The Core Elements of Outpatient Antibiotic Stewardship Programs

Appendix A: Measurement and Evaluation of Antibiotic Use

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Tracking and reporting of antibiotic prescribing are fundamental to antibiotic stewardship implementation in outpatient settings.[4] Tracking antibiotic prescribing metrics is essential for evaluating baseline prescribing practices, identifying antibiotic stewardship interventions, monitoring changes over time, and providing feedback to clinicians. Reliable measurement enables stewardship programs to demonstrate impact, maintain engagement, and align prescribing practices with health system quality and safety priorities.[15, 93]

Electronic measurement of antibiotic use typically relies on two primary data sources: **administrative claims** and **electronic health record data**. These sources provide information on healthcare encounters, including antibiotic prescriptions, diagnosis codes, testing performed and/or services provided. Extraction, validation, and reporting of antibiotic use metrics from electronic health records require dedicated support from information technology staff and data analysts to ensure accuracy, standardization and sustainability.

This appendix outlines common approaches for measuring outpatient antibiotic prescribing, summarizes their benefits and challenges, and provides examples of these measures to guide stewardship improvement.

Measures to evaluate antibiotic use

Antibiotic use measures can be broadly classified into those evaluating **quantity** of antibiotic prescribing and those measuring **quality** of antibiotic prescribing. Using a combination of these measures provides a more complete picture of prescribing practices and supports targeted stewardship interventions.

Quantitative measures track the volume of antibiotic prescribing and are often easier to calculate, making them a good first step in evaluating and comparing antibiotic prescribing at the clinician or practice level. These measures can assess the overall prescribing rate, prescribing of a specific agent, or use composite measures that assess prescribing across multiple common or high priority conditions.[72, 94, 95] Because quantitative measures are less vulnerable to diagnosis shifting, they provide a stable benchmark when tracked alongside quality measures, creating a more comprehensive picture of antibiotic prescribing practices (Appendix Table 1). However, volume measures may not adjust for patient case-mix, thus to improve comparability, clinicians should be assessed against peers in the same specialty or practice type.

Table 1. Measures tracking the *quantity* of antibiotic prescribing

APPROACH	PROS	CONS	EXAMPLE MEASURES
Total Antibiotic Prescribing	• Includes antibiotics not linked to a visit • Simple to calculate and analyze • Not vulnerable to diagnosis shifting	• Does not assess appropriateness of prescribing • Cannot adjust for visit volume or patient acuity	• Total number of antibiotics prescribed/total number of active patients
Antibiotic Prescribing Across All Visits	• Adjusts for visit volume • Simple to calculate and analyze • Not vulnerable to diagnosis shifting	• Does not assess appropriateness of prescribing • Cannot adjust for patient acuity • Excludes antibiotics prescribed outside a visit	• % of visits with an antibiotic prescription
Antibiotic Prescribing Across Multiple Conditions	• Allows grouping of common or high-priority conditions • Less vulnerable to diagnosis shifting	• Does not assess appropriateness of prescribing	• HEDIS® measure: Antibiotic Utilization for Respiratory Conditions (AXR) • % of visits for upper respiratory infections with an antibiotic prescribed

Qualitative measures assess the appropriateness of antibiotic prescribing by comparing observed antibiotic prescribing practices against treatment recommendations or guidelines. These measures can identify unnecessary prescribing, inappropriate drug selection, and excessive treatment durations.[72, 94, 95] Because they directly evaluate prescribing quality, these measures can be used to create actionable targets for stewardship interventions and allow programs to assess progress toward improvement goals.[81, 96–98] However, these measures are typically condition-specific, which provides high specificity but may limit their impact to the selected conditions (Appendix Table 2).

Table 2. Measures tracking the *quality* of antibiotic prescribing

APPROACH	PROS	CONS	EXAMPLE MEASURES
Antibiotic Prescribing for Antibiotic-Inappropriate Conditions	• Evaluates conditions where antibiotics are not indicated • More actionable than volume measures • Can target unnecessary prescribing for a single or multiple conditions	• Requires linkage of prescribing to diagnosis • Vulnerable to diagnosis shifting • Multiple diagnoses in one visit may complicate attribution	• HEDIS® Avoidance of Antibiotics for Bronchitis (AAB) • HEDIS® Appropriate Treatment for Upper Respiratory Infections (URI)
Antibiotic Prescribing for Antibiotic-Sometimes Appropriate Conditions	• Includes conditions where antibiotics are often overprescribed • High prevalence and high potential for impact • Can highlight opportunities for targeted improvement	• Requires linkage of prescribing to diagnosis • Standards for appropriateness less clear than antibiotic-inappropriate conditions	• % of acute sinusitis visits with an antibiotic prescribed

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APPROACH	PROS	CONS	EXAMPLE MEASURES
Optimal Selection for Antibiotic Prescriptions	• Evaluates concordance with treatment guidelines • Identifies overuse of broad-spectrum agents • Can target high-risk or high-cost antibiotics	• May underestimate appropriateness in special cases (e.g., drug allergy, complicated infections) • Does not address unnecessary prescribing	• % of acute sinusitis visits treated with azithromycin • Amoxicillin index (amoxicillin prescriptions/ total antibiotic prescriptions) • % of acute cystitis visits in women treated with fluoroquinolones
Excess Duration of Antibiotic Prescriptions	• Diagnosis information may not be needed • Duration may be easier to benchmark • Optimizing antibiotic duration is generally well-accepted by clinicians • Reducing excess duration can reduce	• May not reflect initiation or selection appropriateness • Specific to diagnoses with shorter recommended durations • Standards may vary by age group and condition • May be influenced by electronic health record defaults	• % of prescriptions with duration >7 days • Median duration of antibiotics by condition • % of sinusitis visits with >10 days of antibiotics prescribed
Use of Diagnostic Testing	• Ensures appropriate testing to improve diagnosis for common infections • Broader impact on patient safety, quality of care, and cost beyond antibiotic use	• Requires complex data and analysis compared to other metrics • Asymptomatic colonization (e.g., throat or urinary tract) can complicate interpretation • Few conditions provide clear targets for diagnostic stewardship	• HEDIS® Appropriate Testing for Pharyngitis (CWP) • Rate of urinalysis or culture orders overall or for patients without urinary tract infection symptoms

Conclusion

This document provides an overview of common approaches for measuring and reporting antibiotic prescribing in outpatient settings to optimize prescribing practices. Selecting measures that align with health system priorities and targeted stewardship interventions is essential for tracking process measures and outcomes. Sustained progress requires health system leadership support and commitment (specifically information technology resources) to ensure that measurement efforts are accurate, reliable, and integrated into quality improvement initiatives. Antibiotic stewardship goals are best achieved by using a complementary set of metrics that evaluate, benchmark, and monitor prescribing changes over time.

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