

The Core Elements of Outpatient Antibiotic Stewardship Programs



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Centers for Disease Control and Prevention
Jay Bhattacharya, MD, PhD, Acting Director

National Center for Emerging and Zoonotic Infectious Diseases
Christopher Braden, MD, Acting Director

Division of Healthcare Quality Promotion
Michael Bell, MD, Director

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Introduction

Antibiotic stewardship is the effort to improve the treatment of infections, ensure patient safety, and prevent the development and spread of antimicrobial resistance. The goal is to maximize the benefits of antibiotic treatment while minimizing harm to individual patients and communities. Effective stewardship implementation is especially important in outpatient settings, where most antibiotics are prescribed in the United States.¹ Research shows that up to 30% of outpatient antibiotic use is unnecessary, contributing to avoidable adverse events and higher healthcare costs.^{2, 3}

Outpatient Stewardship

The Core Elements of Outpatient Antibiotic Stewardship provide an adaptable framework to improve antibiotic prescribing based on published evidence and real-world implementation experience. First released in 2016, the *Core Elements of Outpatient Antibiotic Stewardship* emphasized the role of clinics and clinicians in optimizing antibiotic use.⁴ Since then, healthcare delivery has become increasingly consolidated within health systems, where centralized support has often led to the expansion of hospital stewardship programs.^{5, 6} Over the past decade, outpatient practice ownership by hospitals and health systems has grown substantially, and nearly two-thirds of outpatient physicians are affiliated with a health system.⁷ These systems are well positioned to support the development of effective outpatient antibiotic stewardship programs.⁸ The updated *Core Elements* guidance supports stewardship leaders in health systems and hospitals to strengthen outpatient stewardship program structure and activities to improve prescribing practices across their networks.



Advancing outpatient stewardship from a quality improvement activity to a well-supported, multicomponent program can improve **sustainability** and **scalability** while also improving the quality and consistency of patient care across settings.^{4, 9, 10} While the updated guidance places greater emphasis on strategies that health systems can use to build robust outpatient stewardship programs, it does not replace the original focus on individual clinics and clinicians. Independent practices remain a key audience, and this document provides practical strategies that can be tailored to support stewardship efforts in any outpatient setting.

The structure and scope of outpatient stewardship programs and activities will vary depending on the type of setting ([Box 1](#)), as well as size, resources, and the level of integration within a health system.^{6, 8} Activities under each Core Element are stratified into two categories:

- **Priority activities:** high impact activities that require organizational-level support for standardized, system-wide implementation.
- **Additional key activities:** activities that can be implemented at the health system level and/or tailored to individual practice settings.

The *Core Elements* guidance can be adapted and tailored to meet the needs of a wide range of outpatient settings. Some practices may face challenges in implementing the *Core Elements* because of limitations in staffing, infrastructure and other resources. Even in outpatient settings with limited stewardship capacity, improving antibiotic use remains an important priority.^{2, 3} The activities outlined **in the framework** are broad and applicable across many outpatient settings. In addition, stewardship considerations tailored to specific settings (e.g., telemedicine, dental, dialysis) are available and address challenges and strategies unique to those settings. Setting-specific considerations will be added based on updated evidence.

Box 1. Outpatient settings for The Core Elements of Outpatient Antibiotic Stewardship Programs

- **Primary care:** Such as family practice, pediatrics, and internal medicine.
- **Urgent care:** Facilities offering immediate, non-emergency care for a wide range of conditions.
- **Telemedicine:** Virtual encounters delivered through telecommunication technology, either by traditional clinics (e.g., primary care, urgent care) or direct-to-consumer companies.
- **Emergency care:** Facilities providing immediate evaluation and treatment for acute illness and injuries, including free-standing and independent facilities that are not hospital based.
- **Specialty and subspecialty care:** Clinics serving patients with specialized medical conditions such as gastroenterology, dermatology, urology, oncology, obstetrics, and otolaryngology.
- **Retail health:** Clinics in retail stores or pharmacies that provide preventive health services and treatment for routine conditions.
- **Community pharmacies:** Retail, independent, clinic-based or hospital-affiliated pharmacies.
- **Dental care:** General and specialty dental clinics.
- **Other:** Such as ambulatory surgical centers, outpatient hemodialysis centers, and outpatient parenteral antibiotic therapy (OPAT) services.

Core Elements of Outpatient Antibiotic Stewardship Programs

The updated *Core Elements* (Figure 1) are defined based on established *Core Elements* definitions from various healthcare settings, published evidence and recommended stewardship best practices.¹¹



Figure 1: Definitions of the seven Core Elements of Outpatient Antibiotic Stewardship Programs



Leadership Commitment

Support from senior leadership and administrators is critical for ensuring adequate resources, infrastructure, and collaboration to advance outpatient stewardship program efforts system-wide.^{4, 12} Visible leadership commitment sets clear expectations for clinicians and staff that delivering consistent and high-quality care—including appropriate antibiotic prescribing—is an organizational priority.¹³ Emphasizing the value of outpatient antibiotic stewardship for improving population health, reducing low-value care, optimizing reimbursement, and lowering costs associated with adverse events can further strengthen leadership engagement.¹⁴ Framing antibiotic stewardship within broader health system priorities, such as supporting patient safety and reducing healthcare-associated infections, helps position stewardship as an essential component of high-quality care and increases engagement from diverse partners across the system.^{15, 16}

Health system-supported *Leadership Commitment* priority activity:

- **Allocate dedicated time and resources** for an outpatient stewardship lead(s) to manage and advance the program—independent of inpatient activities—with adequate information technology and analytic staff support to ensure effective and sustainable implementation.^{17, 18}

Additional key *Leadership Commitment* activities:

- **Integrate outpatient antibiotic stewardship-related responsibilities** into job descriptions and annual performance evaluations of stewardship leads, service line leads and key support staff. Clearly defining these expectations reinforces accountability and ensures stewardship remains a recognized organizational priority.⁴ Leadership can also provide stewardship lead(s) with a formal reporting structure for documenting and communicating stewardship activities. Service line leads are individuals who oversee strategy, performance, and coordination of specific clinical departments or patient populations (e.g., pediatrics, urgent care, orthopedics). Service line leads play a critical role in aligning stewardship activities with the needs of their clinical areas.
- **Support ongoing training and education** opportunities for stewardship, service line, and clinic leads, such as participation in formal stewardship training courses and attendance at professional conferences. Providing structured education ensures that program leaders remain current with evolving evidence, guidelines, and best practices.^{15, 19}
- **Engage key support staff across departments and outpatient settings** through participation in stewardship committees and implementation activities. Cross-departmental engagement fosters collaboration and helps integrate stewardship priorities into existing workflows.
- **Support the development of clear, standardized, system-wide processes** that address concerns about the potential impact of antibiotic stewardship activities on patient experience and satisfaction scores.
- **Maintain transparent communication** with outpatient facilities' healthcare staff about antibiotic stewardship activities. Regular updates to outpatient clinicians and staff set expectations regarding appropriate antibiotic use and reinforce stewardship as an organizational priority.



Accountability

The antibiotic stewardship program lead (or co-leads, such as physician and pharmacist) is accountable for program development, management, and outcomes.^{13, 20} Designating a leader(s) with stewardship expertise is critical for effective program implementation. Outpatient stewardship program goals are most effective and sustainable when aligned with broader health system priorities focused on quality improvement and patient safety.^{4, 8} Goals should also address financial and operational considerations, such as performance incentives, value-based payment models, or cost avoidance strategies.²¹ For example, minimizing unnecessary diagnostic testing, preventing hospital readmissions, and reducing adverse drug events not only improve patient outcomes but also demonstrate the value of stewardship in strengthening resource utilization and lowering costs across the system.^{22, 23}

Health system-supported *Accountability* priority activity:

- **Designate a stewardship program leader or co-leaders** to develop an outpatient stewardship charter that sets system-level goals for improving antibiotic use and aligns program activities with the organization's quality, safety, and operational priorities.^{6, 8}

Additional key *Accountability* activities:

- **Define clear outpatient stewardship roles and responsibilities** for the stewardship and service line leads and support staff to ensure accountability across all levels of the program.
- **Establish measurable program targets** (e.g., reducing inappropriate prescribing for viral respiratory infections, increasing guideline-concordant prescribing for specific conditions, improvement target) to track progress.
- **Integrate antibiotic stewardship activities** into existing quality improvement initiatives and patient safety frameworks to reinforce stewardship as an essential component of high-quality care.
- **Report outpatient stewardship activities and outcomes**—including key metrics, trends and success stories—to health system and facility leadership as well as healthcare staff to maintain transparency, demonstrate impact, and sustain engagement.



Expertise

Pairing antibiotic stewardship expertise with outpatient setting-specific expertise is critical for successful stewardship program implementation. Collaboration with service line or clinic leads ensures that stewardship goals are aligned with setting-specific priorities and supports the development of implementation strategies tailored to their practice workflows.^{13, 20} As stewardship champions, service line or clinic leads can leverage their established relationships with clinicians in their departments to facilitate engagement and feedback on prescribing practices.²⁴ An effective antibiotic stewardship champion combines clinical credibility, pragmatic leadership, and strong communication skills to engage peer clinicians in sustained stewardship efforts. In addition, drawing on the expertise of key healthcare staff such as nurses, clinic managers, and information technology and analytic staff enhances program credibility, ensures data-driven decision-making, and supports effective implementation across outpatient settings.

Health system-supported *Expertise* priority activity:

- **Identify service line leads** to support stewardship program lead(s), champion antibiotic stewardship activities, and engage clinicians within their outpatient practice.

Additional key *Expertise* activities:

- **Engage key staff** with the skills and expertise needed to ensure the success of stewardship interventions ([Box 2](#)). Establish a multidisciplinary outpatient stewardship committee including service line leads and key support staff to guide planning, implementation and evaluation.²⁵ Aims of engaging all relevant stakeholders include increased acceptability, uptake, and sustainability of stewardship efforts.^{24, 26}
- **Ensure service line leads and other antibiotic stewardship champions** have access to formal stewardship training or certificate programs including training in academic detailing, an approach where trained clinicians deliver tailored, evidence-based education to peers which can be combined with feedback on prescribing at the practice or prescriber level.²⁷
- **Partner with external experts and professional societies** to connect stewardship leads and champions with peers to share best practices, support problem solving, and expand access to training opportunities that strengthen stewardship capacity.²⁰ Many state and local health departments can provide surveillance data, training, or external expertise.

Box 2. Key staff and partners for successful antibiotic stewardship implementation

Clinical

- **Physicians and advanced practice providers:** Provide input on stewardship interventions focusing on feasibility and workflow impact.
- **Pharmacists:** Deliver patient education and conduct medication reviews during hospital discharge and outpatient visits.
- **Hospital antibiotic stewardship leadership:** Contribute expertise and support outpatient efforts in hospital-associated clinics.
- **Infection prevention programs:** Integrate stewardship efforts with infection control priorities.
- **Laboratory services:** Ensure appropriate use and reporting of outpatient diagnostic tests.
- **Nursing services:** Reinforce stewardship activities and provide patient education.

Administrative and Operational

- **Administrative staff:** Coordinate logistics and provide support for stewardship activities across clinics.
- **Clinic management teams:** Implement and oversee planned stewardship interventions.
- **Communications and marketing services:** Develop patient education materials and resources to promote appropriate antibiotic use.
- **Information technology teams:** Extract and validate prescribing and outcomes data, develop stewardship and prescriber dashboards, and integrate clinical decision support into workflows.
- **Payer relations services:** Provide performance measure data related to antibiotic use by health plan.
- **Quality improvement, patient safety, and regulatory teams:** Support implementation of interventions including those focused on providing feedback to clinicians.

Patient and Family Partners

- **Patients and families:** Provide feedback on patient-centered resources to ensure stewardship efforts align with patient priorities.
- **Community representatives or patient advisory councils:** Provide structured patient input, especially around educational materials, messaging, and satisfaction concerns.



Action

Antibiotic stewardship programs can leverage evidence-based stewardship interventions to improve antibiotic prescribing and diagnostic testing ([Table 1](#)). Integrating these interventions into quality improvement initiatives that prioritize patient safety helps ensure sustainability. Published studies suggest that clinical decision support systems and audit-and-feedback are effective stewardship actions.^{28–31} Locally adapted treatment recommendations are also essential to guide prescribing and inform the development of clinical decision support systems. Recommendations based on national clinical practice guidelines establish a clear standard for defining appropriate prescribing and facilitate effective audit-and-feedback.²¹ Collaboration with information technology staff is critical for integrating stewardship activities into clinical workflows and ensuring their scalability and long-term sustainability.^{32, 33}

Health system-supported *Action* priority activity:

- **Implement clinical decision support and perform audit-and-feedback** guided by health system-specific treatment recommendations.

Additional key *Actions* to improve antibiotic use:

- **Select multifaceted, evidence-based interventions** that combine behavioral, educational, and feedback-based approaches tailored to prescribers and patients ([Table 1](#)). These combined interventions are generally more effective than single interventions.^{34, 35}
- **Develop treatment pathways** at the health system, facility or practice level that incorporate antibiotic stewardship principles to standardize the diagnosis and management of common infections.^{36, 37} These recommendations should address appropriate use of diagnostic and point-of-care testing, adapting strategies outlined in the [Core Elements of Hospital Diagnostic Excellence](#) for outpatient settings. They should focus on common infections (e.g., respiratory infections in primary and urgent care clinics) and high-priority conditions in specific settings (e.g., antibiotic prophylaxis in ambulatory surgical centers). Recommendations should specify appropriate selection, dose, and duration of antibiotic therapy when indicated. To ensure credibility and adoption, recommendations should be developed through a multidisciplinary process involving relevant clinical specialties and updated periodically to reflect emerging evidence.¹³
- **Evaluate patients with a penicillin allergy** label using a stepwise approach that may include reviewing a patient's allergy history, applying validated risk stratification tools,^{38, 39} and performing penicillin skin testing and/or a direct oral challenge in accordance with institutional protocols.^{40, 41} Inaccurate penicillin allergy labels often lead clinicians to prescribe second-line, broad-spectrum antibiotics, which can result in suboptimal antibiotic therapy, increased antimicrobial resistance, higher risk of adverse events, and greater healthcare costs.⁴¹ Systematic penicillin allergy delabeling is a key strategy to optimize antibiotic use and improve patient outcomes.⁴¹

Additional key *Actions* to improve antibiotic use: *(continued)*

- **Integrate antibiotic stewardship best practices within the electronic health records and order entry systems.** Key strategies include creating electronic order sets for common conditions, requiring documentation of clinical indication for every prescription, and generating justification alerts when orders deviate from treatment recommendations. and setting default order durations to shorter guideline-concordant courses.^{42, 43} Clinical decision support can also set default order durations to shorter guideline-concordant courses and incorporate options for active monitoring (i.e., watchful waiting) or delayed prescribing protocols for conditions which may resolve without antibiotics (e.g., acute sinusitis, acute otitis media). Include symptom relief strategies and contingency plans (e.g., when to seek reevaluation) in patient follow-up instructions to improve patient satisfaction and reduce unnecessary prescribing.⁴⁴ Review triage protocols and algorithms (e.g. for patients with respiratory infections) to ensure alignment with clinical guidelines, ensure consistency across setting types, and support stewardship implementation.
- **Optimize effectiveness of feedback interventions** to report clinician- and practice-level antibiotic use metrics.^{45, 46} Effective feedback reports should clearly display prescribing patterns over time, benchmark performance against peers, and identify outliers to highlight opportunities for improvement.⁴⁷ Setting-specific benchmarks can be considered, and including explicit, achievable targets with a clear action plan is recommended.⁴⁸ Applying user-centered design principles (e.g., simplifying data displays, tailoring content to clinician workflows, and including clinically meaningful metrics) can increase acceptability and usefulness of feedback.⁴⁹ Framing within the context of broader quality and patient safety initiatives can also normalize stewardship as part of routine clinical care.
- **Integrate antibiotic stewardship into existing quality improvement initiatives,** such as efforts to improve diagnostic testing, antiviral use, and vaccination. Partnerships with local and national public health agencies, healthcare payers, and other health systems on stewardship priorities can help advance program goals and raise the visibility of antibiotic stewardship across the organization.

Table 1. Evidence-based interventions to improve antibiotic prescribing

INTERVENTION	DESCRIPTION	CONSIDERATIONS	EXAMPLES
Audit-and-feedback	• Systematic review of antibiotic prescribing practices and feedback to clinicians on their performance compared with treatment recommendations and/or peers • Peer comparison feedback reduces overall and unnecessary prescribing and improves antibiotic selection and duration⁵⁰ • Framed as quality improvement within a supportive environment	• Measures of appropriate prescribing should be based on treatment recommendations, and could target unnecessary use, appropriate selection or duration⁴⁶ • Individual-level feedback may be more effective than team- or organization-level feedback⁵¹ • Well-designed regular feedback paired with specific advice for improvement and/or resources supporting the desired behavior change may be more impactful^{46, 51, 52} • Interactive, multimodal feedback delivered by a local champion with an established relationship with the recipient recommended⁵¹ • No benefit when feedback emphasizes antibiotic harms messaging and patient case-mix adjustment⁵⁰	• Identify high-volume or high-rate prescribers for targeted feedback⁵² • Evaluate clinician prescribing for respiratory conditions with peer comparison feedback⁴⁷
Clinical decision support systems	• Tools that provide clinicians with patient-specific information to support evidence-based decision-making	• Embedding into electronic health records or order entry systems can improve adoption⁵³ • Effectiveness depends on system design, integration in clinical workflow, and provider engagement⁵⁴ • Automated, real-time decision support more likely to influence prescribing behavior⁵³ • User-centered design and iterative refinement increase usability and impact⁵⁵ • Needs regular review to ensure recommendations align with evolving evidence and current guidelines • Sustained use and periodic updates are necessary to maintain long-term impact⁵⁶	• Electronic health record alerts or reminders for non-indicated antibiotic use • Condition-specific order sets for guideline-concordant antibiotic selection and duration

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INTERVENTION	DESCRIPTION	CONSIDERATIONS	EXAMPLES
Public commitment	• Visible pledge to prescribe antibiotics only when clinically necessary, displayed in patient care environment • Can significantly reduce inappropriate antibiotic prescribing, especially when combined with other behavioral interventions^{57, 58}	• Improves clinician prescribing behavior by aligning public commitments with professional identity, increasing accountability to adhere to best practices⁵⁹ • Low-cost, low-resource intervention, though administrative approval may be required. • May decrease requests from patients by setting clear expectations for antibiotic use	• Signed commitment posters including clinician's name and photo, screensavers, or educational materials displayed during patient encounters
Accountable justification	• Behavioral intervention that prompts clinicians to document the rationale or indication for prescribing an antibiotic when not aligned with treatment recommendations⁴² • Can significantly reduce inappropriate antibiotic prescribing for acute respiratory infections⁵⁷	• Leverages social accountability and reputational pressure to improve prescribing behavior • Improves congruence between visit documentation and coded diagnosis⁶⁰ • May increase administrative burden and reduce time for direct patient care • Impact may diminish over time if clinicians become accustomed to prompts (i.e., alert fatigue)	• Documenting justification for prescribing a non-first-line agent (e.g., azithromycin for sinusitis) • Documenting justification for prescribing an antibiotic when relevant diagnostic testing was not performed (e.g., pharyngitis without a rapid strep test)
Communication skills training	• Brief structured training to effectively communicate about appropriate antibiotic use, particularly for respiratory tract infections • Focus on techniques such as shared decision making,⁶¹ explaining why antibiotics are not needed prior to offering positive treatment alternatives⁶² • Associated with significant and sustained reductions in antibiotic prescriptions^{63, 64}	• Effective in improving antibiotic prescribing practices while maintaining patient satisfaction by addressing expectations about antibiotics • Impact depends on clinician participation, but benefits can be sustained over time⁶⁵ • Can be delivered online or through in-person workshops⁶⁶ • Time constraints may remain a barrier after training	• Require communication skills training for clinicians who commonly prescribe antibiotics for acute respiratory infections

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INTERVENTION	DESCRIPTION	CONSIDERATIONS	EXAMPLES
Delayed prescribing	• Provide patients with an antibiotic prescription to be filled only if symptoms worsen or fail to improve in a specified timeframe • Requires clear communication with patients about when to use the prescription • Results in lower rates of antibiotic use compared with immediate prescribing, without increasing complication rates or decreasing patient satisfaction⁶⁷ • May reduce re-consultation rate⁶⁸	• Applies to a limited number of acute uncomplicated respiratory tract infections that often resolve without antibiotics • Recommended in treatment guidelines for specific conditions • Success depends on clinician communication skills and patient trust • Not appropriate for conditions where antibiotics are indicated (e.g. bacterial pneumonia) or unnecessary (e.g. acute bronchitis) • May not be effective in populations with limited access to follow-up care	• Delayed antibiotic prescribing for acute otitis media in children • Delayed antibiotic prescribing for acute sinusitis
Performance incentives	• Financial or non-financial rewards • Encourage clinicians to reduce unnecessary antibiotic use and follow treatment recommendations	• Pay-for-performance, bonuses, and penalties may improve short-term antibiotic use, though magnitude and sustainability of these effects uncertain^{69–71} • Can be integrated into broader quality improvement initiatives to advance value-based care	• Clinician compensation bonus linked to quality improvement goals or quality measure benchmarks (e.g., HEDIS antibiotic use measures) • Restrict role of patient satisfaction scores in determining clinician reimbursement for upper respiratory infection visits



Tracking

Monitoring antibiotic prescribing and related outcomes is a central activity of stewardship programs.^{4, 15} Tracking enables programs to identify opportunities for improvement, evaluate the effectiveness of interventions, and measure progress toward program goals.²⁹ It also promotes accountability and provides feedback that can drive changes in prescribing practices. An effective measurement strategy is informed by an assessment of current outpatient prescribing data, including prescribing rates, patterns and variability across settings. Input from service line leads is essential, as they can help identify setting-specific priorities and ensure that data collection is relevant and actionable.

Health system-supported *Tracking* priority activity:

- **Measure antibiotic use**, including both the quantity and quality of prescribing ([Appendix A](#)), using electronic data at the clinician, practice, and health system levels to evaluate adherence to treatment recommendations.^{29, 72}

Additional key *Tracking* activities:

- **Dedicate information technology resources** to define standardized data elements, validate antibiotic use metrics, and automate monitoring of antibiotic prescribing.^{15, 32} Integrating these activities into the health system's quality improvement framework can strengthen sustainability, support long-term resource investment and ensure tracking is actionable for clinicians and leadership.
- **Monitor overall and diagnosis-specific antibiotic prescribing rates** ([Appendix A](#)). Using a combination of **condition-specific** and **composite** metrics can help account for the potential impact of diagnostic shifting, the practice of assigning diagnostic codes that justify antibiotic prescribing, which can mask inappropriate prescribing and compromise the accuracy of stewardship metrics.⁷³ It is also important to track **balancing measures** to reassure prescribers that stewardship efforts do not result in unintended consequences (e.g., follow-up calls or visits, hospital admission).⁷⁴ Reporting **quality indicators**, such as the use of delayed prescribing strategies or adjustments to antibiotic courses after culture results,^{13, 75} can support clinician feedback and practice improvement.¹⁷ **Outcome measures** (e.g., rates of *Clostridioides difficile* infection, antimicrobial-resistant infections, and adverse drug events) are also valuable, though they may be difficult to capture reliably in outpatient settings, particularly by individual health systems or practices.
- **Compare antibiotic use metrics** with both internal and external benchmarks when available.⁷⁶ Benchmarks can be integrated into stewardship dashboards, clinician feedback, and leadership reports. Identifying outlier practices (groups of clinicians) or individual clinicians within health systems and comparing with peer practices and clinicians (i.e. similar case-mix) to highlight opportunities for improvement. Setting or specialty-specific benchmarking also strengthens audit-and-feedback interventions. The National Committee for Quality Assurance (NCQA) has developed HEDIS® (Healthcare Effectiveness Data and Information Set) antibiotic use measures that assess health plan performance on key quality-of-care dimensions.^{77, 78} These measures are linked to value-based reimbursement and payer incentives and can be leveraged to support stewardship activities.⁷⁹ Stratifying antibiotic use metrics by patient and clinician characteristics and setting type can help identify prescribing variability and inform targeted interventions.^{80, 81}



Reporting

Antibiotic stewardship programs should regularly share data on prescribing and related outcomes with health system leadership, service line and clinic leaders, and other relevant partners.^{6, 8} Reporting is an essential component of data-driven stewardship and continuous quality improvement, ensuring that measurement leads to meaningful action. Audit-and-feedback interventions are a particularly effective reporting strategy, promoting accountability and adherence to health system-specific treatment recommendations.³¹

Health system-supported *Reporting* priority activity:

- **Report antibiotic use metrics electronically** through a stewardship dashboard to evaluate antibiotic prescribing patterns and support effective audit-and-feedback for clinicians and practices.

Additional key *Reporting* activities:

- **Share antibiotic prescribing reports** that summarize key antibiotic use metrics and highlight recent stewardship program activities, including progress toward established program goals.⁸² These reports can be distributed to health system leadership, outpatient practice and service line leads, infection prevention and quality improvement staff, and other relevant partners to promote transparency, accountability, and shared ownership of stewardship efforts. Reports should communicate program achievements and challenges, and frame antibiotic use within the context of broader health system priorities.⁸²
- **Use an electronic clinician-facing dashboard** that reports clinician and practice antibiotic use and outcome metrics. Incorporating antibiotic use metrics into a prescriber dashboard alongside other key outpatient safety and quality measures (e.g., diabetes management, opioid prescribing, vaccination) may further increase clinician engagement.⁸³ When antibiotic prescribing data are presented alongside other high-priority outpatient metrics, it contextualizes stewardship as part of a broader commitment to quality and safety.^{84, 85}



Education

Education is a key component of antibiotic stewardship but should not be implemented as a standalone intervention.¹⁵ Knowledge gaps among clinicians are rarely the only barrier to appropriate prescribing, and education is most effective when paired with active stewardship strategies such as audit-and-feedback.⁸⁶ Educational efforts should engage all healthcare professionals to support behavior change and address barriers to inappropriate prescribing.⁸⁷ Patient- and caregiver-focused educational materials can be tailored to improve health literacy about antibiotic use and help reduce demand for unnecessary antibiotics.

Health system-supported *Education* priority activity:

- **Provide training on academic detailing** for service line leads or stewardship champions to support effective delivery of evidence-based antibiotic prescribing education tailored to clinicians' practice needs.^{27, 88}

Additional key *Education* activities for healthcare professionals, patients and caregivers:

- **Use active educational techniques**, such as interactive workshops and case-based learning, which are more effective than passive methods for influencing prescribing behavior.⁸⁹ Highlighting educational webinars or meetings that provide continuing education or maintenance-of-certification credits can further promote engagement in stewardship education. Embedding stewardship principles into postgraduate training curricula and incorporating them into competency assessments within clinical training programs can enhance the effectiveness of stewardship initiatives.⁹⁰
- **Tailor educational activities** to specific clinician groups by aligning content with competencies relevant to their roles and practice settings.¹⁵ This can include training on guideline-concordant prescribing for common conditions, effective patient communication, and the use of clinical decision support tools. Education should also address socio-behavioral drivers of inappropriate prescribing, such as concerns about patient satisfaction.^{42, 58}
- **Engage medical office staff** who interact with patients, such as nursing aides and administrative assistants, in stewardship activities to ensure consistent communication on appropriate antibiotic use.
- **Provide patient educational resources** on appropriate antibiotic use, potential adverse events and antimicrobial resistance during outpatient encounters.^{91, 92} Using a variety of multimedia approaches, such as brochures, waiting room videos, QR codes, emails, patient portals, and text messages, can help strengthen patient engagement. Educational messages can be tailored to the patient population, health literacy level, and care setting. Healthcare organizations can also leverage resources developed by national or local public health agencies and professional societies.
- **Participate in the U.S. Antibiotic Awareness Week (USAAW)**, an annual observance that raises awareness about antimicrobial resistance and the importance of appropriate antibiotic prescribing and use for healthcare professionals, patients, and communities. Clinics and facilities can also share educational resources and promote stewardship messages during community events.

Conclusion & Future Directions

The updated *Core Elements of Outpatient Antibiotic Stewardship Programs* provides health systems and practices with a flexible framework that can be adapted across diverse outpatient settings. Sustained progress depends on leadership commitment, clear accountability and active engagement of stewardship champions and service line leads. To maximize effectiveness and impact, programs should align antibiotic stewardship program goals with broader organizational priorities. Access to information technology and analytic resources is critical to support data-driven implementation. Robust tracking and reporting of antibiotic use are essential for the success of stewardship efforts, enabling the program to identify areas for improvement, evaluate impact of interventions, monitor progress toward health-system goals, and deliver actionable feedback to clinicians.

Prioritizing interventions based on feasibility, acceptability, resource requirements, and potential barriers to adoption strengthens program effectiveness. Using an assessment tool to evaluate current stewardship capacity can provide a structured way to identify improvement opportunities and guide program development ([Appendix B](#)). For smaller programs or independent clinics with limited stewardship capacity and infrastructure, beginning with high-impact activities, such as establishing feedback reports or implementing treatment guidelines for common conditions, and then expanding over time as capacity grows, can facilitate progress ([Box 3](#)). Incremental implementation allows programs to build on early successes, ensuring that stewardship activities are feasible and tailored to the needs of each practice.

As outpatient stewardship programs continue to mature, their integration into system-wide quality and safety initiatives will be critical for achieving long-term sustainability and advancing the shared objective of providing consistent, high-quality patient care across outpatient settings. Sustained commitment at all levels of the health system is needed for establishing outpatient antibiotic stewardship as a standard of care. Although the evidence base for outpatient stewardship interventions has grown, there remains a critical need for comprehensive outpatient stewardship models that can be implemented and sustained at an organizational or health system level.¹⁰

Box 3. Antibiotic stewardship activities for outpatient settings with limited stewardship infrastructure

Outpatient settings with limited antibiotic stewardship capacity and infrastructure—including independent clinics and small stewardship programs—can make meaningful progress in improving antibiotic prescribing practices using a multicomponent approach to improve antibiotic use. The following Core Elements-based strategies offer a practical and feasible pathway for integrating stewardship into outpatient care.

Leadership Commitment

Adopt and communicate a policy that antibiotics will be prescribed only when clinically indicated and aligned with treatment guidelines.

Accountability

Designate a clinic champion responsible for overseeing antibiotic prescribing improvement activities.

Expertise

Identify an external stewardship expert (e.g., public health partner, academic collaborator, or regional stewardship collaborative member) who can provide periodic consultation on stewardship activities.

Action

Identify one or more high-priority conditions for intervention. Implement a specific action or policy for the selected condition and evaluate changes in prescribing over time. High-priority conditions are commonly encountered outpatient diagnoses where prescribing frequently deviates from clinical recommendations, including unnecessary antibiotic use or inappropriate selection of agent, dose, or duration. Examples include:

- **Conditions where unnecessary antibiotics are commonly used**
(e.g., acute bronchitis, upper respiratory infection, viral pharyngitis)
- **Conditions where overdiagnosis is common**
(e.g., streptococcal pharyngitis without confirmatory testing)
- **Conditions where inappropriate antibiotic selection, dosing, or duration may occur**
(e.g., azithromycin prescribed for acute bacterial sinusitis)
- **Conditions where watchful waiting or delayed prescribing may be appropriate**
(e.g., acute otitis media, acute uncomplicated sinusitis)
- **Conditions where antibiotics are underused**
(e.g., sexually transmitted infections)

Tracking

Select at least one metric to monitor the quantity or quality of antibiotic prescribing. Use a metric that aligns with the high-priority condition(s) chosen for stewardship intervention, if possible.

Reporting

Share reports summarizing antibiotic prescribing at the clinic and clinician level for the selected metric and highlight ongoing stewardship activities at regular intervals.

Education

Support antibiotic stewardship continuing education relevant to the clinicians' roles and practice settings. Examples include education on guideline-concordant prescribing for common outpatient conditions or strategies for effective patient communication when antibiotics are not indicated.

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Kevin L. Schwartz, MD, MSc, Public Health Ontario, Toronto, Canada

Ryan W. Stevens, PharmD, Mayo Clinic, Rochester, Minnesota

Michael P. Veve, PharmD, MPH, Henry Ford Health, Detroit, Michigan

Jeffrey S. Gerber, MD, PhD, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

Sara E. Cosgrove, MD, Johns Hopkins University, Baltimore, Maryland

Rachel M. Zetts, MPH, The Pew Charitable Trusts, Washington, DC.

David Y. Hyun, MD, The Pew Charitable Trusts, Washington, DC

Appendix A: Measurement and Evaluation of Antibiotic Use

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

CONTINUED ON NEXT PAGE ►

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.

Appendix B: Outpatient Antibiotic Stewardship Assessment Tool

Use this checklist to identify and monitor outpatient antibiotic stewardship activities.

LEADERSHIP COMMITMENT

1. Do you have dedicated human, financial or information technology resources to improve antibiotic prescribing in outpatient settings? ☐ Yes ☐ No

If Yes, indicate which aspects of *leadership commitment* are in place. (Select all that apply.)

- ☐ Dedicated time and financial resources for an outpatient stewardship lead who is accountable for the program management and outcomes
- ☐ Information technology or analytic support to sustain outpatient stewardship efforts
- ☐ Antibiotic stewardship program and activities clearly defined within broader healthcare system priorities
- ☐ Antibiotic stewardship-related duties formally included in job descriptions or annual performance reviews for leads and key support staff
- ☐ A defined reporting structure for the stewardship leads to communicate program activities and outcomes
- ☐ Regular communication with outpatient clinicians and staff about antibiotic stewardship activities to set expectations for appropriate antibiotic use
- ☐ Support for training and education opportunities for stewardship leads and service line leads

ACCOUNTABILITY

2. Do you have a designated leader or co-leaders responsible for outpatient antibiotic stewardship program development, management and outcomes? ☐ Yes ☐ No

If Yes, indicate which aspects of *accountability* are in place. (Select all that apply.)

- ☐ An outpatient stewardship charter that defines health system-level goals and aligns activities with organizational quality, safety, or operational priorities
- ☐ Clearly defined roles and responsibilities for stewardship leads, service line leads, and support staff
- ☐ Measurable program targets established to track progress (e.g., reducing inappropriate prescribing, increasing guideline-concordant care)
- ☐ Integration of stewardship activities into existing quality improvement activities or patient safety frameworks
- ☐ Regularly share outpatient stewardship activities and key success stories with health system and facility leadership, clinicians, and healthcare staff

EXPERTISE

3. Does your outpatient stewardship program pair antibiotic stewardship expertise with outpatient setting-specific expertise? ☐ Yes ☐ No

If Yes, indicate which aspects of *expertise* are in place. (Select all that apply.)

- ☐ Service line or clinic leads identified to champion stewardship activities and engage clinicians within their outpatient practice
- ☐ Key support staff (e.g., nurses, infection prevention specialists, information technology/analytic staff) engaged to ensure effective, data-driven implementation of interventions
- ☐ A multidisciplinary outpatient antibiotic stewardship committee that includes outpatient service line or clinic leads and key support staff to guide planning, implementation, and evaluation
- ☐ Access to training or certificate programs for stewardship leads or champions (e.g., academic detailing, formal stewardship courses, professional conferences)
- ☐ Collaboration with external experts, professional societies, or public health agencies to strengthen stewardship capacity

ACTION

4. Have you implemented at least one intervention to improve antibiotic use in outpatient settings?

☐ Yes ☐ No

If Yes, indicate which stewardship *action* has been taken. (Select all that apply.)

- ☐ Adapted treatment recommendations for common outpatient conditions that may result in an antibiotic prescription
- ☐ Clinical decision support tools within the electronic health record system to guide diagnostic and therapeutic choices
- ☐ Audit-and-feedback interventions at the practice or prescriber level to improve adherence to treatment recommendations
- ☐ Protocols for active monitoring or delayed prescribing practices for conditions likely to resolve without antibiotics (e.g., acute otitis media in children, acute uncomplicated sinusitis)
- ☐ Performance incentives for clinicians related to improving antibiotic prescribing
- ☐ Integration of stewardship best practices into call center or nursing triage protocols to reduce unnecessary visits and prescriptions
- ☐ Clinical protocols to systematically de-label inaccurate antibiotic allergies among patients through a review of allergy history, penicillin allergy testing, and/or a referral to an allergist
- ☐ Communications skills training for clinicians to support effective discussion about antibiotic use
- ☐ Clinician or organizational commitments displayed in patient care settings (e.g., posters, screensavers, patient-facing materials)
- ☐ Partnerships with public health agencies, payers, or peer health systems to support stewardship priorities and share best practices

TRACKING

5. Do you monitor outpatient antibiotic prescribing, the impact of stewardship interventions or other important outcomes? ☐ Yes ☐ No

If Yes, indicate which *tracking* activities are performed. (Select all that apply.)

- ☐ Measurement of antibiotic use to assess either quantity (e.g., volume, rate per visit) or quality (e.g., antibiotic selection, unnecessary use) of prescribing
- ☐ Electronic tracking of antibiotic prescribing at the clinician, practice, or health system level
- ☐ Use of information technology resources to define standardized data elements, validate metrics, or automate tracking
- ☐ Track balancing measures (e.g., follow-up visits, hospital admissions), quality indicators (e.g., delayed prescribing strategies, culture-based adjustments) or outcome measures (e.g., *Clostridioides difficile* infections, antimicrobial-resistant infections, or adverse drug events)
- ☐ Stratification of antibiotic use metrics by patient or clinician characteristics to identify variability in prescribing practices and inform targeted interventions
- ☐ Comparison of antibiotic use metrics to internal or external benchmarks (e.g., HEDIS® antibiotic use measures)

REPORTING

6. Do you regularly report data on antibiotic prescribing or outcomes to clinicians, leadership, or other partners? ☐ Yes ☐ No

If Yes, indicate which **reporting** activities are performed. (Select all that apply.)

- ☐ Electronic reporting of antibiotic use metrics through a stewardship dashboard to evaluate prescribing patterns by clinician, practice, or setting
- ☐ Distribution of audit-and-feedback reports that include clinician prescribing trends over time, peer benchmarking or identification of outliers
- ☐ Reports summarizing antibiotic use metrics and stewardship program activities shared with health system leadership, outpatient practice/service line leads, infection prevention staff, quality improvement staff, or other relevant partners
- ☐ Integration of antibiotic use metrics into broader prescriber dashboards or quality/safety initiatives (e.g., alongside diabetes management, opioid prescribing, or vaccination measures)

EDUCATION

7. Does your outpatient stewardship program provide education to healthcare professionals, patients or caregivers on optimal antibiotic use, antibiotic-related adverse events, or antimicrobial resistance? ☐ Yes ☐ No

If Yes, indicate which **education** activities are performed. (Select all that apply.)

- ☐ Training on academic detailing strategies for service line leads or champions to deliver peer education
- ☐ Educational activities offering continuing education credits, maintenance of board certification credits, or incorporated into competency assessments/postgraduate curricula
- ☐ Tailored clinician education on effective patient communication, use of clinical decision support tools, or addressing behavioral drivers of inappropriate prescribing
- ☐ Patient or caregiver educational resources provided during outpatient encounters
- ☐ Participation in U.S. Antibiotic Awareness Week (USAAW) or similar campaigns to promote community-wide awareness of stewardship priorities

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