

# Antimicrobial Stewardship Programs

a Toolkit for Critical Access Hospitals in Kansas



Healthcare-Associated Infections  
& Antimicrobial Resistance Program



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Source: Centers for Disease Control and Prevention Public Health Image Library

## Introduction

The availability of effective antibiotics is one of the most important developments in modern medicine, leading to infectious diseases falling out of the top five leading causes of death in the United States. <sup>1</sup> However, continued inappropriate use of antibiotics is contributing to the increased development of antibiotic resistance as well as increased risk of adverse patient outcomes such as *Clostridium difficile* (*C. difficile*) and other adverse events. <sup>2, 3, 4, 5, 6, 7</sup>

For several decades it has been recognized that up to 50% of antibiotic use was inappropriate- meaning there was no infection, the wrong antibiotic was prescribed, or the duration of treatment was incorrect. <sup>8</sup> According to the Centers for Disease Control and Prevention (CDC) "...at least 2 million people become infected with bacteria that are resistant to antibiotics and at least 23,000 people die each year as a direct result of these infections." <sup>4</sup>

Improper use and over prescribing are two of the many factors surrounding antibiotic resistance that are of great importance to the healthcare community, because these are the two areas where we can work to make improvements.

When prescribing antibiotics the benefits need to be weighed against the possible risks associated with increased resistance and adverse health outcomes. The best way to begin to combat this issue is to start with the implementation of antimicrobial stewardship programs (ASPs) in hospitals. An antimicrobial stewardship program can provide specific policies for an institution to address antibiotic prescribing and implement tracking systems to monitor rates of infection and resistance patterns within their facility. <sup>9</sup>

In 2014, the CDC recommended that all acute care hospitals implement antibiotic stewardship programs in order to meet the urgent need to improve antibiotic use in hospitals. <sup>10</sup>

This toolkit follows the CDC's Core Elements of Antimicrobial Stewardship and adapts these core elements to facilities in the state of Kansas, in particular the critical access hospitals and provides specific examples in order to better aid hospitals in the development and implementation of effective ASPs.

## Aim

The aim of this toolkit is to provide an evidence-based outline for antimicrobial stewardship programs in the acute care setting.

## Definitions of Antimicrobial Stewardship



### **Centers for Disease Control and Prevention**

“Antimicrobial stewardship refers to a set of commitments and activities designed to optimize the treatment of infections while reducing the adverse events associated with antibiotic use.”



### **Association for Professionals in Infection Control and Epidemiology**

“Antimicrobial stewardship is a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms.”



### **Infectious Diseases Society of America**

“Antimicrobial stewardship refers to coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration. Antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains.”

## Summary of Core Elements for Antimicrobial Stewardship



### **Leadership commitment**

Demonstrate support and commitment to safe and appropriate antibiotic use in your facility



### **Accountability**

Identify physician, nursing and pharmacy leads responsible for promoting and overseeing antibiotic stewardship activities in your facility



### **Drug expertise**

Establish access to consultant pharmacists or other individuals with experience or training in antibiotic stewardship for your facility



### **Action**

Implement **at least one** policy or practice to improve antibiotic use



### **Tracking**

Monitor **at least one process** measure of antibiotic use and **at least one outcome** from antibiotic use in your facility



### **Reporting**

Provide regular feedback on antibiotic use and resistance to prescribing clinicians, nursing staff and other relevant staff



### **Education**

Provide resources to clinicians, nursing staff, residents and families about antibiotic resistance and opportunities for improving antibiotic use

Source: Centers for Disease Control and Prevention



Source: Centers for Disease Control and Prevention Public Health Image Library

## **Core Element 1: Leadership Commitment**

Clear support from leadership is vital for the success of an antimicrobial stewardship program. Leadership commitment can come in the form of financial support, written statements of support, or dedicated time and resource allocation.<sup>9, 11</sup> Communicating regularly with leadership on the importance of antimicrobial stewardship and directing leadership towards CDC's Get Smart for Healthcare may aid in gaining support from leadership. Studies conducted by CDC using data from the National Healthcare Safety Network (NHSN), as well as local surveys on antimicrobial stewardship practices in Kansas show that support from leadership is the greatest predictor of whether or not a facility has an ASP.<sup>12</sup>

Providing not only information on the importance of ASP in healthcare, leadership may also wish to understand the business case for the ASP. With thin margins hospitals must do more with less money and on their most basic level ASPs can decrease the number of *C. difficile* and multi-drug resistant organism infections which can lead to decreased costs as well as increased patient satisfaction and a better reputation for the facility.<sup>13</sup> Many key national reports also highlight the importance of ASPs and may help when speaking with leadership.

## **Examples of formal statements of support**

Henry Ford Health System will ensure appropriate antimicrobial use throughout its health system. By 2017, the health system will implement the CDC core elements for antibiotic stewardship programs and aim to make the following improvements: implementing a 72-hour "time-out" for intravenous antimicrobials;

implementing a “smart stop date” in EMR systems reflecting best available evidence on duration of therapy; participating in NHSN reporting of antimicrobial utilization; integrating antimicrobial stewardship goals in outpatient prescribing for patients seen in its emergency departments and clinics; and implementing transition of care programs to improve the quality and safety of Outpatient Parenteral Antimicrobial Therapy across the health system.

Johns Hopkins Medicine will have Antibiotic Stewardship Programs (ASP) in all of its hospitals over the next two years by implementing and sustaining activities that include all sites reporting data to the NHSN AUR module and agreeing upon, disseminating Johns Hopkins Medicine guidelines for antibiotic use, and developing, executing, and reporting targeted interventions to improve antibiotic prescribing.

Additional examples of Leaders Committed to Antibiotic Stewardship

<http://www.cdc.gov/drugresistance/federal-engagement-in-ar/stewardship-commitment/index.html>

### **Sample mission statements**

#### **Saint Luke’s Health System**

To achieve the best possible antimicrobial related outcomes across the Saint Luke’s Health System by ensuring the optimal selection, dose, and duration of antimicrobials for treatment or prevention while minimizing the impact of possible side effects and antimicrobial resistance.

#### **Mitchell County Hospital Health System**

The primary mission of antibiotic stewardship is to promote optimal antibiotic therapy in order to improve patient safety at Mitchell County Hospital Health System.

#### **John’s Hopkins**

The mission of the program is to ensure that every patient at Hopkins on antibiotics gets optimal therapy. Our goal is for the Antimicrobial Stewardship Program to be a useful service in optimizing antibiotic use at Hopkins.

#### **Clara Barton Hospital**

The antimicrobial stewardship program at Clara Barton Hospital and medical clinics will optimize the utilization of antimicrobial agents in order to achieve improved patient outcomes, a positive effect on antimicrobial resistance, and an economic benefit.



## Actions of Leadership

- Leadership should provide formal written statements that the facility supports efforts to improve and monitor antibiotic use. Formal statements carry more weight with staff than informal communications such as newsletters and e-mail. <sup>11</sup>
- Leadership should provide either financial support or time allocation or both for stewardship activities including education and training. Stewardship-related duties in job descriptions and annual performance reviews can be used to accomplish this. <sup>11</sup>
- Leadership should ensure adequate staffing for ASP activities in relevant departments in order to provide sufficient time to contribute to stewardship activities. <sup>11</sup>
- Leadership should ensure participation from the many groups that can support stewardship activities. <sup>9</sup>
- Leadership should establish clear communication on antimicrobial stewardship strategies. <sup>11</sup>

## Resources

The Society for Healthcare Epidemiology of America—Making the Business Case for Antimicrobial Stewardship Programs: Taking it to the C-Suite

[https://www.shea-online.org/images/priority-topics/Business\\_Case\\_for\\_ASP.pdf](https://www.shea-online.org/images/priority-topics/Business_Case_for_ASP.pdf)

American Hospital Association Physician Leadership Forum on Antimicrobial Stewardship

<http://www.ahaphysicianforum.org/resources/appropriate-use/antimicrobial/>

Infectious Disease Society of America Promoting Antimicrobial Stewardship in Human Medicine

[https://www.idsociety.org/Stewardship\\_Policy/](https://www.idsociety.org/Stewardship_Policy/)

The President's Council of Advisors on Science and Technology—Report to the President of the United States on Combating Antibiotic Resistance

[https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast\\_carb\\_report\\_sept2014.pdf](https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_carb_report_sept2014.pdf)

The President's National Action Plan for Combating Antibiotic-Resistant Bacteria

[http://www.whitehouse.gov/sites/default/files/docs/national\\_action\\_plan\\_for\\_combating\\_antibiotic-resistant\\_bacteria.pdf](http://www.whitehouse.gov/sites/default/files/docs/national_action_plan_for_combating_antibiotic-resistant_bacteria.pdf)



Source: Centers for Disease Control and Prevention Public Health Image Library

## **Core Element 2: Accountability**

All facilities should identify individuals who are accountable for antibiotic stewardship activities as well as those who also have support of leadership within the facility.

### **Establishing an ASP Team**

An important first step in the development of an ASP is the development of the team as well as the appointment of a leader of the antimicrobial stewardship team. The IDSA recommends core members of the team to include an infectious disease physician as well as a clinical pharmacist with infectious disease training.<sup>8</sup> In smaller hospitals it may be useful to find other physician champions such as hospitalist, or other part time or off site expertise when infectious disease doctors are not available in house.<sup>14, 15, 16</sup>

Antimicrobial stewardship is an important component of patient safety and is therefore considered to be a medical staff function, empowering the medical director to set prescribing standards as well as empowering the director of nursing to set practice standards can have great impacts for antimicrobial stewardship.<sup>8, 17</sup> In addition to having a team with the appropriate core members it is also important to any ASP to have adequate support from leadership.

The ASP team should also include many supplemental members as resources allow. Supplemental members that are beneficial to an ASP include: microbiologists (provide surveillance data on resistance patterns), information

systems specialists (provide computer support for surveillance systems), infection preventionists and hospital epidemiologists (help coordinate efforts on improving antibiotic use).<sup>8</sup> Because an effective ASP involves improving antibiotic use through improving empiric treatment by understanding local resistance patterns as well as improving treatment once microbiological data is available, an effective ASP takes specialists from several disciplines.



### Core members



### Supplemental members

Infectious disease physician or other physician with appropriate capability for this role	Infection preventionist
	Administration
Clinical pharmacist or consultant pharmacist with infectious disease training	Microbiology
	Information technology



### Key Roles of the Support team

Clinicians and department heads	As the prescribers of antibiotics, it is vital that clinicians are fully engaged in and supportive of efforts to improve antibiotic use in hospitals.
Infection preventionists and hospital epidemiologists	These professionals skills can be utilized to coordinate facility-wide monitoring and prevention of healthcare-associated infections and can be readily adapted to auditing, analyzing and reporting data. They can also assist with monitoring and reporting of resistance and CDI trends, educating staff on the importance of appropriate antibiotic use, and implementing strategies to optimize the use of antibiotics.
Quality improvement staff	These staff are key partners given that optimizing antibiotic use is a medical quality and patient safety issue.



## Key Roles of the Support team

Laboratory staff	Laboratory personnel can guide the proper use of tests and the flow of results. They can also guide empiric therapy by creating and interpreting a facility cumulative antibiotic resistance report, known as an antibiogram. Lab and stewardship staff can work collaboratively to ensure that lab reports present data in a way that supports optimal antibiotic use. For facilities that have laboratory service performed off site, information provided should be useful to stewardship efforts and contracts should be written to ensure this is the case.
Information technology staff	Information technology is critical to integrating stewardship protocols into existing workflow. Examples include embedding relevant information and protocols at the point of care (e.g. immediate access to facility-specific guidelines at point of prescribing); implementing clinical decision support for antibiotic use; creating prompts for action to review antibiotics in key situations and facilitating the collection and reporting of antibiotic use data.
Nurses	Nurses are vital to all aspects of healthcare and should work to assure that cultures are performed before starting antibiotics. In addition, nurses review medications as part of their routine duties and can prompt discussion of antibiotic treatment, indication, and duration.

*Courtesy of: Colorado Hospital Association/CDC*

CAHs may not have staff in roles exactly matching some of the specific core and supplemental roles described. CAH ASPs can fill these positions by working with network hospitals or by contracting to acquire participants with appropriate expertise, or by assigning these roles to staff with capable experience in the described roles.



### Actions of Accountability

- Designate a leader or co-leaders to be accountable to leadership for meeting established goals or targets. <sup>11</sup>
- Empower the medical director to set standards for antibiotic prescribing. <sup>17</sup>
- Empower the director of nursing to set the practice standards for assessing, monitoring, and communicating changes in patient conditions by front-line nursing staff. <sup>17</sup>
- Ensure that the approach of the ASP is collaborative with physicians and pharmacy. <sup>11</sup>
- Ensure that the leadership of the ASP has received training in antibiotic stewardship. <sup>11</sup>
- Consider hospital quality measures as performance measures for the ASP. <sup>11</sup>



Source: Creative Commons Pixabay

### **Core Element 3: Drug Expertise**

Having staff with drug expertise or establishing access to individuals with this expertise will be critical to the success of any ASP. Including pharmacy on the team will be vital for expertise and accountability. Obtaining support from infectious disease consultants as well as consultant pharmacists with training in antimicrobial stewardship can help reduce antibiotic use as well as decrease the levels of *C. difficile* in patients for facilities with more limited staffing.<sup>17</sup>

Specialized training courses are available:

- Making a Difference in Infectious Diseases (MAC-ID) Antibiotic Stewardship Course (<http://mad-id.org/antimicrobial-stewardship-programs/>)
- Society for Infectious Diseases Pharmacists Antibiotic Stewardship Certificate Program (<http://www.sidp.org/page-1442823>)

In CAHs that have a Pharmacy and Therapeutics committee, they can be considered as a part of the ASP, but should not be the entire team, unless their role has been greatly expanded to include duties listed as components of stewardship.<sup>14, 18, 19</sup>



### **Actions of Drug Expertise**

- The identified pharmacy leader with expertise in antibiotic use should be responsible for partnering with a physician champion to improve the use of antibiotics within the facility. <sup>11</sup>
- If there is no pharmacist with expertise in antibiotic use education and training opportunities should be provided. <sup>11</sup>
- Pharmacy expert should engage and train others in the pharmacy as well as other staff in the hospital on the importance of appropriate antibiotic use. <sup>11</sup>
- Hospitals without access to infectious disease specialists should consider establishing connections with other facilities to share knowledge or consider the use of telemedicine for this role. <sup>11</sup>
- Develop relationships with infectious disease consultants who may be interested in supporting antimicrobial stewardship within your facility. <sup>17</sup>

### **Resources**

Defining the formulary

<http://www.ashp.org/doclibrary/bookstore/p2371/p2371samplechapter.aspx>

Should you do antibiotic cascading

<http://www.njshp.org/LinkClick.aspx?fileticket=DkpM94IN63E%3D&tabid=1798&mid=4400&forcedownload=true>

Optimize which antibiotics to test and report

[http://jcm.asm.org/content/49/9\\_Supplement/S15.full.pdf+html](http://jcm.asm.org/content/49/9_Supplement/S15.full.pdf+html)

Antibiotic streaming or de-escalation

<http://www.ashp.org/DocLibrary/Bookstore/P4023/Sample-Chapter.pdf>



Source: Creative Commons Pixabay

## **Core Element 4: Actions that Support Optimal Antibiotic Use**

An effective ASP will implement at least one intervention that meets a need within their facility. The needs and resources of each facility are unique and it will be the responsibility of the ASP along with leadership to determine what interventions make the most sense. Using an incremental implementation will help to familiarize staff with the new policies and procedures, and to lessen potential overwhelming affects. <sup>17</sup>



### Actions to Support Antibiotic Optimization

- The ASP should identify facility specific areas that could be improved through antimicrobial stewardship activities. <sup>20</sup>
- The ASP should work to implement the interventions that make the most sense for their facility based on resources and needs. <sup>11</sup>
- Prioritize interventions based on the needs of the facility. <sup>11</sup>
- Share outcomes from successful interventions with nursing staff as well as clinical providers. <sup>9</sup>
- Ensure that current medication safety policies, including medication regimen review, developed to address Centers for Medicare and Medicaid Services (CMS) regulations are being applied to antibiotic prescribing and use. <sup>17</sup>
- Standardize practices and order sets for common clinical diseases. <sup>11, 17</sup>
- Identify clinical situations which may be driving inappropriate courses of antibiotics. <sup>17</sup>

### Steps to developing an ASP Intervention



#### **Institutional Needs Assessment**

It is important to understand your institution, and identify perceived strengths as well as potential barriers and challenges to implementation of an ASP intervention as well as general strengths and weaknesses that can be used to develop or hinder the program.

*Start with the question:* What issues does your institution see as the biggest opportunities for improvement in antimicrobial stewardship?

*Examples:* high *C. difficile* rates, high prescribing rates of expensive last line drugs like carbapenems, high rates of Multi-Drug Resistant Organisms (MDROs), high expenditure of antimicrobials, high readmission rates for infections, etc.

It is important to try not to take on too much at once, but find one area of improvement and start there. Work on the low hanging items to gain the easy wins that will garner support for the program and gradually expand once the program has been established as effective.

Step  
**2**

### **Step two: Brain storm the framework**

Work to come up with strategies to make improvements on the issues that your institution is facing. It may be helpful to rank these strategies as:

*High:* These strategies, improve quality and safety as well as decrease costs within the institution.

*Examples:* Complete antimicrobial stewardship rounds, restrict certain last resort antibiotics

*Medium:* These strategies improve quality and safety but have no impact on costs.

*Examples:* Create alternative dosing regimens, develop an IV to PO policy

*Low:* These strategies will decrease cost but do not change quality or safety.

*Examples:* Promote an antibiogram, develop a tiered susceptibility reporting for microbiology

Step  
**3**

### **Step Three: Formalize the Strategic Plan**

Choose items amongst the high, medium, and low strategies that you feel are achievable within the next year. Chose the low hanging items in order to achieve wins for this first year. Once these strategies are chosen write up a formal statement of support for leadership so they understand the strategy as well as the goals.

*Adapted from the Duke Antimicrobial Stewardship Outreach Network (DASON)*

## Strategies and Recommendations for ASPs

### Broad Interventions

#### Prospective audit and feedback

Prospective audit and feedback engages the provider after an antibiotic is prescribed and typically includes external reviews of antibiotic therapy by an expert such as a clinical pharmacist with infectious disease training or an infectious disease physician.<sup>9, 11</sup> The prospective audit and feedback strategy requires the availability of expertise, this may be more difficult in smaller facilities, however some smaller facilities have shown success by engaging external experts.<sup>14</sup> The effectiveness of a prospective audit and feedback system may depend on the infrastructure of the institution, this strategy can be a labor intensive process, and the identification of appropriate patients for intervention can be challenging. This type of recommendation may require computerized surveillance systems; however, if daily reviewing or preauthorization is not feasible, limited audit and feedback intervention conducted 3 days a week. This limited strategy has demonstrated a decline in days of treatments (DOTs), a reduction in antibiotic expenditures, and a decrease in the use of carbapenems, vancomycin, and levofloxacin.<sup>21</sup> Providing individual feedback with peer to peer comparisons may also be effective. The comparisons can be non-anonymous.<sup>17</sup>

#### Formulary Restriction and Preauthorization

The restriction of the use of certain antibiotics based on the spectrum of activity, cost, or associated toxicities is called formulary restriction and is used to ensure that antimicrobial use is reviewed with an expert before therapy is initiated. This intervention requires the availability of expertise in antibiotic use as well as infectious diseases.<sup>9</sup> Preauthorization must also be completed in a timely manner, therefore requiring real-time availability of the person providing approval and therefore may be difficult in smaller facilities with limited resources. Formulary restriction and preauthorization is a strategy that is primarily used to improve antibiotic use by requiring clinicians to get approval for certain antibiotics before they are prescribed.<sup>8</sup> Preauthorization has been associated with a significant reductions in the use of antibiotics that are restricted by this strategy. This strategy has also been associated with a decrease in costs associated with antibiotic use. Outcome studies with preauthorization have shown decreased antibiotic use as well as decreased antibiotic resistance, particularly among gram-negative pathogens.<sup>21</sup>

## De-escalation or antibiotic time out

De-escalation of empirical antimicrobial therapy or the alteration of antimicrobial therapy once culture results become available, includes the elimination of redundant combination therapy and can more effectively target the causative pathogen, resulting in decreased antimicrobial exposure and substantial cost savings.<sup>21</sup> In some facilities automatic stop orders can be implemented in addition or in place of a time out. This decision should be based on staffing, patient population, as well as the clinical culture.

Steps for de-escalation:

1. Review the data: Once culture results are obtained review which organism (if any) is present as well as which antibiotics are susceptible and resistant. As soon as the information is available is when it is best to move on to step 2, but setting a goal of 48 hours is beneficial.

*Ask the question:*

Does this patient have an infection that will respond to antibiotics?

2. Reassess antibiotic choice

*Ask the question:*

If so, is the patient on the right antibiotic(s), dose, and route of administration?

3. Determine the duration of therapy

*Ask these questions:*

Can a more targeted antibiotic be used to treat the infection (de-escalate)?

How long should the patient receive the antibiotic(s)?

4. Document your decision

*Adapted from Stanford Antimicrobial Safety and Sustainability (SASS) and CDC*

## **Pharmacy Driven Interventions**

### **Parenteral to oral conversion**

The development of clinical criteria and guidelines that will allow for switching from parenteral to oral agents can decrease the length of hospital stay and health care costs, a systematic plan for this switch of antimicrobials with excellent bioavailability is critical. <sup>21</sup> When the situation is appropriate and when the antibiotics show good absorption (e.g., fluoroquinolones, trimethoprim-sulfamethoxazole, linezolid, etc.), switching to oral medications improves patient safety by reducing the need for intravenous access. <sup>22, 23</sup>

### **Dose adjustments**

Antibiotic therapy should be adjusted in the case of organ dysfunction (e.g. renal adjustment). <sup>9</sup>

### **Dose optimization (pharmacokinetics/pharmacodynamics)**

The optimization of antimicrobial dosing that is based on individual patient characteristics, causative organism, site of infection, as well as pharmacokinetic and pharmacodynamics characteristics of the drug is an important part of antimicrobial stewardship. <sup>22</sup> Dose adjustments that are based on therapeutic drug monitoring, optimize therapy for highly drug-resistant bacteria, improve adherence to dosing guidelines, reduce adverse effects, and decrease costs. <sup>21, 24, 25</sup>

### **Automatic alerts where therapy may be unnecessarily duplicative**

This includes the use of multiple agents that may overlap in spectrum such as gram positive and gram negative activity. <sup>26</sup>

### **Time sensitive automatic stop orders**

This can be used for specified antibiotics or for all antibiotics depending on the needs of the facility. <sup>27</sup>

### **Detection and prevention of antibiotic-related drug-drug interactions**

It is important to consider interactions between antibiotics and other medications such as vitamins that are being administered to the patient. <sup>9</sup>

## Infection and syndrome specific interventions

### Community-acquired pneumonia

Interventions for community-acquired pneumonia should focus on correcting recognized problems in therapy which include: improving diagnostic accuracy, tailoring of therapy to culture results and optimizing the duration of treatment to ensure compliance with guidelines. <sup>28, 29, 30, 31, 32</sup>

### Urinary tract infections (UTIs)

Many patients who get antibiotics for UTIs actually have asymptomatic bacteriuria and not infections. <sup>33, 34</sup> IDSA provides a guideline on the diagnosis and treatment of asymptomatic bacteriuria, available at:

<http://www.idsociety.org/Templates/Content.aspx?id=32212255977>

Interventions for UTIs focus on avoiding unnecessary urine cultures and treatment of patients who are asymptomatic and ensuring that patients receive appropriate therapy based on local susceptibilities and for the recommended duration. <sup>35, 36, 37, 38</sup>

### Skin and soft tissue infections

Interventions for skin and soft tissue infections have focused on ensuring patients do not get antibiotics with overly broad spectra and ensuring the correct duration of treatment. <sup>22, 39, 40</sup>

### Empiric coverage of methicillin-resistant *Staphylococcus aureus* (MRSA) infections.

In many cases, therapy for MRSA can be stopped if the patient does not have a MRSA infection or changed to a beta-lactam if the cause is methicillin-sensitive *Staphylococcus aureus*. <sup>41, 42</sup>

### Interventions designed to reduce the use of antibiotics associated with a High risk of *C. difficile* Infections

Reducing *C. difficile* infections is a high priority for all ASPs and should be taken into consideration when crafting stewardship interventions. Treatment guidelines for *C. difficile* infections should urge providers to stop unnecessary antibiotics in all diagnosed patients, reviewing antibiotics in patients with new diagnoses can help to identify opportunities to stop unnecessary antibiotics which can improve the clinical response to treatment and reduces the risk of recurrence. In studies conducted on ASPs

and *C. difficile* infections, ASPs have been shown to reduce hospital onset cases.<sup>21</sup>

It is important to understand that while all antibiotics carry a risk of *C. difficile* infections some are implicated more than others. The following table represents several studies that have shown the associations between antibiotic use and *C. difficile* infections. The primary ASP interventions that have been studied are restrictions of high-risk antibiotics such as clindamycin, and/or broad spectrum antibiotics, especially cephalosporins and fluoroquinolones.<sup>21</sup>

Frequently Associated	Occasionally Associated	Rarely Associated
Fluoroquinolones Clindamycin Penicillins Cephalosporins	Macrolides Trimethoprim Sulfonamides	Aminoglycosides Tetracyclines Chloramphenicol Metronidazole Vancomycin

Other risks of *C. difficile* infections that should be considered by the ASP when developing strategies:

- Current or recent hospitalization: Up to 20 percent of people who are hospitalized and up to 50 percent of people in long-term care facilities carry *C. difficile*, but many do not have diarrhea or other symptoms. Exposure to these carriers significantly increases a person’s risk of becoming infected.
- Older age: The risk of becoming infected with *C. difficile* is 10 times greater in people who are 65 years or older.
- People who have a weakened immune system as a result of an underlying medical condition or a treatment are at increased risk of becoming infected with *C. difficile*, especially during a hospital stay.
- Severe illness
- Recent infection with *C. difficile*: People who have been recently infected with *C. difficile* and treated have an increased risk of becoming infected again soon after stopping the treatment.

[http://www.uptodate.com/contents/image?imageKey=PI%2F79514&topicKey=PI%2F3991&source=see\\_link&utdPopup=true](http://www.uptodate.com/contents/image?imageKey=PI%2F79514&topicKey=PI%2F3991&source=see_link&utdPopup=true)

## Treatment of culture proven invasive infections

Invasive infections (e.g. blood stream infections) present good opportunities for interventions to improve antibiotic use because they are easily identified from microbiology results. The culture and susceptibility testing often provides information needed to tailor antibiotic treatment, or determine when to discontinue antibiotics due to growth of contaminants. <sup>43</sup>

## Additional Interventions

### Education

Education is an essential element of any program where there is a desire to alter prescribing behavior (Barlam). Educational programs can provide a foundation of knowledge that will work to enhance and increase acceptance of stewardship strategies, however, education alone, is only marginally effective in changing prescribing practices and has not demonstrated a sustained impact. <sup>21</sup>

Antibiotic stewardship programs should provide regular updates on antibiotic prescribing, antibiotic resistance, and infectious disease management that address both national and local issues. <sup>5</sup> Sharing facility-specific information on antibiotic use is a tool to motivate improved prescribing, particularly if wide variations in the patterns of use exist among similar patient care locations. <sup>44</sup> There are many options for providing education on antibiotic use such as didactic presentations which can be done in formal and informal settings, messaging through posters and flyers and newsletters or electronic communication to staff groups. Reviewing de-identified cases with providers where changes in antibiotic therapy could have been made is another useful approach. <sup>45</sup> A variety of web-based educational resources are available that can help facilities develop educational content. Education has been found to be most effective when paired with corresponding interventions and measurement of outcomes. <sup>8</sup>

### Facility specific clinical practice guidelines

Facility-specific treatment recommendations should be based on national guidelines, local susceptibilities, and formulary options. When this occurs these guidelines can optimize antibiotic selection and duration, particularly for common indications such as: community-acquired pneumonia, urinary tract infection, intra-abdominal infections, skin and soft tissue infections

and surgical prophylaxis.<sup>9</sup> Facility specific clinical practice guidelines and algorithms can be an effective way to standardize prescribing practices when they are based on local epidemiology. ASPs should develop those guidelines, when feasible, for common infectious disease syndromes and should be involved in writing clinical pathways, guidelines, and order sets that address antibiotic use and are developed within other departments at their facility. Clinical pathways include the multidisciplinary development of evidence-based practice guidelines incorporating local microbiology and resistance patterns can improve antimicrobial utilization. Guideline implementation can be facilitated through provider education and feedback on antimicrobial use and patient outcomes. Specific improvements in antibiotic use have been associated with the implementation of facility specific guidelines and have shown statistically significant increases in the likelihood of adequate initial therapy, the use of narrower-spectrum antibiotic regimens, earlier switching from IV to oral therapy, and shorter duration of treatment.<sup>21</sup>

### **Stratified antibiogram**

Stratification can show important differences in susceptibility patterns for microorganisms and can help the ASP optimize treatment. Institutional antibiograms are helpful to ASPs for the development of guidelines for empiric therapy, however a single institutional, or hospital-wide, antibiogram may mask important susceptibility differences across units within an institution.<sup>21</sup> When it is feasible antibiograms should be created for specific patient populations or specific areas of the hospital. This may not be feasible for many CAHs with single units so ASPs may be limited to facility wide antibiograms.

### **Antibiotic cascading**

Cascade reporting is one type of selective reporting in which susceptibility results for secondary antibiotics (either more costly or broader spectrum) are only reported if an organism is resistant to the primary antibiotic within the particular antibiotic class, this type of selective cascading of antibiotics is highly recommended.<sup>21</sup> The Clinical and Laboratory Standards Institute provides guidance for testing and reporting susceptibilities for certain organisms.

### **Rapid diagnostics for blood cultures**

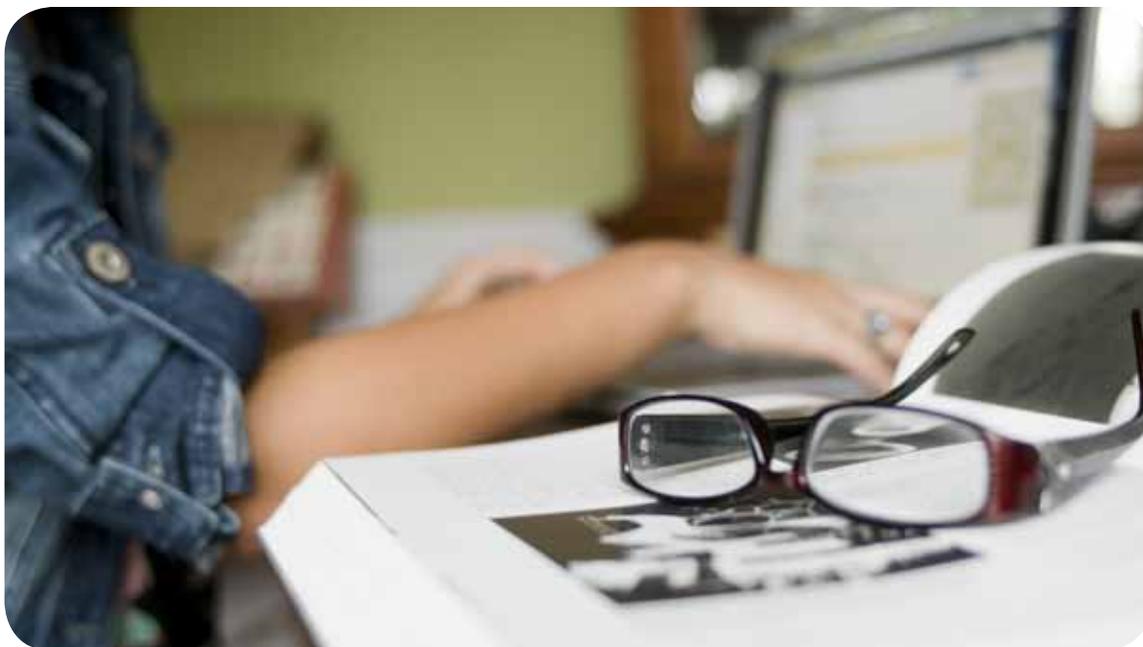
Rapid testing for blood cultures is recommended along with traditional culture methods for the identification of the causative agent of infection. The use of rapid testing on blood cultures has been associated with statistically significant improvements in the initiation of appropriate therapy, rates of recurrent infection, mortality, length of stay, and hospital costs and therefore should be considered if resources allow. <sup>21</sup>

### Measurement of antibiotic consumption

Measurement of antibiotic cost is considered good practice. Costs should be measured based on prescriptions over purchasing data (Barlam 2016). Days of therapy (DOT) is recommended over defined daily dose (DDD) for monitoring use within a facility. <sup>21</sup>

### Additional Notes on choosing elements:

- It is alright to scale back and think smaller if things get too big and unmanageable
  - For example when considering formulary restriction or de-escalation it is acceptable to start with one antibiotic and grow your program from there
- Pharmacists are often at the heart of an effective ASP, find a pharmacy champion
  - If you do not have a pharmacist that can champion the ASP consider finding an outside pharmacist to contract with
- The elements that will be most effective and feasible will depend on the size of the facility the patient population, staffing and the clinical culture. It is important to consider these items when choosing which elements to implement and how.



Source: Centers for Disease Control and Prevention Public Health Image Library

## **Core Element 5: Tracking and Monitoring Antibiotic Use and Resistance**

The importance of measurement cannot be stressed enough. Many readers of this toolkit will be familiar with the phrase: “What gets measured gets managed.” Hospitals that participate in NHSN should consider using the Antimicrobial Use and Resistance (AUR) module, which has a stated purpose of: “The NHSN AUR Module provides a mechanism for facilities to report and analyze antimicrobial use and/or resistance as part of local or regional efforts to reduce antimicrobial resistant infections through antimicrobial stewardship efforts or interruption of transmission of resistant pathogens at their facility.” The AUR module contains two options, one for antimicrobial use, the other for antimicrobial resistance.

For additional information please read: <http://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf> or contact KDHE

Data on adherence to antibiotic prescribing policies and antibiotic use may be beneficial when shared with clinicians and nurses. This can help to maintain awareness about the progress being made in antibiotic stewardship. <sup>17</sup>



### Actions for Tracking and Monitoring

- The ASP should work to collect data on antibiotic use. The preferred method of tracking is DOT and if this is not available DDD should be used. <sup>11</sup>
- The ASP should work to collect data on resistance within the facility. <sup>11</sup>
- Measurements of antibiotic use and resistance can be used to assess, monitor, and improve prescribing practices within the facility. <sup>9</sup>
- In a facility with more limited resources it may make sense to use the CDC Threat Report to identify the top pathogens, discover which of these is most relevant to the facility and track only these organisms.
- Track *C. difficile* infection rates. <sup>11</sup>
- Perform reviews on patient medical records for new antibiotics to determine if antibiotic use is in accordance with facility policy and practice. <sup>17</sup>
- Monitor clinical outcome measures such as *C. difficile* rates, antibiotic-resistant organisms, or adverse drug events. <sup>17</sup>



Source: Centers for Disease Control and Prevention Public Health Image Library

## **Core Element 6: Reporting Information on Improving Antibiotic Use and Resistance**

Reporting information collected on antibiotic use as well as resistance patterns to staff on a regular basis serves as a reminder of why antimicrobial stewardship activities are important. Hospitals that participate in NHSN should consider using the Antimicrobial Use and Resistance (AUR) module.



### **Actions for Reporting** <sup>11</sup>

- Share data collected as well as outcomes with all healthcare providers as well as leadership and any other stakeholders.
- Produce regular reports on antibiotics that are being tracked in the facility.
- Share antimicrobial stewardship data at staff meetings.
- Ensure that ASP reports are available to leadership, physicians, and patients.
- Prepare unit-specific reports if possible.
- Share updates and improvements with leadership, physicians, and all other stakeholders.
- Distribute provider level information on antibiotic use and provide suggestions for improvement when possible.
- Focus reports to providers with actionable information in a way that is nonthreatening in order to prevent data overload as well as appearing threatening or punitive.



Source: Centers for Disease Control and Prevention Public Health Image Library

## **Core Element 7: Education**

While education alone is not sufficient, it is vital to any successful ASP. Continued antimicrobial stewardship education should be provided to physicians, pharmacists, and nurses. Education should also be provided to patients and family members when possible.

The influenza season provides an excellent opportunity for raising consumer awareness of antibiotic stewardship using the CDC Get Smart tools.

<https://www.cdc.gov/getsmart/community/for-patients/common-illnesses/flu.html>



### **Actions for Education**

- Education should be provided on a regular basis to staff, patients, and families.
- Use data collected to educate physicians.
- Included education on antimicrobial stewardship in required provider educations.
- Incorporate antimicrobial stewardship elements into orientation for new medical staff.

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