

Aim For the Target: Optimizing Anti-pseudomonal Antibiotic Utilization at a Community Hospital



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Introduction

The emergence of antibiotic resistance threatens the past 100 years of progress made in the treatment of infectious diseases. For the treatment of *pseudomonas aeruginosa*, multi-drug resistance development risks further limits to the available antibiotic agents available for treating these infections. Identified in the 2019 CDC Antimicrobial Threats Report, multidrug-resistant *pseudomonas aeruginosa* is estimated to have killed 2700 people across the US in 2017.¹

Antibiotic utilization is not without risk. A meta-analysis by Curran and colleagues found that each additional day of antibiotic therapy has a 4% odds ratio per day for adverse events, and 3% odds ratio per day for antibiotic resistance development.² In recent years, Baptist Health Antimicrobial Stewardship program noticed a reduction in anti-pseudomonal antibiotics susceptibility to *pseudomonas aeruginosa* isolates within annual antibiogram reports.

To best care for our patients with infectious disease, broader antibiotic coverage has been shown to not be better. Rhee et al. found that over two-thirds of patients received antibiotics for resistant organisms when only 1 in 8 patients had a resistant Gram-positive organism and 1 in 8 had a resistant Gram-negative organism isolated.³ It is important to consider patient specific risk factors and suspected source of infection to determine appropriate empiric antibiotic therapy.

Utilization of anti-pseudomonal antibiotics at Baptist Health Richmond was among the highest across the health system in terms of days of therapy (DOT) per 1000 patient days, sitting at 261 days for fiscal year 2022. The combined data for the health system was 215 DOT per 1000 patient days.

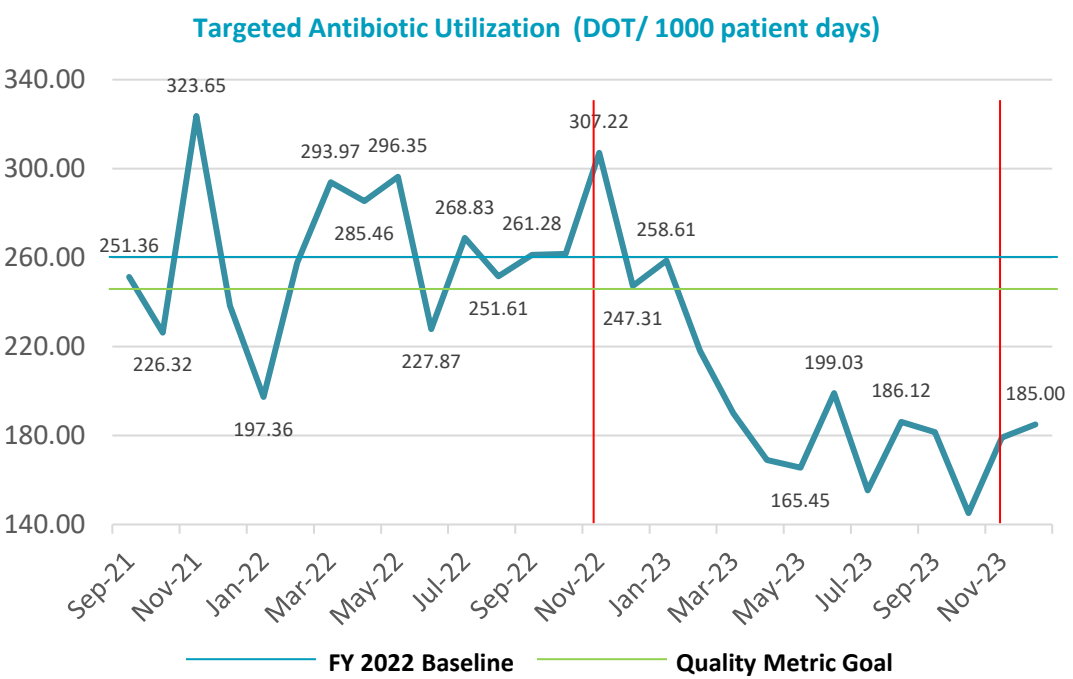
Methods

For fiscal year 2023, the Baptist Health Antimicrobial Stewardship (AMS) Program developed a quality metric for the system score cards rooted in the reduction in utilization of anti-pseudomonal antibiotic agents. These agents included piperacillin-tazobactam, cefepime, meropenem, levofloxacin, ciprofloxacin, and ertapenem. The stewardship program elected to utilize days of therapy (DOT) per 1000 patient days as the measure of utilization to remove bed size from the equation and allow for each of the health system's diverse hospital populations. The goal for the system quality metric was set at a 5% reduction from the baseline DOT/1000 patient days of all included agents.

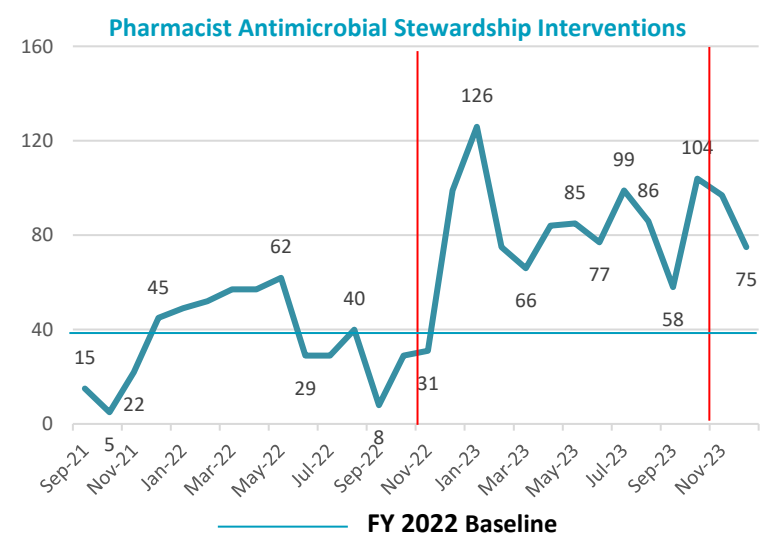
Baptist Health Richmond, a 104-bed acute-care facility in Richmond Kentucky, developed an action plan to support the local hospital score card, and work to reduce the utilization of anti-pseudomonal antibiotic therapy. Action points included:

- Monthly data reporting at the hospitalist monthly meeting.
- Increased pharmacist AMS interventions, focused on targeted antimicrobial therapy based on patient specific factors.
- Implementation of system AMS program initiatives including beta-lactam allergy cross-reactivity education, empiric treatment pocket guide, and duration of therapy guidance document.

Results



- Anti-pseudomonal monthly utilization:
 - November 2022 – 307 DOT per 1000 patient days
 - November 2023 – 179 DOT per 1000 patient days
- Rolling 12-month average anti-pseudomonal utilization:
 - November 2022 – 261 DOT per 1000 patient days
 - November 2023 – 202 DOT per 1000 patient days
 - 22.6% reduction in days of therapy per 1000 patient days



- The rolling 12-month average number of pharmacist AMS interventions increased from 39 interventions per month prior to the project implementation to 83 interventions per month during the project.

Results (cont.)

Intervention Type	Total (n)
De-escalation Recommended	146
Discontinuation Recommended	225
Culture or Other-test recommended	58
Duration of Therapy Adjustment	134
Dose Optimizaiton	136
Initiation or Therapy Change Recommended	112
Other	67

*Total Pharmacist Interventions from November 2022 to November 2023

Conclusion

Anti-pseudomonal antibiotic utilization at Baptist Health Richmond ranked amongst the highest across the health system's eight facilities prior to this project. Over the course of twelve months, the targeted emphasis on appropriate utilization of our anti-pseudomonal antibiotics along with monthly data reporting to our hospitalist group led to reduction from a monthly average of 261 DOT/1000 patient days to 202 DOT/ 1000 patient days at the one-year mark.

Pharmacists that were involved in the multidisciplinary team played a vital role in making recommendations to providers to provide targeted antibiotic therapy for our patients within our facility. This improvement could not have been made without the engagement from our hospitalist group and conscious effort made in admitting patients on targeted antibiotic regimens in accordance with national guidelines.

Implications for Practice

Broader antimicrobial coverage has been shown to be unnecessary, and over utilization increases the risk for resistance development. This project shows the impact an active antimicrobial stewardship program can have on the utilization of anti-pseudomonal antibiotic therapy. With the observed increase in pharmacist antimicrobial stewardship interventions, there was a significant reduction in the utilization of anti-pseudomonal antibiotic therapy.

References

- Centers for Disease Control and Prevention. 2019. Antibiotic Resistance Threats in the United States 2019. Retrieved from <https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf>.
- Curran J, Lo J, Leung V, et al. Estimating daily antibiotic harms: an umbrella review with individual study meta-analysis. *Clinical Microbiology and Infection*. 2021; <https://doi.org/10.1016/j.cmi.2021.10.022>.
- Rhee C, Kadri SS, Dekker JP, et al. Prevalence of Antibiotic-Resistant Pathogens in Culture-Proven Sepsis and Outcomes Associated with Inadequate and Broad-Spectrum Empiric Antibiotic Use. *JAMA New Open*. 2020 Apr 1;3(4):e202899.