Improve Outpatient Antibiotic Prescribing:
A Toolkit for Healthcare Payers

Supplement for Health Departments and Medicaid Agencies

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Overview

Antibiotics can save lives and are essential tools in modern medicine. Appropriate prescribing protects patients from the harms of unnecessary medication use and helps combat antimicrobial resistance.[1]

Antibiotic stewardship is the coordinated effort to promote the optimal use of antibiotics, preserve their effectiveness, and improve patient outcomes.

Healthcare payers, including Medicaid, are leaders in healthcare quality improvement and play a unique role in improving antibiotic use. In 2021, the Centers for Disease Control and Prevention (CDC) released *Improving Outpatient Antibiotic Prescribing: A Toolkit for Healthcare Payers*, which provides a framework for outpatient antibiotic stewardship and includes practical examples to support implementation efforts. Since then, several state Medicaid programs have implemented antibiotic stewardship initiatives in collaboration with health departments and academic institutions.

This supplement is designed to be paired with the previously published toolkit and includes:

- Background information on Medicaid programs and outpatient antibiotic stewardship
- Examples of successful Medicaid-health department stewardship initiatives
- Considerations for effective collaboration between Medicaid programs and health department antibiotic stewardship experts

Background

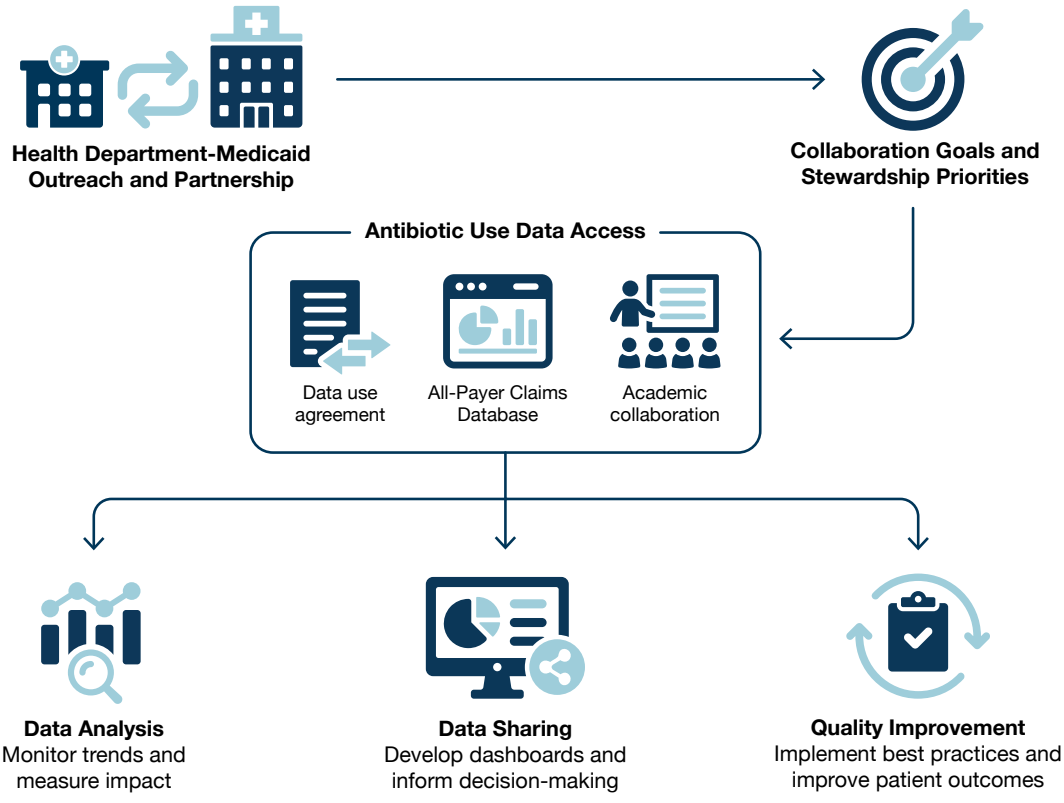
Medicaid is a public health insurance program that provides free or low-cost coverage to individuals and families with limited income or resources. Jointly funded by the federal and state governments and administered at the state-level within federal guidelines, Medicaid programs can vary in structure and operations.[2] As major purchasers of healthcare services, Medicaid programs are uniquely positioned to influence care delivery and advance population health priorities.

Strategic partnerships between Medicaid programs and public health departments can strengthen efforts to improve healthcare quality and outcomes. Through data sharing, collaboration, and policy alignment, these partnerships can support appropriate outpatient antibiotic prescribing and stewardship goals (Figure 1).

Public health antibiotic stewardship experts play an important role in supporting Medicaid quality improvement initiatives. They provide evidence-based guidance, offer access to educational resources, and help elevate stewardship efforts within Medicaid programs. While Medicaid programs routinely analyze claims data to assess and improve quality of care, health departments may also examine Medicaid data through data use agreements or by accessing All-Payer Claims data. These analyses have been used to characterize overall antibiotic use, assess prescribing appropriateness, and track quality measures over time.

For example, an analysis of national Medicaid claims data from 2004 to 2013 found that 17% of antibiotic prescriptions were filled without evidence of an infection-related diagnosis.[3] This finding, along with more recent findings from analyses highlighted later in this toolkit supplement, underscore the opportunity for continued collaboration between Medicaid and public health partners to improve prescribing practices and enhance patient safety.

Figure 1. Health Department-Medicaid Partnership for Antibiotic Stewardship



Using Quality Measures to Advance Antibiotic Stewardship

Antibiotic use data can be used to monitor progress on stewardship-related Healthcare Effectiveness Data and Information Set (HEDIS) measures. HEDIS measures are a standardized set of performance metrics developed and maintained by the National Committee for Quality Assurance (NCQA). Antibiotic-related HEDIS measures include:

- Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis
- Appropriate Treatment for Upper Respiratory Infection
- Appropriate Testing for Pharyngitis
- Antibiotic Utilization for Respiratory Conditions

These measures evaluate the quality of care provided by health plans and enable comparison transparency across health plans. The Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis (AAB) measure has been included in the adult and child Medicaid core measure sets since 2022. States are required to report Medicaid core measure sets. This reporting aims to improve the quality of care provided to Medicaid beneficiaries.

The newest antibiotic-related HEDIS measure is Antibiotic Utilization for Respiratory Conditions (AXR), which assesses overall prescribing for respiratory conditions.[4] This enables comparison of prescribing patterns across practices and clinicians to identify variability and outliers and to compare performance with peers. Several state Medicaid programs, including New York, New Hampshire, and Louisiana, have required AXR reporting.[5] AXR and similar measures have also been used within health systems.[6-8] Monitoring outpatient antibiotic use over time by practice and clinician provides valuable insights that guide quality improvement initiatives.

Medicaid and Public Health Antibiotic Stewardship Initiatives

Partnerships among state Medicaid agencies, health departments, and academic institutions have emerged nationwide to improve antibiotic use. This section highlights effective Medicaid-public health collaborations.

Figure 2. CDC's 6|18 Initiative Overview

6|18 Initiative: Aligning Public Health and Medicaid

The 6|18 Initiative connected healthcare purchasers, payers, and providers with CDC researchers, economists, and policy analysts to find ways to improve health and control costs (Figure 2). CDC and partners focused on six high-burden, high-cost health conditions and 18 evidence-based interventions to inform health and cost decisions by:

- Providing partners with rigorous evidence on high-burden conditions and related interventions.
- Highlighting disease-prevention initiatives to increase their coverage, use, and quality.
- Aligning proven preventive practices with value-based payment approaches.

One focus of the initiative was to improve antibiotic use by implementing CDC's Core Elements of Outpatient Antibiotic Stewardship and supporting stewardship programs in hospitals and skilled nursing facilities. Several state health departments (e.g., Arkansas, Nebraska, Nevada, and Texas) participated in the 6|18 Initiative and established ongoing collaborations with Medicaid. Nebraska is featured on the 6|18 Initiative website for its partnership between the state Medicaid agency and the Department of Health and Human Services. Nebraska's team leveraged HEDIS data to identify areas with high antibiotic prescribing rates and inform educational outreach.

ARKANSAS

Longstanding Medicaid-Public Health Partnership to Implement Quality Measures

Under CDC's 6|18 Initiative, Arkansas Medicaid and the Department of Health (ADH) began a partnership in 2018 to improve outpatient antibiotic prescribing. At any given time, a quarter of Arkansans are covered by Medicaid, making it a key insurer in Arkansas and one that often impacts policy decisions. ADH has served as a key liaison, connecting Arkansas Medicaid with antibiotic stewardship public health partners and incorporating the Medicaid team into its **antibiotic stewardship advisory committee** to obtain feedback from the payer perspective.

The primary focus of this collaboration has been analyzing data to target **education and outreach** to Patient-Centered Medical Home (PCMH) healthcare providers. The PCMH program, launched in 2014, provides a framework to assess and influence clinical care at the practice level. Practices are rewarded for high performance on certain claims-based measures, including rate and volume measures related to antibiotic prescribing. Each practice site receives regular **online report cards** that summarize their antibiotic prescribing in comparison to their peers, with prescription patterns benchmarked against the statewide total antibiotic prescribing rate. The introduction of regular report cards was associated with reductions in antibiotic prescribing rates below the statewide benchmark. The PCMH program also includes **financial disincentives** for practices that are outliers compared to community norms to further encourage optimal antibiotic prescribing.[9]

ADH continues to provide stewardship expertise to Arkansas Medicaid to inform data analysis, and a data-sharing agreement allows ADH access to provider-level data. Moving forward, ADH aims to expand these activities to additional insurers to broaden their impact. This sustained partnership demonstrates the value of leveraging the strengths of both public health and Medicaid to advance stewardship efforts.

KENTUCKY

Using Academic-Medicaid Data to Evaluate Pediatric Antibiotic Prescribing

A partnership between the University of Louisville and Kentucky Medicaid enabled researchers to conduct in-depth analyses of pediatric Medicaid data. Using 2017 data, they examined **antibiotic prescribing appropriateness** and found that 21.0% of antibiotic prescriptions were inappropriate and 13.3% were not associated with a diagnosis.[10] Further analysis revealed that high-volume prescribers had a higher percentage of inappropriate prescriptions than lower-volume prescribers.[11] Researchers also used 2012-2017 data to describe patient and clinician characteristics associated with pediatric antibiotic use and found significant geographic variability in prescribing.[12]

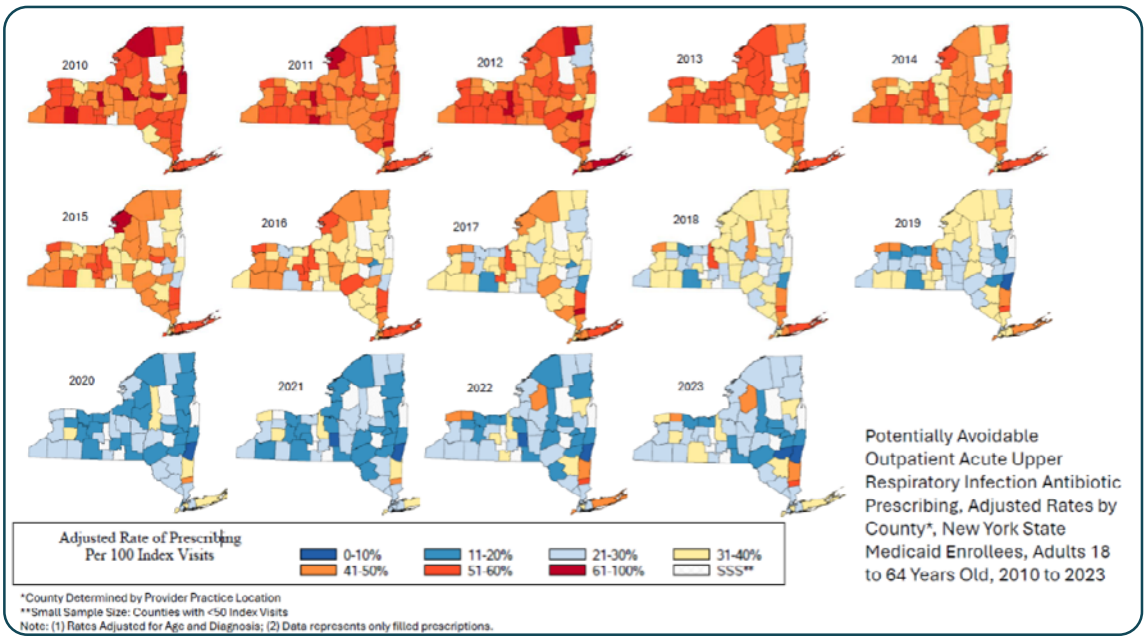
NEW YORK

Data Visualization and Prescriber Education to Advance Antibiotic Stewardship

The New York State Department of Health (the Department) has maintained internal **cross-office collaboration** since 2014. Teams from the Office of Public Health, Office of Health Services Quality and Analytics, and Office of Health Insurance Programs (New York State Medicaid Office) work together to produce **targeted data and educational materials** to support appropriate outpatient antibiotic use. The Department develops **annual county-level maps** for adults and children based on provider practice location to visualize potentially avoidable antibiotic prescribing for upper respiratory infections (Figure 3). These maps support year-over-year comparisons and help local health departments target stewardship outreach to clinics.

Another outcome of this collaboration is the development of educational activities within the New York State Medicaid Prescriber Education Program (MPEP). MPEP provides evidence-based, non-commercial pharmacotherapy information to support informed clinical decision-making. One educational activity, published in April 2022, focused on appropriate antibiotic use. It was developed by a multidisciplinary team of pharmacists, physicians, and epidemiologists from the Department's Office of Health Insurance Programs, the Department's Bureau of Healthcare Associated Infections, and academic partners at the University at Buffalo School of Pharmacy and Pharmaceutical Sciences. The activity is accredited for continuing education, allowing participating clinicians to earn continuing education credit. Content includes background on antibiotic resistance, prescriber communication strategies, and state prescribing guidelines and resources.

Figure 3. New York County-level Maps to Visualize Potentially Avoidable Antibiotic Prescribing for Upper Respiratory Infections



NORTH CAROLINA

Building Payer Partnerships to Expand Antibiotic Stewardship Efforts

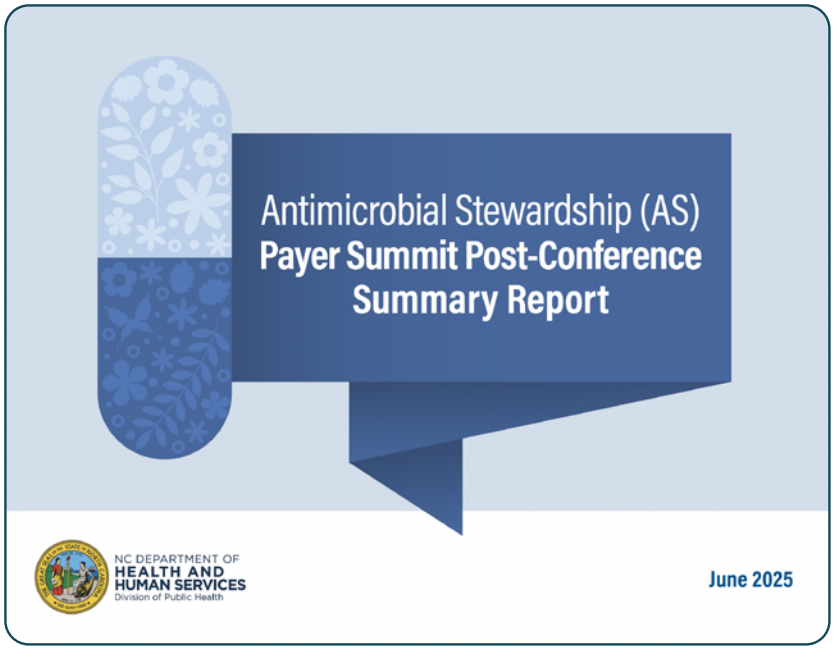
The North Carolina Department of Health and Human Services (NCDHHS) Division of Public Health (DPH) has developed a strong partnership with North Carolina Medicaid through quarterly meetings with the NCDHHS Division of Health Benefits quality improvement team to discuss integrating stewardship-related topics in Medicaid educational initiatives.

In November 2024, NCDHHS DPH convened an in-person **antibiotic stewardship summit** for North Carolina payers and stewardship experts. Seven healthcare insurance companies attended, including the NCDHHS Division of Health Benefits, which administers NC Medicaid. The summit featured brief expert stewardship presentations and facilitated discussions on best practices to support responsible antibiotic prescribing in outpatient settings. One presentation highlighted strategies for using Medicaid and other claims data to generate provider-level feedback on antibiotic prescribing. A discussion session focused on leveraging partnerships, including with NC Medicaid, to advance statewide outpatient stewardship goals. Key themes from the summit are summarized in a publicly available report (Figure 4).

Moving forward, the NCDHHS DPH aims to use Medicaid claims data to **assess the appropriateness and volume** of antibiotic prescribing. These insights will inform future recommendations.

In addition, Duke University researchers analyzed 2013-2019 pediatric Medicaid data to describe prescribing patterns.[13] They found that inappropriate prescribing for children in North Carolina was lower compared with other Appalachian states. Within North Carolina, rural areas had the highest rates of inappropriate antibiotic prescribing.

Figure 4. Antimicrobial Stewardship Payer Summit Post-Conference Summary Report Cover Page



TENNESSEE

Academic-Medicaid Partnership to Analyze Antibiotic Prescribing Trends

The Tennessee Department of Health's (TDH) Healthcare-Associated Infections and Antimicrobial Resistance program has maintained an ongoing collaboration with Vanderbilt University Medical Center's (VUMC) Infectious Diseases Department to promote appropriate outpatient antibiotic use. VUMC had an established relationship with Tennessee Medicaid (TennCare), providing access to TennCare data for various projects. TDH and VUMC collaborated on a proposal to access TennCare prescription and diagnostic claims databases for antibiotic use analyses.

By leveraging this existing relationship, TDH's antibiotic stewardship team gained more **timely** access to Medicaid data and benefited from VUMC's analytic expertise. The VUMC informatics team prepares and cleans datasets with requested variables for TDH analysis. TDH analysts link individual antibiotic prescriptions to diagnosis claims (ICD-10 codes) from recent prescriber visits to assess **antibiotic prescribing appropriateness** among TennCare beneficiaries. VUMC provides infectious disease expertise and analytic support throughout the process.

Future work with TennCare claims data includes personalized clinician feedback letters and statewide reports. TDH and VUMC intend to continue this partnership to maintain TennCare data access and track prescribing trends over time.

WEST VIRGINIA

Data-Driven Stewardship Innovation Through Academic Collaboration

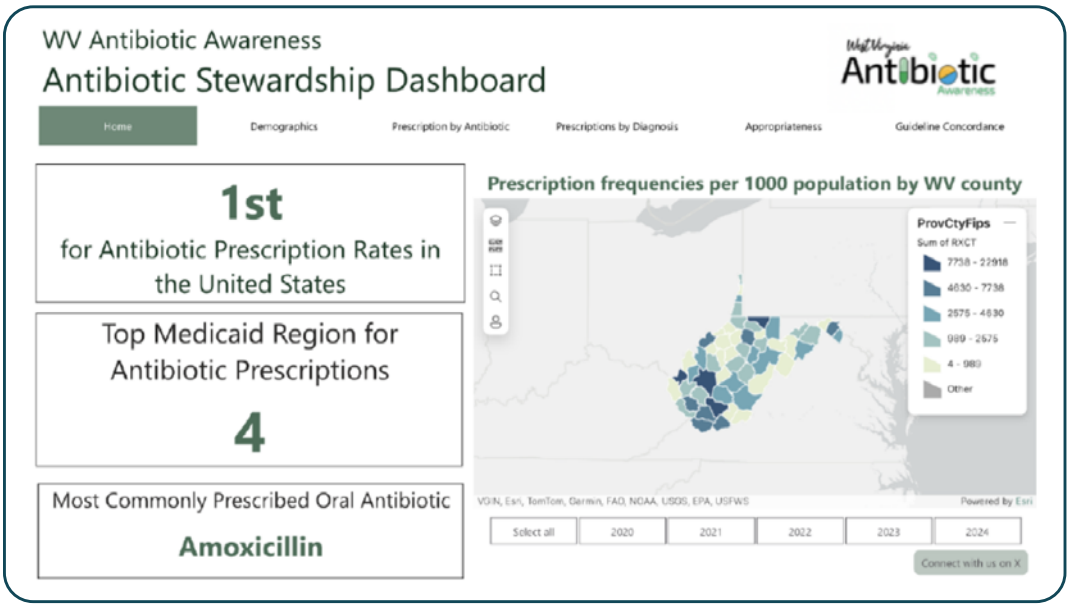
Recognizing that West Virginia has high rates of antibiotic prescribing compared to other states,[14] physicians and public health professionals from the West Virginia Department of Health and Marshall University Joan C. Edwards School of Medicine formed the West Virginia Antimicrobial Awareness Team to improve prescribing practices. Through collaboration with the West Virginia Medicaid Drug Utilization Review team, the group receives access to **near real-time antibiotic use data**, enabling timely, evidence-based interventions. This partnership has allowed the team to implement a range of stewardship initiatives and evaluate Medicaid claims data to inform outpatient stewardship priorities. Comparisons with electronic medical record data confirmed that claims data are a valid and timely resource for stewardship interventions.[15]

The team created **county- and region-level maps** of antibiotic prescriptions per 1,000 Medicaid-enrolled children for 2018 and 2019 and found that children receiving Medicaid assistance in some areas of West Virginia averaged nearly two antibiotic prescriptions per child per year.[15]

The group also implemented a pilot program within the Marshall Health Network, identifying 56 family medicine practitioners and pediatricians to receive quarterly **peer-comparison feedback reports** based on pediatric Medicaid claims data. Metrics included prescribing for antibiotic-inappropriate diagnoses, guideline concordance, and cefdinir prescribing rates. Cefdinir is often prescribed inappropriately to children.[15] The intervention was associated with reduced cefdinir prescribing and improved guideline concordance. Plans are underway to expand this initiative statewide.

Most recently, the team developed an **interactive online dashboard** using 2020-2024 Medicaid antibiotic use data, featuring prescribing by antibiotic, diagnosis, appropriateness, and guideline concordance (Figure 5).[16] A public-facing, de-identified dashboard and provider-specific dashboards are currently in development.

Figure 5. West Virginia Pediatric Outpatient Antimicrobial Prescribing Dashboard



Summary

Antibiotic stewardship remains a critical public health priority. State Medicaid programs are uniquely positioned to improve outpatient antibiotic use and promote high-quality care. Through partnerships with public health stewardship teams and academic institutions, Medicaid agencies can:

- Establish or leverage existing data use agreements;
- Analyze timely antibiotic prescribing data;
- Assess prescribing patterns and appropriateness;
- Develop county- and region-level maps and tools to track trends and identify areas where intervention is needed;
- Provide targeted education and technical assistance to improve prescribing practices;
- Generate clinician or practice-level peer comparison feedback reports;
- Align financial incentives with evidence-based prescribing practices; and
- Develop public-facing dashboards to promote transparency and accountability.

Looking ahead, establishing regular collaboration structures, strengthening data-sharing infrastructure, and incorporating antibiotic-related quality measures into reporting and accountability frameworks can further amplify impact. Medicaid programs may also consider supporting data-driven quality improvement initiatives and cross-state learning collaboratives.

By working together, Medicaid and public health partners can protect patients, improve healthcare quality, and preserve the effectiveness of antibiotics for future generations.

References

1. CDC. Antibiotic Resistance Threats in the United States, 2019. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2019.
2. Baumrucker EP, Braun SK, Mitchell A, Napili A, Saraswathula V. *Medicaid: An Overview*. Congress.gov; 2025. https://www.congress.gov/crs-product/R43357
3. Fischer MA, Mahesri M, Lii J, Linder JA. Non-infection-related and non-visit-based antibiotic prescribing is common among medicaid patients. *Health Affairs.* 2020;39(2):280-288. doi:10.1377/hlthaff.2019.00545
4. Melville BL, Musser T, Fishman E, Rainis D, Byron SC. Developing a quality measure to assess use of antibiotic medications for respiratory conditions. *Antimicrobial Stewardship & Healthcare Epidemiology.* 2023;3(1):e13. doi:10.1017/ash.2022.328
5. Improved antibiotic use will keep people healthier. Pew Charitable Trusts. November 11, 2024. https://www.pew.org/en/research-and-analysis/articles/2024/11/11/improved-antibiotic-use-will-keep-people-healthier
6. Arena CJ, Veve MP, Fried ST, Ware F, Lee P, Shallal AB. Navigating performance measures for ambulatory antimicrobial stewardship: a review of HEDIS® and other metrics the steward should know. *Antimicrobial Stewardship & Healthcare Epidemiology.* 2024;4(1):e217. doi:10.1017/ash.2024.468
7. Hersh AL, Stenehjem EA, Fino N, Spivak ES. Impact of COVID-19 on urgent care diagnoses and the new AXR metric. *Antimicrobial Stewardship & Healthcare Epidemiology.* 2024;4(1):e49. doi:10.1017/ash.2024.62
8. Stenehjem E, Wallin A, Willis P, et al. Implementation of an Antibiotic Stewardship Initiative in a Large Urgent Care Network. *JAMA Network Open*. 2023;6(5):e2313011. Published 2023 May 1. doi:10.1001/jamanetworkopen.2023.13011
9. Golden W, Peng C, Shoptaw EJ, et al. Measurement of practice-level antibiotic utilization in a Medicaid patient-centered medical home program. *The Annals of Family Medicine.* 2025;23(5):407-411. doi:10.1370/afm.240181
10. Wattles BA, Jawad KS, Feygin Y, et al. Inappropriate outpatient antibiotic use in children insured by Kentucky Medicaid. *Infection Control & Hospital Epidemiology.* 2022;43(5):582-588. doi:10.1017/ice.2021.177
11. Wattles BA, Smith MJ, Feygin Y, Jawad K, Flinchum A, Corley B, Spicer KB. Inappropriate Prescribing of Antibiotics to Pediatric Patients Receiving Medicaid: Comparison of High-Volume and Non-High-Volume Antibiotic Prescribers—Kentucky, 2019. *Healthcare*. 2023; 11(16):2307. https://doi.org/10.3390/healthcare11162307
12. Wattles BA, Vidwan NK, Feygin Y, Jawad KS, Creel LM, Smith MJ. Antibiotic prescribing to Kentucky Medicaid children, 2012—2017: Prescribing is higher in rural areas. *The Journal of Rural Health*. 2022;38(2):427-432. doi:10.1111/jrh.12584
13. Moorthy GS, Young RR, Raman SR, Smith MJ. Variations in antibiotic prescribing among children enrolled in North Carolina Medicaid, 2013—2019. *The Journal of Rural Health*. 2024;40(3):585-590. doi:10.1111/jrh.12825
14. CDC. Outpatient Antibiotic Use: Retail Pharmacy Prescription Data. Antimicrobial Resistance & Patient Safety Portal. 2025. https://arpsp.cdc.gov/profile/antibiotic-use/all-classesLanata MM, Kilgore JT, Holthaus B, et al. Assessing insurance claims as a measure for outpatient antimicrobial stewardship. *Antimicrobial Stewardship & Healthcare Epidemiology.* 2025;5(1):e141. doi:10.1017/ash.2025.10042
15. Kilgore JT, Lanata MM, Willis JM, et al. Utilization of West Virginia pediatric Medicaid claims data to guide outpatient antimicrobial stewardship interventions. *Journal of the Pediatric Infectious Diseases Society.* 2022;11(4):172-176. doi:10.1093/jpids/piab125
16. Kilgore JT, Lanata MM, Holthaus B, et al. Pilot dissemination of a realtime, statewide, pediatric outpatient antimicrobial stewardship dashboard. *Journal of the Pediatric Infectious Diseases Society.* 2024;13(Supplement_3):S13-S13. doi:10.1093/jpids/piae088.025

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