Antimicrobial Stewardship Programs

A Toolkit for Settings Using and Prescribing Antimicrobials

April 2025

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Executive Summary

The Antibiotic Stewardship Toolkit presented herein offers a framework for healthcare facilities to optimize the use of antibiotics, combat antimicrobial resistance, and improve patient outcomes across diverse healthcare settings. This toolkit integrates evidence-based strategies, practical tools, and customizable resources to support healthcare professionals in implementing effective antibiotic stewardship programs based on the Centers for Disease Control and Prevention (CDC) Core Elements for Antibiotic Stewardship. Concluding the document are resources for veterinary settings.

KEY COMPONENTS:

1. **Leadership Commitment:** Strong leadership engagement and support are paramount for the successful implementation and sustainability of antibiotic stewardship initiatives. Leadership commitment fosters a culture of accountability, resource allocation, and interdisciplinary collaboration necessary for achieving stewardship goals. Practical guidance is offered for allocating resources effectively to support antibiotic stewardship initiatives within healthcare organizations, ensuring long-term sustainability and scalability.

2. **Accountability:** Designating individuals with accountability for antibiotic stewardship activities, including a designated leader and multidisciplinary team members with expertise in infectious diseases, pharmacy, microbiology, and quality improvement, ensures comprehensive oversight and coordination of stewardship efforts. Fostering collaboration and communication among healthcare professionals across various disciplines, including physicians, pharmacists, nurses, infection preventionists, and laboratory personnel, promotes a team-based approach to antibiotic stewardship, facilitates shared decision-making, and improves patient care outcomes. Strategies for fostering interdisciplinary collaboration and communication are emphasized, recognizing the integral role of teamwork in achieving optimal antibiotic use and patient outcomes.

3. **Expertise:** Ensuring access to expertise in antimicrobial management, including pharmacists and infectious diseases specialists, enhances appropriate prescribing and fosters collaboration among healthcare professionals and patients. Providing education and training to antimicrobial stewardship leaders on stewardship principles, antimicrobial resistance, and optimal antibiotic use enhances awareness, knowledge, and skills necessary for effective antibiotic stewardship practices. Guidance on developing expertise will be provided.

4. **Action:** Implementing strategies to improve antibiotic prescribing practices, such as the use of facility specific evidence-based guidelines and antimicrobial stewardship interventions like prospective audit and feedback enhances the appropriateness of antibiotic therapy, reduces unnecessary antibiotic exposure, and minimizes the emergence of antimicrobial resistance and preventable antibiotic associated adverse events. User-friendly tools and resources will be outlined that promote action.

5. **Tracking and Reporting:** Establishing systems for monitoring antibiotic prescribing practices, tracking antimicrobial resistance patterns, and reporting antibiotic use and resistance data to relevant stakeholders enables continuous surveillance, evaluation, and feedback, facilitating targeted interventions and quality improvement initiatives. Metrics for evaluating antibiotic prescribing practices are outlined, along with strategies for collecting and analyzing data to monitor adherence to stewardship principles. Regular feedback mechanisms are established to provide healthcare providers with actionable insights for continuous improvement.

6. **Education and Training:** Providing education and training on antibiotic stewardship principles, antimicrobial resistance, and optimal antibiotic use to healthcare professionals, patients, and caregivers enhances awareness, knowledge, and skills necessary for effective antibiotic stewardship practices and stewardship team collaboration. Educational materials are included emphasizing the principles of antibiotic stewardship and the importance of individual and collective responsibility in ensuring appropriate antibiotic use.

While this guide offers valuable stewardship resources, it's not exhaustive. We urge facilities to customize toolkit components. Stewardship coordinators should assess what fits best, tailor plans to their facility's needs, and align strategies with existing practices. There is no "one size fits all" strategy for stewardship programs, but by implementing some of the principles included in this Toolkit, in alignment with the CDC Core Elements for Antibiotic Stewardship, healthcare facilities can strengthen their commitment to responsible antibiotic use, mitigate the spread of antimicrobial resistance, and safeguard the effectiveness of antibiotics for future generations.

Leadership Commitment

OVERVIEW:

The CDC Core Element for leadership commitment emphasizes the critical role of strong leadership in driving effective antimicrobial stewardship programs across healthcare settings. It highlights the need for engagement and support from leadership at all levels, including hospital administrators, nursing home directors, and outpatient practice managers, to prioritize stewardship efforts, allocate resources, and foster a culture of accountability and collaboration among healthcare staff. Strong leadership commitment is essential for the successful implementation and sustainability of antimicrobial stewardship initiatives, ensuring that resources are effectively utilized, staff are engaged, and patient outcomes are optimized through responsible antibiotic use.

Hospitals:

In hospitals, leadership commitment involves engaging hospital administrators, department heads, and clinical leaders to champion stewardship efforts, allocate resources, and promote a culture of accountability and collaboration among healthcare staff. **Leadership should dedicate the necessary human, financial, and information technology resources** and the antimicrobial stewardship leaders should have **stewardship responsibilities in their contract, job description, or performance review** to sustain staffing resources needed to operate the program effectively.

Leadership Tools for the Hospital Setting:

Tool	Resource
Leadership Support Statement Templates	• Template from Nebraska that can be adapted and used for administrators to sign a statement of support • Example from Kansas of a statement of support from leadership
Institutional Policy Templates	• Example of a policy on antimicrobial stewardship that can be adapted from Nebraska • Template from Kansas
Commitment Posters	• Poster template from AHRQ of Provider Commitment to use antibiotics appropriately • Template from CDC where company logo can be printed on poster

Making the Case	• Slides and facilitator guide from AHRQ on making a case to administrators that antimicrobial stewardship is an important patient safety issue in acute care hospitals • Example proposal from Kansas of an antibiotic stewardship business plan • Example of a presentation from Kansas that can be used to justify an antimicrobial stewardship program

Nursing homes:

Similarly, in nursing homes, leadership commitment entails the active involvement of facility administrators, medical directors, and nursing leadership to prioritize antibiotic stewardship, provide necessary support and resources, and foster a culture of quality improvement and resident safety. Written statements of support of improving antibiotic use, including stewardship tasks in position descriptions, communicating with staff about expectations about use of antibiotic use, and creating a culture of safety are all examples of commitment.

Leadership Tools for Nursing Homes:

Tool	Resource
Leadership Support Statement	• Descriptions of roles in CDC's Core Elements for Antimicrobial Stewardship for staff and administrators of long-term care facilities • CDC poster on creating a culture of improving antimicrobial use in nursing homes • Template that can be adapted for administrators to use when endorsing support
Institutional Policy Templates	• Policy template from AHRQ • Example of a policy for antimicrobial stewardship in long-term care facility for adaptation
Commitment Posters	• AHRQ poster template of Provider Promise about Antibiotics with directions for adaptation • CDC template of a provider commitment letter specific to antibiotic use in nursing homes • CDC example of a provider commitment poster adaptable to multiple settings

Making the Case	[Slides and facilitator guide from AHRQ on making the case to administrators that antimicrobial stewardship is an important patient safety issue in nursing homes](#) [AHRQ guide on partnering with a senior leadership executive on implementing antimicrobial stewardship](#) [AHRQ guide on changing the system culture to improve antibiotic safety in a nursing home](#)

Outpatient settings:

In outpatient settings, commitment and accountability is demonstrated by the engagement of practice managers, physicians, and other healthcare providers in promoting appropriate antibiotic prescribing, implementing evidence-based guidelines, and integrating stewardship principles into routine clinical practice. Outpatient clinics and health care system leaders can commit by identifying a single leader to direct antibiotic stewardship activities within a facility, include related duties in position descriptions or job evaluation criteria, and communicate with staff members to set patient expectations. The intended audiences for this guidance include clinicians (e.g., physicians, dentists, nurse practitioners, and physician assistants) and clinic leaders in primary care, medical and surgical specialties, emergency departments, retail health and urgent care settings, and dentistry, as well as community pharmacists, other health care professionals, hospital clinics, outpatient facilities, and health care systems involved in outpatient care.

Leadership and Accountability Tools for Ambulatory Settings:

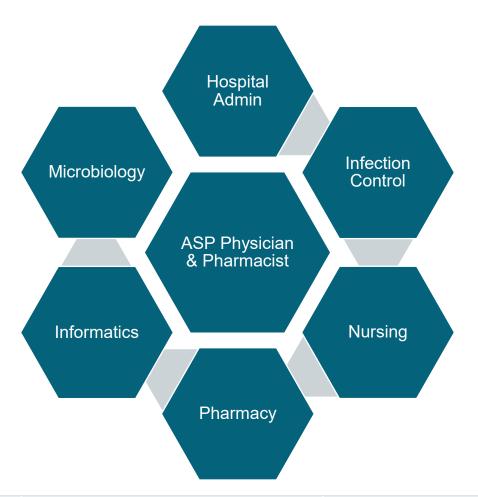| Tool	Resource
Commitment Posters	[AHRQ poster template for prescriber commitment with instructions for adaption](#) [AHRQ poster template for prescriber commitment in Spanish with instructions for adaption](#) [CDC example of a provider commitment poster](#)
Making the Case	[AHRQ guide on convincing prescribers of the importance of improving antibiotic prescribing](#) [AHRQ Slides on implementing antibiotic stewardship into ambulatory care practice](#) [Introduction to Antibiotic Stewardship in the Outpatient Setting - recording from Nebraska](#)

Accountability

OVERVIEW:

The Accountability CDC Core Element for antimicrobial stewardship focuses on establishing clear roles, responsibilities, and processes to ensure the effective implementation of antimicrobial stewardship programs. Across settings, it generally includes designating leadership responsibilities by assigning specific individuals or teams with leadership responsibilities for overseeing and coordinating antimicrobial stewardship activities within healthcare facilities. Accountability should be created by developing clear structures and mechanisms for holding individuals and teams accountable for their roles in antimicrobial stewardship, including regular reporting and performance evaluations. Lastly, education and training should be provided to those who lead the stewardship program. Providing education and training to leaders ensures they understand their roles in antimicrobial stewardship and have the necessary knowledge and skills to implement stewardship practices effectively.

Hospitals:

The hospital's antibiotic stewardship program requires designated leaders with **priority to be co-led by a physician and pharmacist**, accountable for management and outcomes. Leaders of stewardship programs should be qualified through training in infectious diseases and/or antibiotic stewardship. While non-physicians may lead, a designated physician should provide support and serve as a point of contact or as the medical director for the program, as prescribing is ultimately under the direction of the medical staff. Multidisciplinary teams can help increase the effectiveness and oversight of the team. Core members often include those with clinical, pharmaceutical, diagnostic, and technical expertise (infection preventionists, information technology, nursing leaders, microbiologists). Setting clear roles and expectations amongst leaders and team members are essential.

Team Member	Activities this person is accountable for	How? (which core elements, define in more detail)	Resources/ Needs
Medical Director Leader	• Set prescribing standards • Responsible for program management and outcomes • Develop treatment guidelines	Accountability, Reporting, Education, Action	ASP training, dedicated time
Pharmacist Leader	• Review antibiotic utilization • Audit and feedback, pharmacy interventions • Develop treatment guidelines	Pharmacy Expertise, Action, Tracking	ASP training, dedicated time
Infection Preventionist	• Surveillance, education • Day to day data collection, review of infection data (CDI rates)	Tracking, Reporting	
Nurse leader	• Set expectations for standards of practice (assessing, monitoring, communicating changes in patient conditions)	Action, Education	
Microbiologist	• Antibiogram creation • Diagnostic stewardship	Reporting, Action	
Information Technology	• Integrate protocols into existing workflows • Implement AUR reporting	Tracking, Reporting	
Executive ASP "Champion"	• Support Training • Resource allocation	Leadership Commitment	

Tool	Resource
Building the Team	• Identifying key stakeholders template from Kansas • Stakeholder engagement template from Kansas • Assigning members and duties template from Kansas • Resource identification template from Kansas • Committee oversight template from Kansas • AHRQ resources on improving communication and teamwork • AHRQ slides on sustaining stewardship activity

Nursing Homes:

Nursing homes should appoint individuals responsible for antibiotic stewardship activities, with the support of facility leadership. This includes empowering the medical director to set antibiotic prescribing standards and oversee adherence, the director of nursing to establish practice standards for frontline nursing staff and engaging the consultant pharmacist in quality assurance activities. Nursing home antibiotic stewardship leads should collaborate with key partners such as the infection prevention program coordinator, consultant laboratory, and state/local health departments. These partners provide expertise, data, and support to inform and enhance antibiotic stewardship efforts. At a minimum the stewardship team should include an infection preventionist, medical director, and pharmacy leader.

Accountability Tools for Nursing Homes:

Tool	Resource
Building the Team	• AHRQ guide to building a team in a nursing home • AHRQ template for assigning roles and responsibilities in nursing home • AHRQ template for planning agenda • AHRQ template for monitoring agenda

Pharmacy Expertise

OVERVIEW:

Antimicrobial stewardship programs and leaders should establish antibiotic expertise within their facilities or have access to expertise to implement antibiotic stewardship activities. This can involve partnering with infectious disease consultants and consultant pharmacists who have received specialized training in antibiotic stewardship or offering certificate courses to program leaders. It's recommended that the antibiotic stewardship physician and/or pharmacist leaders have completed infectious diseases specialty training or a certificate program to ensure expertise and effectiveness in stewardship efforts.

Hospitals:

Hospitals must ensure that designated antibiotic stewardship leaders possess the necessary qualifications, including education, training, experience, or certification in antibiotic stewardship. Effective hospital antibiotic stewardship programs typically involve strong engagement of pharmacists and physicians with specialized training and expertise in antibiotic stewardship. Priorities include ensuring there is a documented pharmacy leader qualified through training. Some hospitals have found it helpful to seek off-site support by enrolling in multi-hospital collaboratives, placing requirements into contractual responsibilities of external services, or funding remote consultation with experts in antimicrobial stewardship. Note that even when remote expertise is used, it is important to have a leader of the program who is on staff at the hospital.

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Expertise Tools for Hospitals:

Tool	Resource
Regulatory Requirement	• Notice from the Centers of Medicad and Medicare Services (CMS) on Conditions of Participation related to Antimicrobial Stewardship

Training programs	• Centers for Diseases Control and Prevention
	   o 10 hours of free CE
	• Society of Infectious Diseases Pharmacists (SIDP): Antimicrobial Stewardship Certificate
	   o Most extensive certificate training program
	   o $600 per healthcare professional
	• Society of Healthcare Epidemiology of America (SHEA): Primer on Infection Control, Hospital Epidemiology and Antimicrobial Stewardship
	   o Designed for physicians
	   o $399 for non-members
	• Infectious Diseases Society of America (IDSA)
	   o Designed for physicians
	   o $300 for non-members
	• Making A Difference in Infectious Diseases (MAD-ID)
	   o Offers basic and advanced programs
	   o Course cost of $500/physician or pharmacist

CDC Resources	• Useful material from CDC related to improving antibiotic use

Nursing Homes:

Nursing homes should ensure access to individuals with antibiotic expertise. Examples include partnering with consultant pharmacists who have completed specialized training programs, collaborating with hospital antibiotic stewardship program leads, and developing relationships with infectious disease consultants in the community.

Drug Expertise Tools for Nursing Homes:

Tool	Resource
Regulatory Requirement	• CMS long-term care facility antimicrobial stewardship regulations
Training Programs	• All of the tools mentioned in the hospital pharmacy expertise section are applicable to long-term care. • American Society of Consultant Pharmacists (ASCP) resources o Training Material and toolkit specific to long-term care facilities
CDC Resources	• Educational Material from CDC on Antibiotic Use

Action

OVERVIEW:

Healthcare settings can implement policies and interventions to improve antibiotic prescribing practices, aiming for measurable outcomes. Clinicians should use evidence-based diagnostic criteria and treatment recommendations, consider delayed prescribing or watchful waiting when appropriate, and undergo communication skills training. Hospitals and nursing homes should implement interventions including standardizing practices for suspected infections, conducting antibiotic reviews, and addressing clinical situations driving inappropriate antibiotic use. Implementing interventions such as prospective audit and feedback or preauthorization, guided by facility-specific treatment guidelines, is crucial for improving antibiotic use. There is no "one size fits all" set of strategies or policies for Action, and each institution should tailor interventions to what is both a priority and feasible to their local needs as each facility differs greatly in types of prescribers, culture, patient population, resistance patterns, and resources. Initial focus should be on obvious problems that are likely to lead to early and measurable successes. These initiatives should be designed to improve patient care and to promote positive relationships with influential clinicians. The framework below can be used to guide stewardship strategies.

Approach to Implementing Action

Step 1: Perform a needs assessment

- Identify most common infections and which antibiotics are prescribed (and potentially misused), you can target guideline, policy, and education efforts

Step 2: Brainstorm

- Summarize the problems, examine solutions, and describe capacity and resources to address
  - It may be helpful to rank these strategies as high, medium, low yield/priority

Step 3: Formalize plan, execute/implement initiative

- Example: develop CAP guideline, provide education, create order set, perform audit and feedback, track adherence to guideline/monitor effectiveness of interventions)

Hospitals:

Antibiotic stewardship programs should implement interventions, such as **prospective audit/feedback or preauthorization, and facility or region-specific treatment guidelines for commonly encountered infections (community acquired pneumonia, urinary tract infections, and skin/soft tissue infections)** to improve antibiotic use. Priorities should include having a formal policy/procedure for review of antibiotics for either or both methods (preauthorization or prospective audit and feedback) and the creation/utilization of local guidelines. Guidelines streamline and standardize antibiotic decision making and can be used as the framework when developing other interventions including clinical decision support, order sets, prospective audit and feedback interactions, and assessing adherence to local criteria.
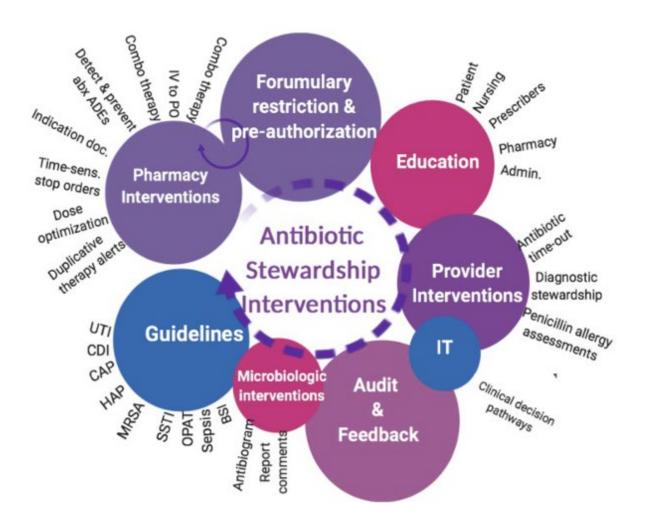

Image from:
http://www.kdheks.gov/epi/download/KS_ABX_Stewardship_CAHs_Toolkit.pdf

Action Tools for Hospitals:

Tool	Resource
Techniques, including tools for performing Prospective Audit and Feedback	- Nebraska ASAP Resources - Template for a database that can be used to track interventions - Sample recommendation template - Daily antibiotic checklist - AHRQ 4 Moments of Antibiotic Decision-Making - Four moments: Posters and screensaver - Antibiotic time out tool - Team antibiotic review form
Local Guidelines	- Examples of Clinical Pathways and Guidance for numerous infections from Nebraska Medicine - AHRQ best practices for the diagnosis and treatment of infectious syndromes: - Asymptomatic bacteriuria and urinary tract infection - Lower Respiratory Tract Conditions - Cellulitis and Skin and Soft Tissue Infections
Diagnostic Stewardship	Examples of diagnostic test guidance for numerous infections from Nebraska Medicine
Pharmacy Based Intervention	- Iowa Antimicrobial Stewardship Summit Presentation: - Reassessing penicillin allergies and ensuring safe and effective antibiotic patient safety webinar recording - Renal dose adjustment guidance from Nebraska Medicine - IV to PO policies: - IV to PO policy template from Nebraska - IV to PO policy template from Kansas - Penicillin allergy protocol template from Kansas

Communication	• Presentation at Iowa Antimicrobial Stewardship Summit:
	
	    ○ [Effective Communication Strategies to Improve Antibiotic Prescribing Webinar recording](#)
	
	• AHRQ tips for Communication Strategy and Behavior Changes
	
	    ○ [Slides on effective behavior changes for antibiotic prescribing](#)
	
	    ○ [Slides on effective changes to antibiotic decision making](#)
	
	    ○ [Slides on identifying targets for improvement in antibiotics](#)
	
	    ○ [Slides on improving communication and teamwork](#)

Microbiology Interventions	• [Example of Antibiogram for most common pathogens](#) • [Antibiogram Excel template from Kansas](#) • [CDC toolkit for reducing blood culture contamination](#)

Nursing Homes:

Action strategies for nursing homes focus on enhancing antibiotic use through policy and practice changes. Existing medication safety policies should be extended to address antibiotic prescribing in accordance with CMS regulations. Broad interventions are recommended to standardize practices for suspected infections or antibiotic use, including improved evaluation, communication of symptoms, diagnostic testing optimization, and implementing antibiotic reviews and/or antibiotic time-outs for all prescriptions. Additionally, it advocates for integrating pharmacists into the care team to support antibiotic stewardship by assisting in appropriate ordering, reviewing culture data, and collaborating on monitoring and guidance. Specific interventions are proposed to identify clinical scenarios contributing to inappropriate antibiotic use, such as asymptomatic bacteriuria or UTI prophylaxis, and implement tailored interventions. The approach emphasizes gradual implementation, prioritizing facility needs and sharing successful outcomes with staff and providers. It is recommended for facilities to implement at least one policy or practice to improve antibiotic use. This should be done in a stepwise fashion, so staff become familiar and not overwhelmed with changed.

Examples of Implementation

• Broad interventions to improve antibiotic use:

- Documentation of dose, duration, indication

- Establish best practices for microbiology testing

- Facility specific treatment recommendations

- Implement algorithms for the assessment of residents (Loeb criteria)

- Utilize a communication tool for suspected infections (SBAR)

- Develop and disseminate facility specific antibiogram

- Perform antibiotic time outs

- Reduce prolonged courses for common infections

Action Tools for Nursing Homes:

Tool	Resource

CDC and ARHQ Toolkits	• [CDC Core Elements of Antibiotic Stewardship in Nursing Homes](#)
	• [CDC Educational Resources](#)
	• [AHRQ Long Term Care Antibiotic Use Toolkit](#)
	    o [Readiness Assessment](#)
	    o [Template for planning agenda](#)

Infection and syndrome specific interventions	• [The 4 moments of antibiotic decision-making form and guide (AHRQ)](#)
	• [AHRQ Learn best practices for common infectious syndromes](#)
	    o [Best practices pocket cards and posters](#)
	    o [Best practices for suspected urinary tract infection](#)
	    o [Best practices for suspected lower respiratory tract infection](#)
	    o [Best practices for skin and soft tissue infections](#)
	    o [Best practices for penicillin allergy](#)
	    o [*Clostridioides difficile* management](#)
	• Iowa Webinar Series on Best Practices for Infections in Nursing Homes:
	    o [Diagnosis, treatment, and prevention of UTI in older adults residing in post-acute and long-term care settings](#)
	    o [Appropriateness of antibiotics for infections in long-term care](#)
	    o [Optimizing antibiotic therapy in nursing homes: Managing adverse events, drug interactions, and renal adjustments](#)
	    o [Implementing key strategies for antimicrobial stewardship in nursing homes](#)
	• Iowa Antimicrobial Stewardship Summit Presentations:
	    o [Antibiotic stewardship for UTIs in the nursing home](#)
	• SBAR Tools + Checklists from Nebraska
	    o [How to use an SBAR](#)
	    o [Implementation of an SBAR](#)
	    o [Loeb's Criteria Checklist](#)

	o Antibiotic Time-Out SBAR
	o Skin and soft tissue infection SBAR
	o Urinary tract infection SBAR
	o Algorithm for management of suspected urinary tract infection in long term care residents
	o Guidance for antibiotic prophylaxis for recurrent urinary tract infections
	o SBAR for urinary tract infection treatment recommendations

Microbiology	• AHRQ appropriate collection of microbiologic samples
	
	  o AHRQ poster for collecting bacterial cultures
	  o AHRQ poster for collecting urine cultures
	  o AHRQ one-pager on collection of microbiologic cultures
	
	• CDC guide to minimizing blood culture contamination
	
	• Antibiograms:
	
	  o Antibiogram template in Excel from Nebraska
	  o Antibiogram template in Word document from Nebraska

Communication	• AHRQ Guide to Communicating Infectious Concerns with Antibiotic Prescribers
	
	  o AHRQ slides on communicating infectious concerns with prescribers
	
	• AHRQ Guide to Discussing Infectious Concerns About Residents With Family Members and Caregivers
	
	  o AHRQ slides on communicating infectious concerns with family and caregivers
	
	• DESC Technique for Dealing with Conflict in Residents and Families from AHRQ
	
	  o AHRQ one-page example of effective communication with residents and family members about *urinary tract infections*
	  o AHRQ one-page example of effective communication with residents and family members about *respiratory tract infections*

Ambulatory Settings:

Outpatient clinicians and clinic leaders can implement policies and interventions to promote appropriate antibiotic prescribing practices. A stepwise approach with achievable goals can facilitate changes and prevent staff from feeling overwhelmed. Assessment and modification of implemented policies are crucial for improvement. Priority should be given to interventions based on feasibility, acceptability, resource commitment, and anticipated barriers. Clinicians can improve prescribing by using evidence-based diagnostic criteria, delayed prescribing practices, or watchful waiting. Clinic leaders can improve prescribing by providing communication skills training, requiring written justification for non-recommended prescriptions, offering clinical decision support, and using triage systems to prevent unnecessary visits. These actions aim to transform policy and practice into measurable outcomes and enhance antibiotic stewardship.

Action Tools for Ambulatory Settings:

Tool	Resource
Infection and Syndrome Specific Interventions	- CDC Outpatient Antibiotic Recommendations - CDC Pediatric Outpatient Antibiotic Recommendations - Watchful Waiting Strategy - CDC on watchful waiting for ear infections - CDC on delayed prescribing - CDC on symptom relief for viral illness - AHRQ Best Practices for Diagnosing and Managing Common Infectious Syndromes - AHRQ four moments of antibiotic prescribing in ambulatory care - Iowa Antimicrobial Stewardship-HAI Webinars - The application of outpatient antimicrobial stewardship principles to commonly encountered pediatric outpatient infections - Reassessing penicillin allergy ensuring safe and effective antibiotic treatment - Optimizing dental antibiotic prophylaxis, guideline adherence and patient safety - Local guideline examples - Ambulatory urinary tract infection guidance from Nebraska - Managing adults with acute respiratory infections pocket card from Nebraska - Acute bronchitis poster from Nebraska - Rhinosinusitis poster from Nebraska - Viral upper respiratory tract infections poster from Nebraska

Communication	• Iowa Antimicrobial Stewardship-HAI Webinar
	o [Effective communication strategies to improve antibiotic prescribing](#)
	• [AHRQ slides on Communicating with patients and families about antibiotic decisions](#)
	• [AHRQ slides on Improving communication between members of the practice](#)
	• [AHRQ poster on When do you need antibiotics?](#)

Tracking and Reporting

OVERVIEW:

Measurement is crucial for identifying areas of improvement and assessing the effectiveness of interventions in antibiotic stewardship programs. This involves evaluating both processes, such as adherence to policies and guidelines, and outcomes, such as patient health, *C. difficile* infections, and antibiotic use and resistance. Regular reporting of data and findings from these evaluations to healthcare providers and leadership is essential for guiding practice changes and maintaining awareness of progress in antibiotic stewardship efforts.

Hospital Settings:

There are multiple ways to monitor antibiotic use and antimicrobial resistance in the hospital setting, but the preferred methods are through the CDC's National Healthcare Safety Network (NHSN). Hospitals are expected to monitor antibiotic prescribing, intervention impacts, and resistance patterns. By electronically **submitting data to the NHSN Antimicrobial Use (AU) and Antimicrobial Resistance (AR) Options** acute care hospitals will have a framework for benchmarking that can be used to inform and assess stewardship interventions. This method provides data on antibiotic usage expressed as days of therapy (DOTs) and comparison values called standardized antimicrobial administration ratios (SAARs). SAAR risk-adjusted summary measures can be used to track antibiotic use, compare antibiotic use against similar facilities, and assess the impact of stewardship activities. Use of the NHSN's AU/AR Options cuts auditing time dramatically, and programs can instead focus on providing this information to providers for feedback. Additionally, it provides a mechanism for facilities to report and analyze the use of multiple antimicrobials and resistance patterns. However, reporting requires an electronic medical record that utilizes barcode medication administration and data formatting for submission requires a validated system for CDA file completion which sometimes must be supplied by an external software vendor.

Reporting priorities include **regular reporting (at least annually) antibiotic use and resistance** to healthcare staff; providing annual prescriber, unit, or service-level reports for targeted feedback; **and monitoring adherence to at least 1 facility-specific treatment guideline.** These requirements are key in integrating into the quality improvement pathway. It is strongly encouraged to **ensure reporting and collaboration between infection control and** stewardship, with reporting through **Quality Assurance and Performance Improvement (QAPI).**

Tracking and Reporting Tools for Hospitals:

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Tool	Resources
NHSN Antibiotic Use and Resistance (AUR) Reporting Option	• Nebraska ASAP resources on reporting antibiotic use • CDC's NHSN Operating Manual for the Antimicrobial Use and Resistance (AUR) options ○ Frequently asked questions about AUR reporting • List of Vendors that can facilitate submission of AUR reports to NHSN ○ AU Vendor List ○ AR Vendor List
NHSN Data Analysis	• Duke Antimicrobial Stewardship Outreach Network: Leveraging NHSN Antibiotic Use Data to Inform, Implement and Assess Antibiotic Stewardship Activities
Reporting Structure	• Ways to Include Antimicrobial Stewardship in your institutional policies ○ Example from Nebraska ○ Example of a policy that includes the structure from Kansas
Tracking and Reporting Interventions	• Example of an intervention tracking worksheet from Nebraska

Nursing Home Settings:

The CDC Core Element for Nursing Homes regarding tracking and reporting involves comprehensive monitoring of antibiotic use practices and outcomes to guide practice changes and evaluate the impact of interventions. Key actions include collecting data on adherence to antibiotic prescribing policies, tracking the amount and frequency of antibiotic use, and reviewing clinical assessments and documentation. Additionally, nursing homes should measure clinical outcomes such as *C. difficile* infections, antibiotic-resistant organisms, and adverse drug events. This data needs to be regularly shared with clinicians, nurses, and leadership to maintain awareness and guide improvements. Targeted feedback can be provided to clinicians to influence prescribing behaviors.

Tracking and Reporting Tools for Nursing Homes:

Tool	Resources
General Resources and Examples	- Example agenda for QAPI meeting on Antibiotic/Infection Monitoring from AHRQ - AHRQ Guide to Choosing an Intervention and Measuring Change - Measuring Antibiotic Prescribing, Use and Outcomes: Appendix B from CDC's Core Elements in Nursing Homes - Appendix C from CDC's Core Elements: Data Sources, Elements, and Measures for Tracking Antibiotic Use in Nursing Homes
Tracking and Reporting	- AHRQ Guide on how to Monitor and Sustain Antimicrobial Stewardship - Antibiotic Tracking Sheet Example (PDF, Word, Excel) - Sample Monthly Summary Reports (PDF, Word, Excel) - Quarterly or Monthly Prescribing Profile (PDF, Word) - Staff Safety Assessment Form - Intervention Worksheet - Monthly Data Collection Form - Monitoring for Adverse Events - Learning from Antibiotic Associated Adverse Events Form AHRQ - Adverse Drug Reaction Worksheet from Nebraska ASAP

Program Outcomes	• Annual report templates
	○ [Activities for Nursing Home Prescribers](#)
	○ [Activities for Nursing Home Staff](#)
	• [Quarterly Summary of Antibiotic Use, Template from Nebraska ASAP](#)

Ambulatory Care Settings:

Tracking and reporting clinician antibiotic prescribing is crucial for guiding practice changes and assessing progress in antibiotic stewardship. Decisions about the level of tracking and reporting, outcomes to track, and data sources are important considerations. Tracking can occur at the individual clinician or facility level, with individualized feedback being effective in promoting adherence to guidelines. High-priority conditions for improvement, such as acute bronchitis, can be identified, and outcomes related to appropriate diagnosis and antibiotic selection can be tracked and reported. Additionally, tracking the percentage of visits resulting in antibiotic prescriptions can help minimize the influence of diagnostic coding practices. Complications of antibiotic use and antibiotic resistance trends can also be monitored, although smaller sample sizes may limit reliability. Clinicians and clinic leaders can both be involved in antibiotic stewardship efforts, either by self-evaluating prescribing practices or implementing tracking and reporting systems at the facility level. Sharing performance on quality measures and established reduction goals can further support improvement efforts in antibiotic prescribing.

Tracking and Reporting Tools for Ambulatory Care Sites:

Tool	Resources
General Guidance	• [Checklist of CDC Core Elements for Outpatient Antibiotic Stewardship](#)
	• [CDC MITIGATE Antimicrobial Stewardship Toolkit for adult and pediatric emergency departments and urgent care settings](#)
	• [Urgent Care Association: Antimicrobial Stewardship Toolkit](#)
	• [Getting Started with Antibiotic Stewardship in Dental Clinics](#)
	○ [ADA Antibiotic Stewardship Guide](#)
	○ [CDC Checklist for Antibiotic Prescribing in Dentistry](#)
Tracking	• [AHRQ Gap Analysis for Antibiotic Stewardship in Ambulatory Care](#)
	• [AHRQ Monthly Data Collection Template for Ambulatory Care](#)
	• [HEDIS measure on Antibiotic Utilization for Respiratory Conditions](#)

Reporting	• AHRQ Implementing Antibiotic Stewardship in Your Practice
	• Effect of an Outpatient Antimicrobial Stewardship Intervention on Broad-Spectrum Antibiotic Prescribing by Primary Care Pediatricians. Gerber JS, et al. JAMA 2013
	• Durability of Benefits of an Outpatient Antimicrobial Stewardship Intervention After Discontinuation of Audit and Feedback. Gerber JS, et al. JAMA 2014

Education

OVERVIEW:

Educational efforts are essential to all stewardship activities. Educational efforts for stewardship should focus on both the why appropriate antibiotic use is essential (decrease antimicrobial resistance, preserve the activity of antibiotics, improve patient outcomes, etc.) and the how antibiotic use be improved. Education should focus on prescribers, especially in the hospital, but in other settings such as LTCF and ambulatory settings, the education of patients and family members is important as well. Education is foundational but effectiveness erodes over time and must be repeated.

Hospital Settings:

Stewardship programs should ensure they are regularly educating and updating prescribers. Numerous topics can be addressed in education but generally **facility specific data will be most relevant to local prescribers**. Topics for recurring education might include updates on antimicrobial resistance and changes in the local antibiogram. Other topics may include formulary changes, guideline updates, or changes in microbiologic testing. Finally, education should be a key component supporting any stewardship intervention.

Education can be deployed in numerous ways. Some options include regular **newsletters** distributed either via paper or electronically. **Didactic presentations** may be done in both formal and informal settings. These are more effective when using **case-based material**, particularly de-identified cases from the facility which highlight antimicrobial use issues. **Web- or app-based resources** can be deployed as well. Institutions may have **electronic learning systems** which could also be used. Development of education should consider the knowledge level and expertise of the target audience.

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Educational Tools for Hospitals:

CDC Resources	• [Core Elements for Antimicrobial Stewardship in Acute Care Hospitals](#)
	
	    o [Priorities for Hospital Core Element implementation](#)
	
	• [Implementing Antimicrobial Stewardship in Small and Critical Access Hospitals](#)
	
	• [Be Antibiotics Aware Toolkit – numerous videos and brochures](#)
	    o [Antibiotic Prescribing and Use](#)
	    o [Antibiotic Use and Resistance Facts](#)
	
	• [Antibiotic Stewardship Courses – CME training in antimicrobial stewardship](#)

State Based Resources	• [Nebraska ASAP](#) • [Colorado](#) • [Minnesota](#)
AHRQ	• [Toolkit for Improving Antibiotic Use in Acute Care Hospitals](#)
Pharmacy and ID Organizations	• [SIDP Education Center](#) • [IDSA Practice Guidelines](#)

Nursing Home Settings:

Optimal education on appropriate antibiotic use in nursing homes must have a multifaceted approach. Residents and their family members need to understand the risks in addition to benefits associated with antibiotic use. Providers are often not on site, and therefore nurses and aides have a larger role in assessment and communication of symptoms for the residents. Some delivery techniques might differ from those in acute care settings.

Education Tools for Nursing Homes:

Tool	Resources
General Guidance	• CDC Core Elements of Antimicrobial Stewardship in Nursing Homes • Compilation of Educational Materials from Nebraska ASAP
Staff Education	• CDC Handout for Nursing Home Professionals: Be Antibiotics Aware with Effective Communication • Washington State Department of Health Toolkit ○ Urinary Tract Infections and Asymptomatic Bacteruria – for Nurses ○ Urinary Tract Infections and Asymptomatic Bacteruria – for Nursing Assistants ○ Antibiotic Use and Antibiotic and Antibiotic Resistance – for Nurses ○ Antibiotic Use and Antibiotic and Antibiotic Resistance – for Nursing Assistants • Appropriate Use Criteria for Flouroquinolones and Clindamycin • Communicating with Residents and Families about Antibiotics
Consultant Pharmacist Involvement	• CDC Educational Posters ○ 5 Ways Consultant Pharmacists Can Be Antibiotics Aware ○ Ensure Documentation of the Indication for Every Antibiotic Order ○ Limit Prolonged Antibiotic Prophylaxis for Urinary Tract Infection ○ Avoid Treatment of Asymptomatic Bacteriuria ○ Use the Shortest Effective Antibiotic Duration ○ Improve Fluoroquinolone Prescribing Practices

Resident & Family Education	• [Numerous handouts, brochures and posters from CDC related to optimal antibiotic use in English and Spanish](#)

Ambulatory Care Settings:

Education is a key intervention for all forms of stewardship but in the ambulatory setting **education of providers, patients and family members is essential**. Numerous educational needs are present for providers. Provider education on the importance of ambulatory stewardship and frequent areas of misuse such as upper respiratory tract infections is important when establishing a program. **Mitigating knowledge deficits** in providers is not the only goal of education but **psychosocial pressures** (time pressure, patient/family expectations, quality metrics, etc.) should be addressed as well. **Managing patient expectations** and providing education is also a key component of improving antibiotic use. Providers should be trained in **communication strategies to address patient expectations for antibiotics and the potential harms of antibiotics**. Numerous tools are available to assist with this education including training, handouts, posters, and flyers from the CDC and AHRQ.

Patient and family education should be a part of ambulatory stewardship efforts as these expectations can drive inappropriate prescribing. Patients should receive clear messaging about the **role antibiotics play and where they provide benefit** and where they do not. When antibiotics are not used patients and families should be provided with **information on how to relieve symptoms and when and how to contact a provider** if they do not improve. Finally educational efforts should be persistent as retention is often poor.

Education Tools for Ambulatory Care:

Tool	Resource
CDC/CMS Resources	• Core Elements for Antimicrobial Stewardship in Ambulatory Care • Antibiotic Stewardship in Outpatient Telemedicine • Numerous educational materials including posters, patient handouts, prescription pads for symptom relief, sticker sheets, window clings • For Healthcare Providers o Antibiotics and Adverse Effects • Patient Education Handouts o Improving Antibiotic Use flyer o Virus or Bacteria Patient Handout o Antibiotics Aren't Always the Answer Brochure • Improving Outpatient Antibiotic Prescribing: CDC Toolkit for Healthcare Payers • CMS Field Guide to Antibiotic Stewardship in the Outpatient Setting
State Based Resources	• Nebraska ASAP (patient and prescriber directed educational tools and templates as well as provider directed educational videos) • Colorado (patient focused posters, handouts, info sheets and videos) • Minnesota (patient focused posters, handouts, info sheets)
AHRQ	• Provider focused educational videos on managing common ambulatory infections • How to develop stewardship in your practice • Communication strategies including training materials on methods and tools for use with patients
Other Organizations	• PEW Trust Antibiotic Resistance Project • Pediatric Infectious Diseases Society (PIDS) ASP Toolkit • American Academy of Pediatrics EQUIPP: Antibiotic Decisions Making MOC Training • American Academy of Pediatrics Antimicrobial Resistance and Stewardship Resources

Current State Assessments

Included are updated assessment tools for both inpatient and long-term care settings.

Antimicrobial Stewardship Self-Assessment Instrument for Acute Care Hospitals			
Facility Name:			
Date Completed:			
I. Hospital Leadership Commitment			
1. Provide program leader(s) dedicated time for program management and daily stewardship interventions?	Yes		No
2. Provide stewardship program leader(s) with resources (e.g., IT support, training) to effectively operate the program?	Yes		No
3. Appoint a senior executive that serves as a champion to ensure the program has resources and support to accomplish its mission?	Yes		No
4. Meet with the stewardship team to report and discuss stewardship activities, outcomes, and resource needs at least annually (including the hospital board)?	Yes		No
5. Have a formal written leadership support statement that commits resources to support an antimicrobial stewardship program?	Yes		No
6. Ensure that antibiotic stewardship activities are integrated into quality improvement and patient safety efforts?	Yes		No
7. Ensure that staff from key support departments (IT, hospital medicine, microbiology) have sufficient time to contribute to stewardship activities?	Yes		No

II. Accountability & III. Drug Expertise			
8. Has your facility identified a leader who is accountable for antimicrobial stewardship program oversight?	Yes	Seeking	No
9. Are antibiotic stewardship duties included in the leader's job description and annual performance evaluation?	Yes		No

10. If yes, indicate who is accountable for antimicrobial stewardship activities, their role, and percent time in an average week dedicated to stewardship activities at the facility. (Select all that apply).
 	
☐ Physician
  ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%
 	
☐ Pharmacist
  ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%
 	
☐ Other _____
  ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%
	Lead
	Lead
	Lead
		Co-Lead
		Co-Lead
		Co-Lead
			Support
			Support
			Support

11. What is the highest level of antibiotic stewardship training of the program leaders? (Select all that apply)
☐ Infectious Disease Residency or Fellowship
☐ Antibiotic Stewardship Certificate Program
☐ Online training modules or conference attendance

12. Does your facility utilize any form of remote stewardship expertise (i.e., tele-stewardship)?	Yes		No

13. Does your facility have an antibiotic stewardship policy that requires an antibiotic stewardship program or requires the implementation of antibiotic stewardship activities?	Yes		No
14. Does the facility have an active multidisciplinary Antibiotic Stewardship Committee that meets at least quarterly?	Yes		No
15. Is on-site pharmacy available? If not available 24/7, name of contract/remote pharmacy _____ ___	24/7	Limited	No
16. Does the ASP work in collaboration with the Infection Prevention Program?	Yes		No
17. Does the ASP work in collaboration with the Quality Program?	Yes		No
IV. Action: Implement Interventions to Improve Antibiotic Use			
Broad Interventions			
18. Does your facility have facility-specific treatment guidelines, based on national guidelines and local susceptibility, to assist with antibiotic selection for common infections (e.g., CAP, UTI, SSTI)? If yes, date the guidelines were last updated? _____ _____	Yes, ≥3	Yes, <3	No
19. Does your facility perform prospective audit and feedback for specific antibiotic agents or specific clinical situations?	Yes	Developing	No
20. Does your facility perform preauthorization for specific antibiotic agents?	Yes	Developing	No

21. Does your facility have a formal procedure for all prescribers to conduct regular reviews of antibiotic selection until a definitive diagnosis and treatment duration are established (i.e., time out)?	Yes	Developing	No
Pharmacy-Driven Interventions			
22. Are there treatment recommendations to assess and clarify documented penicillin or antibiotic allergy? Is penicillin skin-testing available in your facility?	Yes Yes	Developing Developing	No No
23. Does pharmacy have a structured program to review any planned outpatient parenteral antibiotic therapy (OPAT), including evaluation and monitoring of patients discharged on IV antibiotics?	Yes	Developing	No
24. Does pharmacy review antibiotic prescriptions at discharge to ensure the shortest effective duration of antibiotics is prescribed?	Yes	Developing	No
25. Is there a pharmacy-driven protocol in place for changes from intravenous to oral antibiotics without a physician's order?	Yes	Developing	No
26. Is there a pharmacy-driven protocol in place to adjust antimicrobial doses for organ dysfunction?	Yes	Developing	No
27. Are there processes to optimize antimicrobial dosage based on pharmacokinetics/pharmacodynamics? If yes, for which antimicrobial agent(s)? _____ _____ _____	Yes	Developing	No

28. Are there time-sensitive automatic stop orders for specified antimicrobials (e.g., antimicrobials for surgical prophylaxis discontinued after one dose)?	Yes	Developing	No
Diagnosis and Infection-Specific Interventions			
29. Is there a procedure to stop unnecessary antibiotics in new cases of *Clostridioides difficile* infection (CDI)?	Yes	Developing	No
30. Have specific interventions been implemented to promote optimal antimicrobial use for common and high-risk infections?	Yes		No

If yes, indicate for which of infection(s):

☐ Community-acquired pneumonia   ☐ Hospital-acquired pneumonia
☐ Ventilator-associated pneumonia

☐ Urinary tract infections   ☐ Skin and soft-tissue infections
☐ Surgical prophylaxis

☐ *Clostridioides difficile* infection (CDI)   ☐ *S. aureus* bacteremia
☐ Sepsis

☐ Guidelines for patients at high risk of CDI   ☐ Other culture-proven invasive infections

Microbiology and Laboratory Diagnostic Interventions			
31. Is an onsite microbiology lab which performs organism identification and susceptibility testing available? If no, where are tests performed? _____ _____	Yes		No
What is the average results turnaround time for a positive culture?	>3 days	3-5 days	>5 days

32. Does your facility utilize any rapid blood culture identification technology? If yes, which technology?_____ _____ _____ _____	Yes		No
33. Does your facility produce and distribute an antibiogram at least annually?	Yes		No
34. Does the antibiotic stewardship program work in collaboration with microbiology laboratory staff?	Yes		No
35. The stewardship program works with the micro lab to provide selective reporting of antibiotic susceptibility testing results.	Yes		No
36. The stewardship program works with the micro lab to place comments in micro reports to improve prescribing.	Yes		No
Nursing Interventions			
37. Does the antibiotic stewardship program engage bedside nurses in actions to optimize antibiotic use?	Yes	Developing	No
38. Nurses initiate discussions with the treating team on switching from intravenous to oral antibiotics.	Yes	Developing	No
39. Nurses initiate daily antibiotic course review discussions with the treating team (i.e., antibiotic time-out).	Yes	Developing	No

V. Tracking Antibiotic Use and Outcomes			
Process Measures			
40. Does your antibiotic stewardship program monitor prospective audit and feedback interventions by tracking the types of interventions and acceptance rate of recommendations?	Yes	Developing	No
41. Does your antibiotic stewardship program monitor preauthorization interventions by tracking which agents are being requested for which conditions?	Yes	Developing	No
42. Does your stewardship program monitor adherence to facility-specific treatment recommendations?	Yes	Developing	No
43. Does your stewardship program monitor adherence to a documentation policy (dose, duration, and indication)?	Yes	Developing	No
44. Does the ASP monitor compliance with one or more of the specific interventions in place?	Yes	Developing	No
Antibiotic Use and Outcome Measures			
45. Does your antibiotic stewardship program track CDI in context of antibiotic use?	Yes	Developing	No

46. How does your facility monitor antimicrobials use at the unit and/or facility-wide level?

☐ Submitting to the National Healthcare Safety Network (NHSN) Antimicrobial Use (AU) Option

☐ Manual tracking by using electronic health record data

   ☐ Using pharmacy purchasing data

   ☐ Other _____

VI. Reporting Antibiotic Use and Outcomes			
47. Does the ASP share facility-specific reports on antimicrobial use with prescribers at least annually?	Yes		No
48. Is a current antibiogram been distributed to prescribers at your facility at least annually?	Yes		No
49. Do prescribers receive direct, personalized communication on improving their antimicrobial prescribing (compared to peers)?	Yes		No
50. Is antibiotic stewardship data communicated to staff (including prescribers, pharmacists, nurses, and hospital leadership) via email, newsletters, pocket-guides, events, or other avenues?	Yes		No
51. Are antibiotic stewardship outcomes directly reported to quality assurance/performance improvement committees?	Yes		No

52. List hospital committees where antibiotic stewardship data is reported
_____
_____

VII.
Education and Training

53. The healthcare facility provides competency-based education on optimal antibiotic prescribing, antibiotic adverse events, and antibiotic resistance at least annually to: (Select all that apply)

☐ Prescribers

☐ Pharmacists

☐ Nursing staff

☐ Other _____

54. How are patients provided education on important side effects of prescribed antibiotics? (Select all that apply) ☐ Discharge paperwork ☐ Verbally by nurse ☐ Verbally by pharmacist ☐ Verbally by physician ☐ None of the above			
55. Nurses receive training on appropriate criteria for ordering and sending microbiologic tests (urine cultures, blood cultures, respiratory cultures, or stool for *C. diff* testing).	Yes		No
56. Does your stewardship program provide education to prescribers as part of the prospective audit and feedback process?	Yes		No
57. Does facility leadership provide opportunities for hospital staff to obtain further training related to antibiotic stewardship?	Yes		No

VIII. **Additional Questions on Antimicrobial Stewardship Challenges**
58. What is the primary area of antimicrobial misuse in your facility?   _____   _____   __
59. List the top three barriers to improvement of the antibiotic stewardship program   a)   b)   c)

Developed based on CDC Antibiotic Stewardship Program Assessment Tool, CDC Infection Control Assessment and Response (ICAR) Tool, and NHSN Annual Hospital Survey
   Last updated 2023

Veterinary settings

Compared to human healthcare settings, the veterinary profession has room for growth when it comes to antimicrobial stewardship. To assist with this growth the American Veterinary Medical Association (AVMA) adapted CDC's Core Elements of Antibiotic Stewardship to create a policy defining antimicrobial stewardship and the core principles in veterinary medicine. Modeled after the principles outlined for human healthcare settings, it includes:

- committing to stewardship,
- advocating for a system of care to prevent common infectious diseases,
- selecting and using antimicrobial drugs judiciously,
- evaluating antimicrobial drug use practices, and
- educating and building expertise.

In veterinary settings, commitment and accountability is demonstrated by the engagement of practice managers, practice leaders, and other veterinary care providers in promoting appropriate antibiotic prescribing, implementing evidence-based guidelines, integrating stewardship principles into routine clinical practice, and making client education a priority. This toolkit can be used as a starting point for veterinary settings first establishing a stewardship program. For settings with a robust program wanting to further expand, the methodologies implemented in human healthcare settings could be applied to a veterinary setting to enhance a well-established program. Clinics and veterinary professionals wanting to learn more about various stewardship methodologies and auditing practices not currently implemented in veterinary medicine are encouraged to read the previous sections of this document.

Engagement Tools for Veterinary Settings:

Tool	Resource
Commitment Posters	• FDA brochure for antibiotic stewardship in veterinary medicine • AVMA poster highlighting the core principles of antimicrobial stewardship
Making the Case	• Infection disease specialist and zoonotic disease expert Dr. Scott Weese describes the global impact of AMR in humans and animals • Manuscript in *Nature* defining antimicrobial stewardship with a one health perspective
How-To Guides	• Iowa Department of Health and Human Services' One Health antimicrobial stewardship online resources to help veterinary clinics establish or enhance a stewardship program • University of Minnesota Antimicrobial Resistance and Stewardship Initiative online resources for a variety of species, including clinical guidelines
College of Veterinary Medicine Programs	• The Ohio State University educational materials to promote stewardship in companion animals, equine, and farm animals • Michigan State University materials to promote the development and implementation of practical strategies that help dairy farmers prevent infectious bacterial diseases that may require antibiotic treatments