

## Supplementary Online Content

Tamma PD, Miller MA, Dullabh P, et al. Association of a safety program for improving antibiotic use with antibiotic use and hospital-onset *Clostridioides difficile* infection rates among US hospitals. *JAMA Netw Open*. 2021;4(2):e210235.  
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**eAppendix.** Detailed Methods

**eReferences**

**eTable.** Metrics of the Top 30 Downloaded AHRQ Safety Program Content From December 2017 to November 2018

**eFigure.** Distribution of 402 Hospitals Across the United States Enrolled in the AHRQ Safety Program; Color Gradients Represent Number of Sites Enrolled per State

This supplementary material has been provided by the authors to give readers additional information about their work.

## **eAppendix. Detailed Methods**

### **Systematic Review**

Prior to the start of the formal one-year AHRQ Safety Program for Improving Antibiotic Use, PDT and SEC conducted a Systematic Review of the published literature to identify key components associated with successful antibiotic stewardship programs (ASPs). They first reviewed the evidence compiled in “Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America<sup>1</sup>.” These guidelines were developed by an expert panel using the GRADE methodology, a rigorous systematic approach to reviewing literature<sup>2</sup>, that included a PubMed search of articles in the English language published between 1946 and July 2013. To ensure that the most current body of evidence was used to guide the AHRQ Safety Program and to reduce redundancy between the systematic review and the previously published guidelines, an additional PubMed search utilizing identical search parameters to the prior search was conducted<sup>1</sup>, but limited to August 2013 to October 2018. The search yielded 1,747 results, of which 64 studies were selected for full text review. Articles were excluded if they described ASPs or interventions outside of the acute care setting. Four key components of successful ASPs in the acute care setting that were identified including: (1) interventions before and after prescription of select antibiotics, (2) availability of local guidelines at a minimum for urinary tract infections and community-acquired pneumonia, (3) physician and pharmacist ASP leads with dedicated salary support, and (4) quarterly tracking and reporting of antibiotic use. These components are in large part consistent with the Centers for Disease Control and Prevention Core Elements of Antibiotic Stewardship Programs<sup>3</sup>. The importance of each component was underscored throughout the course of the Safety Program. Details supporting these components are provided below. Compliance with the four key components were compared for the 402 participating sites at the beginning (January-February 2018) and end (November-December 2018) of the

Safety Program based on self-reporting provided through the gap analysis, exit interviews, and monthly qualitative data reported to the quality improvement expert assigned to each site.

**Interventions before and after prescription of select antibiotics.** Active interventions both before antibiotics are prescribed (prior-approval) and after antibiotics are prescribed (e.g., post-prescription review with feedback, interventions focusing on intravenous to oral antibiotic step-down therapy, interventions targeting duration of therapy) appear necessary for ASPs to successfully reduce unnecessary antibiotic use<sup>4-22</sup>. Prior-approval generally consists of a phone call to the stewardship team for select anti-infectives justifying the use of the agent before administration to the patient. This approach can reduce unnecessary antibiotic initiation, optimize the selection of empiric antibiotics, provide information on optimal diagnostic tests, and encourage infectious diseases consultations when necessary. Drawbacks of this approach include its focus on specific restricted agents, potential to disrupt frontline clinician workflow, potential to delay antibiotic administration for sepsis, and an inability to address downstream antibiotic use such as intravenous to oral conversion or duration of therapy. Post-prescription review with feedback generally occurs 48 to 72 hours after antibiotics are initiated, when more clinical and microbiological data are available to make recommendations. Advantages to this approach include greater flexibility in the timing of interventions and the ability to address targeted therapy decisions. However, post-prescription review generally does not impact the first few days of antibiotic therapy, which often constitute a large portion of inpatient antibiotic use. A hybrid approach including a component of prior approval and post-prescription review is most impactful.

**Development of local guidelines.** The development and dissemination of institutional guidelines for diagnosing and treating common infectious syndromes is a key component of successful ASPs<sup>23-28</sup>. Guidelines provide evidence-based and standardized diagnostic and treatment recommendations based on local epidemiology. Guidelines should discuss appropriate clinical criteria suggestive of bacterial infections, diagnostic testing, specific empiric and targeted therapy (including dosing and options for

severe drug allergies), and appropriate durations of therapy. Ideally, inpatient antibiotic guidelines should be developed to target common indications for antibiotic use such as asymptomatic bacteriuria/urinary tract infections, community-acquired pneumonia, hospital and ventilator-associated pneumonia, skin and soft tissue infections, intra-abdominal infections, and sepsis<sup>29</sup> – which were all included in the Safety Program content<sup>30</sup>. However, at a minimum, as asymptomatic bacteriuria/urinary tract infections and community-acquired pneumonia constitute a significant portion of inpatient antibiotic prescribing<sup>29</sup>, guidelines for these conditions should be developed and disseminated locally.

**Physician and Pharmacist Leads.** ASPs are most successful when both a physician and pharmacist lead are identified, both with dedicated salary support to ensure adequate time to perform daily stewardship functions<sup>24,31-34</sup>. Although the physician and pharmacist lead are encouraged to develop ASP goals together, unique roles for the physician leader may include underscoring to other clinicians how the overarching goals of the stewardship program are to optimize patient outcomes while preventing patient harm and to engage hospital executive leadership. Pharmacists typically conduct the majority of stewardship interventions and often lead efforts to compile and validate antibiotic use data. The pharmacist also functions as a liaison to the pharmacy and therapeutics committee to encourage agreement between stewardship and pharmacy goals.

**Quarterly tracking and reporting of antibiotic use.** Periodically compiling relevant antibiotic use data informs interventions led by the ASP and enables the ASP to monitor progress over time<sup>35-39</sup>. These data should also be made available to clinicians and hospital administration.

## eReferences

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# AHRQ Safety Program for Improving Antibiotic Use



## Gap Analysis for Antibiotic Stewardship Programs

Instructions: Complete this document to assess your antibiotic stewardship program (ASP) on an annual basis. The ASP areas addressed in this document are those that are discussed throughout the AHRQ Safety Program Toolkit.

Unmarked questions ask about basic structure and commonly utilized interventions. The questions labeled as Enhancing Components (+) address components that may enhance ASPs. Once your ASP is established, discuss whether implementation of the Enhancing Components might be of benefit to your program and what resources would be need to operationalize them.

For answers that are not non-yes/no or non-yes/no/not applicable, select all answers that apply.

Key: + = Enhancing Components

ASP Area	Answers	Comments
<b>Program Leadership</b>		
<b>Physician Leadership</b>		
Has a physician leader been identified?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is the physician leader trained in infectious disease?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable (N/A)	
What salary support [full-time equivalent (FTE) or amount/hour consulting] is received by the ASP physician leader?		
How much time does the ASP physician leader dedicate to ASP (% effort or hours/week)		
Is the ASP physician leader available to the ASP on a daily basis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<b>Pharmacist Leadership</b>		
Has a pharmacist leader been identified?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is the pharmacist leader trained in infectious diseases?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<b>Senior Executive Leadership</b>		





ASP Area	Answers	Comments
<b>To whom does the ASP report?</b>		
<b>How often does ASP leadership meet with senior leadership?</b>	<input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually <input type="checkbox"/> Never <input type="checkbox"/> Other:	
<b>Does senior leadership actively promote/support antibiotic stewardship (AS) prevention activities?</b>	<input type="checkbox"/> No <input type="checkbox"/> Yes: ASP Committee member <input type="checkbox"/> Yes: Provides adequate funding for ASP <input type="checkbox"/> Yes: Provides funding for AS member training <input type="checkbox"/> Yes: Promotes AS messages via newsletters, screen savers, etc. <input type="checkbox"/> Yes: Provides back up to ASP if prescribers do not follow AS approaches <input type="checkbox"/> Yes: Other:	
<b>Program Structure</b>		
<b>How many pharmacists staff the ASP?</b>	Number: FTE for pharmacist leader: FTE for other AS pharmacists:	
<b>Does ASP have access to a data analyst?</b>	Number: Total FTE for AS effort: <input type="checkbox"/> No access to a data analyst	
<b>+ Does the ASP have a regular meeting with infection prevention to discuss issues relevant to both groups?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Is a representative of the ASP involved in antibiotic formulary decisions?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Is there a hospital wide ASP Committee that meets at least quarterly?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Who chairs the ASP Committee?</b>		
<b>Who is on the ASP Committee?</b>  <b>Note: representatives from areas listed are suggestions for robust committee membership; not all committees will have all areas represented.</b>	<input type="checkbox"/> Senior executive <input type="checkbox"/> Pharmacy department <input type="checkbox"/> Front-line nurses <input type="checkbox"/> Infectious diseases physicians <input type="checkbox"/> Information technology <input type="checkbox"/> Microbiology lab <input type="checkbox"/> Infection control/hospital epidemiology <input type="checkbox"/> Department of nursing <input type="checkbox"/> Regulatory affairs	

ASP Area	Answers	Comments
	<input type="checkbox"/> Department of quality improvement <input type="checkbox"/> Department of patient safety <input type="checkbox"/> Patient representative <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
<p><b>What are the activities of the ASP Committee?</b></p> <p><b>Note: activities listed are suggestions for committee activities; not all committees will perform all activities.</b></p>	<input type="checkbox"/> Review antibiotic use data and recommend improvement approaches <input type="checkbox"/> Review the antibiogram and recommend improvement approaches <input type="checkbox"/> Review <i>Clostridioides difficile</i> infection rates and recommend improvement approaches <input type="checkbox"/> Perform proactive risk assessments to determine areas in which harm related to antibiotic prescribing could be avoided with intervention <input type="checkbox"/> Review guidelines developed by the ASP <input type="checkbox"/> Review materials for patient and healthcare worker education regarding optimal antibiotic prescribing <input type="checkbox"/> Review ASP responses to antibiotic shortages <input type="checkbox"/> Review approaches employed by the microbiology lab for reporting culture and susceptibility data <input type="checkbox"/> Assure ASP and its procedures and policies meet relevant regulations <input type="checkbox"/> N/A	
<p><b>Are minutes taken and distributed?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<p><b>To what committee does the ASP Committee report?</b></p>		
<p><b>Does your ASP develop an annual plan outlining goals for the following year?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<p><b>Does your ASP perform an annual risk assessment to identify priorities?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	

ASP Area	Answers	Comments
<p><b>Does your ASP have a binder or other document detailing how it is compliant with The Joint Commission Antimicrobial Stewardship Standard and/or Centers for Disease Control and Prevention’s (CDC) <i>Core Elements of Hospital Antibiotic Stewardship Programs</i>?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Guidelines</b>		
<p><b>Does your facility have facility-specific antibiotic treatment guidelines?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<p><b>Do your facility-specific guidelines cover the following syndromes?</b></p>	<input type="checkbox"/> Urinary tract infection <input type="checkbox"/> Asymptomatic bacteriuria <input type="checkbox"/> Community-acquired pneumonia <input type="checkbox"/> Healthcare-acquired pneumonia <input type="checkbox"/> Ventilator-associated pneumonia <input type="checkbox"/> Intra-abdominal infections <input type="checkbox"/> Skin and soft tissue infection <input type="checkbox"/> Bacteremia <input type="checkbox"/> Sepsis <input type="checkbox"/> Surgical prophylaxis <input type="checkbox"/> <i>Clostridioides difficile</i> infection <input type="checkbox"/> Other: <input type="checkbox"/> Other: <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
<p><b>Who is involved in guideline development?</b></p>	<input type="checkbox"/> ASP members <input type="checkbox"/> Non-AS infectious disease physicians <input type="checkbox"/> Non-ASP pharmacists <input type="checkbox"/> Front-line prescriber content experts <input type="checkbox"/> Trainees (e.g., housestaff, fellows) <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
<p><b>Do your guidelines provide recommendations on empiric therapy?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<p><b>Do your guidelines provide recommendations on oral step-down therapy?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<p><b>Do your guidelines provide recommendations on duration of therapy?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<p><b>Are guidelines disseminated to prescribers at the point of care?</b></p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	

ASP Area	Answers	Comments
	<input type="checkbox"/> N/A	
+Do your facility guidelines provide recommendations about specific antibiotics?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+Do your guidelines provide recommendations for diagnostic testing?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+Do your facility guidelines provide recommendations about the interpretation of microbiology results (including rapid diagnostic tests)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+Are guidelines available in operating rooms detailing specific recommendations for surgical prophylaxis?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

Interventions					
Preauthorization and Post-prescription Review and Feedback					
Instructions for this section: For each agent or class, indicate whether the ASP performs pre-authorization and/or post-prescription review and feedback, and the frequency of these interventions. Use the results from this section to determine if the type of intervention or antibiotics intervened upon are appropriate or	Antibiotic	Pre-authorization	Frequency	Post-prescription review and feedback	Frequency
	Cefazolin	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Ceftriaxone	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Cefepime	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A

Interventions					
should be modified based on institutional data and other ASP concerns.	Ceftaroline	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Piperacillin/Tazobactam	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Aztreonam	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Carbapenems	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Fluoroquinolones	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Aminoglycosides	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Vancomycin IV	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Daily weekdays	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days

Interventions					
		<input type="checkbox"/> N/A	<input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> N/A	<input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Daptomycin	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Linezolid/ Tedizolid	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Ceftazidime/ Avibactam	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Ceftolozane/ Tazobactam	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Polymyxins	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Vancomycin PO	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week

Interventions					
			<input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A		<input type="checkbox"/> Other: <input type="checkbox"/> N/A
	Fidaxomicin	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	<input type="checkbox"/> Daily weekdays <input type="checkbox"/> Daily 7 days <input type="checkbox"/> 2–3 times/week <input type="checkbox"/> Other: <input type="checkbox"/> N/A

ASP Area	Answers	Comments
Do you have software or another mechanism that identifies patients for daily review by the ASP?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
How do you make AS interventions?	<input type="checkbox"/> Phone call to clinicians <input type="checkbox"/> Text to clinicians <input type="checkbox"/> Rounds with teams <input type="checkbox"/> Note in medical record <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
Where do you document AS intervention?	<input type="checkbox"/> No documentation <input type="checkbox"/> Medical record: visible to clinicians <input type="checkbox"/> Medical record: not visible to clinicians <input type="checkbox"/> Database internal to ASP <input type="checkbox"/> N/A	
Does your program monitor adherence to AS interventions?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Other Interventions To Consider		
+ Is there a formal procedure for all clinicians to review the appropriateness of all antibiotics 48–72 hours after the initial orders (e.g., antibiotic time out)?	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Select units	
+ Is there a process for intravenous to oral conversion of antibiotics in the pharmacy?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
+ Does your facility have order sets for any of the following indications?	<input type="checkbox"/> Urinary tract infection <input type="checkbox"/> Community-acquired pneumonia <input type="checkbox"/> Healthcare-acquired pneumonia <input type="checkbox"/> Ventilator-associated pneumonia <input type="checkbox"/> Intra-abdominal infections	

ASP Area	Answers	Comments
	<input type="checkbox"/> Skin and soft tissue infection <input type="checkbox"/> Bacteremia <input type="checkbox"/> Sepsis <input type="checkbox"/> Surgical prophylaxis <input type="checkbox"/> <i>Clostridioides difficile</i> infection <input type="checkbox"/> Neutropenic fever <input type="checkbox"/> Other: <input type="checkbox"/> Other: <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
<b>+Are there time-sensitive automatic stop orders for specified antibiotic prescriptions?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>+Are activities conducted by the ASP to target antibiotics commonly associated with <i>C. difficile</i> infection (e.g., fluoroquinolones, clindamycin, cephalosporins)</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>+Are activities conducted by the ASP to reduce inappropriate treatment of asymptomatic bacteriuria?</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>+Are activities conducted by the ASP to guide interpretation of procalcitonin results?</b>	<input type="checkbox"/> No procalcitonin testing <input type="checkbox"/> Procalcitonin results not acted upon by ASP <input type="checkbox"/> Yes: all patients <input type="checkbox"/> Yes: select patients	
<b>+List interventions conducted by the ASP to improve antibiotic use outside of core interventions.</b>		
<b>Microbiology</b>		



ASP Area	Answers	Comments
Do you have an onsite microbiology lab?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Does the ASP have a regular meeting with the microbiology lab to discuss issues relevant to both groups (e.g., interpretation of susceptibility tests, implementation of new diagnostic tests, etc.?)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Does your microbiology laboratory develop an annual antibiogram?	<input type="checkbox"/> Yes: Whole hospital <input type="checkbox"/> Yes: Stratified by unit <input type="checkbox"/> Yes: Urine isolates <input type="checkbox"/> Yes: Blood isolates <input type="checkbox"/> No	
Does your microbiology lab follow Clinical and Laboratory Standards Institute (CLSI) guidelines for making the antibiogram?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Is the antibiogram disseminated to prescribers?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Does your microbiology lab blind any culture or susceptibility results as a strategy to assist prescribers in selecting appropriate antibiotics?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
+ Does your facility perform rapid diagnostics on blood?	<input type="checkbox"/> Yes: Fungal organisms <input type="checkbox"/> Yes: Gram-negative organisms <input type="checkbox"/> Yes: Gram-positive organisms <input type="checkbox"/> No	
+ Does your facility perform rapid diagnostics on other specimens?	<input type="checkbox"/> Yes: Respiratory specimens for viruses <input type="checkbox"/> Yes: Respiratory specimens for bacteria <input type="checkbox"/> Yes: Cerebrospinal fluid <input type="checkbox"/> Legionella urinary antigen <input type="checkbox"/> <i>Streptococcus pneumoniae</i> urinary antigen <input type="checkbox"/> Other: <input type="checkbox"/> Other: <input type="checkbox"/> No	

ASP Area	Answers	Comments
+ Does your ASP have any specific interventions to adjust antibiotic regimens based on rapid diagnostic results?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Data</b>		
<b>Antibiotic Use Metrics</b>		
Do you have access to antibiotic use data?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
If you have access to antibiotic use data, what type of data is it?	<input type="checkbox"/> Purchasing data <input type="checkbox"/> Days of therapy/1,000 patient-days <input type="checkbox"/> Days of therapy/1,000 days present (National Healthcare Safety Network denominator) <input type="checkbox"/> Defined daily doses <input type="checkbox"/> Other: <input type="checkbox"/> N/A	
Do you monitor antibiotic use trends over time?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Do you stratify data by unit?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Do you stratify data by antibiotic/antibiotic class?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Do you stratify data by clinician?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
How are the data available to the ASP?	<input type="checkbox"/> Report provided at a predetermined interval by IT, pharmacy, etc. What interval? <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually <input type="checkbox"/> Other: <input type="checkbox"/> Data available in real-time on a dashboard <input type="checkbox"/> Other:	
Does your ASP present antibiotic use data to the ASP Committee?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

ASP Area	Answers	Comments
+ Does your ASP present antibiotic use data to facility leadership?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Does your ASP present antibiotic use data to frontline staff or unit directors?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
+ Do you report antibiotic use data to the National Healthcare Safety Network Antimicrobial Use and Resistance Module?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
<b>Other Metrics</b>		
+ Does the ASP measure the number and type of interventions performed?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
+ Does the ASP identify units with high <i>Clostridioides difficile</i> rates and assess antimicrobial use on the units?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Education</b>		
Does your ASP provide updates to healthcare providers about judicious antibiotic prescribing and the role of antibiotic stewardship?	<input type="checkbox"/> No <input type="checkbox"/> Yes: Nurses <input type="checkbox"/> Yes: Pharmacists <input type="checkbox"/> Yes: Prescribers <input type="checkbox"/> Yes: Other(s)	
How frequently does your ASP provide updates to health care providers about judicious antibiotic prescribing and the role of antibiotic stewardship?	<input type="checkbox"/> Annually <input type="checkbox"/> Annually, and as needed <input type="checkbox"/> Unscheduled <input type="checkbox"/> Other: <input type="checkbox"/> N/A	

# AHRQ Safety Program for Improving Antibiotic Use



## Team Antibiotic Review Form

***\*Questions 1–6 should be answered for all patients you evaluate who are actively receiving antibiotics.***

Question 1: Day of antibiotic therapy (choose one)

Day 1       Day 2       Day 3       Day 4       Day 5       Day 6       > 7 Days

Question 2: Record antibiotic regimen and indication below:

Antibiotic: \_\_\_\_\_ Indication: \_\_\_\_\_  
Antibiotic: \_\_\_\_\_ Indication: \_\_\_\_\_  
Antibiotic: \_\_\_\_\_ Indication: \_\_\_\_\_  
Antibiotic: \_\_\_\_\_ Indication: \_\_\_\_\_

Moment ONE			
Question 3: Does the patient have a suspected or confirmed infection that requires antibiotics?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	

Moment TWO			
Question 4: Were appropriate cultures ordered before antibiotics were started?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Question 5: Were specific reactions for reported antibiotic allergies documented?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Question 6: Were empiric antibiotics compliant with local guidelines?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A

**\* For patients who have been receiving antibiotics longer than 24 hours, answer questions 7–14 in addition to the above questions 1–6.**

<b>Moment THREE</b>			
Question 7: Are antibiotics still needed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<i>If you answered "no" to Question 7, answer Question 8. Otherwise go to Question 9.</i>			
Question 8: If antibiotics are not needed, will you stop them today?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Question 9: Can antibiotics be narrowed based on microbiology data or other clinical data?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Already narrowed
<i>If you answered "yes" to Question 9, answer Question 10. Otherwise go to Question 11.</i>			
Question 10: If antibiotics can be narrowed, will you change to a narrower regimen today?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Question 11: Can antibiotics be changed from intravenous to oral?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Already on PO
<i>If you answered "yes" to Question 11, answer Question 12. Otherwise go to Question 13.</i>			
Question 12: If antibiotics can be changed from intravenous to oral, will you change to oral therapy today?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	

<b>Moment FOUR</b>			
Question 13: Has a planned duration been documented in the medical record?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<i>If you answered "yes" to Question 13, answer Question 14. Otherwise this form has been completed.</i>			
Question 14: Is the planned duration consistent with local guidelines?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A

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Acute Care Commitment Poster

# A PROMISE TO OUR PATIENTS ABOUT ANTIBIOTICS

Antibiotics are life saving  
Antibiotics are lifesaving  
drugs but can have  
harmful side effects.

Our institution is committed to  
prescribing the most appropriate  
antibiotics when they are needed  
and to not prescribing antibiotics  
when they are not needed.

Please ask a member of your  
medical team if you have any  
questions about antibiotics.

Thank you!

# Directions for Completing and Displaying the Acute Care Commitment Poster

## How to “sign” the document

Once the document is open in Microsoft Word, click on the bottom right side of the document (the blank space) and you will find a text box (with no fill color or outline).

Use this text box to include the photographs and signatures of the individuals you believe are important to indicate your institution’s commitment to prescribing antibiotics responsibly. If the poster is being displayed in a general area of the hospital, consider having executive leadership and other influential leaders (e.g., medical, pharmacy, and nursing administrators) sign it. If it is being displayed in a specific unit, consider having the unit executive and the medical, pharmacy, and nursing director of the unit sign it.

## How to add a logo

If you choose to add a logo to this document, there are two placement options: in the signature textbox or on the footer (next to the AHRQ logo).

### Add logo to signature box

1. Click in the text box (which has no fill color or outline) located at the bottom right space of the poster. Make sure your cursor is in the box.
2. Go to the “Insert” tab.
3. Click on “Pictures” from the “Insert” tab.
4. A window will pop up so you can search your computer for the logo. Select your logo (.jpg or .png format) and click the insert button.
5. Your logo will appear in the text box.

### Add logo to footer (next to AHRQ logo)

1. Open the footer section (either double click in the footer section of the document or go to the “Insert” tab-> select the drop down menu for “Footer”-> and click on “Edit Footer”).
2. Follow steps 2-4 from “Add logo to signature box.”
3. Your logo will appear in your footer. If you want to move the logo image around, click on the logo-> go to the “Format” tab -> click on the “Wrap Text” dropdown menu -> and select “In front of text.” This formatting will allow you to move the logo freely around the screen.
4. When you are satisfied with the placement of the logo, exit the footer section (either double click outside of the footer area or go to the “Design” tab-> and click the “Close header and footer” button).

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# AHRQ Safety Program for Improving Antibiotic Use



## Antibiotic Time Out Tool

Date: \_\_\_\_\_ Patient Name or Identifier: \_\_\_\_\_

Directions: This form should be completed by frontline clinicians on a daily basis for patients receiving antibiotics.

**Note: A table of commonly recommended durations of therapy is available on the back of this document.**

Antibiotic 1: \_\_\_\_\_ Treatment day #: \_\_\_\_\_  
Antibiotic 2: \_\_\_\_\_ Treatment day #: \_\_\_\_\_  
Antibiotic 3: \_\_\_\_\_ Treatment day #: \_\_\_\_\_

### Check the patient's indication(s) for continuing antibiotics below:

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Prophylaxis                         | <input type="checkbox"/> Hospital-acquired pneumonia               | <input type="checkbox"/> Urinary tract infection (UTI) |
| <input type="checkbox"/> Central nervous system infection    | <input type="checkbox"/> Ventilator-associated pneumonia           | <input type="checkbox"/> Osteoarticular infection      |
| <input type="checkbox"/> Head and neck infection             | <input type="checkbox"/> <i>Clostridioides difficile</i> infection | <input type="checkbox"/> Skin/soft tissue infection    |
| <input type="checkbox"/> Endovascular infection/endocarditis | <input type="checkbox"/> Biliary tract infection                   | <input type="checkbox"/> Sepsis, unknown source        |
| <input type="checkbox"/> Community-acquired pneumonia        | <input type="checkbox"/> Diverticulitis                            | <input type="checkbox"/> Bacteremia                    |
|  | <input type="checkbox"/> Intra-abdominal infection                 | <input type="checkbox"/> Other:                        |

### Is the patient receiving antibiotics for any of the following conditions even though antibiotics are NOT typically recommended?

- Positive urine culture without symptoms of a UTI (Exceptions: pregnancy or impending urologic surgery where mucosal bleeding is expected)
- Enterococcus* in sputum
- Coagulase-negative staphylococci in a single blood culture
- Candida* in sputum or urine
- Surgical prophylaxis beyond 24 hours
- Noninfectious etiology of symptoms

### Answer Yes or No questions below based on patient's clinical status and culture results.

- |  |                              |                             |
|--|------------------------------|-----------------------------|
| Can any of the antibiotics be discontinued?                        | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Can existing therapy be changed to a more narrow spectrum regimen? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Should additional agents or broader-spectrum agents be added?      | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Are there any IV agents that can be changed to the PO route?       | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Are the antibiotics selected consistent with local guidelines?     | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

### What is the planned duration of antibiotic therapy?

Antibiotic 1: \_\_\_\_\_ Planned duration: \_\_\_\_\_ Consistent with recommended duration?  Yes  No  
Antibiotic 2: \_\_\_\_\_ Planned duration: \_\_\_\_\_ Consistent with recommended duration?  Yes  No  
Antibiotic 3: \_\_\_\_\_ Planned duration: \_\_\_\_\_ Consistent with recommended duration?  Yes  No

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Infectious process	Specific agents/circumstances	Recommended duration of antibiotic therapy*
Community-acquired pneumonia	n/a	5 days <sup>1-3</sup>
Hospital-acquired or healthcare-associated pneumonia	n/a	7 days <sup>4,5</sup>
Ventilator-associated pneumonia	n/a	7 days <sup>4,5</sup>
Cystitis	Nitrofurantoin or cephalosporin	5 days <sup>6-8</sup>
	Trimethoprim/sulfamethoxazole (TMP/SMX)	3 days <sup>6-9</sup>
Pyelonephritis	Fluoroquinolone	5–7 days <sup>6,10-12</sup>
	TMP/SMX or oral cephalosporin	10-14 days <sup>6,11</sup> (shorter course if early response)
Complicated urinary tract infection (UTI), including catheter-associated UTI (CAUTI)	Lower tract CAUTI in women ≤ 65 years if catheter is removed	3 days <sup>13,14</sup>
	Prompt resolution of symptoms	7 days <sup>14</sup>
	Delayed response, obstruction or other urologic abnormality	10–14 days <sup>14</sup>
Skin and soft-tissue infection	Clinical response by day 3	5–7 days <sup>15</sup>
Diverticulitis	Acute, uncomplicated	0–4 days <sup>16,17</sup>
	Complicated or initial severe illness with source control	4 days after source control <sup>18</sup>
	Complicated with small abscess, not drained*	5–10 days based on clinical response <sup>15,19</sup>
Biliary tract infection	Acute cholangitis and source control	3 days after source control <sup>20,21</sup>
	Acute cholangitis and source control with concomitant bacteremia	7 days <sup>22</sup>
	Uncomplicated acute cholecystitis, medical management*	5–10 days based on clinical response <sup>15,19</sup>
	Uncomplicated acute cholecystitis, surgical management	No antibiotics after surgery <sup>23</sup>
	Complicated acute cholecystitis (e.g., perforation, fistula), surgical management for source control	4 days after surgery <sup>18</sup>
Intra-abdominal infection with source control	n/a	4 days <sup>18</sup>
Gram-negative bloodstream infection with source control	n/a	7 days <sup>24</sup>

\*For all durations, recommendations are for patients without significant immunocompromise or complex presentations; relevant multi-specialty consultation, including infectious diseases, should be considered for cases falling outside of the scope of these recommendations.

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# Antibiotic Use Submission Template

## Monthly DOT

### General Instructions:

- We are requesting two spreadsheets per quarter for each unit participating in the AHRQ Safety Program for Improving Antibiotic Use, one is monthly antibiotic use data, the other is quarterly CDI event data. Separate spreadsheets will be available for each quarter. This spreadsheet is for data collected during Quarter 1 (1/1/2018-3/31/2018).
- Please make sure the hospital and unit names are consistent across the two sheets (Monthly DOT, Quarterly C. difficile) and different cycles of submissions.
- The predefined cells of this worksheet are locked and protected (Column A, B4--D6). Please avoid editing these cells or changing their orders. If no patient is administered for an antibiotics across all three months, please leave the cells empty or fill in zeros.
- Before uploading this to the website, save it as "DOT Q1\_Hospital Name\_Unit Name." Insert your own hospital and unit name.

### Instructions for Reporting Antibiotic Data:

- Total number of patient-days (B7, C7, D7) are the monthly totals of number of patients present in the unit at the same time (e.g. at midnight) of each day, summed across all days in the month. Please see Appendix 1 for examples.
- B8-B57, C8-C57, and D8-D57 reflect the aggregate number of days patients were administered each of the antibiotics in Column A within the time frame specified in B5-B6, C5-C6, and D5-D6 respectively. For example, if your unit had 3 patients using Amikacin in January 2018 and they used it for 3, 5, & 7 days, respectively, then days of Amikacin in January 2018 should be counted as 3+5+7=15 days and you should fill 15 in cell B8. If a patient used an antibiotic across months - for example, from 1/31/2017 to 2/2/2018 - then 1 day should be counted to January 2018 and 2 days should be counted towards February 2018.
- Please see NDC codes for corresponding antibiotics in Appendix 2.
- If you anticipate difficulties in collecting antibiotic usage data for the antibiotics listed below, please contact your Implementation Advisor for assistance.

Hospital name	[insert hospital name]		
Unit name	[insert unit name]		
Month	January	February	March
Time starts	1/1/2018	2/1/2018	3/1/2018
Time ends	1/31/2018	2/28/2018	3/31/2018
Total number of patient-days each month	[insert total # of patient-days for <b>January</b> here]	[insert total # of patient-days for <b>February</b> here]	[insert total # of patient-days for <b>March</b> here]
AMIKACIN	[insert aggregate # of days patients were administered Amikacin in participating unit in January here]	[insert aggregate # of days patients were administered Amikacin in participating unit in February here]	[insert aggregate # of days patients were administered Amikacin in participating unit in March here]
AMOXICILLIN			

AMOXICILLIN/CLAVULANATE			
AMPICILLIN			
AMPICILLIN/SULBACTAM			
AZITHROMYCIN			
AZTREONAM			
CEFACLOR			
CEFAZOLIN			
CEFEPIME			
CEFOTAXIME			
CEFOTETAN			
CEFOXITIN			
CEFTAROLINE			
CEFTAZIDIME			
CEFTAZIDIME/AVIBACTAM			
CEFTOLOZANE/TAZOBACTAM			
CEFTRIAZONE			
CEFUROXIME			
CIPROFLOXACIN			
CLARITHROMYCIN			
CLINDAMYCIN			
COLISTIMETHATE			
DAPTOMYCIN			
DORIPENEM			
DOXYCYCLINE			
ERTAPENEM			
FIDAXOMICIN			
FOSFOMYCIN			
GENTAMICIN			
IMIPENEM/CILASTATIN			
LEVOFLOXACIN			
LINEZOLID			
MEROPENEM			
MEROPENEM/VABORBACTAM			
METRONIDAZOLE			
MOXIFLOXACIN			
NAFCILLIN			
NITROFURANTOIN			
OXACILLIN			
PENICILLIN G			

PIPERACILLIN/TAZOBACTAM			
POLYMYXIN B			
RIFAMPIN			
SULFAMETHOXAZOLE/TRIMETHOPRIM			
TEDIZOLID			
TELAVANCIN			
TIGECYCLINE			
TOBRAMYCIN			
VANCOMYCIN			

**Calculate Pt-Days**

This example illustrates two methods to calculate the number of patient days

The example shows a case of 5 patients and set the time frame as 1/1/2018-1/5/2018

Both methods calculate the total number of patient days as 18 days among the 5 patients during 1/1/2018-1/5/2018

Patient	Admitted or transferred in to the unit	Discharge or transferred out from the unit
A	1/1/18 12:00 AM	1/5/18 2:00 PM
B	1/1/18 4:00 PM	1/4/18 12:01 AM
C	1/1/18 8:00 PM	1/7/18 11:59 PM
D	1/2/18 3:00 AM	1/6/18 5:00 AM
E	1/2/18 6:00 AM	1/8/18 6:00 AM

**Method 1:** Count number of patients in the unit at the same time for each day in the given time frame and sum across all days

Time	# of patients in the unit
1/1/18 12:00 AM	1 (patient A)
1/2/18 12:00 AM	3 (patient A, B, C)
1/3/18 12:00 AM	5 (patient A, B, C, D, E)
1/4/18 12:00 AM	5 (patient A, B, C, D, E)
1/5/18 12:00 AM	4 (patient A, C, D, E)

**Method 2:** Count days contributed by each patient in a given time frame and sum across all patients

Patient	Patient-days between 1/1/2018 and 1/5/2018
A	5 days (The patient is in the unit at 12:00 AM on 1/1, 1/2, 1/3, 1/4, and 1/5)
B	3 days (The patient is in the unit at 12:00 AM on 1/2, 1/3, and 1/4)
C	4 days (The patient is in the unit at 12:00 AM on 1/2, 1/3, 1/4, and 1/5)
D	3 days (The patient is in the unit at 12:00 AM on 1/3, 1,4 and 1/5)
E	3 days (The patient is in the unit at 12:00 AM on 1/3, 1,4 and 1/5)

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# Quarterly Benchmarking Report, 4th Quarter, October - December 2018

**Facility:** ABC Medical Center

**Unit:** Medical Floor

**Hospital Benchmark:** all participating units from Community Hospitals with less than 300 beds

**Unit Benchmark:** all participating Medical units/wards from all participating hospitals

As part of participation in the AHRQ Safety Program for Improving Antibiotic Use, your unit will receive quarterly benchmarking reports to compare your unit’s progress to those of units in similar facilities.

This report contains individualized results from all the data submitted by your unit for the 1st, 2nd, 3rd, and 4th quarters (January – December 2018). It includes the following results for your unit:

• 1st quarter antibiotic days of therapy (DOT)
• 2nd quarter antibiotic days of therapy (DOT)
• 3rd quarter antibiotic days of therapy (DOT)
• 4th quarter antibiotic days of therapy (DOT)
• 1st quarter <i>C. difficile</i> LabID events
• 2nd quarter <i>C. difficile</i> LabID events
• 3rd quarter <i>C. difficile</i> LabID events
• 4th quarter <i>C. difficile</i> LabID events
• March - May 2018 Team Antibiotic Review Forms
• June - August 2018 Team Antibiotic Review Forms
• September - November 2018 Team Antibiotic Review Forms

The report also includes aggregate data results from all participating units in similar facilities (Hospital Benchmark) and from similar units in all participating hospitals (Unit Benchmark). Both benchmarks include data available at the time of production of this report. The benchmarks and your unit’s relation to these benchmarks may have changed from previous quarterly reports as more data from participating facilities has been included.

If your unit submitted data that are not specific to your registered unit, incomplete quarterly data (e.g., missing data for one month), a denominator other than patient-days (e.g., days-present), and/or out-of-range data (low or high patient-days/rates in comparison to the benchmark), your unit’s data will be excluded from the benchmark calculation as they are not directly comparable to benchmark data. Please see individual results below for more detail.

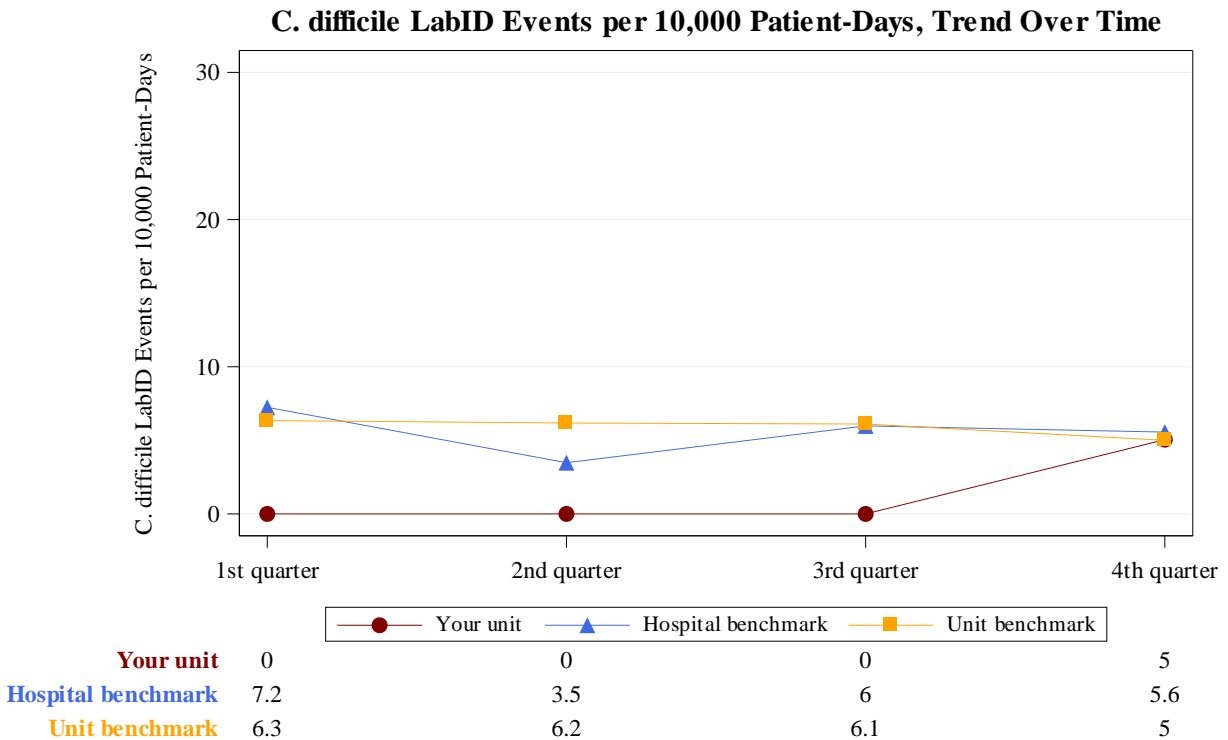
Please note that results from individual units will not be shared with other participating hospitals; the report only includes aggregate benchmark data from other hospitals. We welcome your feedback on the report. If you have any questions about the report, or the individual results from your unit, please contact your implementation adviser.



### C. difficile LabID Events

#### C. difficile LabID events per 10,000 patient-days

The following figure shows the trend of number of *C. difficile* LabID events per 10,000 patient-days in your unit, all participating units from Community Hospitals with less than 300 beds, and Medical units/wards from all participating hospitals. The benchmark rates represent average rates across all included units.



The number of units submitting Q4 data for your unit’s benchmarking cohorts are as follows:

- Hospital Benchmark: 82 units from 69 hospitals
- Unit Benchmark: 64 units from 59 hospitals

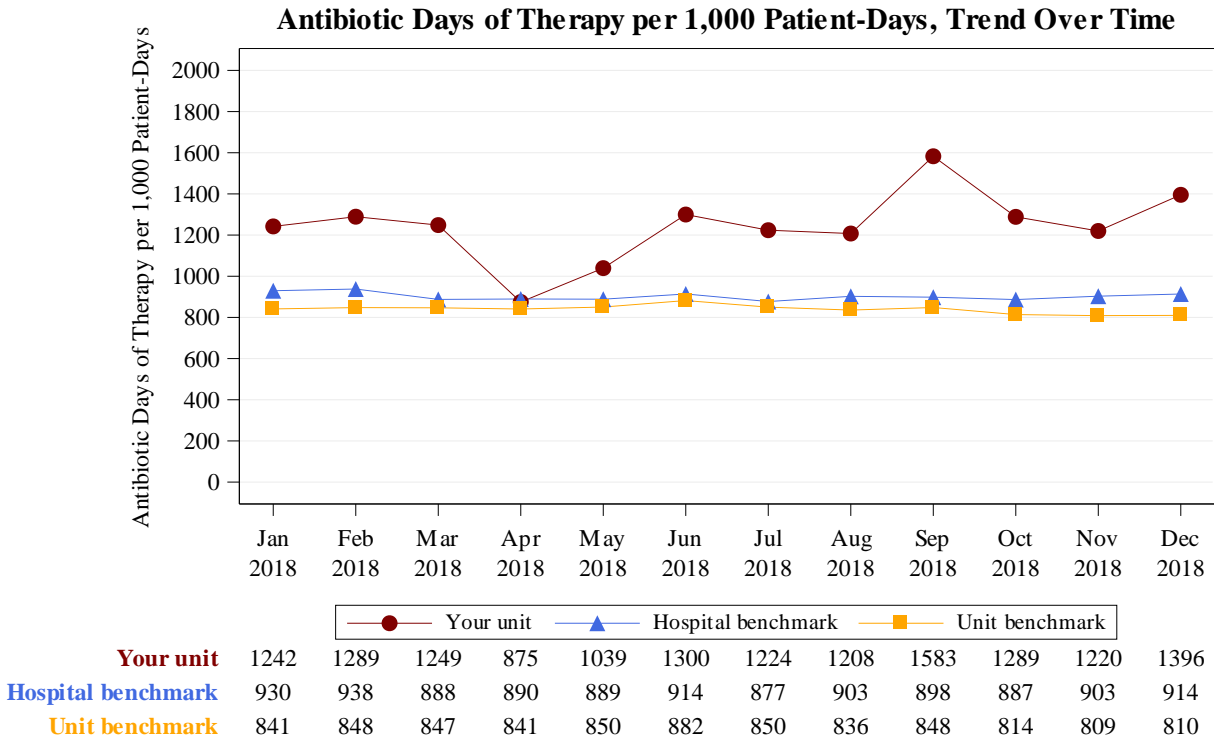
The following results compare your unit’s rate to all rates in your unit’s benchmark cohorts:

- Compared to individual units in your hospital benchmark, your unit's rate of *C. difficile* LabID events is higher than at least 50% of similar units.
- Compared to individual units in your unit benchmark, your unit's rate of *C. difficile* LabID events is higher than at least 50% of similar units.

## Antibiotic Use Data

### Antibiotic days of therapy (DOT) per 1,000 patient-days

The following figure shows the trend of monthly days of therapy per 1,000 patient-days in your unit, all participating units from Community Hospitals with less than 300 beds, and Medical units/wards from all participating hospitals. It includes data for all antibiotics reported by your unit. The benchmark rates represent an average rate across all included units.



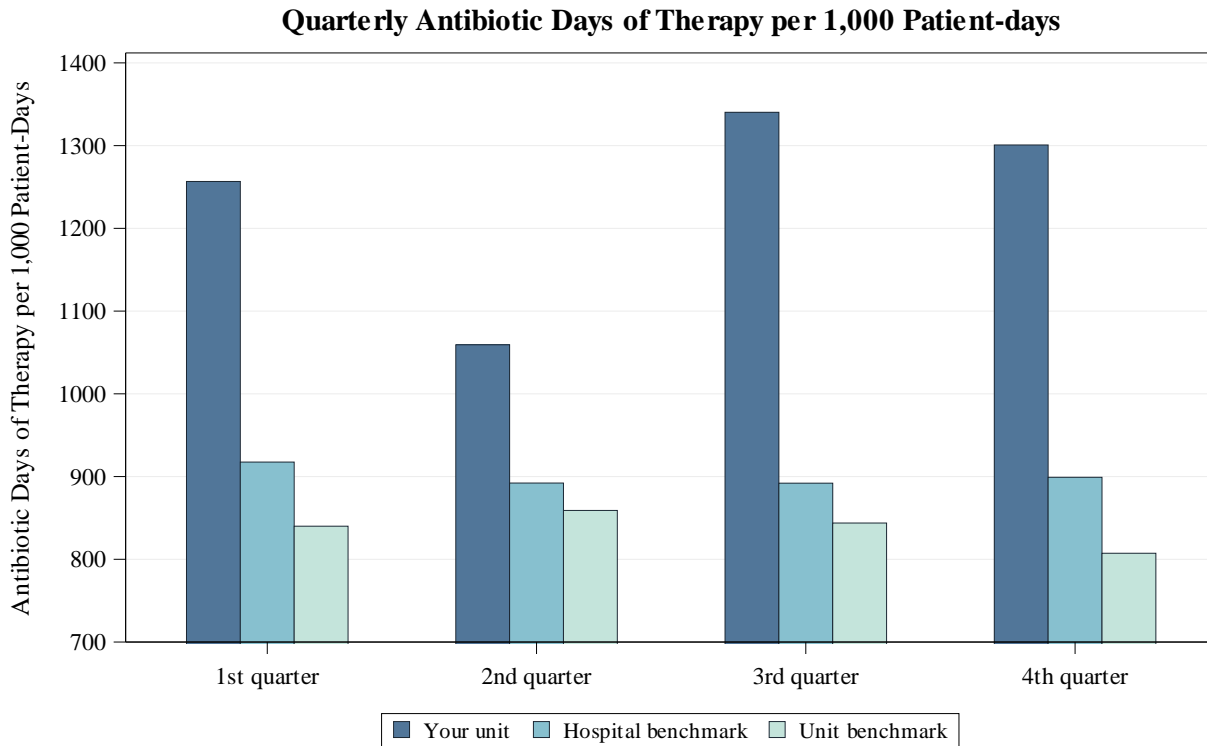
The number of units submitting Q4 data for your unit's benchmarking cohorts are as follows:

- Hospital Benchmark: 87 units from 74 hospitals
- Unit Benchmark: 67 units from 62 hospitals

The following results compare your unit's rate to all rates in your unit's benchmark cohort:

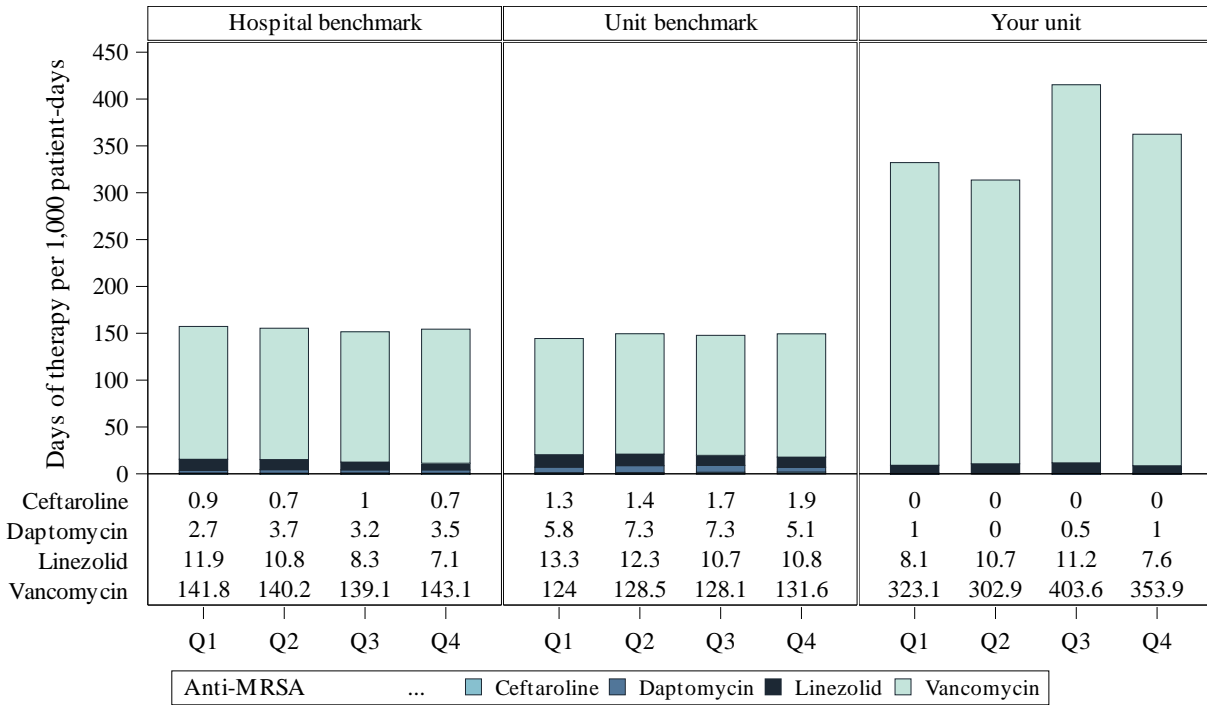
- Compared to individual units in your hospital benchmark, your unit's rate of days of therapy is higher than at least 75% of similar units.
- Compared to individual units in your unit benchmark, your unit's rate of days of therapy is higher than at least 75% of similar units.

The figure below shows the quarterly antibiotic days of therapy per 1,000 patient-days from Q1 to each subsequent program quarter, for your unit and for the hospital and unit benchmarks, respectively. The benchmark rates represent an average rate across all included units.

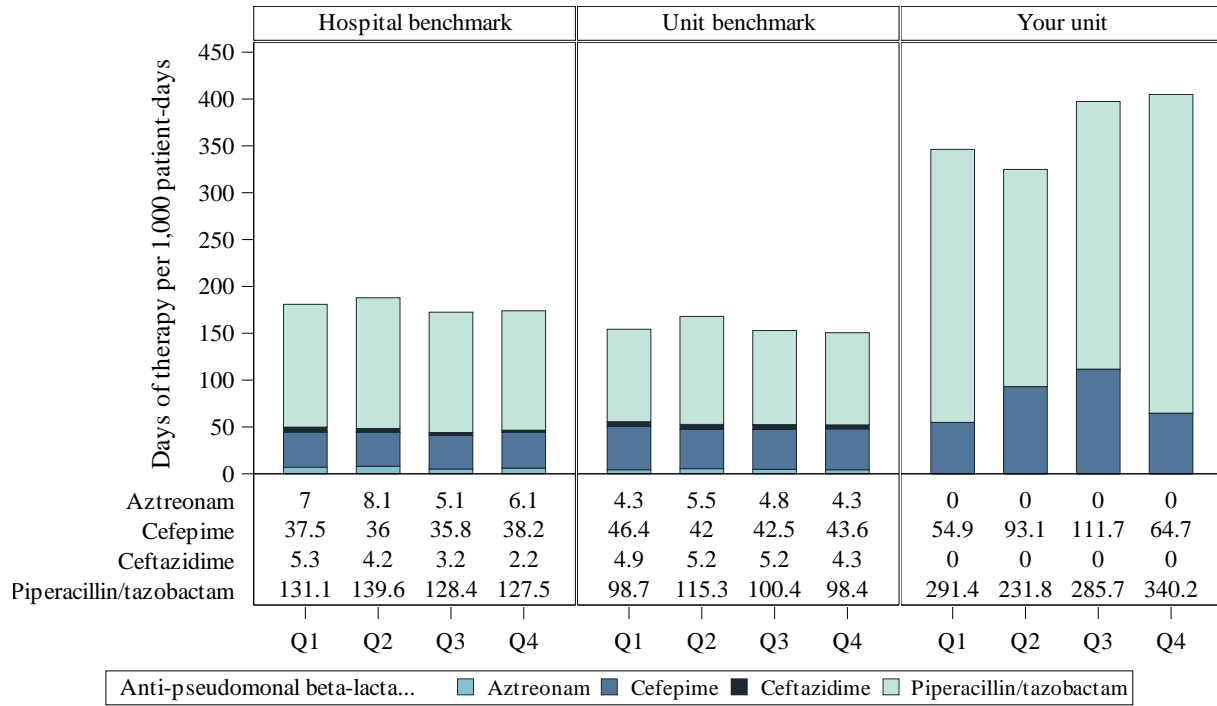


The following figures show the quarterly days of therapy per 1,000 patient-days for antibiotics in each of five drug classes of interest. Data are shown for the hospital benchmark, unit benchmark, and your unit.

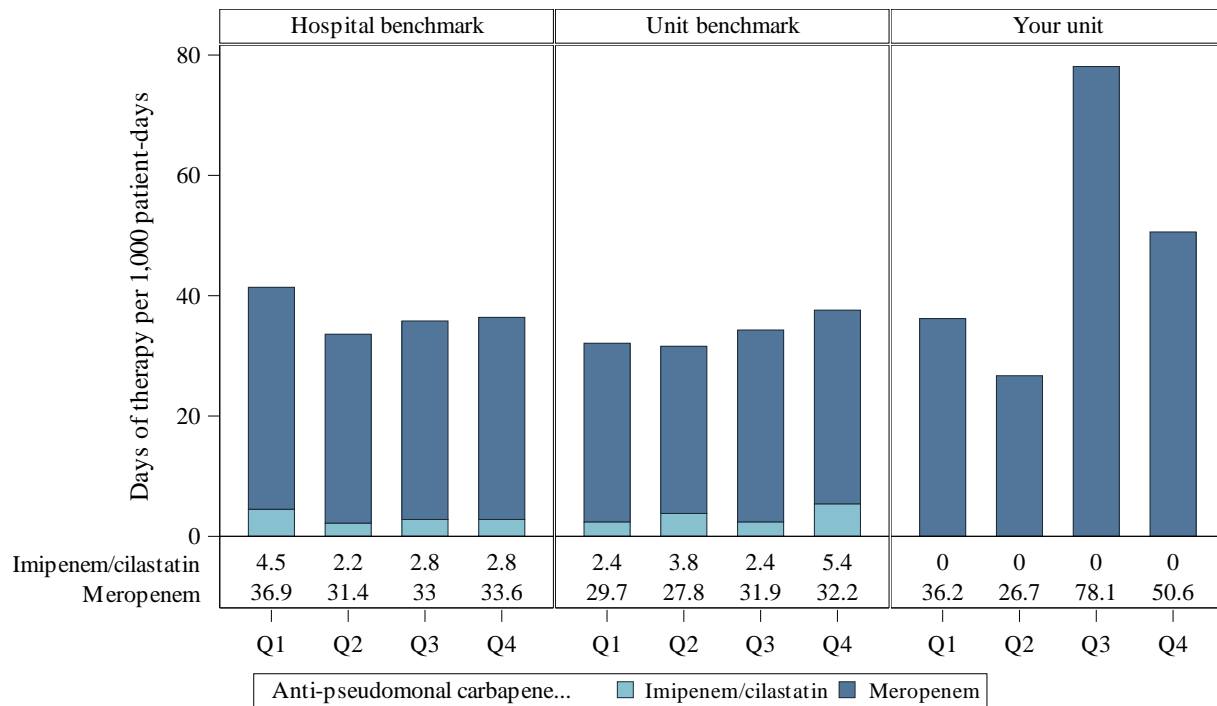
**Antibiotic Days of Therapy per 1,000 Patient-Days, by Quarter**



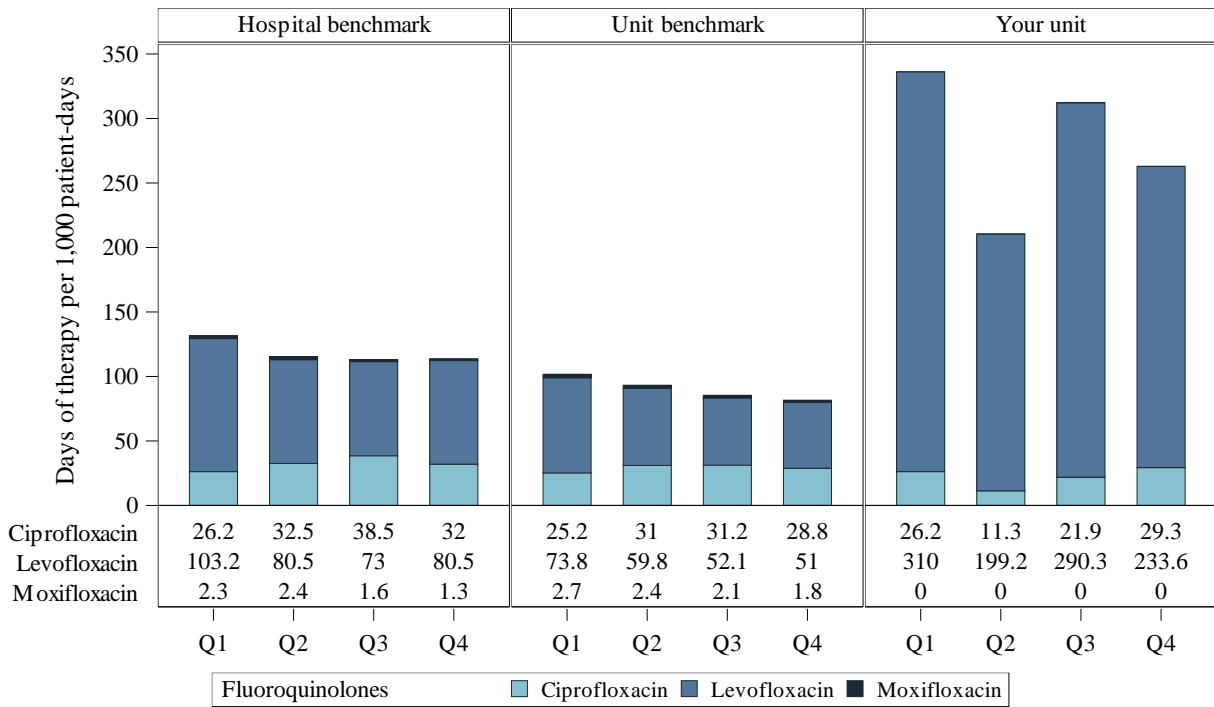
### Antibiotic Days of Therapy per 1,000 Patient-Days, by Quarter



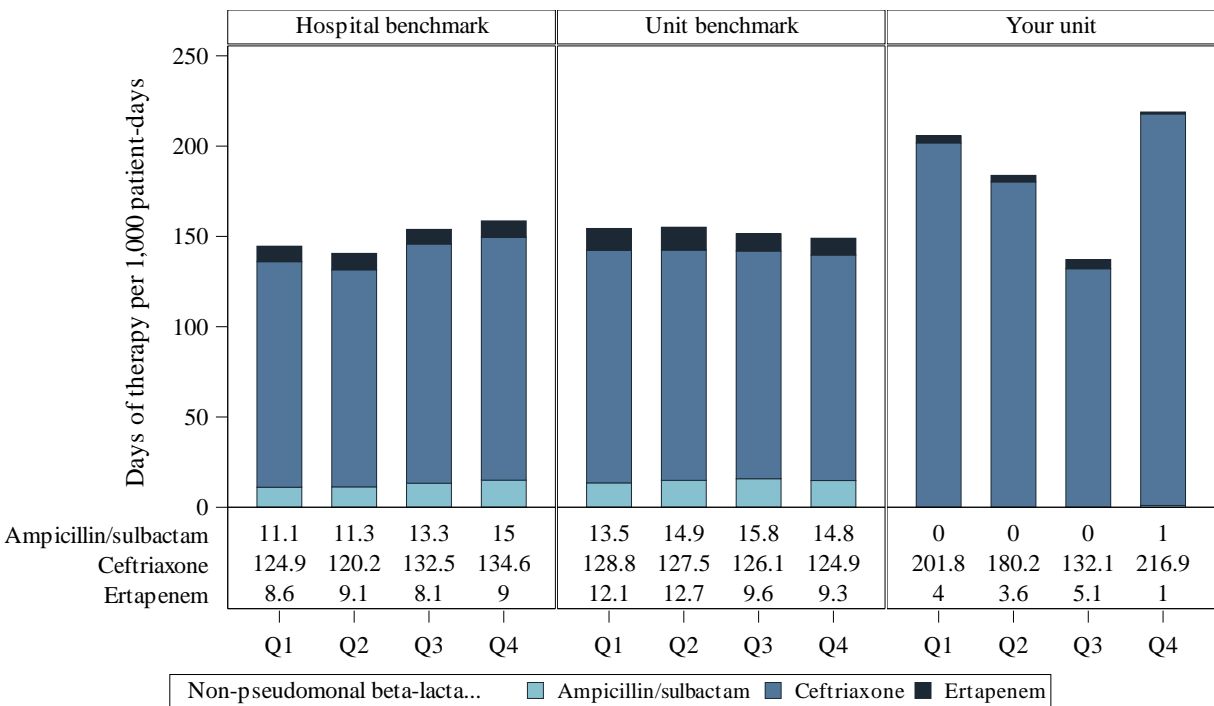
### Antibiotic Days of Therapy per 1,000 Patient-Days, by Quarter



### Antibiotic Days of Therapy per 1,000 Patient-Days, by Quarter



### Antibiotic Days of Therapy per 1,000 Patient-Days, by Quarter



## Team Antibiotic Review Form

See program website for [team antibiotic use review form](#)

Your unit submitted Team Antibiotic Review Forms for 9 months, with an average of 10 antibiotic use review forms per month from March to November 2018. The graph below shows the summary of responses reported on the Team Antibiotic Review Forms, by quarter, for your unit. Each bar represents the percentage of submitted forms answering “yes” to a particular question or set of questions related to the patients on antibiotics that were evaluated. Responses of “not applicable” are not included in the graph.

### Summary of Responses Reported on the Team Antibiotic Review Forms, by Quarter

=== Moment 1 ===

Suspected/confirmed infection

=== Moment 2 ===

Appropriate culture ordered

Reactions for reported antibiotic allergies documented

Empiric antibiotics compliant with local guidelines

=== Moment 3 ===

Decision made to discontinue antibiotics

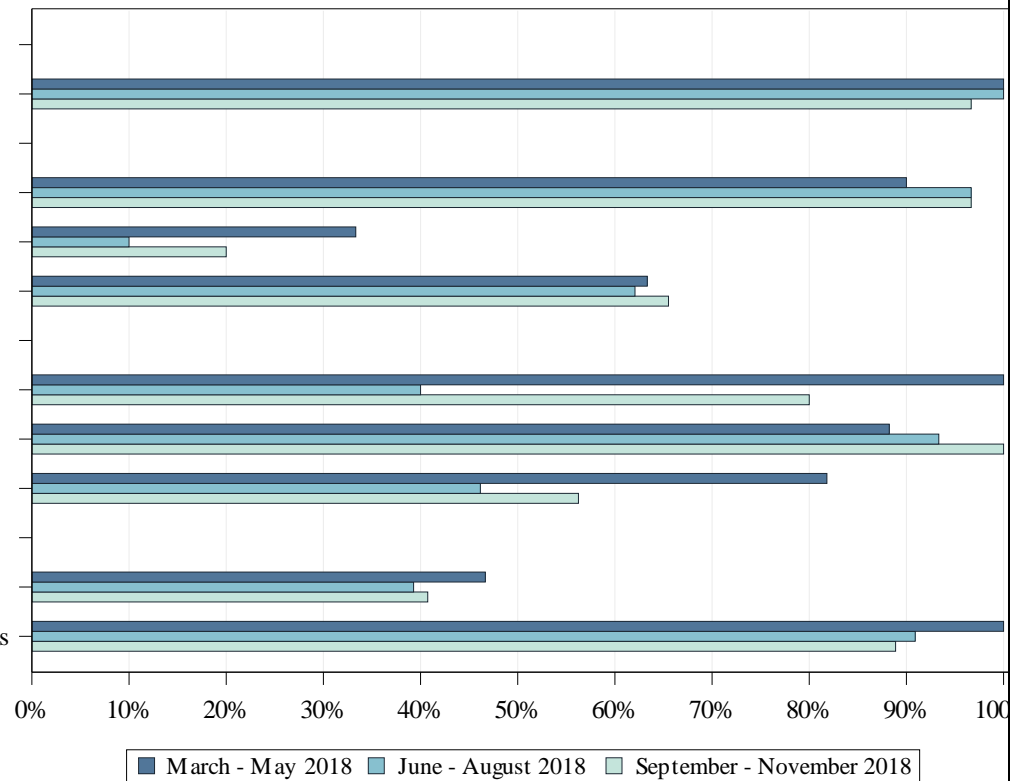
Decision made to narrow antibiotics

Decision made to change antibiotics from IV to oral route

=== Moment 4 ===

Planned duration of therapy documented in progress notes

Documented planned duration consistent with local guidelines



# AHRQ Safety Program for Improving Antibiotic Use



## Toolkit Implementation Guide for Acute Care Antibiotic Stewardship Programs

### Introduction

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Developing an antibiotic stewardship program (ASP) or improving an existing ASP can take time. If you are starting a program or growing a nascent program, the resources provided in the AHRQ Safety Program toolkit are intended to be introduced and implemented over several months. If you have an existing ASP, you should assess what elements of the toolkit will improve your program. Regardless of the stage of your ASP, you should begin by reviewing all elements of the toolkit, described below.

### Develop and Improve Your Stewardship Program

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It may be most useful to begin with the first four presentations under the “Develop and Improve your Stewardship Program” tab to ensure that you have the basics in place for a functioning ASP. Each presentation throughout the toolkit includes both a slide set and a script, referred to in the toolkit as a facilitator guide. The presentations in this section are directed at ASP leaders and cover developing an ASP, determining core interventions that the ASP will perform on a regular basis, measuring the success of the ASP, managing behavior change as a steward, and sustaining an ASP.

The two presentations on developing an ASP (part 1 and part 2) and the gap analysis tool can be used to determine what areas of your program may benefit from improvement. If after completing the gap analysis, you note major deficiencies in your ASP, particularly those that might lead to noncompliance with The Joint Commission Antimicrobial Stewardship Standard or other similar standards, you should meet with hospital leadership to determine how to manage the deficiencies. This may include developing a business case for additional physician or pharmacist resources or gaining access to data analysis resources.

All stewards should view the presentation “Making Effective Behavior Changes Around Antibiotic Prescribing,” which provides an overview of behavioral aspects of antibiotic stewardship and practical approaches to modify prescriber behavior.

Once you have completed this work, consider viewing the two narrated presentations in this section regarding collaboration with bedside nurses and the microbiology lab for ideas about how to integrate the work of these important stakeholders into ASP practice.

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## **Four Moments of Antibiotic Decision Making Framework**

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Next, review the Four Moments of Antibiotic Decision Making framework and determine how to present it to frontline clinicians at your hospital. This framework identifies the critical time periods of antibiotic decision making throughout a course of antibiotics. It is intended to be disseminated to all frontline clinicians to ensure a rational thought process is employed when making decisions about whether antibiotics are needed and if so, what the most appropriate regimen is. Even if you have a robust ASP, consider taking the additional step of introducing the Four Moments framework so that frontline clinicians can be active participants in the process of improving antibiotic prescribing.

Several actions can be taken to integrate the Four Moments into regular practice:

- Local guidelines should be developed using the Four Moments framework. Thus, guidelines should use appropriate diagnostic criteria to determine if a patient has an infection, common causative organisms and cultures that should be obtained, recommendations for empiric therapy, recommendations for narrowing therapy and transitioning from intravenous to oral therapy, and recommendations for duration of therapy.
- All “Best Practices” presentations in the AHRQ Safety Program toolkit incorporate the Four Moments framework; these slide sets can be used for presentations at conferences such as grand rounds. Most have associated One Page document templates and User Guides to assist with guideline development.
- Posters and a screen saver graphic are available that can be reproduced for posting on units and distributing to clinicians to remind them of the Four Moments. These can also be used as content for screen savers on hospital computers.
- Direct interactions by the ASP with clinicians and teams to assist them in (1) understanding the purpose of the Four Moments and (2) determining how they will be operationalized on a daily basis such as during a pre-specified time for discussion on rounds or as part of an antibiotic stewardship section of a daily progress note. The Antibiotic Time Out Tool can be used to facilitate these daily assessments by an individual or team. The ASP is encouraged to meet with frontline teams and providers to review some portion of patients receiving antibiotics; this can be guided by use of the Team Antibiotic Review Form.

## **Develop a Culture of Safety Around Antibiotic Prescribing**

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Next, as you focus on setting up or revitalizing your ASP, it is important to work on changing the culture of antibiotic prescribing at your hospital. Under the “Developing a Culture of Safety Around Antibiotic Prescribing” tab, several presentations can help you achieve this goal. Institutional behavior change can be challenging, and ASPs and frontline providers may be inclined to skip the step of addressing cultural and behavioral issues associated with antibiotic prescribing. However, we strongly recommend that the ASP team view these presentations in addition to the presentation noted above, “Making Effective

Behavior Changes Around Antibiotic Prescribing,” and determine which elements will be helpful in improving their relationship with frontline providers and in engaging frontline providers to optimize antibiotic prescribing. Below is a summary of these presentations.

- “Making the Case That Antibiotic Use is a Patient Safety Issue” provides a general overview of why improving antibiotic use is important. ASP team members should use slides from this presentation to demonstrate to leadership and frontline clinicians the potential harms associated with antibiotic use and why all individuals should work together to use antibiotics in the best possible way.
  - A signable Commitment Poster indicating to your patients and staff that your facility is dedicated to using antibiotics judiciously is available. Sign and post the Commitment Poster in public areas so that it is clear that your hospital is committed to improving antibiotic use.
- “Improving Communication and Teamwork Around Antibiotic Decision Making” addresses common pitfalls in how we communicate medical information to each other and approached to improve communication and teamwork in antibiotic prescription decisions. It includes information about initiating an antibiotic time out and use of the Team Antibiotic Review Form to accomplish these goals.
- “Identifying Targets for Improvement in Antibiotic Decision Making” addresses identifying technical versus behavioral (also known as adaptive) problems leading to antibiotic-associated adverse events as well as first and second order problem solving approaches. The ASP and frontline providers are encouraged to characterize all antibiotic prescribing problems as technical, adaptive, or both, and craft solutions based on that information in multidisciplinary teams.
- “Making Effective Changes in Antibiotic Decision Making” provides a specific framework for developing and implementing solutions to problems that lead to antibiotic associated harm. Two forms are provided to assist with these discussions between ASPs and frontline staff:
  - “Identifying Antibiotic-Associated Adverse Events Form” is brief and can be used at meetings or left on units for frontline providers to complete when they identify a potential antibiotic-associated adverse event.
  - “Learning From Antibiotic-Associated Adverse Events Form” is similar to a root cause analysis form and can be completed during structured meetings to guide strategies to prevent future antibiotic-associated adverse events.

## **Learn Best Practices for the Diagnosis and Treatment of Infectious Syndromes**

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Next, review the material under the “Best Practices for the Diagnosis and Treatment of Infectious Syndromes” tab. Each syndrome is associated with a presentation and support materials that include a One Page document that can be used as a poster, a handout, and/or as a template for local guidelines and a User Guide that assists ASPs with customizing the One Page document to reflect the local formulary and antibiogram. The specific infectious diseases topics addressed are asymptomatic

bacteriuria and urinary tract infections, community-associated lower respiratory tract conditions (including community-acquired pneumonia, aspiration events, and chronic obstructive pulmonary disease exacerbations), ventilator-associated pneumonia, hospital-acquired pneumonia, cellulitis and skin and soft tissue abscesses, diverticulitis, biliary tract infections, bacteremia, sepsis, and *Clostridioides difficile* infections. Each presentation uses the Four Moments of Antibiotic Decision Making framework to walk the participant through relevant decisions for the specific syndrome at each moment. The ASP should determine how to present the material to frontline providers over time. Each of the above topics includes presentation slides as well as a facilitator guide. Suggestions for presenting the material include:

- Standing monthly meetings and conferences with teams or units to review topic-specific presentations followed by the development of relevant guidelines
- Distribution of the supporting materials so that they are available at the point of care (e.g., local website, common workstations, break rooms)
- Regular follow up from the ASP with frontline staff both through routine post-prescription review and feedback and through use of the Team Antibiotic Review Form during scheduled in-person meetings. ASPs may also consider encouraging the frontline teams to review the presentations themselves

ASPs may consider focusing on a specific syndrome each month or every two months. During that period, the activities of the ASP would include developing or updating guidelines on the syndrome, disseminating information about the syndrome, focusing its daily interventions (e.g., post-prescription review and feedback and use of the Team Antibiotic Review Form) on patients with the syndrome, and collecting and feeding back data on improvements in how clinicians are managing these syndromes.

Ultimately, local guidelines for all of the covered topics as well as other topics identified by the ASP and frontline staff should be developed and made available at the point of care.

## Conclusion

The AHRQ Safety Program for Improving Antibiotic Use Acute Care Toolkit provides a pathway for ASPs to develop and improve their programs. ASPs are encouraged to consider how all elements of the toolkit can be applied at their institutions to improve antibiotic use and enhance the safety of patients receiving antibiotics.

**eTable:** Metrics of the Top 30 Downloaded AHRQ Safety Program Content from December 2017 to November 2018<sup>1</sup>

	Topic	Number of unique user downloads
1	Team antibiotic review form	923
2	Asymptomatic bacteriuria and urinary tract infection one page user guide <sup>2</sup>	774
3	Urinary tract infection one page document	765
4	Asymptomatic bacteriuria one page document	697
5	Antibiotic use data template	649
6	Community-acquired pneumonia one page document	648
7	Data collection and submission guide	633
8	Community-acquired pneumonia user guide	497
9	Chronic obstructive pulmonary disease exacerbation one page document	481
10	Asymptomatic bacteriuria and urinary tract infection slide set	464
11	Cellulitis one page document	432
12	<i>Clostridioides difficile</i> infection Lab-ID events data template	420
13	Aspiration pneumonitis one page document	415
14	Four moments of antibiotic decision making pocket card	395
15	Judicious Use of Antibiotics Commitment Poster	365
16	Cellulitis user guide	358
17	Antibiotic time out tool	351
18	Chronic obstructive pulmonary disease user guide	350
19	Aspiration pneumonitis user guide	344
20	Completion guide for team antibiotic review form	323
21	Community-acquired lower respiratory tract infection slide set	309
22	Four moments of antibiotic decision making posters for units	305
23	Hospital-acquired pneumonia one page document	299
24	Asymptomatic bacteriuria and urinary tract infection facilitator guide <sup>3</sup>	274
25	Bacteremia slide set	268
26	Ventilator-associated pneumonia webinar slide set	266
27	Diverticulitis and biliary infections webinar slide set	266
28	<i>Clostridioides difficile</i> infections slide set	266
29	Four moments of antibiotic decision making screen savers	265
30	Sepsis slide set	260

<sup>1</sup>Numbers in table may be an underestimation of content utilization as many tools were also emailed to participants at the same time content was posted to the AHRQ Safety Program website.

<sup>2</sup>User guides describe suggested antibiotics for empiric and culture directed therapy as well as other important information to include when developing local guidelines for both children and adults.

<sup>3</sup>Facilitator guides include scripts to accompany the slide set used in the webinars for participants who would like to review content again or present slides locally.

**eFigure:** Distribution of 402 hospitals across the United States enrolled in the AHRQ Safety Program; color gradients represent number of sites enrolled per state

