



2017

ANTIBIOTIC USE IN THE UNITED STATES

PROGRESS AND OPPORTUNITIES



U.S. Department of
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Control and Prevention

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EXECUTIVE SUMMARY

The Centers for Disease Control and Prevention (CDC) focuses on helping healthcare providers deliver the best possible care for patients every day. Research shows that one way we can improve patient care is through better use of antibiotics.

Modern medicine depends on antibiotics to protect people against infection. These powerful drugs have transformed health care, but as with any medicine, antibiotics carry risks. When antibiotics are needed, the benefits usually outweigh the risks. However, when a patient takes an antibiotic when it is not needed, the patient gets no benefit and is unnecessarily exposed to preventable, and potentially serious, health problems. Each time an antibiotic is used, it can increase the risk that a future infection will be resistant to antibiotics.

Antibiotic resistance occurs when bacteria do not respond to the drugs designed to kill them. It is one of the most serious public health problems in the United States and threatens to return us to the time when simple infections were often fatal. Improving the way we prescribe and use antibiotics, a concept referred to as “antibiotic stewardship,” is critical for all healthcare settings. When we optimize the treatment of infections, we protect patients from harm and combat antibiotic resistance.



Antibiotic Use in Healthcare Settings: Current Status

The United States has made progress in understanding antibiotic prescribing and use in health care and in the community. But there are many opportunities to improve.

Outpatient Settings: Nationally, antibiotic prescribing in outpatient settings like clinics, doctor's offices, and emergency rooms decreased by five percent from 2011 to 2014, but variations among age groups and geographic locations point to areas where prescribing can be improved. CDC estimates that 30 percent of all antibiotics prescribed in outpatient clinics are unnecessary. Even when antibiotics are needed, prescribers often favor drugs that may be less effective and carry more risk over more targeted first-line drugs recommended by national guidelines.

Nursing Homes: More data are needed to understand antibiotic use in nursing homes, where approximately four million Americans receive care each year. A small CDC study of nine nursing homes showed that 11 percent of nursing home residents were taking antibiotics on any single day, and nearly 40 percent of orders for antibiotics lacked important prescribing information. CDC is launching a larger study with more nursing homes across the country and pursuing partnerships with nursing home networks, pharmacies, and other companies to identify where action is needed most.

Hospitals: Hospital antibiotic use data point to opportunities to improve prescribing practices. For example, use of the most powerful antibiotics increased significantly from 2006 to 2012, by nearly 40 percent for carbapenems and more than 30 percent for vancomycin. Data also indicate that roughly 30 percent of antibiotics used in hospitals are unnecessary or prescribed incorrectly.

Improving Antibiotic Use: CDC's Role

Improving antibiotic prescribing and use is part of [CDC's Antibiotic Resistance Solutions Initiative](#), a comprehensive approach to combat antibiotic resistance that includes aggressive responses to outbreaks, groundbreaking approaches to research, and new investments in state and local infection prevention and control. To accelerate improvements and help healthcare facilities and providers make the best decisions to treat and protect their patients, CDC provides technical expertise and tools for implementation, data for action, support for innovation, and education resources.

Evidence and Tools for Implementation: CDC's Core Elements of Antibiotic Stewardship provide frameworks for antibiotic stewardship programs and practices in [outpatient settings](#), [nursing homes](#), and [hospitals](#), including [small hospitals in rural areas](#). CDC works with public health and healthcare partners including health systems, hospital associations, professional organizations, academic investigators, private industry, patient and consumer organizations, state and local health departments, and federal partners to promote and facilitate implementation of the Core Elements. For example, CDC worked with local, state, and national experts to create the [National Quality Partners Playbook: Antibiotic Stewardship in Acute Care](#), a practical guide to help hospitals and health systems of all sizes implement the Core Elements. When [CDC's National Healthcare Safety Network \(NHSN\)](#) annual survey data indicated that smaller hospitals were less likely to implement all of the Core Elements, CDC worked with rural health, hospital, and federal partners to tailor the Core Elements to support implementation in small hospitals and address their specific needs.



Measuring Antibiotic Use in Healthcare: Data for Action: One of the most important ways CDC helps improve antibiotic use is producing and analyzing data to support healthcare facilities and providers in making the best choices for their patients. Healthcare facilities can use these data to identify opportunities to ensure appropriate antibiotic use, assess the impact of antibiotic stewardship efforts, and improve patient care. CDC is working with partners in all settings to identify, track, and understand antibiotic use data.

Hospitals participating in [CDC's NHSN Antibiotic Use Option](#) can compare their antibiotic use to others, monitor use over time, and direct hospital antibiotic stewardship programs. CDC continues to work with clinical experts on ways to use these data for improvement. For example, CDC collaborated to develop an assessment tool to help hospitals identify opportunities to improve antibiotic use.

Innovation: CDC is constantly looking for novel ways to improve antibiotic prescribing and use, and including exploring innovations related to treatment and diagnostics. One example is CDC's partnership with industry to investigate mechanisms to protect and restore the [microbiome](#) (the community of naturally occurring bacteria in and on the body) when antibiotics are used. Through the CDC and Food and Drug Administration (FDA) [Antibiotic Resistance Isolate Bank](#), CDC is helping advance the development of diagnostic tests to identify and characterize resistant bacteria and accelerating research and development for new antibiotics.

Education: CDC leads [Get Smart: Know When Antibiotics Work](#) to educate parents of young children, the general public, and outpatient healthcare providers about antibiotic resistance and optimal antibiotic prescribing and use. This work is being refreshed in 2017. In addition, CDC is undertaking a national educational effort to support healthcare providers' knowledge about early sepsis recognition and treatment, including starting antibiotics quickly when sepsis is suspected and reassessing therapy within 48 hours when the patient's culture results are back.

Moving Forward

Everyone plays a critical role in improving antibiotic use and preventing infections across health care: healthcare providers; patients and their families; health systems, hospitals, clinics, and nursing homes; healthcare quality organizations; health insurance companies; healthcare provider professional organizations; and federal, state, and local health agencies. CDC is committed to working with partners, supporting implementation of programs and practices that optimize antibiotic prescribing and use, using data for action, supporting innovation, and educating patients and healthcare providers about the benefits and risks of antibiotics. Working together, we can improve and protect the health and well-being of everyone who receives health care and help ensure that life-saving antibiotics will be available for generations to come.



EVERYONE HAS A ROLE TO PLAY IN IMPROVING ANTIBIOTIC USE



Healthcare providers

- ❑ Follow clinical guidelines when prescribing antibiotics.
 - ▶ Use the right antibiotic, at the right dose, for the right duration, and at the right time.
- ❑ Talk to patients and families about when antibiotics are and are not needed, and discuss possible harms such as allergic reactions, *Clostridium difficile* (*C. difficile*), and antibiotic-resistant infections.
 - ▶ Ask patients if they have ever had a *C. difficile* infection, and tailor antibiotic treatment accordingly.
- ❑ Be aware of antibiotic resistance patterns in your facility and community; use the data to inform prescribing.
- ❑ Follow hand hygiene and other infection prevention measures with every patient.



Patients and families

- ❑ Talk to your healthcare provider about when antibiotics will and won't help, and ask about antibiotic resistance.
- ❑ Talk to your healthcare provider about how to relieve symptoms.
- ❑ Ask what infection an antibiotic is treating, how long antibiotics are needed, and what side effects might happen.
 - ▶ Take antibiotics only when prescribed and exactly as prescribed.
 - ▶ Don't save an antibiotic for later or share the drugs with someone else.
- ❑ Insist that everyone cleans their hands before touching you.
- ❑ Stay healthy and keep others healthy by cleaning hands, covering coughs, staying home when sick, and getting recommended vaccines.



Health systems, hospitals, clinics, and nursing homes

- ❑ Adopt and implement antibiotic stewardship policies and strategies, including CDC's Core Elements of Antibiotic Stewardship.
- ❑ Designate staff members to coordinate antibiotic stewardship activities.
- ❑ Monitor antibiotic prescribing data to identify areas for improvement, and assess the impact of antibiotic stewardship efforts.
- ❑ Educate staff about antibiotic resistance and strategies to optimize antibiotic prescribing.



Healthcare quality organizations

- ❑ Develop and implement standards requiring antibiotic stewardship programs and practices.
- ❑ Develop and adopt standards measuring the success of antibiotic stewardship programs and practices.



Health insurance companies

- ❑ Incentivize implementation of antibiotic stewardship programs and practices.
- ❑ Use clinical performance data on quality measures for appropriate prescribing, such as the Healthcare Effectiveness Data and Information Set (HEDIS®) measures.



Healthcare provider professional organizations

- ❑ Create and share clinical practice guidelines for the diagnosis and management of common conditions.
- ❑ Incorporate antibiotic stewardship principles into antibiotic use guidelines.
- ❑ Provide continuing medical education opportunities about antibiotic stewardship for members.
- ❑ Bolster national, local, and regional initiatives promoting appropriate antibiotic prescribing and use.
- ❑ Highlight new research and technologies to support antibiotic stewardship.



Federal, state, and local health agencies

- ❑ Set expectations for the implementation of antibiotic stewardship activities across the spectrum of health care.
- ❑ Provide data and tools to help guide stewardship activities.
- ❑ Connect local stakeholders and coalitions.
- ❑ Support partners, healthcare providers, and patients through development and dissemination of educational resources.
- ❑ Support innovations and research, such as diagnostic test development, that facilitate optimal antibiotic use.





HOW TO USE THIS REPORT

Antibiotic Use in the United States 2017: Progress and Opportunities provides an overview of the current state of antibiotic use in human healthcare settings including programs and resources to support healthcare providers and patients in their efforts to improve antibiotic prescribing and use. The purpose of this report is to raise awareness about the need for antibiotic stewardship. Antibiotic stewardship is the systematic effort to improve antibiotic use to improve patient outcomes in order to help patients and combat antibiotic resistance. Antibiotic resistance occurs when bacteria do not respond to the drugs that are meant to kill them. Antibiotic stewardship in agriculture and animal health is also an important topic; however, this report focuses solely on antibiotic use and stewardship in human health care.



INTRODUCTION

Antibiotics are powerful drugs that have transformed health care around the world—making once deadly diseases treatable and saving millions of lives. Antibiotics are the foundation of modern medicine. We rely on antibiotics to treat people with the most serious infections, such as pneumonia or sepsis (a complication caused by the body’s overwhelming and life-threatening response to infection), and those at high risk for developing infections.

ANTIBIOTICS ARE CRITICAL TO TREAT PATIENTS MOST AT RISK FOR SEVERE INFECTIONS



SURGERY

Patients undergoing any type of surgery, including cardiac bypass and joint replacements, are at risk of surgical site infections, which can be very serious and even life threatening.



DIALYSIS FOR END-STAGE RENAL DISEASE

Infection risk is high in patients with end-stage renal disease (a condition in which the kidneys are no longer working) because the patients have weakened immune systems and because dialysis requires access to their bloodstream.



CANCER CHEMOTHERAPY

Patients receiving chemotherapy (a type of cancer treatment) are often at risk for developing serious infections because the treatment weakens their immune systems.



TREATMENT FOR INFLAMMATORY CONDITIONS

Patients with inflammatory conditions, such as rheumatoid arthritis and inflammatory bowel disease, are often treated with medicines that can be associated with an increased risk of infection.



ORGAN TRANSPLANTS

Patients receiving organ transplants are at high risk for infections because they may undergo complex surgery and most receive medicines that weaken their immune system as part of their treatment.

Like other powerful drugs, antibiotics carry a variety of risks. When antibiotics are needed, the benefits outweigh the risks. However, when a patient takes an antibiotic they do not need, the patient gets no benefit and is unnecessarily put at risk for side effects and reactions to drugs. Additionally, antibiotics disrupt the **microbiome**, the community of naturally occurring bacteria in and on the body. The microbiome is very important for staying healthy and preventing disease. When a patient takes antibiotics, the drugs are used with an intent to kill the infection-causing “bad” bacteria, but “good” bacteria that protect against infection can also be destroyed for several months.

ESTABLISHED RISKS OF ANTIBIOTIC USE



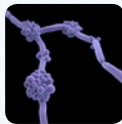
INCREASED INFECTION RISK

Even though antibiotics are used to treat infections, they can also increase the risk of some types of infections. For example, people who have recently taken an antibiotic are at more risk of diarrhea caused by bacteria while traveling (i.e., traveler’s diarrhea) or are at more risk of infection during outbreaks of foodborne illness caused by bacteria. In addition, infections caused by *C. difficile* bacteria and *Candida* fungi are common when taking antibiotics.



Clostridium difficile (*C. difficile*)

Each year nearly half a million illnesses and 15,000 deaths are caused by *C. difficile* infections. People taking antibiotics are 7 to 10 times more likely to get *C. difficile* while on the drugs, or in the month after taking them, than people not taking antibiotics.¹⁻⁴



Candida

When a person’s microbiome is disrupted by taking an antibiotic, there is increased risk for fungus (yeast) such as *Candida* species to grow. Common types of *Candida* infection are diaper rashes caused by yeast, vaginal yeast infections, and infections of the mouth and throat (also called thrush). In patients hospitalized for serious conditions or who have weak immune systems, *Candida* can cause severe illness, including bloodstream infections, or death.



ALLERGIC REACTIONS

Among children, antibiotics are the most common cause of emergency department visits for reactions to drugs. Most of these visits are for allergic reactions, which can range from mild rashes and itching to life-threatening swelling of the face and throat and breathing problems (called anaphylaxis).



DRUG INTERACTIONS

Antibiotics can interact with other drugs patients take. Then, those drugs, or the antibiotics, become less effective or the patient has worse side effects.



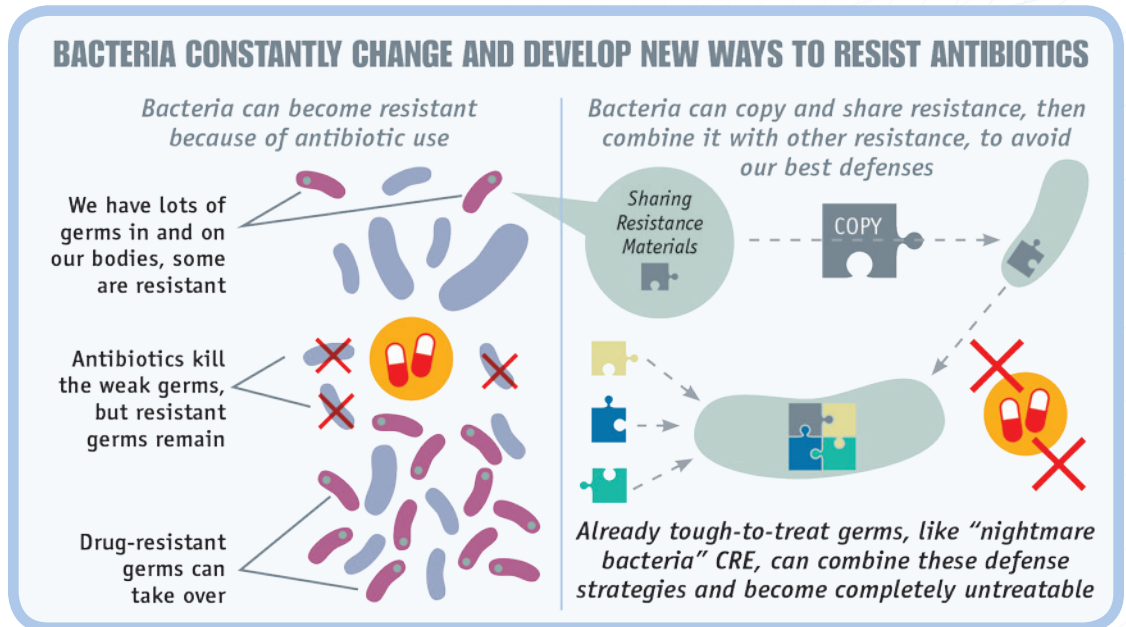
ANTIBIOTIC RESISTANCE

When a patient takes an antibiotic, the bacteria it is fighting might adapt to develop new resistance against the drug. The resistant bacteria can then cause resistant infections in that patient and/or spread to other people.

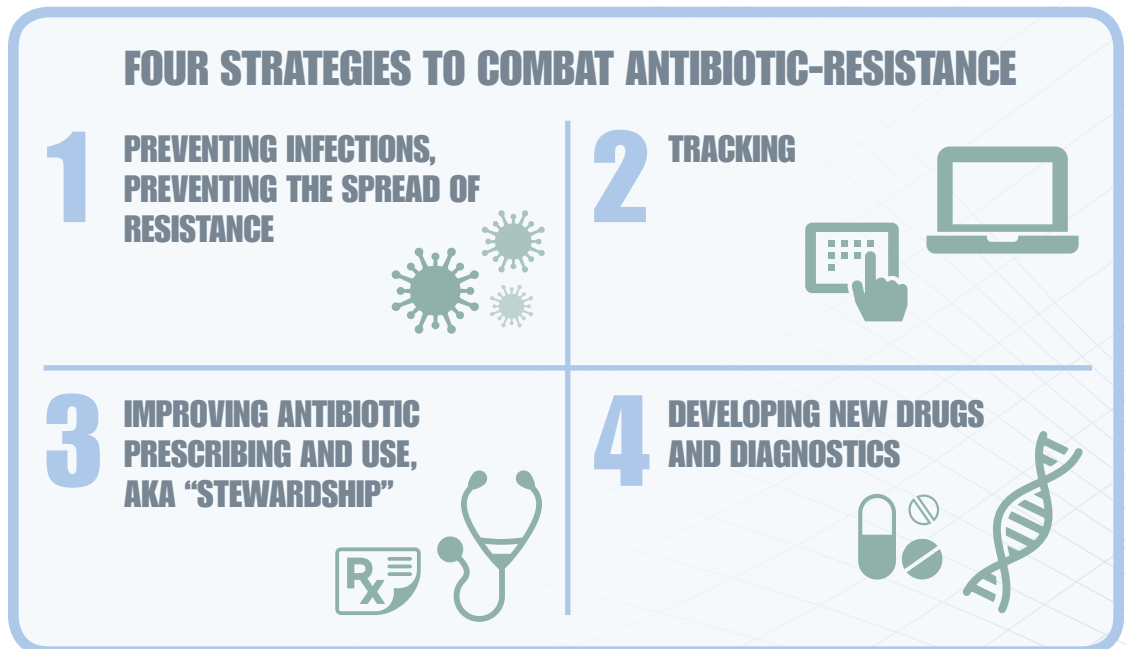


Improving Antibiotic Use to Combat Antibiotic Resistance

Improving antibiotic use is a core component of fighting antibiotic resistance. Antibiotic resistance, when bacteria do not respond to the drugs designed to kill them, threatens to return us to the time when simple infections were often deadly. CDC estimates that each year, in the United States alone, antibiotic-resistant bacteria cause more than 2 million illnesses and about 23,000 deaths. Antibiotic resistance is a threat to every person, to modern medicine, and to the healthcare, veterinary, and agriculture industries.



In 2013, CDC published [Antibiotic Resistance Threats in the United States, 2013](#), a first-ever snapshot of the size of the problem and threats posed by antibiotic-resistant pathogens.



[The National Action Plan for Combating Antibiotic-Resistant Bacteria](#) guides action by the U.S. government and public health partners to protect Americans from serious and urgent antibiotic-resistant threats. In 2016, Congress recognized the urgent need to combat antibiotic resistance and appropriated \$160 million for CDC to implement the [Antibiotic Resistance Solutions Initiative](#), which is improving U.S. capacity to 1) detect, respond to, and contain emerging resistance, 2) prevent and stop spread of resistant infections in healthcare settings and the community, and 3) improve antibiotic use. To accelerate improvements, CDC provides data for action, technical expertise, and tools for implementation, innovation, and education to help healthcare facilities and providers make the best decisions to protect and treat their patients.

Improving the way we use antibiotics, often referred to as “antibiotic stewardship,” is part of the National Action Plan. Appropriate antibiotic use means using the right antibiotic, at the right dose, for the right duration, and at the right time. Antibiotic stewardship has a number of proven benefits. Antibiotic stewardship can protect patients from unintended consequences, improve treatment of infections, and help fight antibiotic resistance. Antibiotic stewardship is also critical to protect new and existing antibiotics so they continue to be effective.

ANTIBIOTIC STEWARDSHIP PROGRAMS AND ACTIVITIES CAN:



IMPROVE PATIENT OUTCOMES

By reducing unnecessary antibiotic prescribing, antibiotic stewardship programs and activities can improve the treatment of infections and prevent avoidable side effects, reactions, and other problems for patients.



DECREASE *C. DIFFICILE* INFECTIONS

Antibiotic stewardship programs and activities significantly reduce *C. difficile* infections. For example, reducing the use of high-risk antibiotics (fluoroquinolones) by 30 percent can lower *C. difficile* infections by 26 percent in hospitals.⁶ Reducing overall antibiotic prescribing in outpatient settings by 10 percent could lower *C. difficile* infections in the community by 17 percent.²



DECREASE ANTIBIOTIC RESISTANCE

Preventing infections and improving antibiotic prescribing could save 37,000 lives from antibiotic-resistant infections over 5 years.



DECREASE COSTS

Antibiotic stewardship programs have consistently demonstrated annual savings of \$200,000 to \$400,000 in hospitals and other healthcare facilities. According to a University of Maryland study, implementation of an antibiotic stewardship program saved one hospital a total of \$17 million over 8 years.

Antibiotic stewardship is necessary in all healthcare settings where antibiotics are prescribed. It is a cornerstone of efforts aimed at improving antibiotic-related patient safety and slowing the development of antibiotic resistance. Efforts to improve antibiotic use will succeed only if everyone plays a role. When everyone plays their part, patient safety is protected and life-saving antibiotics will be preserved for generations to come.



CDC'S APPROACH TO IMPROVING ANTIBIOTIC USE

EXAMPLES OF CDC'S APPROACH TO IMPROVING ANTIBIOTIC USE



DATA FOR ACTION

- ❑ Providing data about facility-level antibiotic use in outpatient settings, hospitals, and nursing homes to help healthcare providers identify opportunities to improve prescribing.
- ❑ Working with partners to develop a benchmark for hospitals to assess their antibiotic use and monitor the impact of antibiotic stewardship programs.



IMPLEMENTATION

- ❑ Providing recommendations for antibiotic stewardship programs and practices in multiple healthcare settings.
- ❑ Providing tools to help organizations incorporate antibiotic stewardship principles into antibiotic use guidelines.
- ❑ Developing tools and providing expertise to support and expand local implementation.
- ❑ Providing expertise to, and coordinating with, other federal partners to develop guidance and tools to implement antibiotic stewardship.
- ❑ Engaging a broad network of partners in healthcare, such as healthcare professional organizations, hospitals, health systems and industry, to implement antibiotic stewardship.



INNOVATION

- ❑ Funding universities and healthcare partners to identify novel ways to implement stewardship activities and improve the implementation of CDC's Core Elements of Antibiotic Stewardship in [hospitals](#), [nursing homes](#), [outpatient settings](#), and [small hospitals in rural areas](#).
- ❑ Advancing the development of diagnostic tests to identify and characterize resistant bacteria by accelerating research and development for new antibiotics.



EDUCATION

- ❑ Leading a national effort to educate Americans about appropriate antibiotic use, and strategies to protect themselves from antibiotic resistance.
- ❑ Spearheading an annual global observance promoting appropriate prescribing and use.
- ❑ Developing an educational effort to emphasize the early recognition, treatment, and reassessment of therapy of sepsis as an important part of antibiotic stewardship.



Implementing Antibiotic Stewardship Programs and Improving Antibiotic Use

Data for Action

One of the most important ways CDC can help improve antibiotic use is to produce and analyze data to support healthcare facilities and providers in making the best choices for their patients. CDC's approach to measuring antibiotic use includes many components, such as national, regional, and state data to determine larger trends and issues; hospital data to explore areas for improvement and assess the impact of specific stewardship activities; and appropriate antibiotic use and antibiotic stewardship program data. Healthcare facilities can use these data to identify opportunities for improvement, assess the impact of antibiotic stewardship efforts, and improve patient care.

CDC is working with partners in all settings where health care is delivered. For outpatient settings, health systems can use their own electronic health record data and track quality measure data, such as those from the Healthcare Effectiveness Data and Information Set (HEDIS), to examine the quality of antibiotic prescribing. This gives facilities, systems, and providers the information they need to improve the care they provide. At the national level, CDC uses [multiple data sources](#) to track outpatient antibiotic prescribing and appropriateness. For example, CDC uses the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) to assess appropriateness of outpatient antibiotic prescribing and proprietary data from QuintilesIMS (formerly IMS Health) to measure outpatient oral antibiotics dispensed in U.S. community pharmacies.





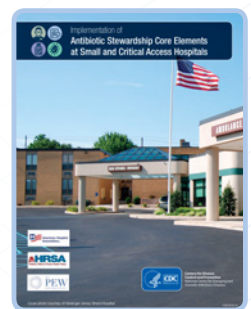
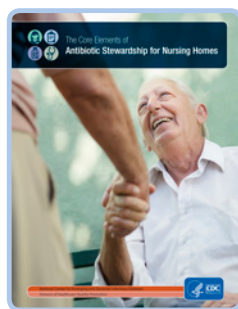
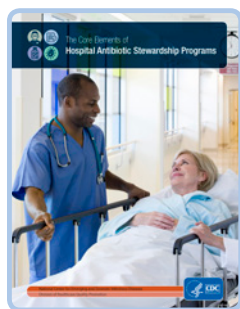
For hospitals, [CDC's National Healthcare Safety Network \(NHSN\)](#), the nation's most widely used healthcare-associated infection (HAI) tracking system, allows hospitals to electronically track and benchmark their antibiotic use data using the Antimicrobial Use (AU) Option.

CDC is also gathering data and building partnerships with urgent care centers and retail health clinics in order to better understand antibiotic prescribing and improve use in these unique settings. Urgent care centers and retail health clinics are experiencing tremendous growth. Incorporating antibiotic stewardship activities in these settings will be an important factor in optimizing antibiotic use.

Implementation

To help healthcare facility leaders and providers implement stewardship activities in their facilities, CDC developed The Core Elements of Antibiotic Stewardship. [The Core Elements of Antibiotic Stewardship in Outpatient Settings](#) (2016), [The Core Elements of Antibiotic Stewardship for Nursing Homes](#) (2015) and [The Core Elements of Hospital Antibiotic Stewardship Programs](#) (2014) provide recommendations for antibiotic stewardship programs and practices in outpatient settings, nursing homes, and hospitals. Most recently, CDC released [Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals \(2017\)](#) as a framework for initiating and/or expanding antibiotic stewardship activities. More details on each set of Core Elements are outlined in the following sections of the report.

Partners are crucial to the successful implementation of CDC's Core Elements. For example, CDC is working directly with several of the nation's largest healthcare systems so they can both monitor and improve antibiotic use. Furthermore, CDC has strong relationships with partner organizations reaching infectious disease providers, pharmacists, and hospitals and is forming new collaborations with dentists, nurses, critical care providers, urgent care centers, and retail health clinics.



Innovation

CDC is driving innovation by looking for novel ways to implement and improve stewardship activities. For example, CDC is exploring ways public health and private industry can work together to protect and restore the [microbiome](#) by encouraging work to help understand: 1) how antibiotics disrupt the healthy microbiome, 2) how a disrupted microbiome puts people at risk, and 3) how that risk might be reduced.

Additionally, CDC is supporting the use of new diagnostic tools to rapidly identify antibiotic-resistant threats and to inform healthcare providers about appropriate antibiotic treatments.



For example, CDC is developing and evaluating rapid antimicrobial susceptibility testing methods to more quickly identify effective treatments for bacteria that could potentially be used in an act of bioterrorism. These same methods, which can reduce the time it takes to get results from 20 hours to less than 5 hours, could also be used to test bacteria that cause everyday infections.

CDC is also helping advance the development of diagnostic tests to identify and characterize resistant bacteria by accelerating research and development for new antibiotics through the CDC and Food and Drug Administration (FDA) **Antibiotic Resistance (AR) Isolate Bank**. The AR Isolate Bank is designed to provide curated drug-resistant isolates to industry, academics, and state partners working on innovative efforts to combat antibiotic resistance.

Education

CDC has led **Get Smart: Know When Antibiotics Work** (Get Smart), educating parents of young children, the general public, and outpatient healthcare providers about antibiotic resistance and best practices in antibiotic use. To support communication between healthcare providers and their patients, the program offers resources such as posters, fact sheets, brochures, videos, and graphics.

CDC also collaborates with international partners during the annual observance of **U.S. Antibiotic Awareness Week** (formerly Get Smart Week) to raise awareness of the threat of antibiotic resistance and the importance of appropriate antibiotic prescribing. The week coincides with European Antibiotic Awareness Day, Australia's Antibiotic Awareness Week, Canada's Antibiotic Awareness Week, and the World Health Organization's (WHO) World Antibiotic Awareness Week.

The goal is to engage professional societies, advocacy groups, for-profit companies, state and local health departments, the general public, and the media around improving antibiotic prescribing and use.

Additionally, there is a critical need to emphasize that the early recognition and treatment of sepsis, followed by reassessing therapy within 48 hours once the patient's culture results are back, as an important part of antibiotic stewardship. CDC is building new educational efforts to ensure that healthcare providers know the importance of early recognition in patients who might have sepsis and of starting them on the right antibiotic quickly.



ANTIBIOTIC USE BY HEALTHCARE SETTING

WHAT DO WE KNOW ABOUT ANTIBIOTIC USE IN OUTPATIENT SETTINGS?

Outpatient settings include healthcare providers (e.g., physicians, dentists, nurse practitioners, and physician assistants) and clinic leaders in primary care, medical and surgical specialties, emergency departments, retail health and urgent care settings, and dental offices. In 2015 alone, approximately 269 million antibiotic prescriptions were dispensed from outpatient pharmacies in the United States, enough for five out of every six people to receive one antibiotic prescription each year. At least 30 percent of these antibiotic prescriptions were unnecessary.⁷

Improve Antibiotic Use to Combat Antibiotic Resistance

70% Necessary Prescriptions
(Still need to improve drug selection, dose and duration)

At least 30% Unnecessary Prescriptions

CDC is working to reduce unnecessary antibiotic use

National Action Plan to Combat Antibiotic-Resistant Bacteria (CARB)

Goal: By 2020, reduce inappropriate outpatient antibiotic use by 50%

Find out when antibiotics are necessary. Visit: <http://www.cdc.gov/getsmart>

Centers for Disease Control and Prevention (2012). Fleming-Dutra, K et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010–2011. Journal of the American Medical Association, May 2016.

Centers for Disease Control and Prevention National Center for Emerging and Zoonotic Infectious Diseases

PERCENT OF ANTIBIOTIC PRESCRIPTIONS THAT WERE UNNECESSARY

| | All conditions* | Acute respiratory conditions** |
|-----------------|-----------------|--------------------------------|
| 0-19 year olds | 29% | 34% |
| 20-64 year olds | 35% | 70% |
| ≥65 year olds | 18% | 54% |
| All ages | 30% | 50% |

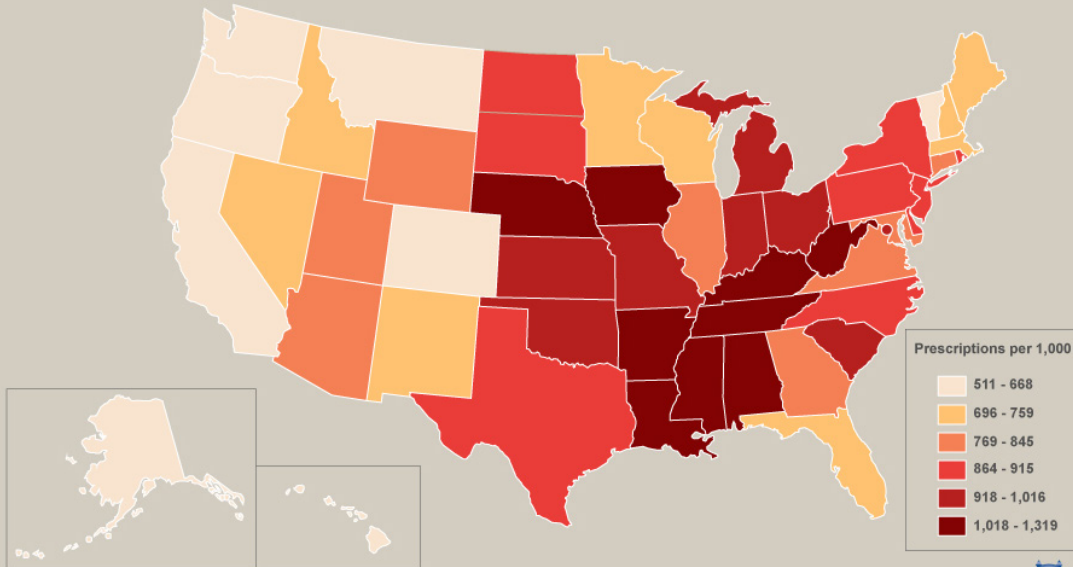
*All conditions included acute respiratory conditions, urinary tract infections, miscellaneous bacterial infections, and other conditions.

**Acute respiratory conditions included ear infections, sinus infections, sore throats, pneumonia, acute bronchitis, bronchiolitis, upper respiratory infections (i.e., common colds), influenza, asthma, allergy, and viral pneumonia.



Community Antibiotic Prescriptions per 1,000 Population by State - 2015

At least 30% of antibiotics prescribed in doctors' offices, emergency departments and hospital clinics are unnecessary.*



Data source: IMS Health Xponent 2014

*Fleming-Dutra, K., et al. (2016). "Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011." JAMA, the Journal of the American Medical Association 315(17): 1864-1873



Each year, there are 47 million unnecessary antibiotic prescriptions written in U.S. doctors' offices and emergency departments.⁷ Most of these unnecessary prescriptions are for respiratory conditions most commonly caused by viruses (including common colds, viral sore throats, and bronchitis) which do not respond to antibiotics, or for bacterial infections that do not always need antibiotics (like many sinus and ear infections). CDC estimated that at least 50 percent of antibiotic prescriptions for these acute respiratory conditions are unnecessary.⁸⁻¹⁰ These excess prescriptions each year put patients at needless risk for reactions to drugs or other problems, including *C. difficile* infections. In 2011 alone, one-third of the nearly 500,000 *C. difficile* infections in the United States were community-associated, or happening in patients who had no recent overnight stay in a healthcare facility.¹⁻⁴

The good news is that antibiotic prescribing nationally has improved with a five percent decrease from 2011 to 2014. However, while there have been noticeable declines in antibiotic prescribing in children (0-19) (the population targeted by the Get Smart program) from 75 million prescriptions in 2011 to about 64 million prescriptions in 2014, antibiotic prescription rates for adults have risen slightly from about 192 million in 2011 to 198 million in 2014. Children under two and adults 65 and older still receive the most antibiotic prescriptions. Data also show that antibiotics are prescribed more frequently in states in the Southern and Appalachian regions.



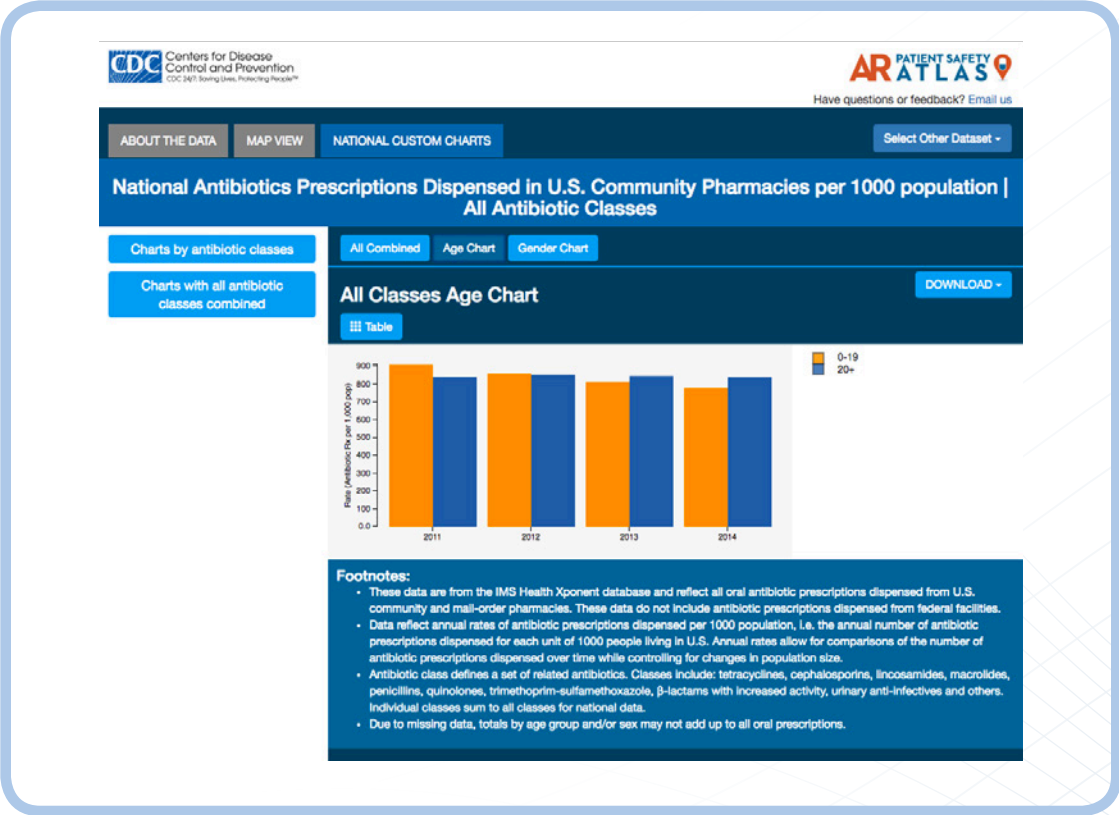
Prescribing the correct antibiotic is another area that requires attention. A CDC and Pew Charitable Trusts study found among outpatient visits in 2010– 2011, when an antibiotic was needed, patients were often prescribed an antibiotic not recommended by current clinical guidelines. For example, for sinus and middle ear infections and sore throats, recommended first-line antibiotics were only used half (52 percent) of the time.¹¹

PERCENT OF PATIENTS RECEIVING THE RECOMMENDED FIRST-LINE ANTIBIOTIC BY CONDITION, UNITED STATES, 2010-2011*

| | Adults (20+ years of age) | Children (0–19 years of age) |
|---------------------------|------------------------------|---------------------------------|
| Sinus infection | 37% | 52% |
| Pharyngitis (sore throat) | 37% | 60% |
| Middle ear infection | N/A | 67% |

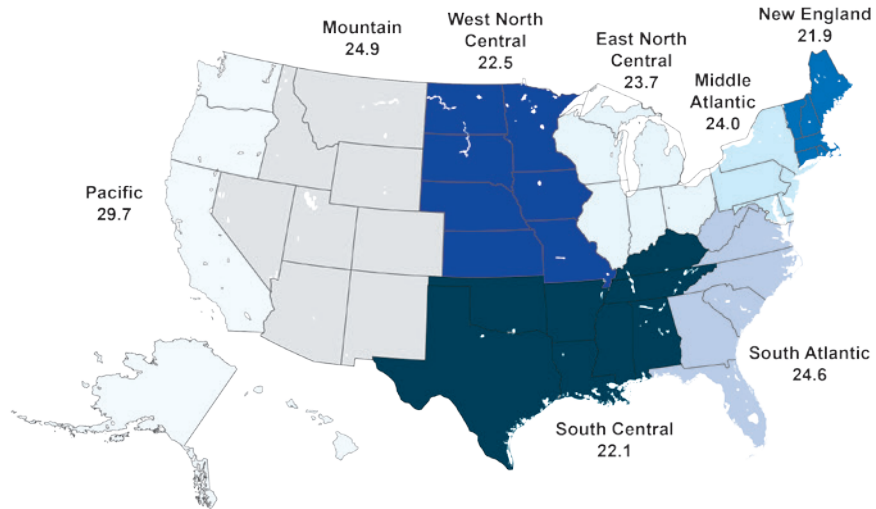
*Based on the prevalence of allergy to first-line antibiotics and estimated treatment failures after first-line antibiotics, at least 80% of patients presenting with these conditions should receive first-line antibiotics. Analysis is based on NAMCS and NHAMCS data.

[CDC’s Antibiotic Resistance Patient Safety Atlas](#) contains data on antibiotic prescriptions dispensed in outpatient pharmacies per 1,000 people. This interactive database provides information on how antibiotic prescribing varies by state, age group, and over time from 2011–2014.



GEOGRAPHIC VARIABILITY IN HEDIS MEASURES RELATED TO APPROPRIATE ANTIBIOTIC USE

Avoidance of antibiotic treatment in adults with acute bronchitis (average), by Census division, 2008–2012



CDC experts found that healthy adults with acute bronchitis only received the right treatment—meaning they did not get an antibiotic—just over 20 percent of the time. This shows that nearly 80 percent of the time, patients were getting an antibiotic unnecessarily.

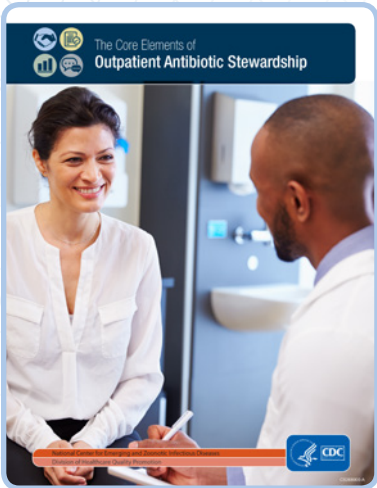


Improving Antibiotic Use in Outpatient Settings

Over the years there has been little progress made in prescribing for adults, indicating a clear need to better support healthcare providers who prescribe for adults. Family practice physicians prescribe the most antibiotics, but nurse practitioners, physician assistants, internal medicine physicians, pediatricians, and dentists also prescribe antibiotics, making these providers important audiences to reach. Because antibiotics are prescribed more frequently in the Southern and Appalachian regions, there is a need to target antibiotic stewardship efforts to providers and patients in these areas.

ORAL ANTIBIOTIC PRESCRIBING BY PROVIDER TYPE IN THE UNITED STATES IN 2014

| Provider type | Number of antibiotic prescriptions in 2014 (millions) |
|--|--|
| Family Practice Physicians | 58.1 |
| Physician Assistants & Nurse Practitioners | 54.4 |
| Internal Medicine | 30.1 |
| Pediatricians | 25.4 |
| Dentistry | 24.9 |
| Surgical Specialties | 19.9 |
| Emergency Medicine | 14.2 |
| Dermatology | 7.6 |
| Obstetrics/Gynecology | 6.6 |
| Other | 25.0 |
| All Providers | 266.1 |



Improving antibiotic prescribing involves implementing effective strategies that follow evidence-based recommendations for diagnosis and management. In 2016, CDC released [The Core Elements of Outpatient Antibiotic Stewardship](#), which were published in the [Morbidity and Mortality Weekly Report \(MMWR\) Recommendations and Reports](#). The Core Elements provides a framework for antibiotic stewardship for outpatient providers and facilities that routinely provide antibiotic treatment. This report augments existing guidance for other clinical settings and is intended for any outpatient provider, clinic or health system interested in improving antibiotic prescribing and use.

CORE ELEMENTS OF OUTPATIENT ANTIBIOTIC STEWARDSHIP



COMMITMENT

Demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety.



ACTION FOR POLICY AND PRACTICE

Implement at least one policy or practice to improve antibiotic prescribing, assess whether it is working, and modify as needed.



TRACKING AND REPORTING

Monitor antibiotic prescribing practices and offer regular feedback to providers, or have providers assess their own antibiotic prescribing practices themselves.



EDUCATION AND EXPERTISE

Provide educational resources to providers and patients on antibiotic prescribing, and ensure access to needed expertise on optimizing antibiotic prescribing.



INTENDED AUDIENCES FOR OUTPATIENT ANTIBIOTIC STEWARDSHIP



Primary care clinics and providers: These clinics and providers prescribe approximately half of all outpatient antibiotics in the United States. This includes providers specializing in family practice, pediatrics, and internal medicine, all of whom treat a wide variety of patients and conditions that might benefit from antibiotic treatment.



Outpatient specialty and subspecialty clinics and providers: These clinics and providers focus on treatment and management of patients with specialized medical conditions that sometimes benefit from antibiotic therapy. These specialty clinics include gastroenterology, dermatology, urology, obstetrics, and otolaryngology.



Emergency departments (EDs) and emergency medicine providers: EDs and emergency medicine providers are positioned between acute care hospitals and the community and encounter unique challenges, including lack of continuity of care and higher concentration of patients who might need urgent or even immediate care, as well as unique opportunities for stewardship interventions, such as greater provider access to diagnostic resources and the expertise of pharmacists and consultants.



Retail health clinics and providers: These clinics and providers provide treatment for routine conditions in retail stores or pharmacies and represent a growing category of healthcare delivery in the United States.



Urgent care clinics and providers: These clinics and providers specialize in treating patients who might need immediate attention or need to be seen after hours but might not need to be seen in EDs.



Dental clinics and dentists: Dental clinics and dentists use antibiotics as prophylaxis before some dental procedures and for treatment of dental infections.



Nurse practitioners and physician assistants: These providers work in every medical specialty and subspecialty involved in antibiotic prescribing and should be included in antibiotic stewardship efforts.



Healthcare systems: Healthcare systems plan, deliver, and promote healthcare services and often involve a network of primary and specialty outpatient clinics, urgent care centers, EDs, acute care hospitals, and other facilities that provide healthcare services. Healthcare systems can use existing antibiotic stewardship programs or develop new ones to promote appropriate antibiotic prescribing practices in their outpatient facilities as well as across the system.

CDC collaborates with partners to implement appropriate antibiotic use efforts at a local level. CDC funds and supports many state and local health departments and other partners across the country to implement targeted antibiotic stewardship improvements in outpatient settings.

Illinois Department of Public Health: Precious Drugs and Scary Bugs



In 2015, the Illinois Department of Public Health (IDPH) developed the [Precious Drugs and Scary Bugs](#) program to improve the appropriate use of antibiotics, particularly for acute respiratory infections, in primary care, urgent care, and community health centers. IDPH asked healthcare providers to:

- Display a poster in exam rooms stating their commitment to appropriate antibiotic prescribing.
- Participate in educational webinars.
- Track their antibiotic prescribing data.
- Complete baseline and follow-up surveys.

Thirty-eight outpatient practices participated representing 239 healthcare providers. More than 500 commitment posters were printed and distributed. Participating healthcare providers reported that the poster improved communication, addressed patient expectations regarding antibiotics for acute respiratory infections, and reinforced a uniform message.

New York State Department of Health: Commitments to Appropriate Antibiotic Prescribing



In 2016, the New York State Department of Health (NYSDOH) offered a [“Get Smart Guarantee” poster](#) for healthcare providers to pledge to only prescribe antibiotics when they are needed. The “Guarantee” poster could be personalized with the provider’s photo and signature. Some providers indicate patients expect antibiotics even if the illness is viral (where antibiotics would not be effective) so NYSDOH developed a [“Get Smart Guarantee” palm card](#). This takeaway serves in lieu of a prescription for antibiotics so patients understand their concerns have been heard and validated. The poster and palm card are offered in English and Spanish.

Utah Department of Health: Using Data to Identify Best and Worst Performing Clinics



The Utah Health Department shared data publicly on the [Open Data Catalog](#) website to show which clinics in the state had the best and worst performance on the HEDIS® measure: Avoidance of antibiotic treatment in adults with acute bronchitis (which usually does not require antibiotics). Utah used its All Payer Claims Database, which combines eligibility, medical claims, pharmacy claims, and provider files each month, to compile 2013-2014 data.





HEALTHCARE PROVIDERS, PATIENTS, AND FAMILIES PLAY A CRITICAL ROLE IN SUPPORTING OPTIMAL ANTIBIOTIC USE AND PREVENTING INFECTIONS IN OUTPATIENT SETTINGS.

What can healthcare providers do to support appropriate antibiotic use and prevent infections in outpatient settings?

- Follow clinical guidelines when prescribing antibiotics.
 - ▶ Use the right antibiotic, at the right dose, for the right duration, and at the right time.
- Place written commitments in support of improving antibiotic use in exam rooms to help facilitate patient communication about appropriate antibiotic use.
 - ▶ Give patients information and materials on appropriate antibiotic use to reference. See examples of [print materials for everyone](#).
- Talk to patients and families about when antibiotics are and are not needed, and discuss possible harms such as allergic reactions, *C. difficile*, and antibiotic-resistant infections.
 - ▶ Ask patients if they have ever had a *C. difficile* infection, and tailor antibiotic treatment accordingly.
- For patients with conditions that usually resolve without antibiotic treatment:
 - ▶ Talk to patients about ways to relieve their symptoms without antibiotics.
 - ▶ Discuss a clear plan for follow-up if symptoms worsen or do not improve.
- Be aware of antibiotic resistance patterns in your community; use the data to inform prescribing decisions.
- Follow hand hygiene and other infection prevention measures with every patient.

What can patients and families do to support appropriate antibiotic use and prevent infections in outpatient settings?

- Talk to your healthcare provider about when antibiotics will and won't help, and ask about antibiotic resistance.
- Talk to your healthcare provider about how to relieve symptoms.
- Take antibiotics only when prescribed and exactly as prescribed.
- Don't save an antibiotic for later or share the drugs with someone else.
- Insist that everyone cleans their hands before touching you.
- Stay healthy and keep others healthy by cleaning hands, covering coughs, staying home when sick, and getting recommended vaccines.



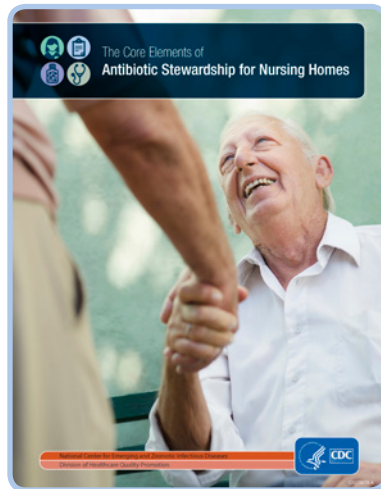
WHAT DO WE KNOW ABOUT ANTIBIOTIC USE IN NURSING HOMES?

Current data on antibiotic use in nursing homes is limited so the information here is based on a few small studies. Over the course of a year, approximately 4 million individuals receive care and services in a nursing home. Antibiotics are some of the most commonly prescribed medications in nursing homes with 50 to 70 percent of residents receiving an antibiotic over the course of a year.^{12,13} Up to 75 percent of antibiotics prescribed in nursing homes are prescribed incorrectly.^{12,13} The most common prescribing problems in nursing homes are using an antibiotic when not needed, choosing the wrong antibiotic, and using the correct antibiotic but for the wrong dose or duration. Prescribing problems can lead to harm including side effects, allergic reactions, *C. difficile* infection, and antibiotic-resistant infections. This is especially concerning because nursing home residents are already at high risk for getting a *C. difficile* infection.

From December 2013 to May 2014, CDC examined the medical records of nine U.S. nursing homes in four different states to assess how many antibiotics residents received in a single day and the documentation for those prescriptions. Researchers found that 11 percent of nursing home residents were on antibiotics on any single day. One in three of these antibiotic prescriptions was for the treatment of urinary tract infections; yet at least half of these prescriptions were for either the wrong drug, dose, or duration. Finally, 38 percent of orders for antibiotics lacked documentation of one or more important prescribing elements.¹⁴ CDC is launching a study with a larger number of nursing homes and pursuing partnerships with nursing home networks, pharmacies, and other companies to identify where action is needed most.



Improving Antibiotic Use in Nursing Homes



To protect nursing home residents, in 2015 CDC released [The Core Elements of Antibiotic Stewardship for Nursing Homes](#). By adapting hospital recommendations to the nursing home setting, the Core Elements guide provides practical ways for nursing homes to initiate or expand antibiotic stewardship activities. The guide provides examples of how antibiotic use can be monitored and improved by nursing home leadership and staff. The companion checklist can be used to assess policies and practices already in place and to review progress in expanding stewardship activities. CDC works to provide support and technical assistance to health departments and nursing home partners to help implement the Core Elements in nursing homes.

CORE ELEMENTS OF ANTIBIOTIC STEWARDSHIP FOR NURSING HOMES



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.

CDC collaborates with partners to implement appropriate antibiotic use efforts at a local level. CDC funds and supports many state and local health departments and other partners across the country to implement targeted antibiotic stewardship improvements in nursing homes.

Massachusetts Department of Public Health: Reducing *C. difficile* through Educational Interventions in Nursing Homes



The Massachusetts Department of Public Health extended *C. difficile* prevention activities from acute care hospitals into nursing homes. Sixteen nursing homes implemented multi-faceted educational interventions to reduce unnecessary antibiotic use for asymptomatic bacteriuria (when bacteria are found in urine without causing symptoms of a urinary tract infection). They conducted in-person trainings on antibiotic use for urinary tract infections and engaged patients and families. After one year, nursing homes experienced:

- Improved urinary tract infection diagnostic practices with a 28 percent decrease in unnecessary urine cultures for patients who did not have symptoms of urinary tract infection.
- Decreased antibiotic use with a 37 percent reduction in antibiotics given to patients experiencing asymptomatic bacteriuria.
- Improved patient outcomes with a 47 percent reduction in healthcare-acquired *C. difficile* infections.

Presbyterian Senior Care Network: Implementing the Core Elements of Antibiotic Stewardship for Nursing Homes



Presbyterian Senior Care Network is a network of senior care and independent living facilities in Erie, Pennsylvania. The first Antibiotic Stewardship Program team was initiated by two nurses focused on quality care and infection prevention and control. They anticipate all Presbyterian Senior Care Network communities will adopt the program over time. Their activities are based on [CDC's Core Elements of Antibiotic Stewardship for Nursing Homes](#).

State Policies to Improve Antibiotic Use in Nursing Homes

- **State of California: Requiring Antibiotic Stewardship in Nursing Homes**
California Senate Bill 361 required skilled nursing facilities to adopt and implement an antibiotic stewardship policy by January 1, 2017. According to the bill, the antibiotic stewardship policy should be consistent with [CDC's Core Elements of Antibiotic Stewardship for Nursing Homes](#). California was the first state to enact legislation to improve antibiotic use in nursing homes.





HEALTHCARE PROVIDERS, RESIDENTS, AND FAMILIES PLAY A CRITICAL ROLE IN SUPPORTING OPTIMAL ANTIBIOTIC USE AND PREVENTING INFECTIONS IN NURSING HOMES.

What can healthcare providers do to support appropriate antibiotic use and prevent infections in nursing homes?

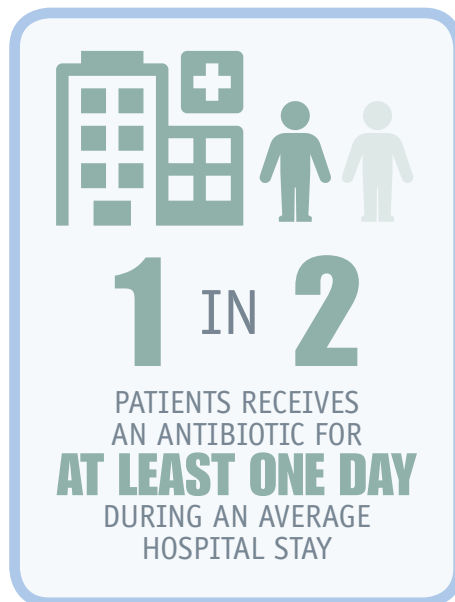
- Follow clinical guidelines when prescribing antibiotics.
 - ▶ Use the right antibiotic, at the right dose, for the right duration, and at the right time.
- Review antibiotic therapy 2-3 days after it is started based on the resident's clinical condition and microbiology culture results.
- Talk to residents and their families about when antibiotics are and are not needed, and discuss possible harms such as allergic reactions, *C. difficile* and antibiotic-resistant infections.
 - ▶ Ask residents if they have ever had a *C. difficile* infection, and tailor antibiotic treatment accordingly.
- Be aware of antibiotic resistance patterns in your facility and community; use the data to inform prescribing decisions.
- Follow hand hygiene and other infection prevention measures with every resident.

What can residents and families do to support appropriate antibiotic use and prevent infections in nursing homes?

- Talk to your healthcare provider about when antibiotics will and won't help, and ask about antibiotic resistance.
- Ask what infection an antibiotic is treating, how long antibiotics are needed, and what side effects might happen.
- Ask what your nursing home is doing to protect you from antibiotic-resistant and *C. difficile* infections.
- Insist that everyone cleans their hands before touching you.
- Ask visitors and family not to visit when they feel ill.
- Get vaccinated for flu and pneumonia, and encourage others to stay up-to-date on vaccines.

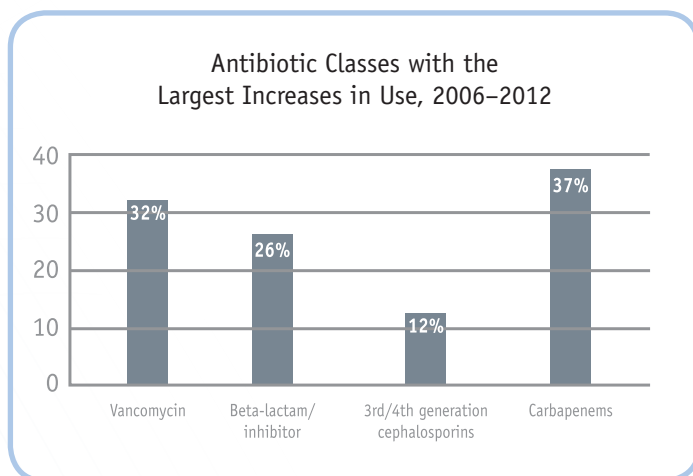
WHAT DO WE KNOW ABOUT ANTIBIOTIC USE IN HOSPITALS?

In a 2016 study, CDC experts found that overall rates of antibiotic use in U.S. hospitals did not change from 2006–2012. More than half of patients received at least one antibiotic during their hospital stay.¹⁵ However, there were significant changes in the types of antibiotics prescribed with the most powerful antibiotics being used more often than others. There was a 37 percent rise in the use of carbapenems. Infections caused by bacteria that develop resistance to carbapenems can be especially hard to treat, and even deadly. There was also a 32 percent rise in the use of vancomycin, an important antibiotic used to treat common antibiotic-resistant infections caused by methicillin-resistant *Staphylococcus aureus*, or MRSA. Data from [CDC's National Healthcare Safety Network](#) Antimicrobial Use Option show healthcare providers in some hospitals prescribe up to three times as many antibiotics as providers in similar areas of other hospitals. This variation suggests there are opportunities to improve prescribing practices.



One-third of antibiotic prescriptions in hospitals involve potential prescribing problems such as giving an antibiotic without proper testing or evaluation, prescribing an antibiotic when it is not needed, or giving an antibiotic for too long.¹⁶ [The National Action Plan for Combating Antibiotic-Resistant Bacteria](#) sets a goal that all hospitals have antibiotic stewardship programs to help reduce inappropriate antibiotic prescriptions by 20 percent by 2020.

A national survey of antibiotic use done by [CDC's Emerging Infections Programs](#) identified key opportunities to reduce inappropriate use. This study found that two out of three antibiotics in hospitals are given for three conditions: pneumonia, urinary tract infections (including bladder and kidney infections), and skin infections.¹⁷ There are [data](#) showing a variety of ways to improve antibiotic use in treating these conditions, so targeting them could have a large impact on improving appropriate antibiotic use. Likewise, studies have shown that there are many opportunities to improve the use of vancomycin and fluoroquinolones, two of the most commonly prescribed antibiotics in hospitals.



Improving Antibiotic Use in Hospitals



Evidence demonstrates that hospital-based antibiotic stewardship programs improve the treatment of infections and reduce side effects associated with antibiotic use. They also significantly reduce hospital rates of *C. difficile* infection and antibiotic resistance. Moreover, these programs often achieve these benefits while saving hospitals money.

In 2014 CDC recommended that all acute care hospitals implement antibiotic stewardship programs. [CDC's Core Elements of Hospital Antibiotic Stewardship Programs](#) provides a framework for establishing and improving antibiotic stewardship in hospitals. Since their adoption, the Core Elements have been used as an implementation

framework by large health systems and have become part of The Joint Commission's accreditation standard for antibiotic stewardship.

CORE ELEMENTS OF ANTIBIOTIC STEWARDSHIP FOR HOSPITALS



LEADERSHIP COMMITMENT Dedicating necessary human, financial and information technology resources.



ACCOUNTABILITY Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.



DRUG EXPERTISE Appointing a single pharmacist leader responsible for working to improve antibiotic use.



ACTION Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. "antibiotic time out" after 48 hours).



TRACKING Monitoring antibiotic prescribing and resistance patterns.



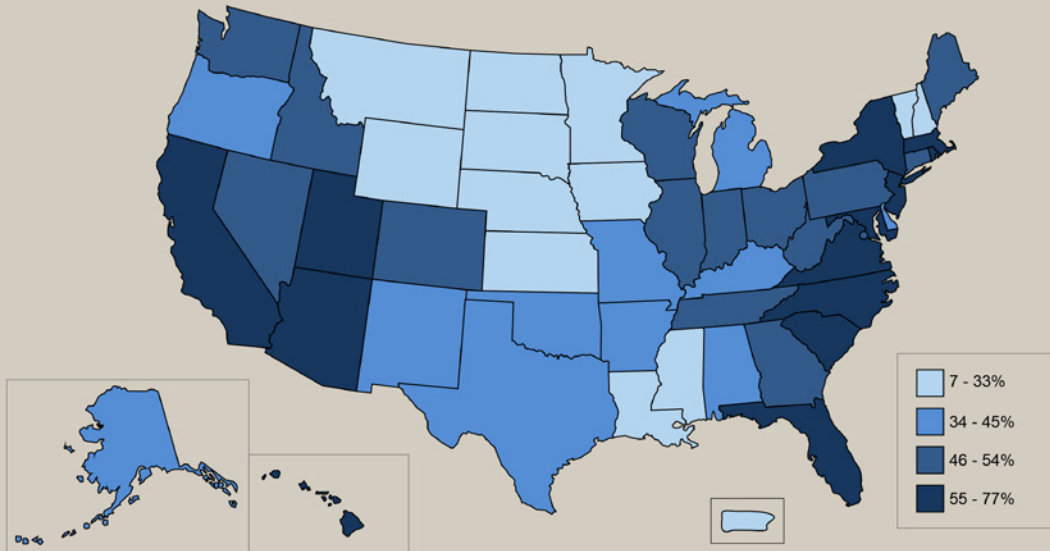
REPORTING Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.



EDUCATION Educating clinicians about resistance and optimal prescribing.

Percent of Hospitals with Antibiotic Stewardship Programs by State, 2015*

Nationally, 48.1% of all hospitals have stewardship programs (2,199 of 4,549); the national goal is 100% of hospitals by 2020.



*A hospital stewardship program is defined as a program following all 7 of CDC's Core Elements of Hospital Antibiotic Stewardship Programs.

Source: CDC's National Healthcare Safety Network (NHSN) Survey

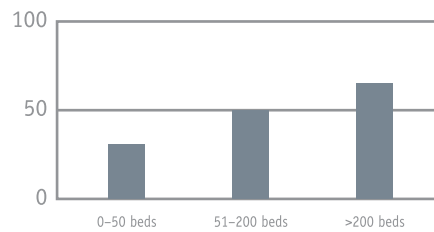


The Core Elements were designed to be flexible enough to be adopted in hospitals of any size. In 2016, CDC partnered with the National Quality Partnership of the National Quality Forum, a not-for-profit, nonpartisan, membership-based organization that works to catalyze improvements in health care, to lead a team of experts in creating a practical guide to help hospitals implement the Core Elements.

The Antibiotic Stewardship in Acute Care:

A Practical Playbook provides real-world strategies to help hospitals and health systems of all sizes implement and improve antibiotic stewardship programs.

Percentage of U.S. Acute Care Hospitals (n=4,569) Implementing All 7 Core Elements of Hospital Antibiotic Stewardship Programs



CDC has been assessing the implementation of the Core Elements through the NHSN Annual Survey. In 2014, 41 percent of hospitals reported implementing all seven elements. By 2015, that had increased to 48 percent. However, there were important differences in implementation, with larger hospitals showing much more uptake: 66.1 percent of hospitals with over 200 beds reported all seven Core Elements, compared to 49.6 percent of hospitals with 51–200 beds and 31.1 percent of hospitals with 1–50 beds. Data from this survey indicate that there is much more to do, especially in smaller hospitals which face special challenges in implementing the Core Elements. CDC partnered with The Pew Charitable Trusts, the American Hospital Association and the Federal Office of Rural Health Policy to develop **Implementation of Antimicrobial Stewardship Core Elements at Small and Critical Access Hospitals** to support the implementation of stewardship programs in these hospitals.



CDC's Standardized Antimicrobial Administration Ratio (SAAR): Assessment Tool Offers Step for Improvement

The NHSN Antimicrobial Use Option is available to hospitals currently using NHSN and allows hospitals to monitor antibiotic use. The centerpiece of the Antimicrobial Use Option is a risk-adjusted benchmarking measure of antibiotic use, the Standardized Antimicrobial Administration Ratio, or SAAR, which was endorsed by the National Quality Forum in 2016. The SAAR calculates the ratio of observed antibiotic use to predicted antibiotic use, based on modeled data from all reporting hospitals and allows hospitals to compare their antibiotic use with similar facilities. The SAAR offers a way to collect data for action by allowing facilities to not only compare their antibiotic use to others, but to monitor use over time. CDC is working with a variety of experts to further improve the SAAR. For example, experts suggested that a variety of different benchmarks would be most useful, so CDC has developed SAARs for five different antibiotic categories and several different hospital locations.

While the SAAR cannot be used to measure the appropriateness of antibiotic use in a hospital, it can be used to direct hospital antibiotic stewardship programs to areas where antibiotic use deviates from what is expected. A high SAAR signals a need for further review to see if there are opportunities to improve use. CDC collaborated with The Pew Charitable Trusts and a number of experts to develop an assessment tool to help hospitals find opportunities to improve use in locations with high SAARs. Though the tool is designed to be used in conjunction with the SAAR, it could be used to look for improvement opportunities in any location where stewardship programs believe use is higher than expected. For more information on the SAAR and strategies to assess antibiotic use in hospitals, visit [Strategies to Assess Antibiotic Use to Drive Improvements In Hospitals](#).

CDC collaborates with partners to implement appropriate antibiotic use efforts at a local level. CDC funds and supports many state and local health departments and other partners across the country to implement targeted antibiotic stewardship improvements in hospitals.

Ascension: Building the Infrastructure for Antibiotic Stewardship in a Large Health System



Ascension is the largest non-profit health system in the United States, with facilities in 25 states and the District of Columbia, including 141 hospitals and more than 21,000 acute care beds.

Ascension has made swift progress in its antibiotic stewardship efforts by implementing four strategies in support of full implementation of [CDC's Core Elements](#) in all Ascension hospitals:

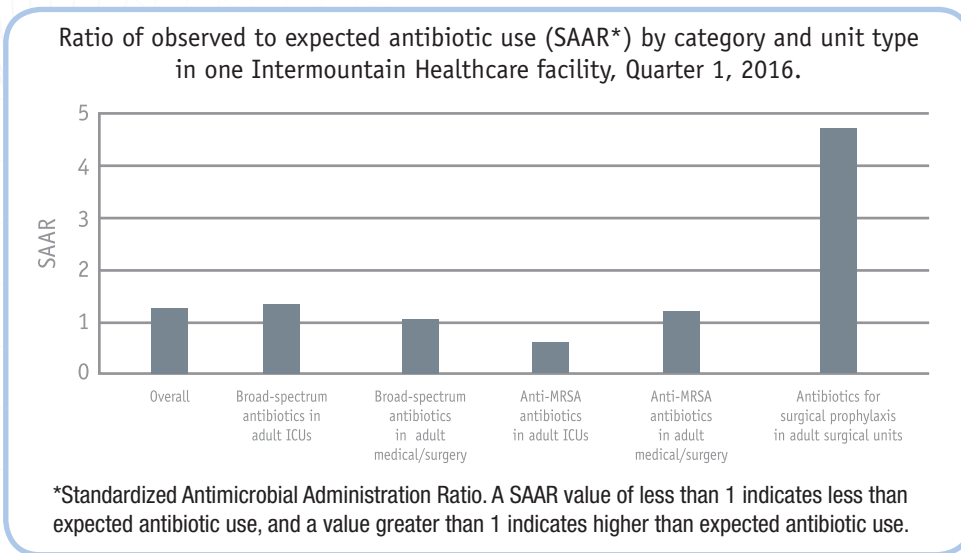
- Making antibiotic stewardship a system priority with full leadership support.
- Creating an infrastructure to promote and share best practices.
- Promoting the careful use of narrow-spectrum antibiotics (antibiotics that are specifically effective against a limited number of bacteria).
- Helping hospitals achieve their goals by investing in clinical decision support systems, strengthening local expertise, and tracking and evaluating antibiotic use data.

As a result of these efforts, Ascension has seen reductions in antibiotic use and 15.9 percent reduction in *C. difficile* infections. One 376-bed teaching hospital drove a 70 percent drop in the use of selected antibiotics over a six-month period.

Intermountain Healthcare: Using Data to Identify Opportunities for Improvement



Intermountain Healthcare is a not-for-profit health system based in Salt Lake City, Utah, with 22 hospitals, about 1,400 primary care and secondary care physicians at more than 185 clinics in the Intermountain Medical Group, and health insurance plans from SelectHealth. Intermountain Healthcare has been an early adopter of the NHSN Antimicrobial Use Option and has been using the data for action. For example, they identified one facility that had an overall antibiotic SAAR measure indicating use was as expected, but found one very high SAAR – for antibiotics used for surgical prophylaxis on adult surgical units—indicating higher use of these antibiotics than would be expected. This highlighted a specific area for further exploration and improvement.



Southwest Health System: Pharmacist-led Antibiotic Stewardship in a Small Health System



Southwest Health System (SHS) serves about 50,000 people in rural southwest Colorado, and in parts of Utah, Arizona, and New Mexico, and the Ute Mountain and Navajo reservations. SHS has 25 inpatient beds and 8 clinics. SHS has made antibiotic stewardship a priority through a variety of strategies while implementing CDC's Core Elements:

- Creating a stewardship team of hospital leaders, including laboratory professionals, physicians, pharmacists, infection preventionists, nurse educators, and a wound care specialist.
- Using pharmacists to lead the antibiotic stewardship program. Pharmacists also work to decrease risk of *C. difficile* by adjusting medications.
- Educating hospital staff and providing feedback through active daily rounding where staff discuss medications, antibiotic choice, duration of therapy, and discharge medications.
- Collaborating with partners in a state-wide antibiotic stewardship collaborative (including implementation of a urinary tract infection (UTI)/upper respiratory infection (URI) stewardship program in SHS' eight clinics) and seeking efforts to expand stewardship to local long-term care organizations and dentists.



The Richard L. Roudebush Indianapolis Veterans Affairs Medical Center: Using NHSN Data to Evaluate a Stewardship Activity



The Richard L. Roudebush VA Medical Center located in Indianapolis, Indiana, is a general medical and surgical hospital and teaching hospital with 150 beds. The organization used CDC's NHSN Antimicrobial Use Option to evaluate their hospital stewardship program. Infectious disease physicians and clinical pharmacists tracked and reviewed antibiotic usage in their hospital and gave feedback to providers. They used NHSN data to track antibiotic use before and after the intervention and identified a hospital-wide decrease in antibiotic use, as reflected in lower SAAR values, especially in anti-MRSA agents and antibiotics used for hospital onset infections, which were targets of their reviews.

State Policies to Improve Antibiotic Use in Hospitals

- California: California Senate Bills 739 and 1311 require hospitals to develop a process for monitoring antibiotic use and implementing antibiotic stewardship. California was the first state to enact legislation to improve antibiotic use.
- Missouri: In addition to requiring all Missouri hospitals to create antibiotic stewardship programs, Missouri Senate Bill 579 (passed in 2016), requires that all non-psychiatric hospitals must begin reporting antibiotic use to CDC's NHSN by August 2017.



HEALTHCARE PROVIDERS, PATIENTS, AND FAMILIES PLAY A CRITICAL ROLE IN SUPPORTING OPTIMAL ANTIBIOTIC USE AND PREVENTING INFECTIONS IN HOSPITALS.

What can healthcare providers do to support appropriate antibiotic use and prevent infections in hospitals?

- Follow clinical guidelines when prescribing antibiotics.
 - ▶ Use the right antibiotic, at the right dose, for the right duration, and at the right time.
- Review antibiotic therapy 2–3 days after it is started based on the patient’s clinical condition and microbiology culture results.
- Talk to patients and families about when antibiotics are and are not needed, and discuss possible harms such as allergic reactions, *C. difficile* and antibiotic-resistant infections.
 - ▶ Ask patients if they have ever had a *C. difficile* infection, and tailor antibiotic treatment accordingly.
- Be aware of antibiotic resistance patterns in your facility and community; use the data to inform prescribing decisions.
- Follow hand hygiene and other infection prevention measures with every patient.

What can patients and families do to support appropriate antibiotic use and prevent infections in hospitals?

- Talk to your healthcare provider about when antibiotics will and won’t help, and ask about antibiotic resistance.
- Ask what infection an antibiotic is treating, how long antibiotics are needed, and what side effects might happen.
- Tell your healthcare provider if you have been hospitalized in another facility or have recently taken antibiotics.
- If you have a urinary catheter, ask daily if it’s necessary.
- Ask what your hospital is doing to protect you and your family from antibiotic-resistant and *C. difficile* infections.
- Insist that everyone cleans their hands before touching you.
- Get vaccinated for flu and pneumonia, and encourage others to stay up-to-date on vaccines.



CONCLUSION

Antibiotics have saved millions of lives and transformed modern medicine, but they are becoming less effective and therefore are an increasingly limited resource. Too often antibiotics are used inappropriately, putting patients at risk for developing antibiotic-resistant infections, *C. difficile* infections, or a number of other problems. With the implementation of antibiotic stewardship programs and resources, patients should expect to receive the right antibiotic, at the right time, with the right dose and duration.

Across the United States, the number of antibiotic prescriptions given to children and adults remains high. Numerous studies have found that antibiotics are being prescribed for illnesses which do not require antibiotics, and the incorrect type of antibiotic, dose, or duration are often prescribed across all healthcare settings. In outpatient settings, acute respiratory infections are the leading cause of inappropriate prescribing, while in nursing homes and hospitals, urinary tract infections and pneumonia are the leading conditions for which antibiotic prescribing needs to be improved. Additionally, antibiotic overuse may cost the lives of thousands due to deadly *C. difficile* infection.

CDC has helped combat inappropriate antibiotic use and antibiotic resistance with the [Antibiotic Resistance Solutions Initiative](#), by collaborating with healthcare partners to promote the importance of appropriate antibiotic use, and by educating healthcare providers and patients. The Core Elements of Antibiotic Stewardship provide a framework for antibiotic stewardship and outline how healthcare providers, health systems, hospitals, clinics, and nursing homes can participate as active forces in helping to improve antibiotic use. Many hospitals have already improved their antibiotic prescribing by following the Core Elements, paving the way for more action and better patient outcomes. When antibiotic stewardship programs and practices are adopted, patients receive the best antibiotic treatment.

Engaging patients is critical to the effort to improve antibiotic use. Helping patients know what they can do to keep themselves and their loved ones safe is part of the discussion of improving antibiotic use. This means raising awareness about the side effects of antibiotics, as well as the unintended consequences of antibiotic use. CDC's new and existing educational efforts will work to ensure that antibiotics are used properly and that patients who might have sepsis are recognized and started on the right antibiotic quickly, and reassessed within 48 hours when the patient's culture results are back.

Efforts to improve antibiotic use will succeed only if everyone plays a role. Success will depend upon coordinated efforts to promote and adopt principles of responsible antibiotic prescribing and use across the globe, from government agencies, foundations, professional organizations, companies, health systems, hospitals, clinics, nursing homes, patients, and healthcare providers. CDC is committed to using data for action, supporting implementation of programs and practices to optimize antibiotic use, working with partners, driving innovation, and educating patients and healthcare providers about the benefits and risks of antibiotics.

When everyone plays their part to improve antibiotic use, patient safety is preserved and life-saving antibiotics will be available for generations to come.



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