identifying Higher-Volume Antibiotic Outpatient Prescribers Using Medicare Part D Prescription Data — Arizona, 2021**

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**Background:** Increased antibiotic resistance is a rising global health problem that can result from overprescribing and misusing antibiotics. The impact of antibiotic overprescribing is significant, particularly among the older adult population due to increased adverse reactions. The objective of this study is to identify higher volume antibiotic outpatient prescribers and their antibiotic prescription rates by region and provider specialties in Arizona. **Methods:** Publicly available data from the Center for Medicare and Medicaid Services Part D Prescriber database during 2021 was analyzed. Those prescribers who had beneficiaries and antibiotic claims of fewer than 11 were excluded from the analysis. Higher-volume prescribers were identified by estimating the providers who prescribed the highest 10th percentile of antibiotic volume. The cumulative percentage of antibiotic prescriptions and prescriber's antibiotic volume per 1000 beneficiaries (prescribing rate) were compared between the higher volume prescribers and lower volume prescribers by the EMS region and specialty. Median prescribing rates among prescribers were compared using the Wilcoxon rank-sum test. All analyses were performed using SAS (version 9.4; SAS Institute, NC). **Results:** The number of Arizona prescribers included in the dataset during 2021 was 27,124. After excluding prescribers with fewer than 11 antibiotic prescriptions, 14,410 prescribers were included in the analysis. These providers prescribed a total of 1,095,559 antibiotic prescriptions, with a median of 45 antibiotic prescriptions per prescriber. Thirty-nine percent of antibiotic prescriptions were written by the higher volume prescribers and prescribed a median of 236 antibiotic prescriptions. Higher-volume prescribers had a 52% higher median antibiotic prescribing rate compared with lower-volume prescribers (600 versus 396 prescriptions per 1,000 beneficiaries) ($p < 0.01$). The median antibiotic prescribing rate among higher volume prescribers was highest in the central region (602 antibiotic prescriptions per 1,000 beneficiaries) compared with other regions (581 prescriptions per 1,000 beneficiaries in the north region) ($p < 0.01$). The top two specialties that higher volume prescribers



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