Analysis of Medicare Part D Data to Identify High-Volume Antibiotic Prescribers among Primary Care Providers in Hawaiʻi

Background: Antibiotic resistance is an emerging global public health threat, recognized by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO). Combating antibiotic resistance and reducing the rate of antibiotic resistance requires collaboration between public health entities and clinicians, specifically those who prescribe antibiotics. The CDC recognizes tracking and reporting of antibiotic prescribing practices as one of The Core Elements of Outpatient Antibiotic Stewardship. Healthcare providers in Hawaiʻi have varying levels of antibiotic usage, which the Centers for Medicare and Medicaid Services (CMS) publishes annually with a two-year lag. We analyzed Hawaiʻi's primary care providers (PCP) in the Public Use File (PUF) "Medicare Part D Prescribers - by Provider'' to determine the highest 10% of antibiotic prescribers by volume, and we evaluated the use of specific antibiotic classes of interest by multiple metrics including cost per beneficiary, antibiotics per beneficiary while controlling for demographic characteristics (gender, specialty, county, RUCA).

Data Collection: The datasets "Medicare Part D Prescribers - by Provider" and "Medicare Part D Prescribers - by Provider and Drug" are free and publicly available online through CMS. The data include information about prescription drugs provided to Medicare Part D beneficiaries, aggregated by healthcare provider. The National Provider Identifier (NPI) is the unique identifier in the dataset. Provider characters assessed include zip code, gender, total antibiotic claims, total beneficiaries, and provider specialty type.

Sample Inclusion Criteria: The 2021 PUF includes health care providers in Hawaiʻi who prescribe drugs to Medicare Part D beneficiaries. Healthcare providers who do not prescribe in Hawaiʻi, as reported to the National Plan and Provider Enumeration System (NPPES), were excluded from this analysis. Only physicians who were categorized as "internal medicine" or "family practice" were included, as those are the specialties of interest in this analysis. It was determined that providers should not be compared across vastly different specialties, because the patient population they see and the training they receive on antibiotic prescribing may greatly influence the volume of antibiotics they prescribe. PUF datasets suppress beneficiary data and claims data when the number of claims or beneficiaries is between 1 and 10. All providers who had zero or suppressed values for "total claims of antibiotic drugs, including refills", and all providers with zero "number of Medicare beneficiaries filling antibiotic claims" were excluded from analysis. Number of Medicare beneficiaries filling antibiotic claims was replaced with 10 when the value was suppressed, to give the most conservative estimate of antibiotic claims per beneficiary when calculated. Beneficiaries of these providers include those 65 years old or older who are entitled to or enrolled in Medicare, people who have received Social Security Disability Insurance (SSDI) benefits for more than 2 years, and people with end-stage renal disease (ESRD).

Statistical Analysis: We used SAS 9.4 and R version 4.3.2 to generate descriptive statistics, visualizations and to perform a logistic regression to produce odds ratio estimates with 95% confidence intervals. Reference groups for Factor variable analysis include Honolulu for Prescriber County, Internal Medicine for Specialty, and Urban Area for rural-urban commuting area code grouping.

Result: The analysis included 824 family practice or internal medicine physicians that had at least 11 total antibiotic claims filled, and at least one Medicare beneficiary who received antibiotics. Of 824 providers, 56.6% were classified as internal medicine (n=466), and 43.4% were classified as family practice (n=358). Of all providers, 55.7% (n=460) identified as male, while 44.3% (n=366) identified as female. Honolulu County contained 68.7% of providers (n=566), followed by the Island of Hawaiʻi with 13.8% (n=114), Maui with 12.9% (n=106), and Kauaʻi with 4.6% of providers (n=38). 643 providers (78.0%) had a practice address located in an urban rural-urban commuting area code (RUCA), 138 providers were in a large rural area (16.7%), and 43 providers were in a small/isolated rural area (5.2%).

82 providers were identified as "High-Volume" Prescribers (top 10th percentile), and the remaining 742 providers were identified as "Low-Volume" Prescribers. High volume prescribers were more likely to be male (OR 3.12, 95% CI 1.85 – 5.52, p <0.001), practice in large rural areas (OR 2.04, 95%CI 1.19-3.41, p = 0.008) and practice in Hawai'i County (OR 1.70, 95%CI 0.92-3.00, *p= 0.078*), though not significant statistically. High Volume prescribers prescribed an average of 238 antibiotic claims compared to 53 for the low volume group. Similarly mean annual cost of antibiotics per provider was $6,507 for the high-volume group compared to $1,673 for the low volume group. Specialty analysis did not show a significant difference between Family and Internal Medicine when controlling for county, RUCA and prescriber gender (Family Medicine OR 1.05, 95% CI 0.56 – 1.99, p=0.9).

Separate groups of High-Volume Prescribers were identified for antibiotic classes of interest including fluoroquinolones, MRSA active Antibiotics (Lincomycins, Sulfonamides, Tetracyclines), and macrolides. When comparing primary care specialties, Family Medicine physicians were less likely to be high volume fluoroquinolone providers (OR 0.17, 95% CI 0.03, 0.60, p = 0.019).

Discussion

Ten percent of family practice and internal medicine prescribers accounted for over one-third of total antibiotic claims filled among Medicare Part D beneficiaries. Targeting high-volume prescribers with antibiotic stewardship initiatives is a resource-efficient way to address a disproportionately large share of the total antibiotic claims.[1] Providing peer-comparison and social norm feedback has shown reductions in antibiotic prescriptions[2],[3]. The analysis identifies a smaller group of healthcare providers for which focus groups or surveying could be conducting for better understanding of prescribing patterns and behaviors. High-volume prescribers can also be targeted for antibiotic class-specific stewardship interventions, such as fluoroquinolones use, as they were more likely to be high-volume prescribers across all classes. A supplemental analysis of providers' patient populations and secondary specialty types may provide further insights into high-prescribing behavior. We hope that providing high-volume providers with their prescription percentiles for specific antibiotics (i.e. MRSA actives, Fluoroquinolones, Macrolides) as well as surveys and resources will encourage a constructive and effective dialogue with community physicians.

Limitations

The dataset is released with a two-year delay and therefore may not reflect current antibiotic prescribing practices. Antibiotic stewardship interventions based on this data can only be evaluated after two years due to the data lag. The dataset is only representative of Medicare beneficiaries who have Part D prescription drug coverage, and therefore it may not be representative of the general population. The dataset does not include diagnostic data and therefore cannot be used to assess appropriateness. The suppression and subsequent exclusion of providers with fewer than 11 antibiotic claims may have led to the exclusion of providers with smaller practices and/or fewer Medicare Part D beneficiaries, Provider type may not be reflective of providers who subspecialize but practice within multiple specialties. RUCA codes were last assigned in 2010[4], and may not be reflective population density changes influencing healthcare access disparities present during 2021 CMS data collection.[5]

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