Kansas
Department of Health and Environment

ANTIMICROBIAL STEWARDSHIP PROGRAMS

A Toolkit for Small and Critical Access Hospitals in Kansas

November 2020

Healthcare-Associated Infections & Antimicrobial Resistance Program

Kansas Department of Health and Environment
Bureau of Epidemiology and Public Health Informatics
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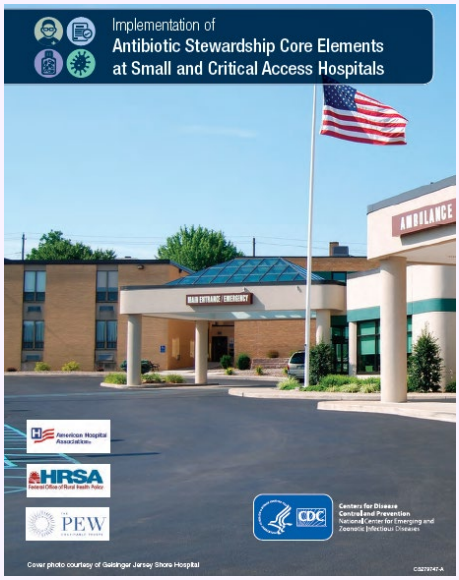
Executive Summary

The purpose of this antimicrobial stewardship toolkit is to provide critical access hospitals across Kansas with the tools and guidance needed to develop and implement practical, efficient, and effective antibiotic stewardship programs. Our original *Antimicrobial Stewardship Programs, a Toolkit for Critical Access Hospitals in Kansas* was published in 2017 and was met with favor from our community partners. In the interim the Infectious Disease Society of America and the Society for Healthcare Epidemiology of America antibiotic stewardship program guidelines were updated, the Centers for Disease Control and Prevention updated their 7 Core Elements, the Joint Commission implemented standards for stewardship programs, and the Centers for Medicare & Medicaid Services issued mandates for hospital stewardship implementation.

After we published our first version of our CAH toolkit in 2017, CDC asked us to provide input on their Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals.



Throughout this period, Kansas hospitals have both developed and expanded the scope of their stewardship programs. A National Healthcare Safety Network hospital survey indicated that in 2014 only 30% of Kansas acute care hospitals had a stewardship program in place that met all 7 Core Elements (1), and only 8% (3/36) of Kansas critical access hospitals reported having an active stewardship program (20). By 2018 66% acute care hospitals reported fulfilling all 7 elements. However, we remain second-to-last nationally for inpatient stewardship program implementation – likely related to Kansas's high number of critical access hospitals and the correlating low stewardship implementation rates at these types of facilities. It is clear that critical access and small acute care hospitals have limited resources (e.g., infectious disease, pharmaceutical, technical expertise) making it difficult to accomplish what their larger hospital peers have attained. Yet, we remain confident that the high-quality clinical care that Kansas hospitals are providing to our citizens, can also be translated to antimicrobial stewardship success.

This document serves as a multifaceted guide which builds on our 2017 toolkit. This guide is not meant to serve as an exhaustive reference of stewardship ideas and efforts, and we encourage facilities to tailor components within this toolkit to their facility. There is no "one size fits all" stewardship program. Successful programs often start with a solitary initiative and build from there. Stewardship coordinators should consider which components of this toolkit will work best in their facility, tailor implementation plans to institutional or provider concerns, and strategize based on activities already in development or practice.

Finally, antimicrobial stewardship is distinct from infection prevention and control; however, the sum of both are greater than either's parts. Many who serve on stewardship committees are part of the infection prevention and control program, and if they are separate entities, we suggest coordinating efforts to tackle initiatives aimed at the lowest hanging fruit. After all, the objective of both entities is the same: to provide the safest care for patients, with the ultimate goal to reduce morbidity and mortality from transmissible diseases.

The Kansas Department of Health and Environment's Healthcare-Associated Infections and Antimicrobial Resistance Program, along with our partner organizations involved in the Kansas Healthcare-Associated Infection and Antimicrobial Resistance Advisory Group, strive to assist Kansas healthcare facilities in developing their own stewardship programs. To help Kansas hospitals achieve these goals, we have expanded our program expertise to include a clinical infectious disease physician, Dr. Kellie Wark, MD MPH, a practitioner at The University of Kansas Health System. Dr. Wark has worked to update this toolkit and has created new tools to assist facilities in jump-starting and expanding stewardship activities. These include downloadable antibiotic utilization spreadsheets, timeline and agenda guides, PowerPoints for making a stewardship case to the C-suite, editable policies, a statewide antibiogram and antibiogram templates, among many others. Additionally, we would like to highlight the great work Kansas small and critical access hospitals are doing in quality across the state. We present several Kansas facility examples in this document. We encourage you to reach out to us for assistance and input on what and how we can better serve our Kansas communities.

Thank you for reading and for helping us to improve healthcare in Kansas!

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Introduction

Much of the antimicrobial stewardship (AS) efforts over the past few decades have been directed towards large hospitals and health systems, with less efforts within the smaller volume facilities. Yet a large proportion of U.S. healthcare takes place in these small volume hospitals, with nearly three quarters of national hospitals under 200 beds (5). Approximately 56% of hospitals in Kansas are critical access hospitals (CAHs).

The Centers for Disease Control and Prevention (CDC), American Medical Directors Association, Association for Professionals in Infection Control and Epidemiology (APIC), Infectious Disease Society of America (IDSA), Pediatric Infectious Disease Society (PIDS), and the Society for Healthcare Epidemiology of America (SHEA) encourage all CAHs and acute care hospitals (ACH) to develop policies and procedures establishing antimicrobial prescribing standards, ensuring that antibiotics are used in credible scenarios, are not treating colonization or contamination, and that the correct dose is used for the appropriate purpose and duration (2,3).

What is Antimicrobial Resistance and Why Does It Matter?

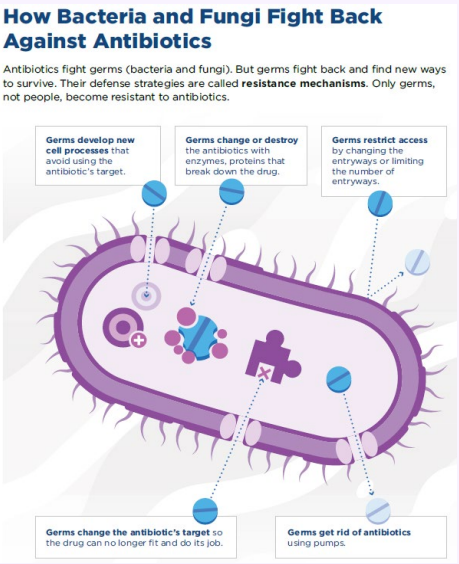
Dr. Alexander Fleming, notoriously known amongst his St. Mary's London Hospital colleagues as a generally less-than-fastidious lab keeper, upon returning from summer vacation found mold had encroached on one of his petri dishes containing *Staphylococcus aureus*, preventing further growth. That mold, *Penicillium notatum* (now *P.chrysogenum)*, was quite persnickety, and it took almost 20 more years for another British group of researchers to figure out how to mass produce it. Dr. Fleming began treating patients with penicillin (after first experimenting on his lab assistant) (6). This discovery marked one of the most important milestones in modern medicine, and many of the infections we think of today as relatively benign (e.g., pneumonia, skin and soft tissue infections) were a century ago the leading causes of death globally (7).

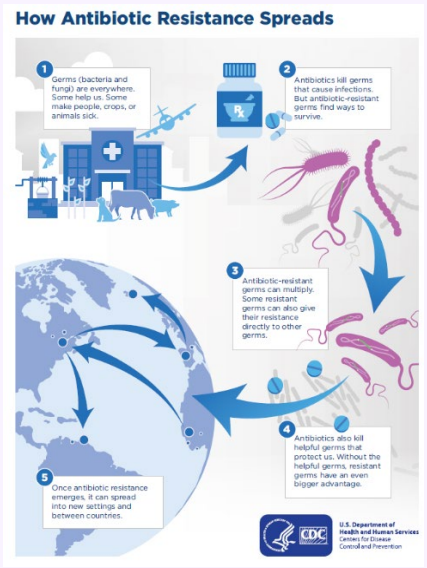
Shortly following mass distribution of penicillin, Sir Alexander Fleming warned "the public will demand [the drug and] then begin an era of abuses" (8). We indeed now find ourselves returning to that pre-antibiotic era, whereby the numbers of available antibiotics are insufficient for increasingly resistant bacterial infections, with illnesses as simple as urinary tract infections often lacking effective antibiotics to treat them. Further, when MDROs contribute to true infection, more costly and/or toxic antibiotics are generally required. With the antibiotic pipeline dwindling the past few decades, concerns of an impending post-antibiotic era, in which no antibiotics will be available for many infections, remains a significant concern for public health practitioners and clinicians alike. Curtailing our antibiotic hunger starts with judicious antibiotic use (AU), with the most efficient way in which to achieve this is by way of serving as stewards of the antibiotics we currently have.

How Antibiotic Resistance Develops and Spreads

Antimicrobial resistance (AMR) occurs when an organism can resist the effects of drugs meant to stop its function or kill it. Prevalence of resistant organisms increases when an antimicrobial, antibiotics being one of the most commonly recognized type of antimicrobial, is used. Antibiotics kill the bulk of bacteria except those resistant to that antibiotic. These resistant bacteria are then able to spread their evading mechanisms with other bacteria, and now more pathogens have figured out how to go about surviving regardless of presence of antibiotic, deemed antibiotic resistance (AR). This same process happens with viruses to antivirals, fungi to antifungals, and so on. For more information go to the CDC AMR site.

AR happens rapidly. In one study, while on antibiotic (either azithromycin or clarithromycin), 54% of patients' bacteria (*Streptococcus pneumoniae*) recovered from throat swabs had become resistant to those antibiotics within a week (9). Most people harboring resistant pathogens are often asymptomatic, in which no signs or symptoms of infection are exhibited at all. However, when an infection does develop treatment is more complex, more expensive, and often associated with greater morbidity and mortality.





Source: CDC (https://www.cdc.gov/drugresistance/about.html)

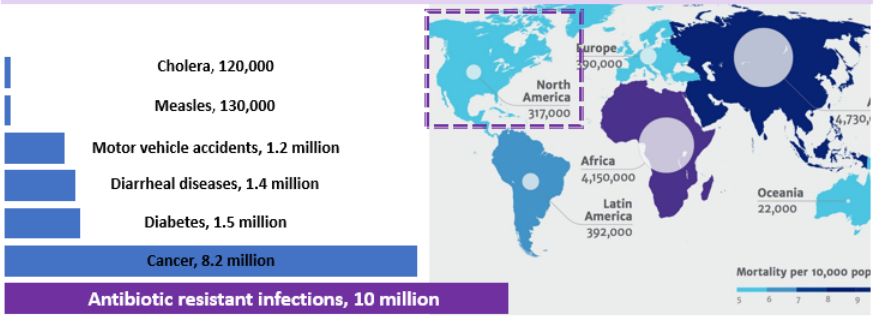
THE SCOPE OF THE PROBLEM

Multidrug-resistant organisms (MDRO) are not a future or theoretical threat, but in fact, a clear and present danger. The World Health Organization (WHO) deems AR as one of the three most significant threats to human health in the coming decade (7). Over 700,000 people die worldwide every year from MDROs. By 2050 AR is projected to contribute to 10 million deaths annually – surpassing diabetes, heart disease and cancer as the leading cause of death. These resistant infections come at a projected cumulative global cost of $100 trillion, potentially amounting to a 2008 global financial crisis *every year* (7,10).

CDC's *Antibiotic Resistance Threats in the United States 2019* reports 2.8 million people in the U.S. acquire infections from resistant bacteria and fungi, contributing to 35,900 deaths annually –nearly a third of these deaths from *Clostridioides difficile* (*C.diff*) alone (21).

C.diff is the most common healthcare-associated infection (HAI) in the U.S., surpassing methicillin-resistant *S. aureus* (MRSA) over the past decade (21,21). From 2000 to 2010, *C.diff* rates doubled (perhaps stabilizing in recent years) (21,23). *C.diff* places a significant burden on our healthcare system, with each inpatient *C diff* infection (CDI) case-attributable cost upwards of $42,000, resulting in $6.3 billion added costs to the U.S. healthcare system (2015 U.S. dollars) (11).

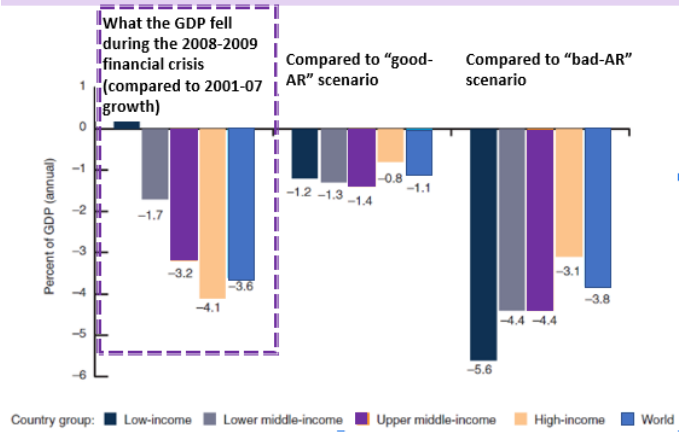
Deaths from Drug-Resistant Infections Worldwide, 2050



Source: Review on Antimicrobial Resistance, 2014

Acute care settings are critical to this problem, but also to solving it. Over half of the individuals developing CDI were preceded by hospitalization and unnecessary antibiotics administered during their hospitalization (21). CDI is not just a problem of the large health systems, but also the rural and community hospitals. Of the 48 critical access hospitals reporting to NHSN, Kansas was in the top quartile for highest inpatient onset CDIs (KS CAH SIR 0.965 vs. national CAH 0.790) (12).

Economic Costs of Antibiotic Resistance by 2050 could be as Severe as the Financial Crisis of 2008

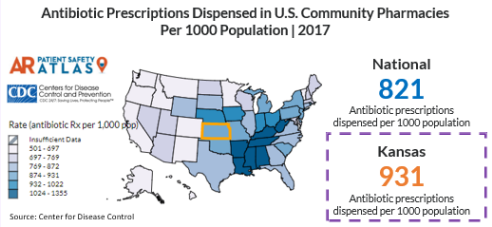


Source: World Bank, 2017

Unnecessary Antimicrobial Use

Overprescribing is an issue globally, nationally, and **locally**. Kansas is consistently ranked as one of the highest antibiotic prescribing states (40th in 2017), meaning Kansas clinicians are prescribing at some of the worst rates nationally (25). Kansas has improved inappropriate prescribing utilization in recent years, yet there is much work to be done.

By reducing inappropriate antibiotics, we improve the health of our patients, citizens, and state in general.



DRIVERS OF ANTIMICROBIAL RESISTANCE

Bacteria harboring AR genes predates antibiotics. Thirty-thousand-year-old permafrost sediment in a cave previously inhabited by humans was discovered to have a variety of bacteria resistant to 14 different commercially available antibiotics (undoubtedly not available 30,000 years ago) (14). In the current era, AR occurs following antibiotic exposure. Innumerable experimental and observational studies demonstrate that simply by exposing people to antibiotics, resistance occurs. Cephalosporins and quinolones are implicated in increases in the risk of extended-spectrum beta-lactamase (ESBL) producing Enterobacteriaceae infections, with carbapenems and quinolones increasing the risk of carbapenem-resistant Enterobacteriaceae (CRE) infections four-fold (15-17). Antimicrobial use, both appropriate and inappropriate, contribute to a host of problems beyond just AR. Over 200,000 emergency department visits occur annually in the US as a result of antibiotic side effects, with over half of those visits resulting in hospitalizations (18). Antibiotics are among the most frequently prescribed agents contributing to adverse events among the elderly and the young, as well as the most significant factor in *C. diff* (18,21).

Core Elements of an Antimicrobial Stewardship Program

SHEA and IDSA define AS as the "set of coordinated strategies to improve the use of antimicrobial medications with the goal of enhancing patient health outcomes, reducing antibiotic resistance, and decreasing unnecessary costs" (3). In 2014, CDC recommended that all acute care hospitals implement antibiotic stewardship programs in order to meet the urgent need to improve AU in hospitals (2). A set of seven core elements is recommended by CDC when developing and implementing effective antimicrobial stewardship programs (ASP) for hospitals: **commitment, accountability, expertise, actions to improve AU, tracking, reporting, and education**.

Effective ASPs generally include four main drivers of change (29)

1. Leadership & culture change
2. Timely & appropriate antibiotic initiation
3. Appropriate administration & de-escalation
4. Data monitoring and reporting

In 2019 CDC's Core Element recommendations were updated, with greater emphasis on commitment by hospital leadership, formal ASP leadership appointments, expanded pharmacist involvement including pharmacists as co-leaders or leaders, commitments to auditing and reporting, implementation of evidence-based interventions (e.g., audit-feedback, preauthorization, facility guidelines), and expanding education to nurses and patients (2)

This toolkit follows CDC's *The Core Elements of Hospital Antibiotic Stewardship Programs: 2019*, adapting the core elements to Kansas CAH specific needs, as well as providing helpful links and tools to better aid hospitals in the development, implementation and expansion of effective ASPs.

1: Hospital Leadership Commitment

For an ASP to become established, the institution must recognize the value of stewardship. Successful ASPs *must* be supported and endorsed by facility leadership including owners, governing boards, administrators, medical, pharmaceutical and nursing directors, as well as clinicians. Studies by the CDC, using National Healthcare Safety Network (NHSN) data, show that **support from leadership is the single greatest predictor of whether a facility has an ASP** (1). Local surveys of ASPs confirm this finding in KS (26).

A lack of necessary resources is one of the most commonly cited barriers to success (2). Kansas surveys

indicate that despite AS initiatives positively impacting prescribing behaviors and practices across 42 reporting CAHs (from 37% to 70%), the one core element which remained unchanged was leadership commitment (26). Failure to provide salary support was the sole element universally unchanged over the years.

Investing in Antibiotic Stewardship

Healthcare is measured by outcomes achieved, not just the volume of services provided. While ASPs often focus on AU, downstream effects result in improved patient outcomes, ultimately driving down resource utilization and associated costs (24). Although stewardship aims to improve clinical outcomes, program activities are frequently invisible to the public and health system unless the ASP shares results and feedback with those outside of the ASP team. Keep your stakeholders engaged by ensuring continued communication and demonstration of AS values, progress, and successes.

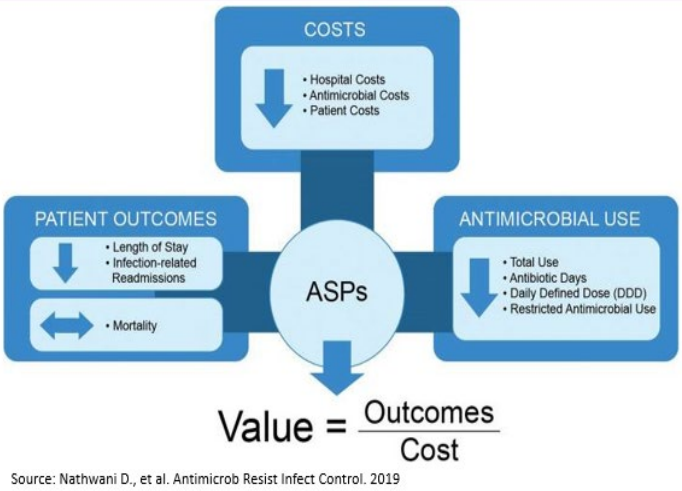
ASP directors can leverage the anticipated outcomes and cost savings of ASPs with leadership in order to gain stewardship commitment. Commitment should always be exhibited by resource allocation to the program (financial support, personnel, time), and may also be demonstrated by means of written statements of support, allocation of dedicated time, appointing a senior executive leader to serve as the hospital leadership "champion".

The (Financial) Value of Stewardship

Ensure leadership are aware of the value AS provides, not just at reducing AR and AU – but in improving patient outcomes by reducing morbidity, mortality, readmissions, length of stay (LOS). A meta-analysis of 79 large and small hospital stewardship's effects found significant financial benefits (24).

- 85% ASPs were associated with reduced LOS
- Average LOS reduction =3.24 days, 20.6% per stay
- Three-quarters of hospitals reported reductions in annual operational costs (e.g., treatment costs, diagnostics, human resources)
- Average annual operation cost savings = $18,305 to 2.5 million
- Average savings per patient =$732 (range $2.50-$2,640)

Framework of Antibiotic Stewardship Program Cost Savings

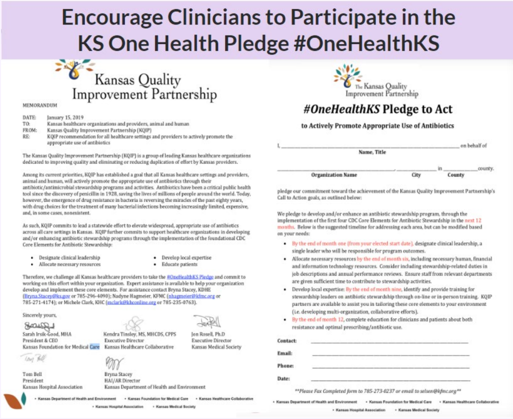


Source: Nathwani D., et al. Antimicrob Resist Infect Control. 2019

Examples of Commitment

- **Priority examples of leadership commitment:**
    - Provide stewardship leaders time to manage the ASP and conduct daily AS interventions
    - Resource allocation (staffing, information technology [IT] expertise, marketing funds)
    - Develop and issue formal statements of commitment to stewardship
    - Include the statement of ASP commitment in annual reports
    - Appoint a hospital executive or administrator to serve as the ASP "champion"
    - Report AS activities and outcomes including success stories to senior leadership and hospital board on a regular basis (e.g., including AS measures in hospital quality dashboard reports)

- **Other examples of leadership commitment may include:**
    - Set clear ASP leadership and staffing expectations (e.g., include in contracts or job description at hire)
    - Set clear expectations for AS leaders regarding responsibilities, outcomes
    - Include performance evaluation in annual reviews for key support staff
    - Ensuring medical director participates in ASP practices and policies
    - Allocate stewardship educational time and resources to clinicians, staff, and patients
    - Include AS in provider education and annual competencies
    - Ensure ongoing communication of ASP targets and progress towards goals - meet quarterly with ASP director on updates
    - Support enrollment in and reporting to NHSN Antimicrobial Use and Resistance (AUR) Module, including IT support (for more information go to CDC, or KDHE)
    - Individual providers can take the #OneHealthKS Pledge through Kansas Quality Improvement Partnership's website
    - Dedicate areas of the patient portal and facility website to AS
    - Create a culture around appropriate antibiotic utilization by disseminating frequent messages, newsletters or e-mails highlighting initiatives and educational opportunities, and celebrating the achievements of ASP activities and goals


Encourage Clinicians to Participate in the KS One Health Pledge #OneHealthKS

Kansas Quality Improvement Partnership

#OneHealthKS Pledge to Act

to Actively Promote Appropriate Use of Antibiotics

Leadership

Facility administration and organizational support of ASP for resource allocation is largely dependent upon making a persuasive business case. Administrators want to see that ASP will improve value by cutting costs and improving quality and health outcomes. Download and edit a proposal template, editing to your facility needs and financials.

LEADERSHIP DOCUMENT TEMPLATES

Download and edit these policy statements, editing to your facility needs and resources.

Proposal for Stewardship Program

[Facility] Antibiotic Stewardship Program Proposal

[Facility Logo]

SUBJECT: Antimicrobial Stewardship Program Proposal

DATE: [effective date]

RELEVANT REGULATION: CFR § 482.42(b)(1-4), § 482.42(c)(1), and § 482.42(c)(3) [ACUTE CARE HOSPITALs] OR CFR § 485.640(b)(1-4), § 485.640(c)(1), and § 482.42(b)(c)(3) [CRITICAL ACCESS HOSPITALS]

APPROVED BY: [Approving individual or committee]

Background

Currently, the antimicrobial expenses at facility, is approximately $*** dollars per year, in the acute care setting. Another $*** is spent annually in the outpatient setting. However, there are significant costs associated with antibiotics that are not reflected in the purchasing expenses for antimicrobial use. Inappropriate selection leads to therapeutic failures which prolong length of stay, necessitate use of additional drugs, lab tests and other resources. Parenteral antimicrobial use of antibiotics contributes to IV related complications, impacting quality of care and increasing resources. Developing antibiotic resistance also reduces the effectiveness of current antibiotics. Programs which improve the use of antibiotics and subsequently reduce antibiotic resistance has the potential to make a large favorable impact on patient outcome at HOSPITAL.

The costs of antibiotic resistance may have the most significant impact on costs. Nationally and regionally, the use of antibiotics is the key driving force for the emergence of antimicrobial resistance. Antibiotic resistance is of increasing prevalence amongst gram-positive and gram-negative bacteria as well as fungal pathogens in local community and hospital settings. In recent years HOSPITAL has experienced a significant*** increase in the prevalence of antibiotic resistant pathogens.

Over just the past 10-15 years, infections with common bacteria (*pseudomones, acinetobacter spp.*) which were previously mostly susceptible to broad spectrum antibiotics such as carbapenems, are increasingly occurring not just more frequently, but also seem to be occurring in healthier patients compared to prior resistant infections which generally was limited to critically ill or immunocompromised (Lasho et al 2013, Kaye et al 2016; Jones 2015). Now these infections are occurring commonly in our community and our state. From 2018 to 2019 Kansas acute care hospitals and long-term care facilities have been experiencing increasing outbreaks of carbapenem-resistant Enterobacteriaceae (CRE), in 2019 alone 213 cases of CRE and over 40 cases of carbapenem-resistant *Acinetobacter* cases were investigated by the Kansas Department of Health and Environment division of Healthcare Associated

Kansas Healthcare-Associated Infections & Antimicrobial Resistance Program

[Facility] Antibiotic Stewardship Program Proposal

Infections and Antibiotic Resistance (KDHE HAI/AR). These infections are not limited to urban areas, and represent an urgent threat to our local community and citizens.

Antibiotic resistant infections place a significant economic burden on our healthcare system. Infections with extended spectrum beta-lactamase *Enterobacteriaceae* (ESBL) add an average of $16,500 and 9.7 days to each hospitalization (Smith et al 2013), multi-drug resistant *Acinetobacter* infection costs an estimated extra $129,000 per hospitalization (Nelson et al, 2016). These resistant infections also come at a high individual cost, with patients having CRE infections experiencing 3-4 fold higher mortality than had they been infected with a susceptible strain (Cassik et al 2009), and patients with methicillin-resistant staphylococcus aureus (MRSA) infections experiencing higher all-cause mortality as high as 3 fold in blood stream infections, as well as a 2 fold higher risk of discharge to skilled nursing facilities (Antonanzas 2015, Rubin et al). These trends are similar for a multitude of other resistant pathogens and we are seeing a significant increase in our community resistant rates over the past few years.***

Resistance emerges simply by being exposed to antibiotics. One study revealed that by day 4 of azithromycin, over half of *streptococcus* cultured in patient's throats had become resistant to that antibiotic (Nahvins-Kumar S. et al Lancet 2007). This process occurs because the initial bacteria which are susceptible to the antibiotic are killed, however the less frequent bacteria harboring resistance to the antibiotic are able to take over, spread their genetic makeup to other bacteria, reproduce, dominate and then potentially lead to infection and subsequent spread.

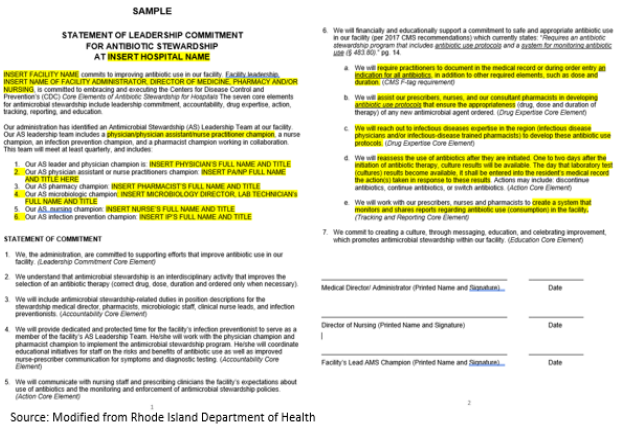
Antibiotic stewardship is defined as a coordinated program which promotes the appropriate use of antibiotics, improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multi-drug resistant organisms (Barlam et al 2016). Several decades worth of studies have shown antibiotic stewardship programs produce significant benefits in terms of both quality of care, and cost savings.

Often, cost savings occur in the first few years as a result of reductions in antibiotic utilization, especially as the broader spectrum costlier antibiotics are the initial targets. Small rural hospitals in Northwest Washington were able to reduce antibiotic purchasing costs over 50% in just the first 2 quarters, resulting in a reduction of *C.diff* from 5.5 to 1.6 (cases/10,000) the first year (Yam et al, Am J of Health-system pharm. 2012;69(142-8).

A program at the Departments of Infectious Diseases and Pharmacy at the Oklahoma City Veterans Administration Medical Center (VAMC) produced not only reduction in product costs, but also reductions in length of stay and mortality. Analysis of clinical outcomes and antimicrobial costs revealed a 2.4 reduction in length of stay and a reduction in infection related mortality from 8.28 percent to 6.61 percent. Additionally, the institution experienced an 11.8 percent reduction in antimicrobial acquisition costs, after adjustments for change in census. A similar program at Summa Health System in Akron, Ohio produced similar results. During an eight month period, the physician and pharmacist team intervened in 953 cases. The most common actions taken by the team included: 1. Changing the antibiotics for better

Kansas Healthcare-Associated Infections & Antimicrobial Resistance Program

Formal Statement of Commitment Example



SAMPLE

STATEMENT OF LEADERSHIP COMMITMENT FOR ANTIBIOTIC STEWARDSHIP AT INSERT HOSPITAL NAME

INSERT FACILITY NAME commits to improving antibiotic use in our facility. Facility leadership, INSERT NAME OF FACILITY ADMINISTRATOR, DIRECTOR OF MEDICINE, PHARMACY AND/OR NURSING, is committed to embracing and executing the Centers for Disease Control and Prevention's (CDC) *Core Elements of Antibiotic Stewardship for Hospitals* The seven core elements for antimicrobial stewardship include leadership commitment, accountability, drug expertise, action, tracking, reporting, and education.

Our administration has identified an Antimicrobial Stewardship (AS) Leadership Team at our facility. Our AS leadership team includes a physician/physician assistant/nurse practitioner champion, a nurse champion, an infection prevention champion, and a pharmacist champion working in collaboration. This team will meet at least quarterly, and includes:

1. Our AS leader and physician champion is: INSERT PHYSICIAN'S FULL NAME AND TITLE
2. Our AS physician assistant or nurse practitioners champion: INSERT PA/NP FULL NAME AND TITLE HERE
3. Our AS pharmacy champion: INSERT PHARMACIST'S FULL NAME AND TITLE
4. Our AS microbiologic champion: INSERT MICROBIOLOGY DIRECTOR, LAB TECHNICIAN'S FULL NAME AND TITLE
5. Our AS nursing champion: INSERT NURSE'S FULL NAME AND TITLE
6. Our AS infection prevention champion: INSERT IP'S FULL NAME AND TITLE

STATEMENT OF COMMITMENT

1. We, the administration, are committed to supporting efforts that improve antibiotic use in our facility. (*Leadership Commitment Core Element*)
2. We understand that antimicrobial stewardship is an interdisciplinary activity that improves the selection of an antibiotic therapy (correct drug, dose, duration and ordered only when necessary).
3. We will include antimicrobial stewardship-related duties in position descriptions for the stewardship medical director, pharmacists, microbiologic staff, clinical nurse leads, and infection preventionists. (*Accountability Core Element*)
4. We will provide dedicated and protected time for the facility's infection preventionist to serve as a member of the facility's AS Leadership Team. He/she will work with the physician champion and pharmacist champion to implement the antimicrobial stewardship program. He/she will coordinate educational initiatives for staff on the risks and benefits of antibiotic use as well as improved nurse-prescriber communication for symptoms and diagnostic testing. (*Accountability Core Element*)
5. We will communicate with nursing staff and prescribing clinicians the facility's expectations about use of antibiotics and the monitoring and enforcement of antimicrobial stewardship policies. (*Action Core Element*)
6. We will financially and educationally support a commitment to safe and appropriate antibiotic use in our facility (per 2017 CMS recommendations) which currently states: "Requires an *antibiotic stewardship program that includes antibiotic use protocols and a system for monitoring antibiotic use* (§ 483.80)." pg. 14.
   a. We will require practitioners to document in the medical record or during order entry an indication for all antibiotics, in addition to other required elements, such as dose and duration. (*CMS P-tag requirement*)
   b. We will assist our prescribers, nurses, and our consultant pharmacists in developing antibiotic use protocols that ensure the appropriateness (drug, dose and duration of therapy) of any new antimicrobial agent ordered. (*Drug Expertise Core Element*)
   c. We will reach out to infectious diseases expertise in the region (infectious disease physicians and/or infectious-disease trained pharmacists) to develop these antibiotic use protocols. (*Drug Expertise Core Element*)
   d. We will reassess the use of antibiotics after they are initiated. One to two days after the initiation of antibiotic therapy, culture results will be available. The day that laboratory test (cultures) results become available, it shall be entered into the resident's medical record the action(s) taken in response to these results. Actions may include discontinue antibiotics, continue antibiotics, or switch antibiotics. (*Action Core Element*)
   e. We will work with our prescribers, nurses and pharmacists to create a system that monitors and shares reports regarding antibiotic use (consumption) in the facility. (*Tracking and Reporting Core Element*)
7. We commit to creating a culture, through messaging, education, and celebrating improvement, which promotes antimicrobial stewardship within our facility. (*Education Core Element*)

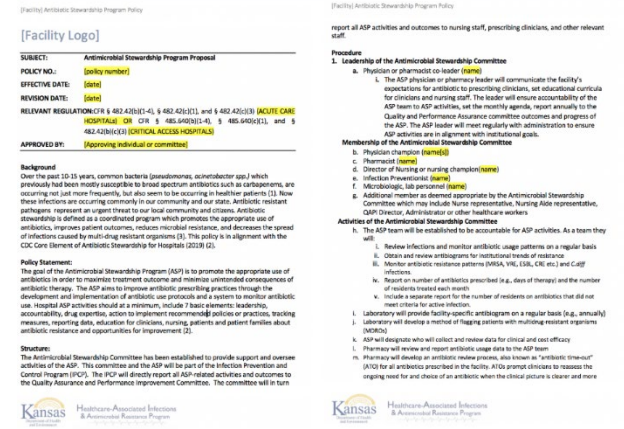
Medical Director/ Administrator (Printed Name and Signature) _____ Date _____

Director of Nursing (Printed Name and Signature) _____ Date _____

Facility's Lead AMS Champion (Printed Name and Signature) _____ Date _____

Source: Modified from Rhode Island Department of Health

Institutional Policy for Stewardship



[Facility] Antibiotic Stewardship Program Policy

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APPROVED BY: [Approving individual or committee]

Background

Over the past 10-15 years, common bacteria (*pseudomones, acinetobacter spp.*) which previously had been mostly susceptible to broad spectrum antibiotics such as carbapenems, are occurring not just more frequently, but also seem to be occurring in healthier patients (1). Now these infections are occurring commonly in our community and our state. Antibiotic resistant pathogens represent an urgent threat to our local community and citizens. Antibiotic stewardship is defined as a coordinated program which promotes the appropriate use of antibiotics, improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multi-drug resistant organisms (3). This policy is in alignment with the CDC Core Element of Antibiotic Stewardship for Hospitals (2019) (2).

Policy Statement:

The goal of the Antimicrobial Stewardship Program (ASP) is to promote the appropriate use of antibiotics in order to maximize treatment outcome and minimize unintended consequences of antibiotic therapy. The ASP aims to improve antibiotic prescribing practices through the development and implementation of antibiotic use protocols and a system to monitor antibiotic use. Hospital ASP activities should at a minimum, include 7 basic elements: leadership, accountability, drug expertise, action to implement recommended policies or practices, tracking measures, reporting data, education for clinicians, nursing, patients and patient families about antibiotic resistance and opportunities for improvement (2).

Structure:

The Antimicrobial Stewardship Committee has been established to provide support and oversee activities of the ASP. This committee and the ASP will be part of the Infection Prevention and Control Program (IPCP). The IPCP will directly report all ASP-related activities and outcomes to the Quality Assurance and Performance Improvement Committee. The committee will in turn

Kansas Healthcare-Associated Infections & Antimicrobial Resistance Program

[Facility] Antibiotic Stewardship Program Policy

report all ASP activities and outcomes to nursing staff, prescribing clinicians, and other relevant staff.

Procedure

1. Leadership of the Antimicrobial Stewardship Committee

a. Physician or pharmacist co-leader (name)
   i. The ASP physician or pharmacy leader will communicate the facility's expectations for antibiotic to prescribing clinicians, set educational curricula for clinicians and nursing staff. The leader will ensure accountability of the ASP team to ASP activities, set the monthly agenda, report annually to the Quality and Performance Assurance Committee outcomes and progress of the ASP. The ASP leader will meet regularly with administration to ensure ASP activities are in alignment with institutional goals.

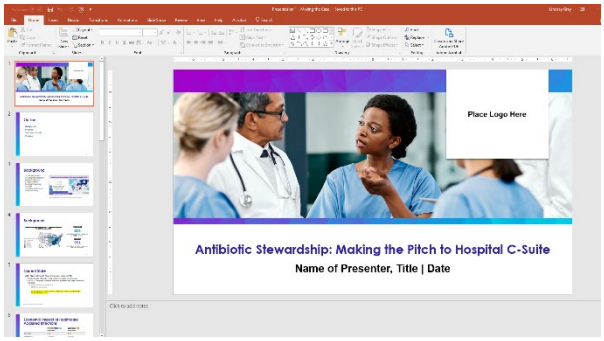
Membership of the Antimicrobial Stewardship Committee

b. Physician champion (name(s))
c. Pharmacist (name)
d. Director of Nursing or nursing champion(name)
e. Infection Preventionist (name)
f. Microbiologic, lab personnel (name)
g. Additional member as deemed appropriate by the Antimicrobial Stewardship Committee which may include Nurse representative, Nursing Aide representative, QAPI Director, Administrator or other healthcare workers

Activities of the Antimicrobial Stewardship Committee

h. The ASP team will be established to be accountable for ASP activities. As a team they will:
   i. Review infections and monitor antibiotic usage patterns on a regular basis
   ii. Obtain and review antibiograms for institutional trends of resistance
   iii. Monitor antibiotic resistance patterns (MRSA, VRE, ESBL, CRE etc.) and *C.diff* infections
   iv. Report on number of antibiotics prescribed (e.g., days of therapy) and the number of residents treated each month
   v. Include a separate report for the number of residents on antibiotics that did not meet criteria for active infection.
i. Laboratory will provide facility-specific antibiogram on a regular basis (e.g., annually)
j. Laboratory will develop a method of flagging patients with multidrug-resistant organisms (MDROs)
k. ASP will designate who will collect and review data for clinical and cost efficacy
l. Pharmacy will review and report antibiotic usage data to the ASP team
m. Pharmacy will develop an antibiotic review process, also known as "antibiotic time-out" (ATO) for all antibiotics prescribed in the facility. ATOs prompt clinicians to reassess the ongoing need for and choice of an antibiotic when the clinical picture is clearer and more

Making the Business Case for Stewardship Presentation



Download power point here.

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MAKING THE BUSINESS CASE

Facility administration and organizational support of ASP for resource allocation is largely dependent upon making a persuasive business case. Administrators want to see that ASP will improve value by cutting costs and improving quality and health outcomes. Download and edit this proposal template, editing to your facility needs and financials.

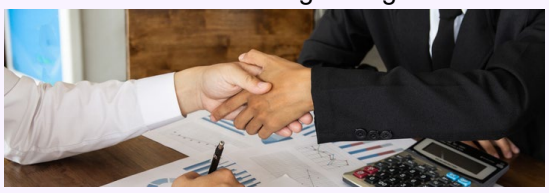
Once you have figured out who your primary administrator targets are, present a convincing case regarding AS and its value. To pitch the case to your C-suite, download this presentation, edit to your facility needs, financials and goals to make a succinct and persuasive case.

Engage Stakeholders

Stakeholders are individuals (or groups) affected by, or can affect, the ASP. Subsequently, they have the most to gain or lose, and should be commissioned when developing the program.

Potential stakeholders:

- Affected by ASP activities
- Involved in ASP operations
- Impact ASP success
- Critical to meeting ASP goals



STAKEHOLDER IDENTIFICATION

When considering ASP start-up strategies, start by considering which departments and disciplines are most affected by antibiotic overuse and resistance. Potential stakeholders include hospital CEO, COO, CMOs, board members, administrators, governing boards, medical pharmacy and nursing directors, financial and operating staff, as well as residents and their family members. A mix of roles, expertise, skills, and perspectives is important. Consider what role they may play in your ASP development or in which ways they may assist in AS activities, and at what stage (i.e., planning, implementation, scale-up or evaluation) stakeholders could contribute.

Fill out the following tables to identify stakeholders (table 1) and how to strategically engage those individuals or groups in the planning and implementation stages of the ASP (table 2).

Table 1

Stakeholder identification	Who? (name or role)	How? (which core element(s) or other means of assistance)	When? (planning, implementation, scale-up, evaluation stage)
ex) Director of nursing	**1.** *ex)* responsible for *nursing staff* **2.** **3.** **4.** **5.**	**1.** *ex) education (awareness of symptoms of infection vs. colonization, facility issues), engagement (ASP planning [i.e. what do staff perceive as significant drivers of misuse] barriers [i.e. provider prescribing norms, communication])* **2.** **3.** **4.** **5.**	**1.** *ex) all stages, especially development, implementation, evaluation* **2.** **3.** **4.** **5.**
Who is involved in the program's operations?	**1.** **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.** **5.**
Who will benefit from the program?	**1.** **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.** **5.**	**1.** **2.** **3.** **4.** **5.**

Adapted from ERASE Clostridium difficile project questionnaire (28) and *Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)*

Download complete tools here.

Table 2

Key Stakeholder engagement ("what's in it for them?")			
	List key stakeholders identified above	**Which activities or outcomes are most important to this stakeholder**	**How can the facility address this stakeholder's needs?**
1.	*ex) nursing staff*	*ex) implementation and leadership (i.e. administrative, medical and nursing roles clearly delineated) ASP direction & goals (i.e. provision of materials, meetings regarding ASP expectations, guidelines, education)*	*ex) allocated educational time, auditing and feedback*
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Adapted from ERASE Clostridium difficile project questionnaire (28) and *Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)*

Accountability

Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.

2. ASP Team Development

TIP: Make a point to bring the "loudest" staff members onboard. These individuals are usually very influential and can help bring about AS changes.

Following leadership commitment, next work on building the ASP team. Choosing team members is critical to any program's success, and members should be passionate about improving the quality of your facility and reducing AMR and antimicrobial misuse. Chosen members should be invested in program activities, have some degree of clinical, pharmaceutical, laboratory, technical or environmental services expertise (or interest). Generally, members should be trusted and known to the facility, and work well with others. Depending on the size and resources of the CAH and whether local skilled nursing facilities are involved, the team may be composed of two to three members, or up to six or more for larger facilities.

IDENTIFYING THE TEAM LEADER AND CORE MEMBERS

TEAMS ARE GENERALLY RECOMMENDED TO INCLUDE AT A MINIMUM:

- Medical Director
- Pharmacist
- Infection Preventionist

ASP leaders should be knowledgeable and respected among both the ASP team members and the facility at large. As stewardship is a quality improvement and care matter, the medical director may be a relevant member to set goals, monitor intervention effectiveness and serve as the liaison to facility clinicians and nursing staff (34). Empowering the medical director to set prescribing standards and the director of nursing (DON) to set practice standards can have a significant impact in both the effectiveness of the ASP, and also build confidence in the ASP and interventions. Selecting an esteemed and informed leader is key in developing an efficient and effective ASP team. IDSA and SHEA AS guidelines recommend infectious disease (ID) specialists as effective leaders when available, however this is infrequently the case for most Kansas CAHs (3). ID consultants or clinicians specializing in ASP are increasingly being contracted by way of telemedicine (resources below). However, if your facility's medical director or physician advocate has a passion for quality improvement, is knowledgeable of AR and antimicrobials, and has the will to learn about AS, they may be a more effective ASP leader than an outside consultant.

Many successful programs have employed pharmacists as co-leaders, and increasingly as leaders. A 2019 NHSN survey found that 59% hospital ASPs are co-led by physician and pharmacist (2,35). If you choose to have a co-led program, ensure roles are clearly delineated. If a non-physician is the leader, consider designating a physician who can serve as the point of contact and support for the non-physician leader (2).

Because an effective ASP involves improving AU through improving empiric treatment by understanding local resistance patterns as well as improving treatment once microbiological data is available, an

effective ASP team includes a multidisciplinary group with clinical, pharmaceutical, diagnostic, and technical expertise. Core members should include clinicians, DON, charge nurse or nursing staff, infection preventionists, pharmacists, microbiologists and/or lab personnel (2,3). The ASP team may also include supplemental members as resources and interest allows. Supplemental members beneficial to an ASP include administrator champions, IT specialists (for assistance with ASP interventions within the electronic health record [EHR] ASP), patients, and family representatives.

DELINEATING ROLES

After identifying team members, roles in the ASP should be assigned. The ASP leader should set practice standards and empower the DON or nursing staff to set nursing practice standards. Infection preventionists may perform the day to day data collection and review of infection data. Pharmacists may review antibiotic utilization, suggest alternatives, help develop facility treatment guidelines. Nursing leaders may be able to coordinate education for licensed and unlicensed nursing staff, set expectations for standards of practice and actions consistent with ASP's goals, and help patients and patient's families understand AR, AS, and the intended impact on patient's care and health outcomes. Microbiologists may provide surveillance data, resistance patterns and assist in creating a facility antibiogram (i.e., a cumulative resistance table).

Informal Leaders

Informal leaders are an effective tool for influencing workplace **attitudes and behaviors**. While these individuals may not be designated the formal leader, or even have a formal leadership role in the institution, they may have more clout and influence on the program than that of a formal leader (31).

Identify informal leaders:

- Opinion leaders
- Respected by peers
- Social status in workplace
- Accessible
- Innovative and influential
- Strong interpersonal and communication skills
- Informally influence peers' attitudes or behaviors

It is a good strategy to investigate who the informal leaders are in the hospital, and ensure they are in alignment with activities before implementing changes. Evidence suggests when informal leaders are *not* on board with changes and exhibit skepticism there is poor acceptance among other staff (32).

Team Identification Worksheet

After identifying which members will make up the ASP team, fill out table 3 and 4 to delineate roles and responsibilities, including identification of anticipated barriers members may have in completing AS activities, possible solutions to those barriers, weekly hours dedicated to AS activities, and what needs are to be met for those members to serve (i.e. compensation, time).

Table 3

Team member	Activities this member is accountable for	Estimation of weekly hours	What needs are to be met for this person to serve as an ASP team member?
Medical Director			
Pharmacist			
Nurse leader			
Infection preventionist			
Microbiologist			
Physician / Clinician			
Nurse			
Nurse aids			
Patient or family advocates			
Environmental service staff			
Other			
Other			

Adapted from ERASE Clostridium difficile project questionnaire (28) and *Jump Start Stewardship in Nursing Homes, Washington Department of Health* (29)

Download complete tools here.

Small rural acute care and critical access hospitals may not employ individuals matching all the roles described above. Partnership with local nursing facilities, pharmacies, or labs may allow for individuals with those skill sets or expertise to be contracted or compensated upon ASP membership, serving to diversify and strengthen your program. ID physicians or ID-trained pharmacists provide expertise however are not always accessible locally. Increasingly, ID or stewardship-experienced physicians are available by way of telehealth services. Local pharmacists interested in serving on the ASP team can be provided with ID continuing education (see page 16 under pharmacy expertise call-out).

RESOURCE PLANNING

Resources, both operational and functional, will be needed over the course of the first year to assist in ASP activities. In thinking about the logistics of developing a program, consider the following functions and add others which are anticipated during the first year of the ASP.

Download complete tools here.

Table 4

Resource	Needed	Frequency of need	Description of need	Actions	Cost estimates
Education (for ASP team members)	☐ Yes ☐ No	☐ Once ☐ Ongoing: _____ (monthly, annually, other)	*Ex) 1) courses on prescribing practices (i.e. antibiotic indications, duration, institutional misuse), 2) ASP processes (i.e. approaches to technology uses, stop orders, development guidelines and algorithms)*	*Ex) 1) surveys / assessments ASP members (for deficiencies), 2) survey attitudes (for needs), 3) determine number of educational programs, 4) determine number attendees for each (and when)*	*Ex) antibiotic or process course = [assemble materials (5h x $/hr)] + [create power point & materials (7h x $/h)] + [print materials x $/attendee] + [attendees (# attendees x $/hr salary compensated)] = $950 per event for est. 15 attendees*
Education (for ASP members)	☐ Yes No	☐ Once ☐ Ongoing: _____ (monthly, annually, other)			
Education (for staff)	☐ Yes No	☐ Once ☐ Ongoing: _____ (monthly, annually, other)			

Adapted from ERASE Clostridium difficile project questionnaire (28) and Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

COMMITTEE OVERSIGHT

Regular and timely meetings with discussion of progress are critical in achieving goals. By outlining the ASP hierarchy roles and activities, your program and program members are more likely to be held accountable for their designated activities. Oversight committees (e.g., Quality Improvement, Pharmacy and Therapeutics) may provide even greater accountability. If there is no committee available for oversight, a new committee could also be developed to oversee both antimicrobial stewardship and infection control programs. An organizational chart provides an operational structure so that the roles within the ASP are made explicit. It should be noted that although it is helpful to outline an organizational structure, reviews of successful ASP programs nationally have revealed that a multidisciplinary program with shared responsibility is more effective than a top-down approach (38).

Examples of Actions of Accountability

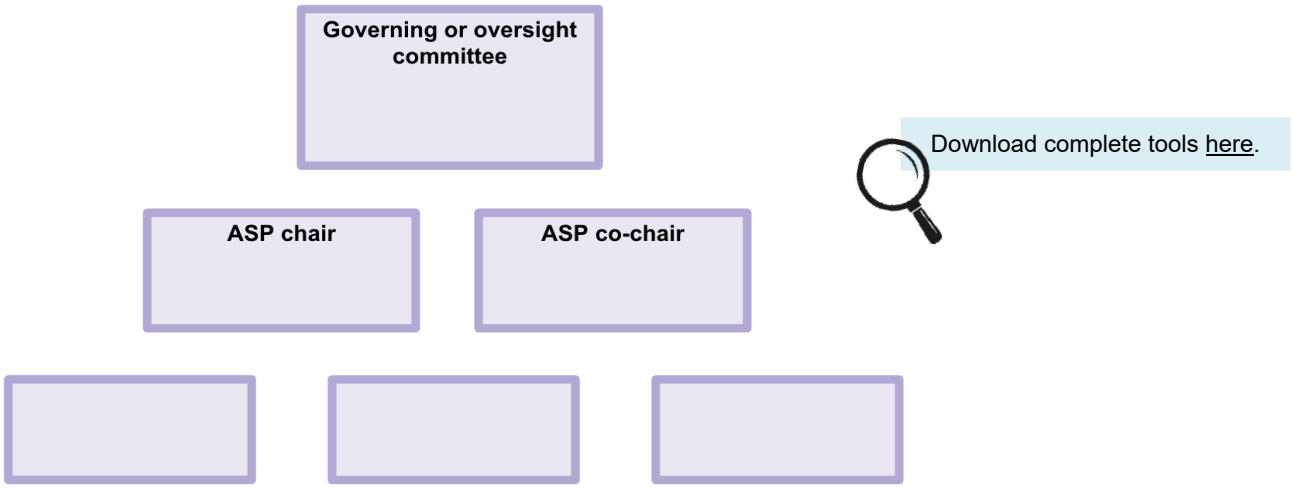
Faciltiy leadership and ASP together are responsible for ensuring AS implementation. The first step in creating accountability is developing the stewardship team.

Facility leadership should empower the program by offering support and resources:

- Oversight by governing body
- Post statement of support for AS - in public view for staff, patients and families
- Designate a leader or co-leaders
- Ensure leadership of the ASP has received training in AS
- Hospital quality measures as performance measures for the ASP

Clinical leadership should support the program:

- Standards for antibiotic prescribing – set by the medical director
- Nursing engagement and awareness of ASP activities – set by the nursing director
- Standards for assessing, monitoring, and communicating changes in patient conditions by front-line nursing staff – set by nursing director
- Review, audit antibiotic utilization - set by the pharmacy director
- Review and provide surveillance data, facility antibiotic susceptibility profiles (e.g. antibiograms) - microbiology director
- Guidance on use of testing and flow of results, rapid diagnostic tests (i.e., diagnostic stewardship) – microbiology director assistance
- Integrate AS protocols into existing workflow – IT staff
- IT can assist in implementing and maintaining NHSN AUR reporting



Download complete tools here.

Pharmacy Expertise (previously "Drug Expertise"):
Appoint a pharmacist, ideally as the co-leader of the stewardship program, to help lead implementation efforts to improve antibiotic use.

3. Pharmacy Expertise

Engaging staff with antibiotic expertise or establishing access to individuals with this expertise will be critical to the success of your ASP (2-3,40). Pharmacist and ID specialists can assist in ASP coordinators' policy and protocol development, educational efforts, prepare outbreak response plans, set the standards of prescribing, provide peer-to-peer education, and assist with difficult prescribers.

Pharmacists having received additional ID training may be available for partnership, and if not, ID pharmacy training should be offered. If no local ID specialists are available for partnership, ID specialists are available via telehealth. Another resource available to Kansas communities for AS education and networking is Project ECHO (Extension for Community Healthcare Outcomes). This platform utilizes free web-based video conferencing technology. Antibiotic stewardship ECHO for the state of Kansas started in 2019 with great success prompting plans of expanded sessions.

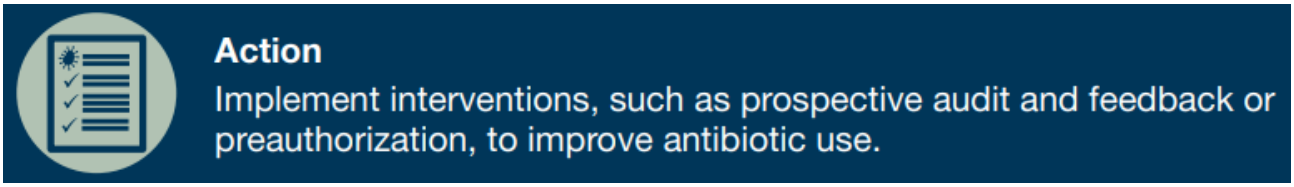
Continuing Pharmaceutical ID education:

- **Making a Difference in Infectious Disease (MAD-ID) stewardship**, *course cost of program is $500 per physician or pharmacist, $350 per trainee, with discounts available for larger groups; 19 ACPE accredited CE hours available, with online, teleconference and practical components included.*
- **Society for Infectious Disease Pharmacists (SIDP) antibiotic stewardship certificate for pharmacists** *is a more rigorous curriculum, costing $750 per pharmacist, $500 per trainee, with discounts for larger groups. Phase 1 is self-study, phase 2 is live webinar, and phase 3 includes a skills component at the practice site; 40-43 ACPE accredited CE hours are applicable.*

Stewardship and ID specialists may be utilized via telehealth services:

- **Project ECHO**, or contact projectecho@kumc.edu
- **IDSA antibiotic stewardship resource video**
- **University of Arizona telemedicine agency directory**

When Pharmacy and Therapeutics (P&T) committees are available, they should be vested in ASP, but should not make up the entire team unless their role has been greatly expanded to include duties listed as components of stewardship (36,39-40).



4: Action

Process for selecting antibiotic stewardship interventions

You may have an idea of your facility's AU issues or clinicians' primary prescribing problems, however, until examining infection rates, AU, needs, and resources these ideas may be wrong. By first examining your hospital's prescriber standards and practices, and collecting infection and outcome data, you will get a better view of what the problem(s) in your institution are so that you may determine appropriate interventions and AS targets. Ultimately, antibiotic overuse occurs as a result of policies, knowledge, awareness and the culture surrounding antibiotics and infectious disease. There is no "one size fits all" set of strategies or policies, and each facility should tailor interventions to what is deemed both a priority and feasible to their hospital.

STEPS TO DEVELOPING AN ASP INTERVENTION

Step 1: Perform a needs assessment

Every hospital is different, some hospitals may have high rates of unnecessary AU for conditions generally not needing antibiotics (e.g., colonized wounds, asymptomatic bacteriuria), while other hospitals notice clinicians seem to be reacting to unnecessary tests. The key to determining a facility's strengths and weaknesses is to conduct a needs assessment, examining the current state of AU, antibiotic-related adverse events, MDROs, and types of infections seen in your facility.

Identify the Most Common Infections & Antibiotics

By identifying the most common infections for which antibiotics are prescribed (and potentially misused), you can target guideline, policy, and educational efforts.

Split up tasks for collecting this data (e.g., the pharmacist collects AU data, nurse manager or nursing team member reviews physician-nursing calls for proportion of antibiotics resulting from calls, leader reviews guidelines).

- **Fill out the antibiotic utilization tables** (tables 6,7) to examine AU rates if no process already in place. Use this data to review the most commonly prescribed antibiotic regimens for the 3 or so most common infections within the past 12 months (alternatively, 1 month)
- To more fully examine antibiotic use, tally the 3 most common antibiotics use over the past 3 months (alternatively 1 month), and determine whether prescribed antibiotics are in alignment with policies or guidelines (tables 10 and 11).

Table 6

Hospital Antibiotic Use	
Last calendar year or last 12 months *(alternatively, start with one month)*	
What are the 3 most common infections, or conditions, (i.e., asymptomatic bacteriuria, acute COPD exacerbation) for which patients are treated with antibiotics	1. ___ 2. ___ 3. ___
What proportion of **asymptomatic bacteriuria** cases are treated with an antibiotic	___%
What are the 3 most common antibiotics prescribed for **UTIs** (including asymptomatic bacteriuria)	1. ___ 2. ___ 3. ___
What proportion of **acute bronchitis** (without COPD) are treated with an antibiotic	___%
What proportion of **acute bronchitis** cases (with COPD) are treated with an antibiotic	___%
What are the 3 most common antibiotics prescribed for **acute bronchitis** (regardless of whether the patient has COPD or not)	1. ___ 2. ___ 3. ___
What are the 3 most common antibiotics prescribed for **community acquired pneumonia**	1. ___ 2. ___ 3. ___
What are the 3 most common antibiotics prescribed for **hospital acquired pneumonia**	1. ___ 2. ___ 3. ___
What are the 3 most common antibiotics prescribed for **cellulitis or infected wounds** (and/or other skin and soft tissue infections [**SSTIs**])	1. ___ 2. ___ 3. ___
Other infections a concern in your facility: What are the 3 most common antibiotics prescribed for ___	1. ___ 2. ___ 3. ___

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Table 7

Infection	# cases	Antibiotic regimen most often prescribed		
		Antibiotic 1	Antibiotic 2	Antibiotic 3
Ex) UTI (catheter)	*Ex) 15/mo (avg)*	**Drug**: *ceftriaxone* **Dose**: *1 gram* **Route**: *IV* **Duration**: *4 days*	**Drug**: *piperacillin/tazobactam** **Dose**: *4.5 g (1/4 Rx were 3.375 g)* **Route**: *IV* **Duration**: *5 days (average))*	**Drug**: *levofloxacin* **Dose**: *500 mg (2/3 Rx were 750) ** **Route**: *IV (1/3 Rx PO)* **Duration**: *7 days (average, including IV to PO conversion)*
		Drug: **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**
		Drug: **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**
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		Drug: **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**	**Drug:** **Dose:** **Route:** **Frequency:** **Duration:**
**Dosage adjusted by renal function (e.g., if 3.375g piperacillin/tazobactam was dosed for a patient with a creatinine clearance of 35, ensure counted as the antipseudomonal dosing of 4.5g); pay attention to trends as reviewing data, and if consistent guideline-misaligned antibiotics, provider or structural recurring issues, make a note - you may identify an issue not previously recognized*				

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Table 8

IV Antibiotic	Utilization last calendar month (days of therapy)	Cost of utilization last calendar year	Notes

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Table 9

PO Antibiotic	Utilization last calendar year (days of therapy)	Cost of utilization last calendar year	Notes

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Download complete tools here.

Examples of Actions to Improve Drug Expertise

- Pharmacist and physician champion partner to develop and set standards of antibiotic prescribing practices
- Provide continuing medical and pharmacy education and training opportunities (examples above)
- Engage ID physicians or consider contracting expertise by way of telehealth services (potentially in conjunction with other local CAH or LTCF ASPs)

Table 10

Patient name/ date	Antibiotic (drug, dose, duration)	Indication for antibiotic	Clinical notes	Micro/ imaging results	Infection surveillance log	CDC Infection surveillance criteria met	Facility policy alignment (if there is a policy)
ex) A, 1/1/20	*ex) Cipro 250 mg p.o. BID x 14 days*	*ex) UTI*	*ex) Urine catheter in place, cloudy urine*	*ex) UA packed WBC, UC<10k contaminants*	*ex) UTI*	*ex) No*	*ex) No*
ex) B, 1/2/20	*ex) cefazolin*	*ex) cellulitis*	*ex) erythema, fevers*	*ex) n/a*	*ex) SSTI*	*ex) Yes*	*ex) Yes*

Adapted from Minnesota Department of Health Long-Term Care Facility Toolkit (30)

Common Infections & Antibiotic Appropriateness

3 types of infections account for the bulk of antibiotic usage in hospitals: CAP, UTIs, and SSTIs (19).

To determine appropriateness, compare the indication to CDC's surveillance definitions for common infections: UTI, skin and soft tissue infections, bacteremia, pneumonia, surgical site infections.

Table 11

Summary of facility antibiotics	Number	
Total number antibiotics reviewed		
Total number of data sources reviewed (in addition to antibiotic orders)		
Summary of facility antibiotic appropriateness	**Number**	**%**
Antibiotic appropriate based on clinical documentation		
Antibiotic appropriate for microbiologic data (and/or POC studies such as urinalysis, serologic, molecular studies, or other lab data)		
Antibiotic appropriate for imaging		
Antibiotic indication aligned with expectations outlined in facility policies/protocols (if applicable)		
Antibiotic indication aligned with CDC surveillance case definition		

Adapted from the Minnesota Department of Health Long-Term Care Facility Toolkit (30)

Download complete tools here.

- **Fill out the facility profile** (table 12) to examine organizational infrastructure, number of prescribers, drug experts, and barriers including the chronic conditions most frequently treated in the facility which may affect antimicrobial de-escalation attempts (e.g., indwelling urinary catheters, decubitus wounds, foot ulcers).

TIP: **Don't forget to examine the behavioral, environmental, and social factors contributing to antibiotic overprescribing.** Evaluate prescribers, pharmacists, and nursing staff's attitudes, awareness and beliefs regarding infections, antibiotics, and barriers to successful ASP implementation.

Minnesota Department of Health provides a downloadable survey. Distribute the survey prior to developing interventions to better understand your populations concerns and needs, and so that appropriate interventions can be tailored to identified behavioral risk factors.

Table 12

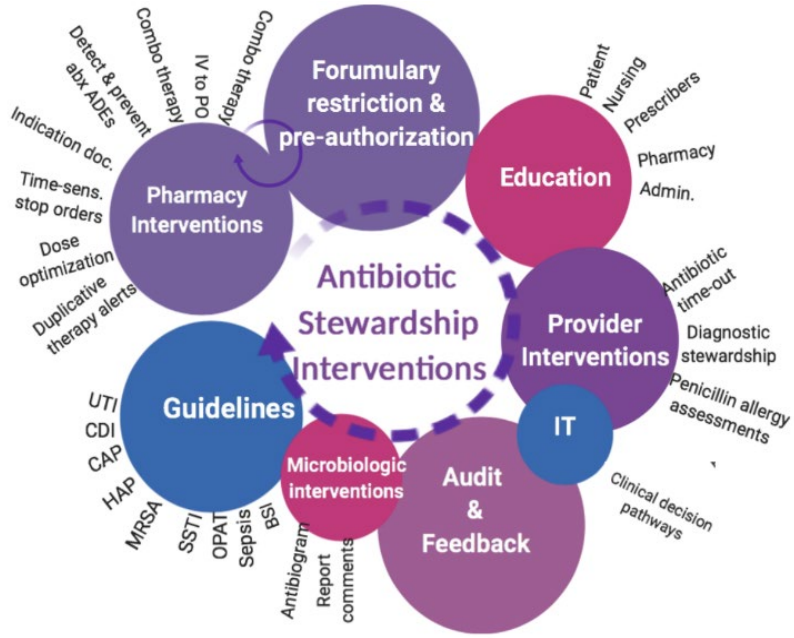
Last 12 months or last calendar year	Number
Licensed beds	
Admissions	
Patient days	
Average daily census	
Number of prescribers	
Clinical pharmacists (hours per month)	
Patient characteristics	**Average daily census**
Residents with indwelling urinary catheters	
Residents with pressure injury o Stage 1-2 o Stage 3-4 o Unstageable / unable to determine	
Patients admitted with acute on chronic foot or leg ulcers	

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Download complete tools here.

Step 2: Brainstorm the framework

Review data form A and B in the initial ASP planning meetings: Summarize the problems, examine solutions, and describe the organization's capacity and resources. While working through your facility data, you have probably already recognized many potential intervenable-problems. With this information, your team will be able to proceed with a more thoughtful and evidence-based plan of action.



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, medium, low (34). High yield strategies improve quality and safety while decreasing costs. Examples of high-yield interventions include formulary restrictions or audit and feedback. Medium yield strategies improve quality and safety but have no impact on costs. Such an example may include policy development for an intravenous (IV) to per oral (PO) antibiotic conversion, alternative dosing regimens or clinical decision support pathways, and order set development. Low yield strategies

decrease costs but do not change quality or safety. Development of an antibiogram, a tiered reporting susceptibility by microbiology are examples.

Interventions to Improve Antibiotic Use

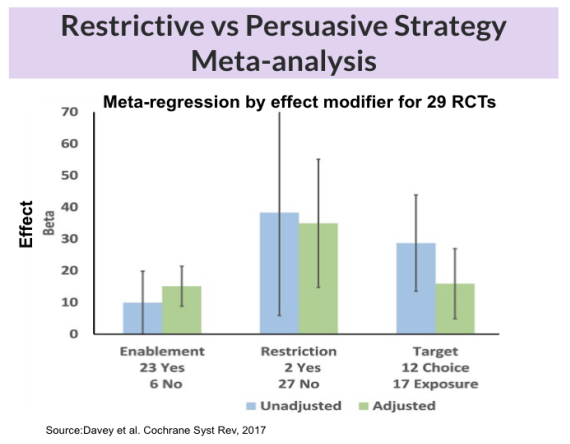
ASP teams may get overwhelmed with determining which interventions to choose. However, developing an ASP in this systematic and organized manner is more helpful, and efficient, in the long run.

If ***developing*** an ASP, it is best to focus on one or two high-yield strategies (the two top priority interventions are: 1. formulary restriction/prior-authorization 2. audit/feedback). If ***expanding*** your program, take what so far has been successful and build off those initiatives.

Types of Strategies

Restrictive vs. Persuasive Interventions

Reviews of the past 2 decades worth of AS interventions suggest restrictive strategies have a greater impact on prescribing behaviors than persuasive or structural strategies (although a combination is probably most influential) (33,46).



Antibiotic prescribing is a complex, multifactorial process between clinicians, nursing, and patients and is impacted greatly by environmental, social, and cultural factors (33). Broadly speaking, there are three general types of strategies which aim to change prescribing behaviors: persuasion, restriction, and structural (33).

- **Persuasive** approaches attempt to enable and empower providers to improve their prescribing practices by increasing knowledge, awareness, changing belief systems by **positive reinforcement.** Persuasive strategies include education, guidelines, audit and feedback, and written or verbal prompts (33).
- **Restrictive** methods **reduce the opportunity to engage** in poor prescribing behaviors (i.e., less opportunity to prescribe inappropriate antibiotics, reduce unnecessary lab testing). Prior-authorization, restrictive formularies, automatic stop orders, and selective microbiologic reporting are restrictive in nature.
- **Structural** strategies are built into the system, such as a clinical decision support system and point of care or rapid diagnostic testing.

Priority Interventions to Improve Antibiotic Use

Prior authorization is a restrictive strategy, requiring prescribers to go through an authorization process prior to antibiotic dispersal (2-3, 39). The prescriber must first seek out approval (usually from a pharmacist) prior to the antibiotic being dispensed, with the goal being to reduce the use of overly broad or toxic antibiotics. The additional step of placing a phone call or request of authorization is a significant deterrent for unnecessary antibiotics (39).

The pros of this method include significant up-front and continued cost savings from reduced AU, earlier pharmacist evaluation of cases and assessment of appropriateness of antimicrobial requested, and (at least) reduced broad spectrum usage.

Key Terms

- **Formulary:** a list of all approved medications. Pharmacists, physicians, and other healthcare workers establish policies, identifying medications which are most medically appropriate and cost-effective (52).
- **Closed formulary:** a list of medications which is limited in access to certain prescribers (e.g., daptomycin use by ID physicians), patient care areas, or disease states via formulary restrictions.
- **Open formulary:** a list of medications with unlimited access by prescribers.
- **Formulary restriction**: the act of limiting the use of specific formulary medications to specific physicians by expertise (e.g. AS pharmacist approval of daptomycin)
- **Non-formulary request:** non-formulary agents not on the formulary. Occasional unique patient needs may necessitate use request is reviewed, and upon approval, the drug will be procured from appropriate outlets for inpatient administration.
- **Prior authorization:** process requiring prescribers to go through an authorization process, review by pharmacy, prior to dispersal.

For more information, visit the American Society of Hospital Pharmacists chapter on Developing the Formulary.

Restrictive strategies such as prior authorizations and restricted formularies, in general, run the risk of creating a negative culture, with clinicians perceiving loss of autonomy, de-valuation of expertise and experience, and resulting breakdowns in trust and communication (33). Prescribers may quickly learn to circumvent the restriction by intentionally providing inaccurate information to "pass" the formulary algorithm (43). Additionally, CAHs are unlikely to provide 24-hour coverage by a pharmacist controlling a restricted formulary, which could potentially lead to delayed antibiotic initiation (33). Solutions for this problem include allowing release of a first dose but requiring pharmacist approval by the time of the next dose (43).

This strategy works best if there is communication between the P&T Committee and physicians on what is designated as restricted, that the institution has drug expertise (pharmacists) in control of the restricted formulary, and that prescribers have confidence in those who control the restricted formulary (2,43).

Prior authorization is deemed one of the most influential and frequently utilized ASP interventions (2,3,24,33,39). Reviews of prior authorizations for broad-spectrum antibiotics in community hospitals have resulted in as much as 32-51% reductions in antibiotic expenditures within six months of implementation, 28% over a year. In larger institutions, reductions in gram negative resistance were recognized within two years. These policies have also been associated with quicker receipt of *appropriate* antimicrobials, and no negative effects on in-hospital mortality or re-admission (33,36,37). Meta-analysis of 22 studies reviewing interventions involving prior authorizations found these strategies typically reduced annual operation costs an average of 17.5% (24).

Community hospitals have sought innovative ways of achieving the expertise to implement prior authorizations. One method, by employing an ID pharmacist or ID physician three days per week, resulted in 19% annual cost reductions and $177,00 savings (1999 USD) and was rated as very acceptable by prescribers (41). Another rural ACH utilized an ID specialist via a 30-minute once weekly telehealth case review. Reductions were seen in *C. diff* rates from 5.5 cases per 10,000 patient days to 1.6 per 10,000 (36). Additionally, it seems small hospitals are commonly performing formulary restriction. In 2017, the Office of Rural Health Policy conducted a survey of 1,139 CAHs participating in the Medicare Beneficiary Quality Improvement Project (MBQIP) through NHSN inquiring about their facility ASP (50). Results indicate 51% of CAHs report policies restricting antibiotics with pharmacy or physician approval prior to dispensing (caveat: 94% of the reporting hospitals had an ASP in place).

Separate meta-analyses have shown no negative impacts on mortality, re-admission, and other outcome measures (24,33). However, certainly the ASP should monitor for unintended effects, for

example as restriction policies may affect sepsis initiatives including in-hospital and 30-day mortality, re-admission rates, and time to first antibiotic. Programs should also monitor for unforeseen use of other antibiotics, for example, a cephalosporin restriction policy led to an increase in imipenem/cilastatin use with subsequent *Pseudomonas aeruginosa* imipenem resistance in one hospital (48).

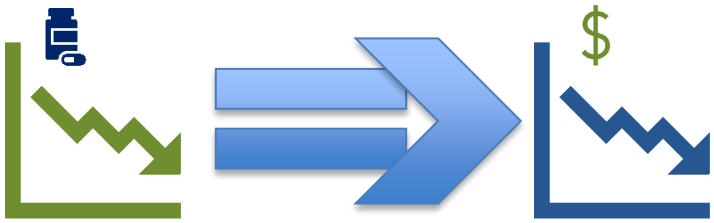
Prescription audit and feedback

Key Terms

Audit and feedback: also known as post-prescribing review or prospective auditing, is the process of externally reviewing AU, followed by suggestions (feedback) to the prescriber at some point *after* the antibiotic was prescribed (2)

Audit and feedback engages the prescriber *after* an antibiotic is prescribed, typically by external review for appropriateness by pharmacists, ID specialists, or ASP leaders (2,3,34). This type of intervention is a persuasive strategy and is deemed a "core component of any stewardship program" with evidence it is one of the most effective methods at improving antibiotic use (2,3). Prospective auditing is enhanced with clinical decision support software incorporating microbiologic or laboratory results with pharmaceutical orders (44). Software can also assist with bug-drug mismatches, and de-escalation or streamlining opportunities. When software was utilized targeting specific antibiotic combinations it decreased the number of patients requiring review by 84% (53).

Pros of audit and feedback (when effectively implemented) is that this method elicits long-term results by way of behavioral and cultural change among prescribers (33). A meta-analysis of 90 AS studies found that while audit-feedback increased operational costs an average of 27%, but when combined with other interventions 92% of those studies resulted in overall antibiotic cost reductions, 85% performance improvement (24).



Limitations with audit and feedback is a larger up-front investment (software, personnel to conduct audits), dependence on facility infrastructure and AS organization to conduct auditing and feedback, and the expertise available to convince providers to change prescribing behaviors. Feedback can however be accomplished via face-to-face meetings or rounding with providers – referred to as "handshake stewardship" (2,49). Many rural hospitals have gained ID physician expertise by way of telehealth (36,41). While more labor intense, this strategy is certainly achievable. The Office of Rural Policy's 2017 NHSN MBQIP survey of CAHs indicated 83% (of over 1000 CAHs) have a process in place whereby a physician or pharmacist reviews certain antibiotic courses and communicates results with prescribers (50).

Pharmacy-based Interventions

Documentation of antibiotic indication works effectively in conjunction with audit and feedback interventions. Antibiotic therapy should be adjusted in the case of underlying comorbidities or acute organ dysfunction (e.g., renal adjustment, morbid obesity). Forty-seven percent (506/1,306) of

reporting MBQIP CAHs reported implementing a policy requiring prescribers to document antibiotic indications during order entry (50).

Dose optimization to ensure the most appropriate antimicrobial dosing based on individual patient characteristics, causative organism, site of infection, pharmacokinetic and pharmacodynamics characteristics of the drug. Dose adjustments that are based on therapeutic drug monitoring optimize treatment of drug-resistant bacteria, improve adherence to dosing guidelines, reduce adverse effects, and may even decrease costs (3,54). Another way to potentially cut antibiotic costs is by implementing extended-infusion administration of beta-lactams, which has better efficacy for critically ill patients and/or those with MDROs because of time-dependent killing. For example, by increasing the time the antibiotic remains above the pathogens' MIC the maximal bactericidal effect can be as high as four-fold higher while cutting down the dosing interval as much as 40-60%, although this does require a continuous infusion generally over 2 to 4 hours as opposed to 30 to 60 minutes (57-59).

De-escalation/streamlining of empirical antibiotics, or the alteration of antibiotic therapy once culture results become available, is the elimination of redundant combo therapy (2). For more information, visit the American Society of Hospital Pharmacists chapter on Streamlining.

Promoting a "Culture" of De-escalation: Culture Review

1) **Does this patient have an infection that will respond to antibiotics?** Set a goal to review culture results and reassess treatment in 48-72 hours (electronic notification or lab can facilitate depending on staffing/resources). Of note: rapid diagnostics (e.g., PCR/NAAT, MALDI-TOF) can shorten this window to hours!

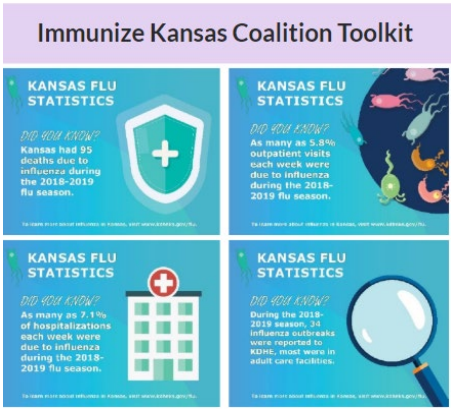
2) **Once culture resulted, review which (if any) organism present and which antibiotics are the infection susceptible to.** Antibiogram can help in cases of negative cultures. Appropriate and adequate empiric therapy is the goal. Is this patient on the right antibiotic(s), dose, route?

3) **Document decision**

Streamlining examples

Sample Intervention	Outcomes / Benefits
Discontinuation of metronidazole when the patient is receiving piperacillin/tazobactam for intra-abdominal infection	• Avoids duplicative therapy • Minimizes adverse drug reactions
Discontinuation of vancomycin in a nursing home patient who is colonized with MRSA but displays no sign of active infection	• Avoids unnecessary treatment of colonization in a patient without active signs of infection
Converting from ertapenem to cefazolin in a patient with a UTI caused by an *E. coli* that is susceptible to 1st generation cephalosporins	• Prevents the development of antimicrobial resistance • Reduces selective pressure on *E. coli* (and other Enterobacteriaceae) for carbapenem resistance

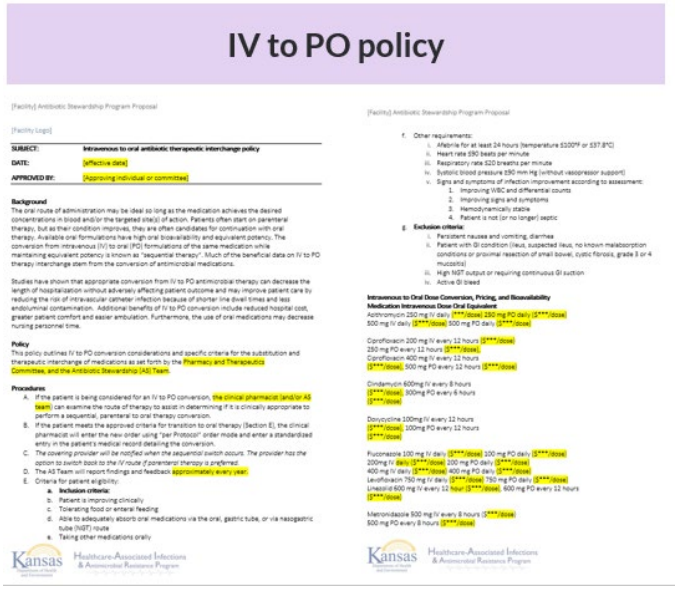
Adapted from Society of Hospital Pharmacists Ch. 32, Streamlining (56).



Antibiotic "timeouts" are a provider-led reassessment of reviewing need of antibiotics or choice of antibiotics. Timeouts are different than audit and feedback because the prescriber is the one doing the review, not the pharmacist or AS team (2). These persuasive strategies are advantageous in that they are less resource intense and can be addressed by prescribers and nursing staff which allows more teamwork (44). Disadvantages include: relying on culture results which take days and are often low-yield, clinicians may be hesitant to change treatment regimens once patients are improving, and there is relatively little data demonstrating effectiveness on AU or patient outcomes (61-63). However, a pilot study in a nursing home implementing timeout did show a 5% reduction in AU compared to a 5% increase in comparable nursing homes (64). The MBQIP 2017 NHSN survey indicated that 45% (490) reporting CAHs have a formal procedure for clinicians to review the appropriateness of all antibiotics at or after 48 hours from initial orders (50).

TIP: Automatic EHR alerts may be used to detect these pharmacy-based interventions and notify the providers, pharmacy, and AS team to a situation in which the antimicrobial therapy needs to be reassessed.

Automatic stop orders work by permitting antibiotics for a defined period (often 48-72 hours), after which time the provider is required to re-enter an order for the antibiotic if continuation is intended. This strategy is effective for surgical or procedural prophylaxis, as antibiotics are not intended to continue past a certain period. However, stop orders also may be a way to prompt evaluation of new culture, diagnostic data or clinical changes (44). If choosing this method as part of a treatment algorithm, longer stops could be implemented (e.g., order stop on day five which many infections would have received adequate coverage). Automatic stop orders are enforced either through computer provider order entry systems or manually by pharmacists (44). Before implementation of this type of strategy it is critical to ensure clinician and pharmaceutical buy-in, and that staffing can oversee the medication records to ensure needed antibiotics don't fall off.



Intravenous (IV) to oral (PO) conversion can decrease hospital length-of-stay as well as healthcare costs (2). Policy development for clinical criteria and guidelines for IV to PO conversion should keep in mind the pharmacokinetics and pharmacodynamics of an oral antibiotic switch (e.g., oral bioavailability of some agents).

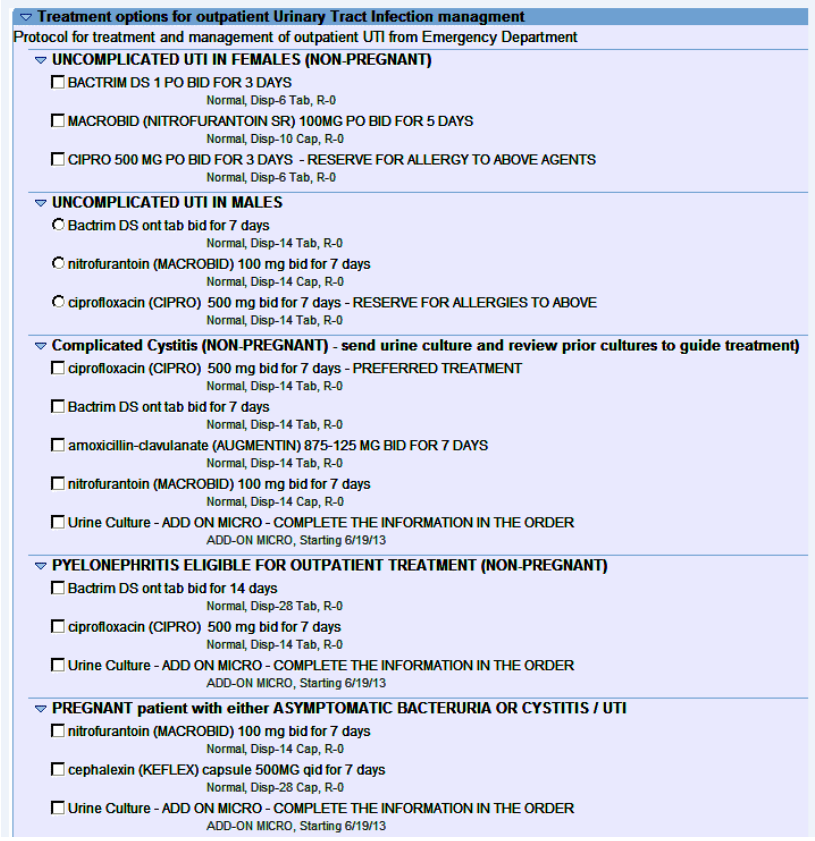
Download complete tools here.

Vaccination expansion is an excellent strategy to couple stewardship efforts with prevention. Not only does the Joint Commission and Centers for Medicare & Medicaid Services (CMS) have standards for CAP treatment, they also have a number of standards to prevent and reduce CAP by way of pneumococcal and influenza vaccination. As vaccinations prevent infections they contribute to the overarching goal of less antibiotics (44).

Pneumococcal vaccination is associated with reduced incidence of CAP, less severe complications, lower mortality and shorter lengths of hospital stays (4). Influenza season is a perfect opportunity to raise patient (and staff) awareness of vaccinations *and* antibiotic stewardship. The Immunize Kansas Coalition in conjunction with the Kansas Quality Improvement Partnership has developed an influenza immunization campaign. Sample social media graphics, Kansas facts can be found here. Vaccinations can be bundled with AS initiatives or infection-based initiatives such as sepsis, CAP and/or HAP.

Infection-specific Treatment Guidelines

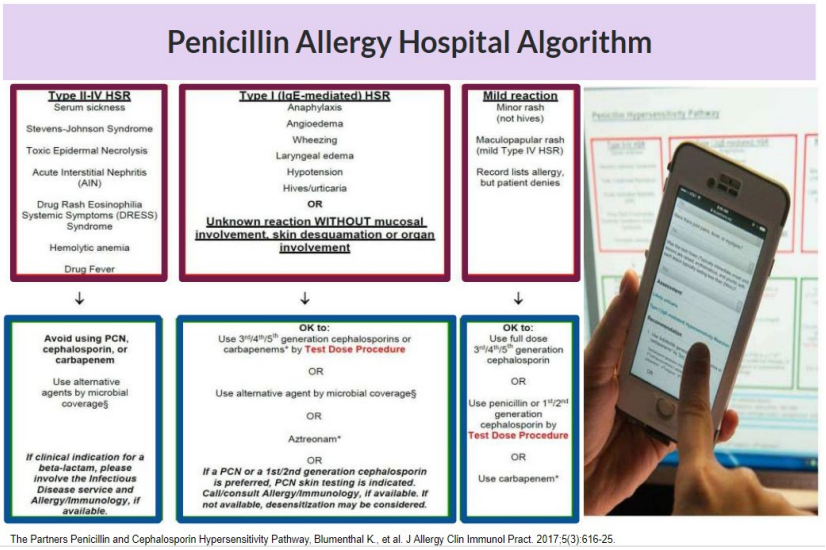
Guidelines are a common and relatively simple intervention to implement and should be a high priority for ASP development (2-3). They should always promote best practice and can incorporate educational initiatives. Institution-specific guidelines for commonly encountered diseases should be based on national guidelines then tailored to local resistance data, patient population characteristics, and keep in mind the local formulary (44). Examples of common guidelines include community acquired pneumonia (CAP), hospital-acquired pneumonia (HAP), UTI, surgical prophylaxis, SSTI, sepsis, empiric MRSA-coverage guidelines, and CDI. You can also incorporate these into electronic order sets or decision support pathways to improve uptake.



Source: Electronic order set for urinary tract infection management (60)

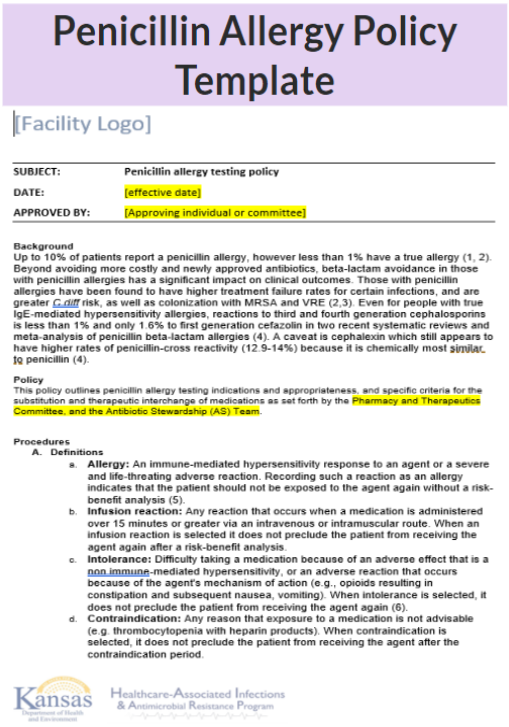
Provider-based interventions

Education is essential to AS and is itself one of the core elements of a stewardship program (2-3). Educational programs can provide a foundation of knowledge that will work to enhance and increase acceptance of AS strategies, however, education alone, is only marginally effective in changing prescribing practices and has not demonstrated sustained impacts (3).



The Partners Penicillin and Cephalosporin Hypersensitivity Pathway. Blumenthal K., et al. J Allergy Clin Immunol Pract. 2017;5(3):616-25.

Assessing for penicillin allergy can open up treatment options and allow for less toxic, less broad, and/or less expensive antibiotics. Up to 10% of patients report a penicillin allergy, however <1% have a true allergy (67-68). Beta-lactam avoidance can have a significant impact on clinical outcomes. Those with penicillin allergies have been found to have higher treatment failure rates for certain infections, are at greater risk for *C.diff* infections, and have higher rates of MRSA and VRE colonization (68-69). Even for people with true IgE-mediated hypersensitivity allergies, reactions to third and fourth generation cephalosporins is <1%, and only 1.6% to first generation cefazolin in two recent systematic reviews of penicillin allergies (71). A caveat is cephalexin which still appears to have higher rates of penicillin-cross reactivity (12.9-14%) because it is chemically most like penicillin.


Penicillin Allergy Policy Template

[Facility Logo]

SUBJECT: Penicillin allergy testing policy
DATE: [effective date]
APPROVED BY: [Approving individual or committee]

Background
Up to 10% of patients report a penicillin allergy, however less than 1% have a true allergy (1, 2). Beyond avoiding more costly and newly approved antibiotics, beta-lactam avoidance in those with penicillin allergies has a significant impact on clinical outcomes. Those with penicillin allergies have been found to have higher treatment failure rates for certain infections, and are greater C.diff risk, as well as colonization with MRSA and VRE (2,3). Even for people with true IgE-mediated hypersensitivity allergies, reactions to third and fourth generation cephalosporins is less than 1% and only 1.6% to first generation cefazolin in two recent systematic reviews and meta-analysis of penicillin beta-lactam allergies (4). A caveat is cephalexin which still appears to have higher rates of penicillin-cross reactivity (12.9-14%) because it is chemically most similar to penicillin (4).

Policy
This policy outlines penicillin allergy testing indications and appropriateness, and specific criteria for the substitution and therapeutic interchange of medications as set forth by the Pharmacy and Therapeutics Committee, and the Antibiotic Stewardship (AS) Team.

Procedures
A. Definitions
a. **Allergy:** An immune-mediated hypersensitivity response to an agent or a severe and life-threating adverse reaction. Recording such a reaction as an allergy indicates that the patient should not be exposed to the agent again without a risk-benefit analysis (5).
b. **Infusion reaction:** Any reaction that occurs when a medication is administered over 15 minutes or greater via an intravenous or intramuscular route. When an infusion reaction is selected it does not preclude the patient from receiving the agent again after a risk-benefit analysis.
c. **Intolerance:** Difficulty taking a medication because of an adverse effect that is a non immune-mediated hypersensitivity, or an adverse reaction that occurs because of the agent's mechanism of action (e.g., opioids resulting in constipation and subsequent nausea, vomiting). When intolerance is selected, it does not preclude the patient from receiving the agent again (6).
d. **Contraindication:** Any reason that exposure to a medication is not advisable (e.g. thrombocytopenia with heparin products). When contraindication is selected, it does not preclude the patient from receiving the agent after the contraindication period.

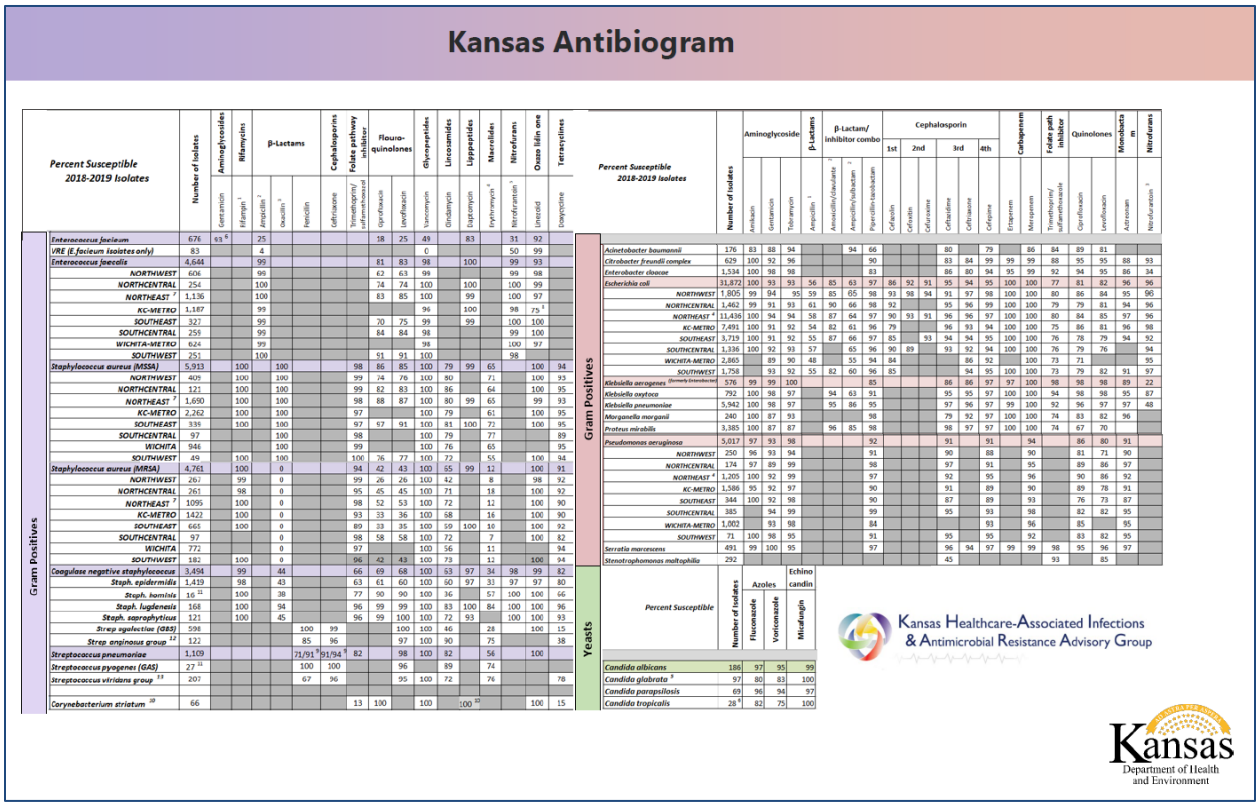
Kansas Healthcare-Associated Infections & Antimicrobial Resistance Program

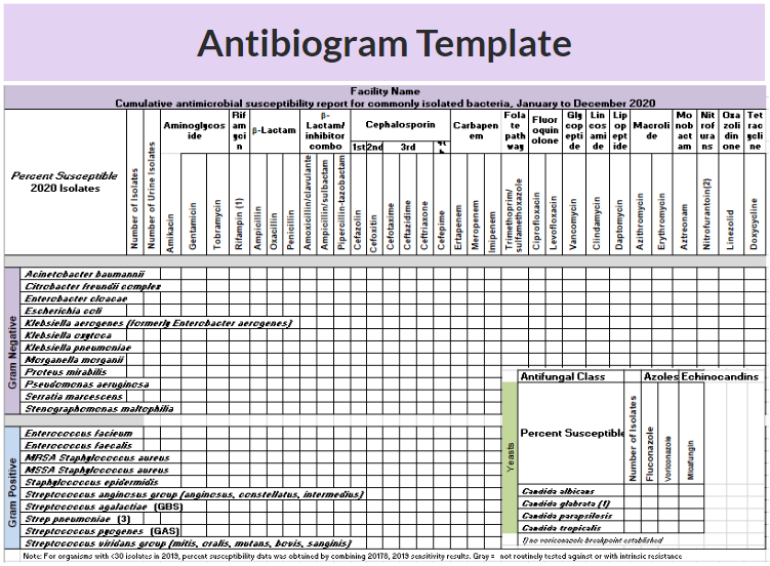
Blumenthal et al. provide an excellent review of hospital guidelines for non-allergists wanting to implement safe use of beta-lactams in patients with proven or suspected penicillin allergies (70). Cost savings from reducing non-beta-lactam agents (e.g., daptomycin, linezolid) in this population can be dramatic. A five-hospital system in Boston implementing an allergy testing algorithm into the EHR with a mobile app, projected a potential $8.9 to 13.7 million savings in the first year alone (70). Although the cost savings in smaller CAHs is unclear, by improving appropriate beta-lactam coverage, penicillin allergy testing does have the potential benefit of improving patient outcomes and should be considered as part of any ASP team's initiatives.

Download complete tools here.

Microbiology-based Interventions

Antibiograms show important differences in susceptibility patterns for microorganisms and can help the ASP optimize treatment and develop guidelines for empiric therapy (2). Many Kansas CAHs do not yet have antibiograms, and reliance on larger health systems in urban areas may be less representative of their population. KDHE HAI/AR provides a statewide antibiogram, including regional susceptibility patterns of many isolates.





Download complete tools here.

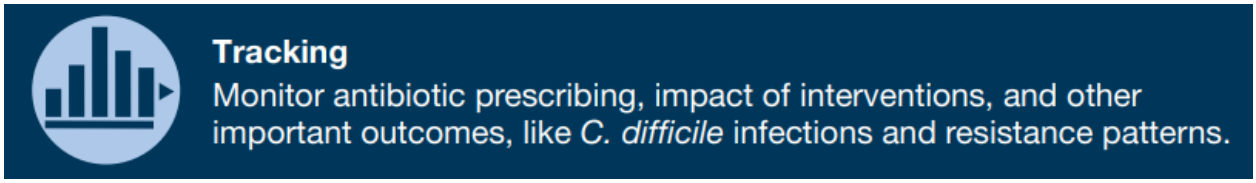
TIP: Once the program strategies are chosen, write a formal statement of support so leadership understands the strategy and the goals. Leadership can then post publicly the steps taken to improve the institutional and community antimicrobial resistance efforts.

Antibiotic cascading is a type of selective reporting in which susceptibility results for secondary antibiotics (less desirable for use; more costly or broad spectrum) are only reported if an organism is resistant to the primary antibiotic within the particular antibiotic class. This type of antibiotic reporting is highly recommended (3). The Clinical and Laboratory Standards Institute provides guidance for testing and reporting susceptibilities for certain organisms.

Rapid diagnostics 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 (3).

Step 3: Formalize the strategic plan

Choose interventions targeting priority facility problems. Consider choosing strategies that are achievable within the next year. Review proposed interventions at the third or fourth stewardship meeting, and re-review the second meeting's identified needs. Choosing the lowest hanging fruit often makes the most sense and helps to achieve program wins in the first year.



5: Tracking

Measurement is a key component of all ASPs. Many readers will be familiar with the phrase: **"what gets measured gets managed"** (42).

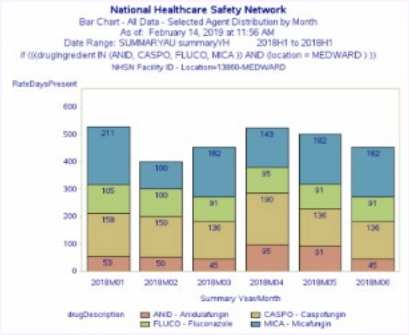
The importance of measurement cannot be stressed enough. Measurement is a key component to stewardship and should be undertaken as one of the first steps in every ASP. SHEA and IDSA guidelines recommend improvement in antibiotic prescribing conditions within the facility (e.g., identify conditions in which antibiotics are overprescribed *or* under-prescribed, establish standards for prescribing and auditing). Improving antibiotic prescribing standards cannot be effectively accomplished without data collection and auditing (3).

Prescription audit and feedback is one of the most effective AS interventions in hospitals yet is labor intensive (2). Use of the NHSN's AU option cuts auditing time dramatically, and programs can instead focus on providing this information to providers for feedback.

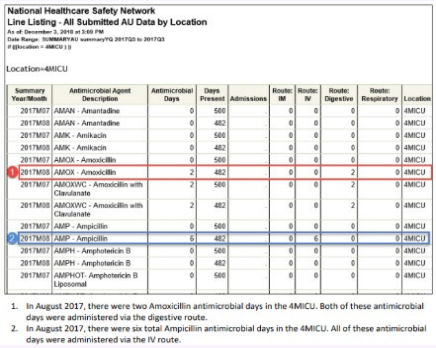
National Healthcare Safety Network Antibiotic Use and Antimicrobial Resistance Module

Hospitals reporting measures to CDC's NHSN should consider using the AUR module, which provides a mechanism for facilities to report and analyze use of multiple antimicrobials and resistance patterns within the facility. Software ties electronic medication administration records (eMAR) or bar-coding medication administration (BCMA) systems to AU data submission using an HL7 standardized clinical document architecture (2). Software to package the data into a standardized format of Clinical Data Architecture (CDA) for upload to NHSN is necessary. Facility IT with knowledge of HL7 and CDA will be able to facilitate this process, alternatively a vendor system can be contracted to link your system, SIDP has a list of AUR vendors.

- NHSN AU Option provides rates of use expressed as days of therapy (DOT). DOT is the sum of days for which any amount of a specific antibiotic is administered to a patient, and is considered the most useful measure of inpatient AU (2,19).
- The AU option also allows for evaluation of metrics such as tracking adherence to treatment guidelines, and performance of interventions such as antibiotic time-outs.



- Reports of DOTs per days present for nearly all antibiotics can be broken down into units (e.g., emergency department, observation), and the entire hospital in the AU module.
- NHSN also allows tracking of the Standardized Antimicrobial Administration Ratio (SAAR), a risk-adjusted benchmark of AU comparing the observed use to predicted use. Using the SAAR and AU options allows comparison of individual prescriber, unit, and facility data.


National Healthcare Safety Network
Line Listing - All Submitted AU Data by Location

Location=4MICU

Summary Year/Month	Antimicrobial Agent Description	Antimicrobial Days	Days Present	Admissions	Route: IM	Route: IV	Route: Digestive	Route: Respiratory	Location
2017M07	AMAN - Amantadine	0	500		0	0	0	0	4MICU
2017M08	AMAN - Amantadine	0	482		0	0	0	0	4MICU
2017M07	AMK - Amikacin	0	500		0	0	0	0	4MICU
2017M08	AMK - Amikacin	0	482		0	0	0	0	4MICU
2017M07	AMOX - Amoxicillin	0	500		0	0	0	0	4MICU
1 2017M08	AMOX - Amoxicillin	2	482		0	0	2	0	4MICU
2017M07	AMOXWC - Amoxicillin with Clavulanate	2	500		0	0	2	0	4MICU
2017M08	AMOXWC - Amoxicillin with Clavulanate	2	482		0	0	2	0	4MICU
2017M07	AMP - Ampicillin	0	500		0	0	0	0	4MICU
2 2017M08	AMP - Ampicillin	6	482		0	6	0	0	4MICU
2017M07	AMPH - Amphotericin B	0	500		0	0	0	0	4MICU
2017M08	AMPH - Amphotericin B	0	482		0	0	0	0	4MICU
2017M07	AMPHOT- Amphotericin B Liposomal	0	500		0	0	0	0	4MICU

1. In August 2017, there were two Amoxicillin antimicrobial days in the 4MICU. Both of these antimicrobial days were administered via the digestive route.
2. In August 2017, there were six total Ampicillin antimicrobial days in the 4MICU. All of these antimicrobial days were administered via the IV route.

Source: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-qrg-linelist.pdf

Interested facilities first should be enrolled in NHSN (go to the 5-Step Enrollment for Acute Care Hospitals/Facilities if not already enrolled). If already enrolled and want to pursue AU option, contact KDHE HAI/AR Program for more information on how to get the module going. Enrolling hospitals in the NHSN AU Option was set as a priority goal by the National Strategy for Combating Antibiotic-Resistant Bacteria and the President's Advisory Committee on Combating Antibiotic Resistant Bacteria.

Hospitals not yet reporting via NHSN can obtain AU data from their pharmaceutical record systems - either as DOT or defined daily dose (DDD). Other metrics to look at AU include financial metrics (e.g., antibiotic cost per patient day, cost per adjusted patient day, percent of antibiotic cost to total drug budget or total antibiotic spending). You can find more about the difference between DDD and DOT metrics from this video from Nebraska's 2018 Antibiotic Stewardship Summit.

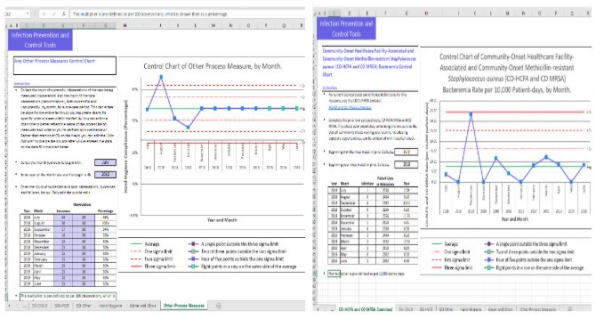
For CAHs without a current means of AU and AR surveillance we have created Excel spreadsheets for collecting facility level indicators including infection incidence, AU, and AR (spreadsheet 2). Data can be collected monthly, and rates calculated quarterly.

Another important metric which can be tracked and monitored are financial impacts. ASPs are anticipated to achieve cost savings – often the first year alone will result in significant antibiotic cost savings from restricted formulary changes, prior-authorizations, and IV to PO conversions alone (44). Tracking financial metrics ensures the value of your program is conveyed to administration. The most substantial savings often occur upfront, administration may expect to attain high cost savings year after year. One way to ensure continued value is to compare current AU and costs to pre-stewardship implementations. Variable financial metrics can be used to configure cost savings (e.g., cost per infectious-disease related groups, cost per length of stay, cost attributed to re-admissions, total antibiotic expenditures) (34). If configuring in costs averted from reduced adverse events, resultant infections (e.g. *C. diff)*, AR savings can reach into the millions (45).

Examples of Antibiotic Use and Prescribing Monitoring (2,19,34)

- Submit AU and AR data to CDC's NHSN AUR Module
- Track number of antibiotics administered to patients per day (i.e., DOT)
- Track grams of antibiotics administered to patients (i.e., DDD)
- Monitor adherence to facility-specific treatment policies and guidelines:
    - Adherence rates for documenting antibiotic indication of use
    - Time-out performance
    - Adherence to facility CAP, UTI, SSTI or other treatment guidelines
    - Monitor provider adherence to treatment guidelines
- Track diagnosis, drug, dose, duration, and de-escalation with antibiotic time-out
- Track direct antibiotic expenditures (i.e., purchasing costs)
- Record accurate antibiotic allergy and adverse reaction histories
- Perform medication use evaluation to assess antibiotic courses for selected antibiotics (e.g., piperacillin-tazobactam, meropenem, ertapenem, vancomycin, levofloxacin)
- Monitor frequency in which patients are converted from IV to PO antibiotics, assess for missed opportunities
- Assess how often patients are prescribed unnecessary duplicate therapy
- Monitor antibiotic outcome measures (e.g., *C. diff* rates, adverse drug events)

Infection, Process Control & Antibiotic Utilization Spreadsheets



Download complete tools here.

Outcome Measures

Monitoring outcomes from inappropriate AU is another metric to track in your stewardship program. Most CAHs are already monitoring and reporting information on *C. diff* infections as part of payment programs for CMS (2). The IP, microbiology director, or lab staff can help provide this data. Monitoring readmission rates for *C. diff* is another important AU to consider tracking.

Rates of resistance change with type and degree of antibiotics used (e.g., CRE increases with carbapenem use, ESBL with cephalosporins) (15-17). The long-term impact of AU on resistance is better reflected in the degree of AR after discharge (i.e., after selective pressure from antibiotic leads to emergence of resistance), and it is important to track how these rates are changing over time (3). Facilities can track AR through the NHSN AR Option.

Examples of Monitoring Outcome Measurements

- Sequential tracking of resistance patterns (e.g. gram negative resistance)
- Tracking infection rates (e.g., *C. diff,* ESBL, CRE, MRSA)
- 30-day readmission rates (e.g., related to *C. diff*, pneumonia)

Table 13

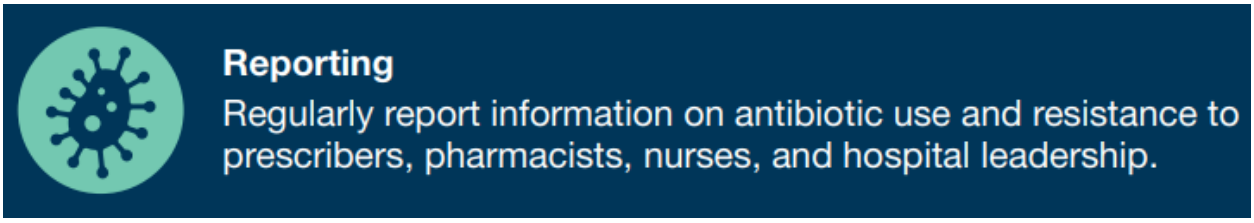
Last 12 months or last calendar year	Number
Clostridiodes difficile	
Facility onset infections	
Community onset infections	
Numbers of non-duplicate isolates of following isolates:	
MDR Gram-Negative Bacteria	
Carbapenem-resistant Enterobacteriaceae (*E. coli, Klebsiella spp., Morganella morganii., Proteus spp., Providencia spp.*)	
Carbapenem-resistant *Pseudomonas aeruginosa*	
Carbapenem-resistant *Acinetobacter baumannii*	
ESBL Enterobacteriaceae	
MDR Gram-Positive Bacteria	
Methicillin-Resistant *Staphylococcus aureus* (MRSA)	
MRSA	
Vancomycin-Resistant Enterococci (VRE)	
VRE	
Other drug-resistant gram-positives	
Penicillin-Resistant *Streptococcus pneumoniae* (non-meningeal MIC)	
Erythromycin-resistant group A *Streptococcus*	
Clindamycin-resistant group B *Streptococcus*	
Other MDROs of concern:	

Adapted from Jump Start Stewardship in Nursing Homes, Washington Department of Health (29)

Hospital Infection Profile

To investigate which infections are most critical to target your ASP's activities towards, determine which infections are the most common within the facility. Microbiology director or staff should be able to assist in obtaining this information over the past 12 months. If your lab is unable to provide this data, check with your IP for the HAI surveillance data. Consider listing how many isolates were identified among all patients (table 13). If infections are redundant (i.e. same pathogen for persistent UTI) include only initial isolate. If 12 months data unavailable, consider starting with 1 month.

Download complete tools here.



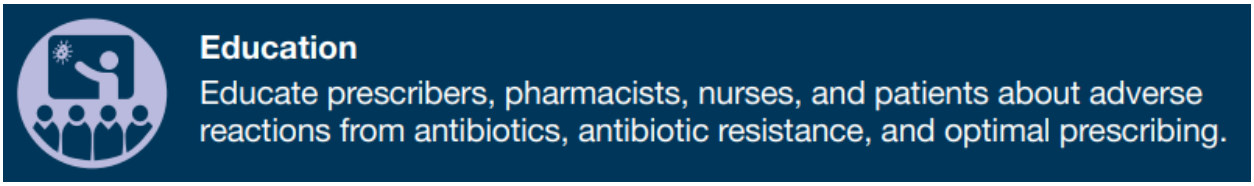
Core Element 6: Reporting

Based on the facility pathogen and infection profiles, discuss which issues are most critical within the facility, focusing initial AS efforts to identified problem areas.

Reporting information collected to staff on a regular basis serves as a reminder of why AS activities are important. Hospitals that participate in NHSN should consider using the AUR module. ASPs should provide regular updates on antibiotic prescribing, AR, and infectious disease management that address both national and local issues. Sharing facility-specific information on AU is a tool to motivate improved prescribing, particularly if wide variations in the patterns of use exist among similar patient care locations (65).

Examples of Reporting (34)

- 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 AU and provide suggestions for improvement when possible.
- Focus reports to providers with actionable information in a way that is non-threatening in order to prevent data overload as well as appearing punitive.



Core Element 7: Education

Antimicrobial prescribing practices are a multifactorial process driven by more than just the clinician's knowledge. Physician attitudes and beliefs greatly affect prescribing habits. Among physicians, advanced practitioners, and nurses - AR has been perceived to be a global and national problem rather than a local one (18). When considering whether to prescribe antimicrobials, AR was ranked last as a barrier to prescribing practices, while diagnostic tests were often viewed as too invasive, expensive or time consuming compared to simply prescribing the antibiotic (18). Clinicians also tend to overestimate a patient's expectations and underestimate the desire for reassurance (74-

TIP: Beyond setting standards and developing policies, ASP team members should be aware of the impact social norms and culture have on prescribing practices. Interventions targeting education alone to improve the spectrum or duration of antibiotics have been shown to have limited success without underlying culture change (76).

75).

At small community hospitals and CAHs, physicians may not be on-site, relying on nursing updates. Therefore, nursing education is a vital component of an ASP. Nursing communication strongly influences prescriber's practices. When nursing staff call an off-site prescriber informing them of positive cultures without context, providers often feel pressured to "do something". Targeting deficiencies in this complex interaction has been shown more dramatic and lasting AS improvements than that provided by education alone (74-75). A curriculum should be developed for both clinicians and nursing staff with dedicated in-service training. The nursing or medical director should be present for questions and to reinforce facility commitment.

Educational initiatives should focus on not just antibiotic prescribing and AR, but also infections which necessitate antibiotics versus those which do not (e.g., uninfected wounds, asymptomatic bacteriuria). Knowledge of the nursing staff can also affect attitudes and beliefs, not just among their peers but also among patients and families, so being aware of what constitutes a true infection over colonization is vital.

Examples of Educational Activities

- Data collected in AS activities used to educate clinicians on the facility's current state
- Educational curriculum provided on a regular basis to staff, patients, and families
- Allocate time and resources for clinician and nursing education
- Require stewardship and AR training to new hires
- Nursing director sets standards for assessment of resident clinical conditions (e.g., avoidance of checking urinalysis if asymptomatic or "test of cure" for *C.diff)*
- Nursing director sets standards for relaying resident assessment information to clinicians

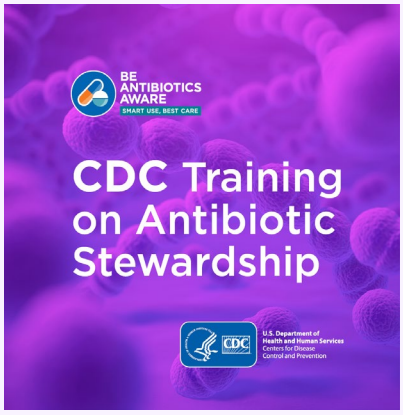
While education alone is insufficient, it is vital to any successful ASP. Continued antimicrobial stewardship education should be provided to physicians, pharmacists, and nurses. Increasingly patient and family education is incorporated into AS strategies and is an essential component of educational initiatives stressed in CDC's *2019 Core Elements for Hospitals* (2).

Continuing Education & Informational Resources

There are many options for providing education on AR/AU/AS: in person didactics can be done in formal or informal settings, messaging through posters, flyers and newsletters or electronic communication to staff groups, annual education as part of provider competency, and daily by feedback review.

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 (2-3).

The CDC's Be Antibiotics Aware Partner Toolkit includes key messages for clinicians, nursing working in hospitals, provides examples of successful ASPs, common illness treatment options, patient information including video, audio, graphics and press materials, as well as how AR affects food safety, The CDC also offers 10 hours of free continuing education for healthcare workers in the CDC Training on Antibiotic Stewardship module.



Current State Assessment

It is not feasible to implement all seven core elements upon start-up. It is critical to identify the current state of your facility's infrastructure, prescribing practices, resistance profile, and personnel to prioritize which element(s) should be focused upon initially. The following questionnaire will assist in delineating which areas need the most work.

7 Core Elements Worksheet

After reviewing the above seven core elements, examine the current state of your own facility's stewardship activities and readiness (table 14).

Download complete tools here.

Table 14

1. Leadership Support / Commitment		
Can your facility demonstrate leadership support for AS through one or more of the following ways?	☐ Yes ☐ No	If yes, indicate which actions (selecting all that apply) ☐ Written statement of leadership support to improve AU ☐ Written and displayed public commitment in support of antibiotic stewardship ☐ Antibiotic stewardship duties included in Medical Director position description ☐ Antibiotic stewardship duties included in DON position description ☐ Leadership monitors whether antibiotic stewardship policies are followed ☐ AU and AR data are reviewed in quality / performance improvement meetings ☐ Clinician(s) completed stewardship continuing education in the prior 12 months ☐ Other: _____
2. Accountability		
Has your facility identified 1+ leaders for antibiotic stewardship activities?	☐ Yes ☐ No	If yes, indicate who is accountable for stewardship activities (selecting all that apply) ☐ Medical Director ☐ Nursing Director ☐ Pharmacist ☐ Infection Prevention and Control Officer/ Infection Preventionist ☐ Quality Improvement Officer ☐ Staff Development Coordinator ☐ Other: _____
Has your facility demonstrated dedication to and accountability for optimizing prescribing and patient safety related to antibiotics?	☐ Yes ☐ No	If yes, indicate which are in place (select all that apply) ☐ Identified a leader to direct AS activities ☐ Included AS related duties in position descriptions or job evaluation criteria ☐ Communicate with all facility nursing staff members to assist in educating patients regarding antibiotics ☐ Other: _____
3. Drug Expertise		
Does your facility have access to individual(s) with antibiotic stewardship expertise?	☐ Yes ☐ No	If yes, indicate which individuals are providing expertise (select all that apply) ☐ Medical Director ☐ Pharmacist ☐ Stewardship team members ☐ ID / stewardship consultant ☐ Corporate support/nurse consultant ☐ Other: _____

Setting a Timeline

After building your ASP team, designating roles, examining current state assessment and resource needs you now have a better understanding where your facility is in terms of ASP infrastructure and readiness. Using data from the above worksheets, next work on the selecting (as a team) your long-term (2-3 year), intermediate (6 months to 1 year) and short term (next few months) goals.

Example of a Timeline

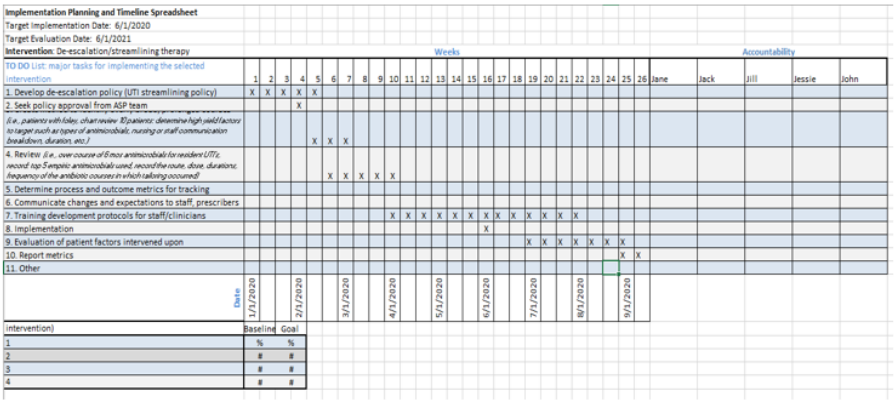
A potential schedule for the first year may resemble the following:

- **Month 1**: First meeting – review this toolkit and other designated materials, discuss areas of interest among team members, and create a plan for monthly data collection
- **Month 4**: Second meeting – review the 3-month data, set goals, plan education
- **Month 7:** Third meeting – review the 6-month data, re-visit goals, begin to discuss policy or practice standards (e.g., develop a delayed antibiotic prescribing policy for acute sinusitis or UTI, policy on review of residents returning from emergency department or clinic with diagnosis of "UTI", avoidance of C. *diff* testing in setting of laxative use or non-diagnostic diarrhea)
- **Month 10:** Fourth meeting – review 9-month data, plan additional education, review policy draft, and implement policy and practice standards
- **Month 13:** Fifth meeting – review 1-year data and progress towards goals, set new goals

Adapted from University of North Carolina, Cecil Sheps Center for Health Services Research. *Implementing an Antibiotic Stewardship Program in a Nursing home, 2016.*

Once the team has determined the goals make the goals and the timeline explicit. Download the timeline template spreadsheet to facilitate your planning initiatives. Included in this timeline are the activities to be completed, target dates of completion, tools needed to complete activities, how activities will be implemented, ASP members responsible for which activity, and some description of monitoring and oversight.

Timeline Spreadsheet



Implementation Planning and Timeline Spreadsheet
Target Implementation Date: 6/1/2020
Target Evaluation Date: 6/1/2021
Intervention: De-escalation/streamlining therapy

TO DO List: major tasks for implementing the selected intervention	Weeks 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Accountability Jane	Jack	Jill	Jessie	John
1. Develop de-escalation policy (UTI streamlining policy)	X	X	X	X	X																										
2. Seek policy approval from ASP team				X																											
(i.e., patients with foley, chart review- ID patients; determine high yield factors to target such as types of antimicrobials, nursing or staff communication breakdowns, duration, etc.)					X	X	X																								
4. Review (i.e., over course of 5 most antimicrobials for resident UTI's; record top 5 empiric antimicrobials used; record the route, dose, duration, frequency of the antibiotic courses in which tailoring occurred)						X	X	X	X	X																					
5. Determine process and outcome metrics for tracking																															
6. Communicate changes and expectations to staff, prescribers																															
7. Training development protocols for staff/clinicians										X	X	X	X	X	X	X	X	X	X	X	X										
8. Implementation																X															
9. Evaluation of patient factors intervened upon																		X	X	X	X	X	X	X							
10. Report metrics																									X	X					
11. Other																															
Date	1/1/2020			2/1/2020			3/1/2020			4/1/2020			5/1/2020			6/1/2020			7/1/2020			8/1/2020			9/1/2020						

(intervention)	Baseline	Goal
1	%	%
2	#	#
3	#	#
4	#	#

Download complete tools here.

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