

Figure 1. Volume of antibiotic prescriptions dispensed from retail pharmacies in the United States by age group and drug class, January 2019 – October 2021

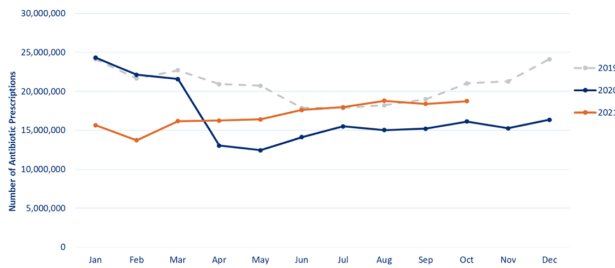
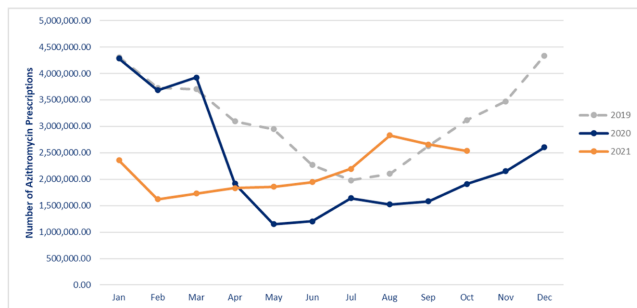


Figure 2. Volume of azithromycin prescriptions dispensed from retail pharmacies in the United States by age group, January 2019 – October 2021



(NPA) data set to identify all antibiotic prescriptions dispensed from US retail pharmacies during January 2019–October 2021. We calculated the percentage change in volume of prescriptions for each month during the pandemic (beginning in March 2020) compared to the baseline (defined as the corresponding month in 2019). Data were characterized by patient age group (0–19 years, 20–64 years, ≥65 years) and antibiotic class and drug, including azithromycin. **Results:** Antibiotic prescriptions were lower than baseline during March 2020–June 2021. The greatest decrease in antibiotic prescribing volume occurred in May 2020 (40.0% lower than May 2019) (Fig. 1), with the greatest decreases among children 0–19 years of age. However, prescribing was similar to baseline levels in July–August 2021 (Fig. 1). Specifically, azithromycin prescribing exceeded the 2019 baseline by 11.0% in July and further to a 34.5% increase in August 2021 (Fig. 2). Increases in azithromycin prescribing in August 2021 were observed across all age groups: 20–64 years (46.9% above baseline), ≥65 years (25.3% above baseline), and children 0–19 years (7.8% above baseline). **Conclusions:** Antibiotic prescribing volume was lower during 2020 and the first half of 2021 compared to the corresponding months in 2019. Decreases in outpatient antibiotic prescriptions during the pandemic likely reflect decreased utilization of outpatient healthcare and decreased transmission of non-COVID-19 infections secondary to non-pharmaceutical interventions (eg, masking, social distancing, school closures). However, outpatient antibiotic prescribing levels in general, and azithromycin prescribing in particular, approached or exceeded pre-pandemic levels in July and August 2021. Ongoing surveillance and sustained outpatient antibiotic stewardship efforts are needed to optimize antibiotic use during the COVID-19 pandemic and beyond.

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**Presentation Type:**

Poster Presentation - Top Poster Award

**Subject Category:** Antibiotic Stewardship

**The effect of a parenteral-to-oral conversion program for high-bioavailability antibiotics use**

Wooyoung Jang and Bongyoung Kim

**Background:** Appropriate conversion of antibiotics from parenteral to the oral route can lower the risk of catheter-associated infections, reduce medical costs, and shorten hospitalization. We investigated the effect of a parenteral-to-oral conversion program on high-bioavailability antibiotics conducted by medical students and the changes in perceptions of oral antibiotics after participating in the program. **Methods:** The parenteral-to-oral conversion program was implemented as a core clinical practice course for the fifth-year medical students in 2021 at the infectious diseases department in an affiliated hospital of a medical school in Korea. Half of the students in this class participated in the program from January to October 2021. An evaluation of the possibility of oral conversion was performed for parenterally administered, high oral-bioavailability antibiotics including ciprofloxacin, levofloxacin, moxifloxacin, metronidazole, linezolid, and trimethoprim-sulfamethoxazole. These agents are prescribed in the departments of pulmonology, gastroenterology, general surgery, and neurology. The medical students reviewed medical records for the patients treated with those antibiotics and wrote a recommendation for oral conversion for the cases with “possible oral conversion” after an infectious disease specialist confirmed their assessments. The cases without administration of any oral drugs or with the duration of parenteral antibiotic use of <3 days were excluded from the evaluation. The following cases were considered as “impossible oral conversion” and were excluded from the intervention: (1) admitted to the ICUs, (2) admitted to the protected isolation rooms, (3) difficult to take oral medication, (4) risk of insufficient medication absorption, (5) bone and joint infections, (6) fever within 24 hours, (7) insufficient response to antibiotic therapy, and (8) recommended to use intravenous antibiotics by consultation with an infectious disease specialist. Furthermore, a survey was conducted on the perception of oral antibiotics in medical students before and after clinical practice to evaluate the educational effect of this program. **Results:** In total, 923 cases were reviewed, and 190 (20.6%) of 923 antibiotics prescriptions with high oral bioavailability were found to be administered parenterally even though they could be converted oral administration. Among these 190 antibiotics prescriptions, 46 (24.2%) were changed via a written proposal within 48 hours, 83 (43.7%) proposed changes were declined, and 61 (32.1%) antibiotics prescriptions were discontinued within 48 hours.

Table 1. Possible oral conversion among parenteral-administering antibiotics with high-bioavailability

	Pulmonology (n=487)	Gastroenterology (n=283)	General Surgery (n=79)	Neurology (n=74)	Total (n=923)
Possible oral conversion	121 (24.8)	60 (21.2)	5 (6.3)	4 (5.4)	190 (20.6)
Impossible oral conversion	366 (75.2)	223 (78.8)	74 (93.7)	70 (94.6)	733 (79.4)
History of adverse effects of antibiotics	4 (0.8)	1 (0.4)	1 (1.3)	4 (5.4)	10 (1.1)
Admitted to the intensive care units	108 (22.2)	7 (2.5)	6 (7.6)	13 (17.6)	134 (14.5)
Admitted to the protected isolation rooms	20 (4.1)	7 (2.5)	1 (1.3)	0 (0)	28 (3.0)
Difficult to take oral medication due to tube feeding	150 (30.8)	11 (3.9)	4 (5.1)	20 (27.0)	185 (20.0)
Difficult to take oral medication due to fasting	61 (12.5)	83 (29.3)	19 (24.1)	22 (29.7)	185 (20.0)
Risk of insufficient medication absorption due to the history of gastrointestinal surgeries	37 (7.6)	43 (15.2)	49 (62.0)	14 (18.9)	143 (15.5)
Bone and joint infections with parenteral antibiotics within 28 days	2 (0.4)	1 (0.4)	1 (1.3)	4 (5.4)	8 (0.9)
Fever within 24 hours	101 (20.7)	65 (23.0)	30 (38.0)	22 (29.7)	218 (23.6)
Insufficient response to antibiotic therapy for more than 3 days such as CRP or procalcitonin elevation	202 (41.5)	99 (35.0)	47 (59.5)	31 (41.9)	379 (41.1)
Recommended to use intravenous antibiotics by infectious disease consultation	54 (11.1)	13 (4.6)	14 (17.7)	36 (48.6)	117 (12.7)
Response to the recommendation of the conversion of parenteral to per oral antibiotics <sup>1</sup>					
Accept within 48 hours	27 (22.3)	19 (31.7)	0 (0)	0 (0)	46 (24.2)
Decline	59 (48.8)	20 (33.3)	2 (40.0)	2 (50.0)	83 (43.7)
Discontinuation within 48 hours	35 (28.9)	21 (35.0)	3 (60.0)	2 (50.0)	61 (32.1)

Data are presented as number (%).

These are investigated in case of one of Metronidazole, Ciprofloxacin, Levofloxacin, Moxifloxacin, Trimethoprim/sulfamethoxazole, and Linezolid were administered intravenously or intramuscularly for more than 3 days, and oral medications are being administered besides parenteral antibiotics.

Abbreviations: CRP, c-reactive protein

<sup>1</sup> These values are the ratio among the cases which are possible oral conversion.

Table 2. Changes in antibiotics-related perceptions among students before and after clinical practice in infectious diseases

	Students participated in the parenteral to oral conversion program		
	Pre (n=41)	Post (n=41)	P
<b>Demographic data</b>			
Age		23.68±1.90	-
Male sex		29 (70.7)	-
<b>Perception of oral antibiotics</b>			
Patients will likely have a lot of complaints if oral antibiotics are used for inpatients	2.37±0.73	2.61±1.05	0.127
I am familiar with which patients can be given oral antibiotics	3.02±0.72	3.90±0.58	<0.001
Parenteral antibiotics are more effective than oral antibiotics if it is the same antibiotics	3.15±1.11	2.17±0.86	<0.001
Parenteral antibiotics have a faster effect than oral antibiotics if it is the same antibiotics	4.07±0.61	4.10±0.74	0.868
The price of parenteral antibiotics and oral antibiotics is almost the same if it is the same antibiotics	2.24±0.70	1.78±0.85	0.005
Parenteral antibiotics have similar or fewer side effects than oral antibiotics if it is the same antibiotics	2.05±0.84	2.10±0.77	0.822
When oral antibiotics are available, oral antibiotics are beneficial to patients compared to parenteral antibiotics	4.00±0.81	4.22±0.61	0.136
<b>Perception on conversion of parenteral to per oral antibiotics</b>			
Patients should be able to swallow oral drugs	4.51±0.51	4.59±0.59	0.491
There should be no structural abnormality in the patient's gastrointestinal tract	4.32±0.69	4.39±0.74	0.665
Chronic diseases such as diabetes mellitus or hypertension should not exist	2.41±0.74	2.20±0.68	0.101
Oral antibiotics with the same ingredients as parenteral antibiotics must be present	2.95±1.09	3.88±1.00	<0.001
The causative bacteria of infection and antibiotic susceptibility results must exist	4.07±0.82	3.54±1.05	0.016
Fever must not exist for more than 24 hours	3.29±0.87	4.00±0.87	<0.001
Inflammatory markers such as white blood cell count and CRP should be normalized	2.95±0.95	3.78±1.04	<0.001
Vital signs such as pulse rate, respiratory rate, and blood pressure etc. should be normalized	3.54±0.87	3.90±0.77	0.034

Data are presented as number (%) or mean ± standard deviation.  
 These were collected and analyzed 'Strongly disagree' as 1 point, 'Disagree' as 2 points, 'Neutral' as 3 points, 'Agree' as 4 points, 'Strongly agree' as 5 points.  
 Abbreviations: CRP, c-reactive protein

Through this program, students have gained a better perception of oral antibiotics. **Conclusions:** This parenteral-to-oral conversion program showed a 24.2% acceptance rate of oral antibiotics conversions in the hospital, and it had significant educational effects on medical students regarding an appropriate perception of oral antibiotics.

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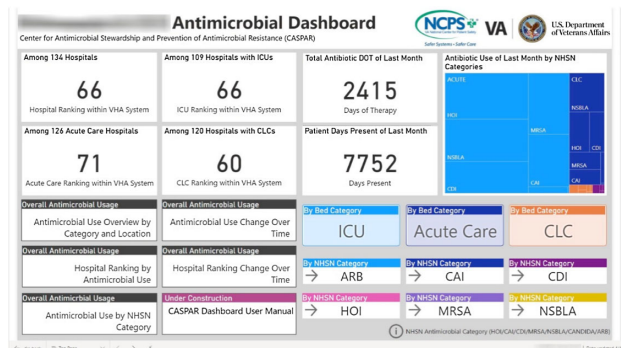
Poster Presentation - Top Poster Award

**Subject Category:** Antibiotic Stewardship

**Qualitative Evaluation of an automated nationwide benchmarking antimicrobial utilization dashboard for the VHA**

DeShauna Jones; Alexandre Marra; Daniel Livorsi; Eli Perencevich and Michihiko Goto

**Background:** Antimicrobial stewardship programs (ASPs) are advised to audit antimicrobial consumption as a metric to feedback to clinicians. However, many ASPs lack the tools necessary for appropriate risk adjustment and standardized data collection, which are critical for peer-program benchmarking. We evaluated the impact of the dashboard deployment that displays these metrics and its acceptance among ASP members and antimicrobial prescribers. **Materials/methods:** We conducted semistructured interviews of ASP stewards and antimicrobial prescribers before and after implementation of a web-based ASP information dashboard (Fig. 1) implemented in the VA Midwest Health Care Network (VISN23). The dashboard provides risk-adjusted benchmarking, longitudinal trends, and analysis of antimicrobial usage patterns at each facility. Risk-adjusted benchmarking was based on an observed-to-expected comparison of antimicrobial days of therapy at each facility, after adjusting for differences in patient case mix and facility-level variables. Respondents were asked to evaluate several aspects of the dashboard, including its ease of use, applicability to ongoing ASP activities, perceived validity and reliability, and advantages compared to other ASP monitoring systems. All interviews were digitally recorded and transcribed verbatim. The analysis was conducted using MaxQDA 2020.4 and the Consolidated Framework for Implementation Research (CFIR) constructs. **Results:** We completed 4 preimplementation interviews and 11 postimplementation interviews with ASP champions and antimicrobial prescribers from 6 medical centers. We derived 4 key themes from the data that map onto CFIR constructs. These themes were interconnected so that implementation of the dashboard (ie, adapting and adopting) was influenced by respondents' perception of a facility's size, patient population, and priority placed on stewardship (ie, structural and cultural context), the availability of dedicated stewardship staff and training needed to implement the dashboard (ie, resources needed), and how the dashboard compared to established stewardship



activities (ie, relative advantage). ASP champions and antimicrobial prescribers indicated that dashboard metrics were useful for identifying antimicrobial usage and for comparing metrics among similar facilities. Respondents also specified barriers to acceptance of the risk-adjusted metric, such as disagreement regarding how antimicrobials were grouped by the current NHCN protocol, uncertainty of factors involved in risk adjustments, and difficulty developing a clear interpretation of hospital rankings. **Conclusions:** Given the limited resources for antimicrobial stewardship personnel, automated, risk-adjusted, antimicrobial-use dashboards provided by ASPs are an attractive method to both facilitate compliance and improve efficiency. To increase the uptake of surveillance systems in antimicrobial stewardship, our study highlights the need for clear descriptions of methods and metrics.

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Poster Presentation - Top Poster Award

**Subject Category:** Antibiotic Stewardship

**A little education goes a long way: Decreasing antibiotics for community-acquired pneumonia in COVID-19 patients**

Ravi Tripathi; Rohini Dave; Elizabeth Eden and Jacqueline Bork

**Background:** Antibiotic use was common in patients with suspected or confirmed COVID-19 infection; however, data emerged demonstrating low rates of bacterial coinfection (6%–10%). Antimicrobial stewardship best practice was challenged during this time, requiring new strategies and education to limit the inappropriate use of antibiotics. At the Veterans' Affairs Maryland Healthcare System, we evaluated the use of community acquired pneumonia (CAP) specific antibiotics in COVID-19-positive patients after successive interventions. **Methods:** We conducted a pre-post evaluation of common CAP antibiotics (ceftriaxone IV/IM, cefpodoxime PO, azithromycin PO/IV, ampicillin/sulbactam IV, amoxicillin-clavulanate PO, levofloxacin) during the COVID-19 pandemic. The preintervention period was April–October 2020 and the post-intervention period was November 2020–April 2021. During the preintervention period, intervention A was carried out as follows: (1) inpatient weekly virtual interdisciplinary COVID-19 rounds were led by an antimicrobial stewardship champion, (2)  $\chi$ procalcitonin was implemented in clinical decision making, and (3) inpatient audit and feedback of active antibiotics was conducted by the antimicrobial stewardship team. In the postintervention period, intervention B was added as follows: (1) weekly educational COVID-19 virtual seminars were conducted for providers, and (2) targeted education was provided to emergency department and hospitalist directors. Comparisons of the proportions of antibiotics prescribed were made between the pre- and postintervention periods using  $\chi^2$  statistic, and data were stratified by location. The rates of CAP antibiotic prescription per 100 COVID-19-positive patients were also compared