Antimicrobial Stewardship

Syndromic and System-Level Interventions
Collaborators

INNOVATION HORIZONS
TRANSFORMING IDEAS INTO ACTION

GW
School of Medicine
& Health Sciences
More resources available at:
https://dchealth.dc.gov/dcrx
Course Overview

• Antibiotic Overuse
  – Defining antimicrobial stewardship
  – Misuse of antibiotics

• Syndromic Stewardship
  – Defining syndromic stewardship
  – Syndromic examples

• System-level Interventions
  – Challenges
  – Strategies

• Implementation Practices
Presenters

• Kerry L. LaPlante, Pharm.D., FCCP, FIDSA
  – Chairperson, Antimicrobial Stewardship and Environmental Cleaning Task Force, Rhode Island Department of Health
  – Chairperson and Professor of Pharmacy, University of Rhode Island, College of Pharmacy
  – Adjunct Professor of Medicine, The Warren Alpert Medical School of Brown University
  – Senior Director of the Rhode Island Infectious Diseases Research (RIID) Program Co-Director of Antimicrobial Stewardship Program, and Infectious Diseases Pharmacotherapy Specialist, Providence Veterans Medical Center
Presenters

• Clara Ni, PharmD, BCIDP
  – Clinical Pharmacist – Antimicrobial Stewardship, MedStar Georgetown University Hospital
Advisors

• **Barbara Bolstorff**, MPH, CIC, *Epidemiologist*, MA Dept. of Health

• **Melissa Cumming**, MS, *Epidemiologist* and *Statewide Antibiotic Resistance Coordinator*, MA Dept. of Health

• **Glenn Wortmann**, MD, FIDSA, FACP, *Section Director of Infectious Disease*, MedStar and *Professor of Clinical Medicine*, Georgetown University

• **Kimberly Sommers**, MD, *Team Lead for the Guidance and Policy Team*, DC Health
Conflicts of Interest

• None of the speakers or advisors have a conflict of interests to declare.
Important Information

The video will progress at its own pace.

Do not attempt to speed up the video.

The video can be paused and resumed later.
Antibiotic Overuse in Our Community;

A call to action

Kerry L. LaPlante, Pharm.D., FCCP, FIDSA, FIDP

Chairperson, Antimicrobial Stewardship and Environmental Cleaning Task Force, Rhode Island Department of Health
Department Chairperson and Professor of Pharmacy, University of Rhode Island, College of Pharmacy
Adjunct Professor of Medicine, The Warren Alpert Medical School of Brown University
Senior Director of the Rhode Island Infectious Diseases Research (RIID) Program
Co-Director of Antimicrobial Stewardship Program, and Infectious Diseases Pharmacotherapy Specialist, Providence Veterans Medical Center
Disclosures

Speaker Bureaus: None

Grant Investigator: Merck, Pfizer,

Advisory Committee/Boards: Merck, Entasis, Paratek, Ferring, Spero

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• This presentation will not include discussion of unapproved or investigational uses of products or devices.
LEARNING OBJECTIVES

At the end of this presentation, the learner will be able to:

1. Discuss how **antibiotic overuse**, and a dwindling antimicrobial pipeline has led to antimicrobial resistance and subsequent public health emergency

2. Describe how a **syndromic stewardship** approach focuses efforts in an already overwhelmed and under resourced community setting

3. Describe effective **implementation** practices for antimicrobial stewardship in community settings
Framework (Start with “Why”....)

- Antibiotics are a shared resource...and now a scarce resource
- Antibiotics are essential to patient safety
- Antibiotics are essential to national security
- Geriatric patients use the highest rates of antibiotics
- United States population is aging
- Antibiotics do not treat viral illness like COVID, Influenza, Common Cold

**GOAL:** Increase the number of antibiotic stewardship champions in DC
Homo sapiens, a culture-bearing upright-walking species that lives on the ground and very likely first evolved in Africa about 315,000 years ago.
“Mold Juice” – The Discovery of Penicillin

St. Mary's Hospital in London in 1928. A 47 year old Alexander Fleming observed that a plate culture of Staphylococcus had been contaminated by a blue-green mold (*Penicillium notatum*) and that colonies of bacteria adjacent to the mold were being dissolved.

*Bacterial inhibition originally noticed by a French medical student, Ernest Duchesne, in 1896

~ Nobel Prize in Physiology or Medicine in 1945 ~
One of the most important medical events of medical history: discovery and use of antibiotics...
Antibiotics’ Effectiveness

Antibiotics caused US deaths to decline by ~220 per 100,000 in 15 years

Sulfa
Penicillin

All other medical technologies reduced deaths by ~20 per 100,000 over the next 45 years

## The Power of Antibiotics

<table>
<thead>
<tr>
<th>Disease</th>
<th>Death Pre-Antibiotics</th>
<th>Death With Antibiotics</th>
<th>Change in Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Pneumonia(^1)</td>
<td>~35%</td>
<td>~10%</td>
<td>-25%</td>
</tr>
<tr>
<td>Hospital Pneumonia(^2)</td>
<td>~60%</td>
<td>~30%</td>
<td>-30%</td>
</tr>
<tr>
<td>Heart Valve Infection(^3)</td>
<td>~100%</td>
<td>~25%</td>
<td>-75%</td>
</tr>
<tr>
<td>Brain Infection(^4)</td>
<td>&gt;80%</td>
<td>&lt;20%</td>
<td>-60%</td>
</tr>
<tr>
<td>Skin Infection(^5)</td>
<td>11%</td>
<td>&lt;0.5%</td>
<td>-10%</td>
</tr>
</tbody>
</table>

*By comparison...treatment of myocardial infarction with aspirin or streptokinase*\(^6\)  

Sir Alexander Fleming on June 26, 1945:

“The microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out....In such cases the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organism. I hope this evil can be averted.”

Antibiotic Pipeline
A steady decline in new antibiotics

Number of Antimicrobial NDA Approvals in the U.S. from 1983-2014

“A call to action for the medical community from the Infectious Diseases Society of America”

Antimicrobial Stewardship

Defined and formalized in 2007

“Coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration.”
Antibiotic “Misuse” Across Settings

Outpatient settings

- Appropriate Use: 70%
- Inappropriate Use: 30%

Acute Care Setting

- Appropriate Use: 50%
- Inappropriate Use: 50%

Long Term Care Settings

- Appropriate Use: 70%
- Inappropriate Use: 30%
NEW CDC DATA

MORE THAN HALF OF ANTIBIOTIC PRESCRIBING FOR SELECTED EVENTS IN HOSPITALS WAS NOT CONSISTENT WITH RECOMMENDED PRESCRIBING PRACTICES

ANTIBIOTIC PRESCRIBING WAS NOT SUPPORTED IN:

- **79%** of patients with community-acquired pneumonia
- **77%** of patients with urinary tract infections
- **47%** of patients prescribed fluoroquinolone treatment
- **27%** of patients prescribed intravenous vancomycin antibiotic

HOSPITAL PRESCRIBERS & PHARMACISTS CAN IMPROVE PRESCRIBING:

- Optimize antibiotic selection
- Re-assess antibiotic treatment when the results of diagnostic testing are available
- Use the shortest effective duration of therapy

FIND RESOURCES ON HOW TO IMPROVE HOSPITAL ANTIBIOTIC USE AND HELP FIGHT ANTIBIOTIC RESISTANCE:

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

DC HEALTH
GOVERNMENT OF THE DISTRICT OF COLUMBIA

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Antibiotic Misuse

- Given when they are not needed
- Continued when they are no longer necessary
- Given at the wrong dose (under-dosed)
- Broad-spectrum agents are used to treat susceptible bacteria
- The wrong antibiotic is given to treat an infection
ANTIBIOTIC RESISTANCE THREATS IN THE UNITED STATES

2019

2020 UPDATE ANTIBIOTIC USE IN THE UNITED STATES PROGRESS AND OPPORTUNITIES
SYNDROMIC STEWARDSHIP

Discuss how to customize specific interventions based on local needs
What is syndromic stewardship?

**Syndrome:** a disease or disorder that involves a particular group of signs and symptoms

**Stewardship:** the careful and responsible management of something entrusted to one's care

Careful management of a particular infection
So many “Stewardship’s”

**Antimicrobial Stewardship**
- Right interpretation
- Right antimicrobial
- Right time

**Diagnostic Stewardship**
- Right test
- Right patient
- Right time

**Syndromic Stewardship**
- Right disease
- Right diagnosis
- Right disciplines
Syndromic Stewardship

Disease-based antimicrobial stewardship emphasizes improving patient outcomes by optimizing antimicrobial use and increasing compliance with performance measures.
Advantages of Syndromic Stewardship

FOCUS

Define an area of need...

Multi-disciplinary

• Physicians (diagnosis)
• Laboratory (diagnostics)
• Pharmacy (antibiotics & order sets)
• Nursing (administration and assessment)
Disease Specific Stewardship

**IMPROVED CLINICAL OUTCOMES**

- Bloodstream infection
  - Mortality
- Length of stay
- Clinical success

**LIMITED IMPACT ON CLINICAL OUTCOMES**

- Upper respiratory tract infections
- *Clostridioides difficile* infection
- Asymptomatic bacteriuria

**WHY?**

- Mortality is already extremely high

**WHY?**

- Mortality is lower

**BUT...**

- Associated with increased antibiotic use
~ Clostridioides difficile ~

Designated an URGENT Global Threat by the CDC

“THREAT LEVEL URGENT: immediate public health threat that requires urgent and aggressive action”

- Spans all Health Care (ACF, LTCF, AmCF, Urgent Care)
- HAC (Costs 1% of CMS)
- Preventable (Patient Focused)

CDC=Centers for Disease Control and Prevention.

CDC. Antibiotic resistance threats in the United States, 2019..
https://www.cdc.gov/drugresistance/biggest-threats.html

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Pharmacy
- Restrict FQ use
- Decrease P/T use
- Transition to Tetracycline’s
- Implement PPI Stewardship

Laboratory (Diagnostic)
- Evaluate PCR/Toxin Testing

Infection Prevention and Control
- Environmental Cleaning
- Hand Hygiene
Antimicrobials Predisposing Patients to CDI

Among symptomatic patients with CDI:
- 96% of patients received antimicrobials within the 14 days before onset
- 100% received an antimicrobial within the previous 3 months

Antibiotic pose increased risk to *C. difficile* infection

Olson MM, et al Infect Control Hosp Epidemiol 1994
Cohen SH, Infect Control Hosp Epidemiol 2010
Linear association between a 4-point antibiotic risk index and community-associated CDI risks.
### Predictors of Mortality Among a National Cohort of Veterans With Recurrent *Clostridium difficile* Infection

Haley J. Appanoole, Aisling R. Caffrey, Maya Beganovic, Sanja Avramovic, and Kerry L. LaPlante

1Infectious Diseases Research Program, Providence Veterans Affairs Medical Center, Providence, Rhode Island; 2College of Pharmacy, University of Rhode Island, Kingston, Rhode Island; 3Center of Innovation in Long-Term Support Services, Providence Veterans Affairs Medical Center, Providence, Rhode Island; 4Brown University School of Public Health, Providence, Rhode Island; 5Health Administration and Policy, George Mason University, Fairfax, Virginia; 6Division of Infectious Diseases, Warren Alpert Medical School of Brown University, Providence, Rhode Island

**Background.** Though recurrent *Clostridium difficile* infection (CDI) is common and poses a major clinical concern, data are lacking regarding mortality among patients who survive their initial CDI and have subsequent recurrences. Risk factors for mortality in patients with recurrent CDI are largely unknown.

<table>
<thead>
<tr>
<th>Independent Predictors of Mortality</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proton pump inhibitor (within 7 d before)</td>
<td>3.86 CI (2.14 – 6.96)</td>
</tr>
<tr>
<td>Antibiotics (non CDI Tx antibiotic)</td>
<td>3.33 CI (1.79 – 6.17)</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>8.62 CI (1.71 – 39.92)</td>
</tr>
<tr>
<td>Nutritional deficiency</td>
<td>2.91 CI (1.37 – 6.21)</td>
</tr>
<tr>
<td>Cognitive dysfunction</td>
<td>2.41 CI (1.02 – 5.72)</td>
</tr>
<tr>
<td>Age</td>
<td>1.04 CI (1.01 – 1.06)</td>
</tr>
</tbody>
</table>
Proton Pump Inhibitors....

FDA Drug Safety Communication: Clostridium difficile associated diarrhea can be associated with stomach acid drugs known as proton pump inhibitors (PPIs)

Proton-Pump Inhibitor (PPI) Use

The FDA has issued multiple warnings on the long-term use of PPIs. These include: increased risk of *C. difficile* infection, hypomagnesemia, and fractures of the hip, wrist, and spine. Therefore, prudent prescribing of PPIs is warranted. The FDA recommends use of the lowest dose and shortest duration of PPI therapy appropriate for the condition being treated. Patient compliance, time of administration (prior to meals), and dietary indiscretions (i.e. alcohol or irritating foods) should be assessed prior to titration of PPI doses.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Omeprazole (Prilosec ®)</th>
<th>Pantoprazole (Protonix ®)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duodenal Ulcers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active treatment</td>
<td>20 mg PO daily x 4 weeks, additional 4 weeks may be required</td>
<td>40 mg PO daily x 2-4 weeks</td>
</tr>
<tr>
<td>Maintenance treatment</td>
<td>10-20 mg PO daily; long-term use</td>
<td>--</td>
</tr>
<tr>
<td><em>H. pylori</em> infection</td>
<td>40 mg PO daily x 14 days (dual therapy)</td>
<td>20 mg PO BID x 10 days (triple therapy)</td>
</tr>
<tr>
<td><strong>Gastric Ulcers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-term active treatment (non-NSAID)</td>
<td>40 mg PO daily x 4-8 weeks</td>
<td>40 mg PO daily x 4-8 weeks</td>
</tr>
</tbody>
</table>

https://web.uri.edu/antimicrobial-stewardship/
IMPLEMENTATION

Describe effective implementation practices
Core Elements of Antibiotic Stewardship

Antibiotic stewardship is the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients. Improving antibiotic prescribing and use is critical to effectively treat infections, protect patients from harms caused by unnecessary antibiotic use, and combat antibiotic resistance.

CDC's Core Elements of Antibiotic Stewardship offer providers and facilities a set of key principles to guide efforts to improve antibiotic use and, therefore, advance patient safety and improve outcomes. These frameworks complement existing guidelines and standards from key healthcare partner organizations, including the Infectious Diseases Society of America, Society for Healthcare Epidemiology of America, American Society of Health System Pharmacists, Society of Infectious Diseases Pharmacists, and The Joint Commission.

CDC recognizes that there is no “one size fits all” approach to optimize antibiotic use for all settings. The complexity of medical decision-making surrounding antibiotic use and the variability in facility size and types of care in U.S. healthcare settings require flexible programs and activities.

Core Elements of Hospital Antibiotic Stewardship Programs

Core Elements of Outpatient Antibiotic Stewardship

Core Elements of Antibiotic Stewardship for Nursing Homes

Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals
Antimicrobial Stewardship Core Elements

- Leadership Commitment
- Accountability & Drug Expertise
- Educate & Action
- Tracking and Reporting
The Core Elements of Outpatient Antibiotic Stewardship
Clinician Checklist
Avoid Antibiotics for Inappropriate Indications

✅ Upper respiratory tract infections (URTIs)
  • Colds, acute bronchitis, non-streptococcal pharyngitis

✅ Early or mild sinusitis
  • > 90% of patients with acute sinusitis are given antibiotics, but essentially 80-90% of URIs are viral

✅ Asymptomatic bacteriuria (ASB)

Little or no potential benefits which are significantly outweighed by potential harms
Six ways to improve Antibiotic Appropriateness in Community Settings

- Employ “watch and wait” or “delayed prescribing”
- Limit antibiotic duration
- Improve fluoroquinolone prescribing practices
- Do not treat viral upper respiratory tract infections
- Avoid prolonged antibiotic use
- Avoid prophylactic antibiotic use
#1: Employ watch and wait

- Documentation of the indication for every antibiotic order can inform antibiotic selection and help determine the appropriate duration of treatment

- Alert the provider if the indication of an antibiotic order is not provided
# Adult Treatment Recommendations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Epidemiology</th>
<th>Diagnosis</th>
<th>Management</th>
</tr>
</thead>
</table>
| Acute rhinosinusitis | • About 1 out of 8 adults (12%) in 2012 reported receiving a diagnosis of rhinosinusitis in the previous 12 months, resulting in more than 30 million diagnoses  
• Ninety–98% of rhinosinusitis cases are viral, and antibiotics are not guaranteed to help even if the causative agent is bacterial. | • Diagnose acute bacterial rhinosinusitis based on symptoms that are:  
  ○ **Severe (>3-4 days)**, such as a fever ≥39°C (102°F) and purulent nasal discharge or facial pain;  
  ○ **Persistent (>10 days) without improvement**, such as nasal discharge or daytime cough; or  
  ○ **Worsening (3-4 days)** such as worsening or new onset fever, daytime cough, or nasal discharge after initial improvement of a viral upper respiratory infections (URI) lasting 5-6 days.  
• Sinus radiographs are not routinely recommended. | If a bacterial infection is established:  
• Watchful waiting is encouraged for uncomplicated cases for which reliable follow-up is available.  
• Amoxicillin or amoxicillin/clavulanate is the recommended first-line therapy.  
• Macrolides such as azithromycin are not recommended due to high levels of *Streptococcus pneumoniae* antibiotic resistance (~40%).  
• For penicillin-allergic patients, doxycycline or a respiratory fluoroquinolone (levofloxacin or moxifloxacin) are recommended as alternative agents. |

[Image: Healthy Sinus](https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html)  
[Image: Sinusitis](https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html)
# Adult Treatment Recommendations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Epidemiology</th>
<th>Diagnosis</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharyngitis</td>
<td>• Group A beta-hemolytic streptococcal (GAS) infection is the only common</td>
<td>• Clinical features alone do not distinguish between GAS and viral pharyngitis; a rapid antigen detection test (RADT) is</td>
<td>• Antibiotic treatment is NOT recommended for patients with negative RADT results.</td>
</tr>
<tr>
<td></td>
<td>indication for antibiotic therapy for sore throat cases.</td>
<td>necessary to establish a GAS pharyngitis diagnosis</td>
<td>Amoxicillin and penicillin V remain first-line therapy due to their reliable antibiotic activity against GAS.</td>
</tr>
<tr>
<td></td>
<td>• Only 5–10% of adult sore throat cases are caused by GAS.</td>
<td>• Those who meet two or more Centor criteria (e.g., fever, tonsillar exudates, tender cervical lymphadenopathy, absence of cough) should receive a RADT. Throat cultures are not routinely recommended for adults.</td>
<td>For penicillin-allergic patients, cephalexin, cefadroxil, clindamycin, or macrolides are recommended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GAS antibiotic resistance to azithromycin and clindamycin are increasingly common.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recommended treatment course for all oral beta lactams is 10 days.</td>
</tr>
</tbody>
</table>
Antibiotics are only needed for treating certain infections caused by bacteria. Viral illnesses cannot be treated with antibiotics. When an antibiotic is not prescribed, ask your healthcare professional for tips on how to relieve symptoms and feel better.

<table>
<thead>
<tr>
<th>Common Condition</th>
<th>Common Cause</th>
<th>Are Antibiotics Needed?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bacteria</td>
<td>Bacteria or Virus</td>
</tr>
<tr>
<td>Strep throat</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Whooping cough</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sinus infection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Middle ear infection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Bronchitis/cheast cold</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(in otherwise healthy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>children and adults)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common cold/runny nose</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sore throat (except strep)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flu</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Studies show that in otherwise healthy children and adults, antibiotics for bronchitis won't help you feel better.
#2 Limit Antibiotic Duration

• Guidelines for treatment duration are available for common infectious diseases, such as pneumonia, urinary tract infection, and skin and soft tissue infection

• Contact the provider if the length of antibiotic treatment exceeds the recommended duration


#3: Improve Fluoroquinolone Prescribing

- Due to risk of serious adverse events, the U.S. Food and Drug Administration issued a boxed warning to limit fluoroquinolone prescribing in specific conditions, such as acute bacterial sinusitis and uncomplicated urinary tract infections, where other treatment options are available

- When possible, discuss alternatives to fluoroquinolones with providers

“FDA Drug Safety Communication: FDA updates warnings for oral and injectable fluoroquinolone antibiotics due to disabling side effects.”
The History of Fluoroquinolones

Risks outweigh the benefits for certain conditions including patients with uncomplicated UTI.
#4: Avoid Treatment of Asymptomatic Bacteriuria

• Nursing Home residents with asymptomatic bacteriuria should not be treated with antibiotics in most cases

• Advocate for the use of protocols that help providers evaluate for urinary tract infection specific signs and symptoms before testing for urinary tract infection and the starting antibiotics

Loeb M, Brazil K, Lohfield L et al.. BMJ. 2005 Sep 24;331(7518):669.
# Adult Treatment Recommendations

<table>
<thead>
<tr>
<th>Condition</th>
<th>Epidemiology</th>
<th>Diagnosis</th>
<th>Management</th>
</tr>
</thead>
</table>
| Acute uncomplicated cystitis\(^{10,11}\) | • Cystitis is among the most common infections in women and is usually caused by *E. coli*. | • Classic symptoms include dysuria, frequent voiding of small volumes, and urinary urgency. Hematuria and suprapubic discomfort are less common.  
• Nitrites and leukocyte esterase are the most accurate indicators of acute uncomplicated cystitis | For acute uncomplicated cystitis in healthy adult non-pregnant, premenopausal women:  
• Nitrofurantoin, trimethoprim/sulfamethoxazole (TMP-SMX, where local resistance is <20%), and fosfomycin are appropriate first-line agents.  
• Fluoroquinolones (e.g. ciprofloxacin) should be reserved for situations in which other agents are not appropriate. |

[https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html](https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html)  
Accessed: September 10, 2021
#5: Limit the Use of Prolonged Antibiotic Prophylaxis for Urinary Tract Infection

- There is no clear evidence supporting prolonged antibiotic use for the prevention of recurrent urinary tract infections in nursing home residents with asymptomatic bacteriuria.

- Identify residents on prolonged antibiotic therapy for prevention of urinary tract infection and discuss the benefits and risks of prolonged antibiotic use with providers.

Patients requesting Antibiotics?
What do I tell my patients if antibiotics are not deemed necessary?

Do antibiotics have side effects?

Any time antibiotics are used, they can cause side effects. However, antibiotics can save lives. When you need antibiotics, the benefits outweigh the risks of side effects. If you don’t need antibiotics, you shouldn’t take them because they can cause harm.

Common side effects of antibiotics include:

- **Rash**
- **Dizziness**
- **Nausea**
- **Yeast Infection**
- **Diarrhea**

Get immediate medical help if you experience severe diarrhea. It could be a symptom of a $C.\text{difficile infection}$ (also called $C.\text{diff}$), which can lead to severe colon damage and death. People can also have severe and life-threatening allergic reactions.

If you experience side effects, follow up with your healthcare professional.

To learn more about antibiotic prescribing and use, visit [www.cdc.gov/antibiotic-use](http://www.cdc.gov/antibiotic-use) or call 1-800-CDC-INFO.
Question 1

Which of the following is incorrect about antibiotic misuse and how it has led to antimicrobial resistance and a subsequent public health emergency?

A. Antibiotics are given when they are not needed (i.e. viral infections and asymptomatic bacteriuria)
B. Antibiotics are continued when they are no longer necessary
C. Antibiotics are given at the wrong dose (under-dosed)
D. Antibiotics given at the correct dose, duration and only when needed improve outcomes
True of False: Antimicrobial Stewardship is defined as: Coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration?

A. True

B. False
Question 3

Which of the following is accurate about how a syndromic stewardship approach focuses efforts in community settings?

A. Improved clinical outcomes through focusing interdisciplinary efforts
B. Focusing on the pharmacist alone to improve outcomes
C. Focusing on the prescriber alone to improve outcomes
D. Focusing on the educating the patient to improve outcomes
Question 4

Which of the following is accurate about effective implementation practices for antimicrobial stewardship in community settings?

A. Leadership commitment
B. Tracking and reporting antibiotic use metrics
C. Naming a champion for accountability
D. Educating and taking action
E. All of the above are correct
Question 5

Which of the following is accurate about improving appropriate antibiotic use (AU) in community settings?

A. Employ “watch and wait” or “delayed prescribing”
B. Improve fluoroquinolone prescribing practices
C. Do not treat viral upper respiratory tract infections
D. Avoid prophylactic antibiotic use
E. All of the above are accurate
Antibiotic OVERUSE in Our Community;

A call to action

Kerry L. LaPlante, Pharm.D., FCCP, FIDSA

Chairperson, Antimicrobial Stewardship and Environmental Cleaning Task Force, Rhode Island Department of Health
Department Chairperson and Professor of Pharmacy, University of Rhode Island, College of Pharmacy
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ANTIMICROBIAL STEWARDSHIP

SYSTEM-LEVEL INTERVENTIONS

Clara Ni, PharmD, BCIDP
Clinical Pharmacist – Antimicrobial Stewardship
MedStar Georgetown University Hospital
OBJECTIVES

- Identify challenges of system-level work
- Share strategies on how to address challenges of system-level work
- Interpret the standardized antimicrobial administration ratio (SAAR)
CDC Core Elements

- Hospital Leadership Commitment
- Accountability
- Pharmacy Expertise
- Action
- Tracking
- Reporting
- Education

GENERAL CHALLENGES OF SYSTEM-LEVEL WORK

Different EHR
Different sizes
Different policies

Standard System

EHR: electronic health record
**ATRIUM HEALTH**

<table>
<thead>
<tr>
<th>Location</th>
<th>Southeast</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28 acute care facilities</td>
</tr>
<tr>
<td></td>
<td>67.9% ≤200 beds</td>
</tr>
<tr>
<td></td>
<td>35.7% without ID consult service access (tele or in-person)</td>
</tr>
<tr>
<td></td>
<td>4 different electronic medical record systems</td>
</tr>
<tr>
<td><strong>System-Level Resources</strong></td>
<td>Medical director</td>
</tr>
<tr>
<td></td>
<td>2 FTE clinical pharmacist</td>
</tr>
<tr>
<td></td>
<td>1 FTE data analyst</td>
</tr>
</tbody>
</table>

FTE: full time equivalent

## ATRIUM HEALTH

| System-Level Structure       | Bimonthly system wide meeting  
|                            | Monthly coaching call with central advisory team: review data trends, discuss targets, monthly DOT data, education  
|                            | Site visits  
| Opportunities               | Education: annual symposium, newsletter, empiric antibiotic therapy guidelines  
|                            | Maximizing/creating resources:  
|                            | • Integrate responsibilities into existing daily rounds  
|                            | • Hospitals without ID MD/RPh – relied on routine access to system level resources  
|                            | • Business plan for dedicated stewardship pharmacist  
|                            | Optimizing technology: integrate CDS system into work flow  
|                            | Communication (amongst local level groups)  
|                            | • local multidisciplinary ASC  
|                            | • incorporate into another standing committee  

ASC: Antibiotic subcommittee; CDS: clinical decision support; DOT: days of therapy

Figure 1: Bar graph of cumulative antibiotic days of therapy (DOT) for 2016 by facility in relation to baseline (red line), target goal (green line), and stretch goal (blue line). Bar graphs are color coded by goal achievements (blue: stretch goal achieved; green: target goal achieved; orange: decreased DOT from baseline but target not attained; red: increased DOT from baseline). Hospitals are listed in order of monthly patient census (lowest to highest). LH, large hospital (> 200 beds); SH, small hospital (51–200 beds); CAH, critical access hospital (≤ 50 beds); *3-hospital regional network; **3-hospital regional network; ***10-hospital regional network.
## BJC HEALTHCARE

<table>
<thead>
<tr>
<th>Location</th>
<th>Midwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>13 acute care facilities</td>
</tr>
<tr>
<td></td>
<td>46.2% ≤200 beds</td>
</tr>
<tr>
<td>System-Level Resources</td>
<td>0.35 FTE ID physician</td>
</tr>
<tr>
<td></td>
<td>0.6 FTE clinical pharmacist</td>
</tr>
<tr>
<td></td>
<td>0.5 FTE RN</td>
</tr>
<tr>
<td></td>
<td>• 60 members system-wide</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Type</th>
<th>No. Staffed Beds</th>
<th>Approximate Pharmacist FTE&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Approximate Physician FTE&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Urban academic adult tertiary care</td>
<td>1,342</td>
<td>1.0</td>
<td>0.5</td>
</tr>
<tr>
<td>B</td>
<td>Suburban community</td>
<td>497</td>
<td>0.2</td>
<td>0.01</td>
</tr>
<tr>
<td>C</td>
<td>Suburban community</td>
<td>485</td>
<td>0.8</td>
<td>0.01</td>
</tr>
<tr>
<td>D</td>
<td>Suburban community</td>
<td>397</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>E</td>
<td>Urban academic pediatric tertiary care</td>
<td>280</td>
<td>1.0</td>
<td>0.5</td>
</tr>
<tr>
<td>F</td>
<td>Suburban community</td>
<td>216</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>G</td>
<td>Suburban community</td>
<td>206</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>H</td>
<td>Rural critical access</td>
<td>133</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>I</td>
<td>Suburban community</td>
<td>127</td>
<td>0.25</td>
<td>0.01</td>
</tr>
<tr>
<td>J</td>
<td>Suburban community</td>
<td>113</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>K</td>
<td>Suburban community</td>
<td>72</td>
<td>0.25</td>
<td>0.01</td>
</tr>
<tr>
<td>L</td>
<td>Suburban community</td>
<td>67</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>M</td>
<td>Rural critical access</td>
<td>35</td>
<td>0.02</td>
<td>0.01</td>
</tr>
</tbody>
</table>

<sup>a</sup>FTE = full-time equivalent.
## BJC HEALTHCARE

<table>
<thead>
<tr>
<th>System-Level Structure</th>
<th>Bimonthly system wide meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities</td>
<td>Education: local/national/online training, regional conferences Maximizing/creating resources: • Contract ASP MD • Hospitalist as ASP champion Optimizing technology (CDS) Reporting • Local benchmarking: Tableau dashboard by drug, drug class, NHSN drug categories, unit, DRG • National benchmarking: NHSN AU and AR modules Leadership support</td>
</tr>
</tbody>
</table>

DRG: diagnosis related group

# AVERA HEALTH

<table>
<thead>
<tr>
<th>Location</th>
<th>Midwest (rural)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>33 acute care facilities</td>
</tr>
<tr>
<td>System-Level</td>
<td>ID physician (medical director)</td>
</tr>
<tr>
<td></td>
<td>ID pharmacist (pharmacy lead)</td>
</tr>
<tr>
<td>Resources</td>
<td>AVP Hospital Pharmacy</td>
</tr>
<tr>
<td></td>
<td>(administrative lead)</td>
</tr>
</tbody>
</table>

AVP: assistant vice president

## System-Level Structure

- Bimonthly system wide meeting

## Opportunities

- Education: local/national/online training, regional conferences
- Maximizing/creating resources:
  - Telemed ID
  - M-F ASP web-conference
- Optimizing technology (CDS)
- Reporting (Tableau)
- Leadership support

Levofloxacin DOT/1,000 Patient Days

AMCK, ASL, ASM, ASHH, AQOP

AMCK = Avera McKennan Hospital and University Health Center, ASL = Avera St. Luke’s, ASM = Avera St. Mary’s, ASHH = Avera Sacred Heart, AQOP = Avera Queen of Peace, NA = not available.
### UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
Knowledge Check

Which of the following are common challenges when implementing antimicrobial stewardship across the system?

A. Limited resources
B. Lack of data/reporting
C. Lack of leadership support
D. All of the above
Knowledge Check

Which of the following strategies address a CDC Core Element?

A. Holding an annual symposium on antimicrobial stewardship that provides continuing education for the healthcare team

B. Naming an Assistant Vice President of Hospital Pharmacy as a member of the system-level antimicrobial stewardship committee

C. Using data visualization software to track and report antimicrobial usage

D. All of the above
MEDSTAR HEALTH

Not-for-profit

Baltimore-Washington, D.C.

10 hospitals

• 9 acute care
• 1 rehabilitation facility
## MEDSTAR HEALTH

<table>
<thead>
<tr>
<th>Acute Care Hospital</th>
<th>Type</th>
<th>No. Staffed Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suburban teaching</td>
<td>338</td>
</tr>
<tr>
<td>2</td>
<td>Urban teaching</td>
<td>394</td>
</tr>
<tr>
<td>3</td>
<td>Suburban community teaching</td>
<td>214</td>
</tr>
<tr>
<td>4</td>
<td>Urban teaching</td>
<td>131</td>
</tr>
<tr>
<td>5</td>
<td>Suburban community</td>
<td>104</td>
</tr>
<tr>
<td>6</td>
<td>Rural</td>
<td>93</td>
</tr>
<tr>
<td>7</td>
<td>Rural</td>
<td>178</td>
</tr>
<tr>
<td>8</td>
<td>Urban teaching</td>
<td>185</td>
</tr>
<tr>
<td>9</td>
<td>Urban teaching</td>
<td>769</td>
</tr>
</tbody>
</table>
UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
CORPORATE PHARMACY STRUCTURE

AVP Pharmacy Services

System Director Clinical Pharmacy Services

System Director Drug Use Policy

System Director Pharmacy Informatics and Technology

Pharmacy PI Analytics Manager

System Medication Management Clinical Strategist

System Drug Policy Specialist
SYSTEM ASP STRUCTURE

Local Antimicrobial Stewardship Subcommittees

System-Level ID Pharmacy Clinical Practice Council (IDPCPC)

- System Director
- Drug Use Policy
- Monthly
- Formulary standardization, review and feedback of CPG and proposed initiatives

System-Level Antimicrobial Stewardship Subcommittee

- System Director
- Clinical Pharmacy Services
- Bimonthly
- 2 ID physicians
- Physician review and approval

System P&T
UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
MAXIMIZING/CREATING RESOURCES

Hybrid local- and system-level resource

- Added to larger urban teaching hospital with existing 1 FTE ID pharmacist
- Provide assistance to local stewardship efforts
- Assist with running IDPCPC, system ASC
MAXIMIZING/CREATING RESOURCES

- Dose adjustment
- De-escalation
- IV to PO
- Staff RPh
- Clinical Decision Support
- Staff RPh IV to PO
- Staff RPh De-escalation
UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
OPTIMIZING TECHNOLOGY

- Build alerts
- Educate
- Collect/Analyze Data
- Implement

Feedback
- Redundant
- Lack of clinical utility
- Alert fatigue
OPTIMIZING TECHNOLOGY
OPTIMIZING TECHNOLOGY

Improvements made when held accountable with data
UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
# REPORTING

## Internal
- Pharmacy PI analytics manager
- Workload metrics
- Vancomycin AUC metrics
- Vendor analytics resource
- EHR: antibiotic utilization dashboard
- Vancomycin AUC software

## External
- GPO database
- NHSN AU reporting

AUC: area under the curve; GPO: group purchasing organization
Vancomycin Dosing: Patient Demographics

Data are from Patients Discharged Between 01/01/2019 - 06/30/2019

Patient Gender Distribution

<table>
<thead>
<tr>
<th>Sex</th>
<th>Min Age</th>
<th>Average Age</th>
<th>Median Age</th>
<th>Max Age</th>
<th># Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>18</td>
<td>63</td>
<td>64</td>
<td>118</td>
<td>3,132</td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>60</td>
<td>62</td>
<td>99</td>
<td>3,554</td>
</tr>
<tr>
<td>Grand Total</td>
<td>18</td>
<td>62</td>
<td>63</td>
<td>118</td>
<td>6,686</td>
</tr>
</tbody>
</table>

Summary of Vancomycin Levels Taken

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Levels</td>
<td>16,247</td>
</tr>
<tr>
<td>Levels Per Patient</td>
<td>4.3</td>
</tr>
<tr>
<td>Number of Patients with 1 Level</td>
<td>1,992</td>
</tr>
<tr>
<td>Number of Patients with 2+ Levels</td>
<td>3,295</td>
</tr>
</tbody>
</table>

Patient BMI Distribution

Number of Patients

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Female Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>34</td>
</tr>
<tr>
<td>30</td>
<td>73</td>
</tr>
<tr>
<td>40</td>
<td>164</td>
</tr>
<tr>
<td>50</td>
<td>226</td>
</tr>
<tr>
<td>60</td>
<td>211</td>
</tr>
<tr>
<td>70</td>
<td>298</td>
</tr>
<tr>
<td>80</td>
<td>368</td>
</tr>
<tr>
<td>90</td>
<td>416</td>
</tr>
<tr>
<td>100</td>
<td>436</td>
</tr>
</tbody>
</table>

Number of Male Patients

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Male Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>34</td>
</tr>
<tr>
<td>30</td>
<td>111</td>
</tr>
<tr>
<td>40</td>
<td>176</td>
</tr>
<tr>
<td>50</td>
<td>222</td>
</tr>
<tr>
<td>60</td>
<td>232</td>
</tr>
<tr>
<td>70</td>
<td>232</td>
</tr>
<tr>
<td>80</td>
<td>158</td>
</tr>
<tr>
<td>90</td>
<td>64</td>
</tr>
<tr>
<td>100</td>
<td>13</td>
</tr>
</tbody>
</table>
### Patient Details

<table>
<thead>
<tr>
<th>Facility</th>
<th>FIN</th>
<th>Enc Type</th>
<th>Discharge D/T</th>
<th>Length of Stay</th>
<th>DRG1</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>25</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 AM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
<td>1 PM</td>
<td>3/12/2021</td>
<td>16.750</td>
<td>Null</td>
</tr>
</tbody>
</table>

### Order Details

<table>
<thead>
<tr>
<th>Drug Code</th>
<th>Drug Name</th>
<th>Drug Routes</th>
<th>Therapeutic Category</th>
<th>Ordering Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>gentamicin</td>
<td>IV/PO</td>
<td>aminoglycosides</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>cefUracile</td>
<td>IV/PO</td>
<td>cephalosporins</td>
<td></td>
</tr>
</tbody>
</table>

**MUE: medication use evaluations**
External Benchmarking

Addressing provider resistance

• “Unique” patient population
• “Our patients are more critically ill”

Comparison of variance

• GPO database
• DOT by: drug and base-DRG
• Top 20 AMCs vs. internal hospital
National Healthcare Safety Network (NHSN)

NHSN Components:
- Patient Safety
- LTCF
- Outpatient
- Dialysis
- Healthcare Personnel Safety
- Biovigilance
- Outpatient Procedure
- Antimicrobial Use and Resistance (AUR)
- CLABSI/CAUTI/VAP, etc
- Surgical Site Infection
- MDRO/CDI
- COVID-19

https://www.cdc.gov/nhsn/pdfs/pscmanual/1psc_overviewcurrent.pdf
NHSN - Objectives

Evaluate antimicrobial use trends over time at the facility and national levels

Risk-adjusted inter and intra-facility antimicrobial use benchmarking
NHSN - Metrics

Days of therapy ("antimicrobial days") per 1000 days present

\[
\frac{\text{Drug specific antimicrobial days per patient care location per month}}{\text{Days present per patient care location per month}} \times 1000
\]

\[
\frac{\text{Drug specific antimicrobial days for all inpatient units in a facility per month}}{\text{Days present per facility wide inpatient per month}} \times 1000
\]

Antimicrobial days per 100 admissions

\[
\frac{\text{Drug specific antimicrobial days for inpatient units in a facility per month}}{\text{Admissions per facility wide inpatient per month}} \times 100
\]
NHSN – Facility Mapping

Facility location is “mapped” to one CDC Location

CDC-defined Locations

- Acuity level
- Service type

Table 5. Location types able to generate SAARs

<table>
<thead>
<tr>
<th>CDC Location Type</th>
<th>CDC Location Code</th>
<th>NSHN Healthcare Service Location (HL7) Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Critical Care</td>
<td>IN:ACUTE:CC:M</td>
<td>1027-2</td>
</tr>
<tr>
<td>Surgical Critical Care</td>
<td>IN:ACUTE:CC:S</td>
<td>1030-6</td>
</tr>
<tr>
<td>Medical-Surgical Critical Care</td>
<td>IN:ACUTE:CC:MS</td>
<td>1029-8</td>
</tr>
<tr>
<td>Medical Ward</td>
<td>IN:ACUTE:WARD:M</td>
<td>1060-3</td>
</tr>
<tr>
<td>Surgical Ward</td>
<td>IN:ACUTE:WARD:S</td>
<td>1072-8</td>
</tr>
<tr>
<td>Medical-Surgical Ward</td>
<td>IN:ACUTE:WARD:MS</td>
<td>1061-1</td>
</tr>
<tr>
<td>ONC General Hematology-Oncology Ward</td>
<td>IN:ACUTE:WARD:ONC_HONC</td>
<td>1232-8</td>
</tr>
<tr>
<td>Adult Step Down Unit</td>
<td>IN:ACUTE:STEP</td>
<td>1099-1</td>
</tr>
</tbody>
</table>

NHSN – SAAR

Standardized Antimicrobial Administration Ratio

\[ \text{SAAR} = \frac{\text{Observed antimicrobial use}}{\text{Predicted antimicrobial use}} \]

For specific:

- Category of antimicrobial agent
- Patient care locations

CDC predictive models

- Nationally aggregated data from 2017/2018
- Separate predictive models for each antimicrobial agent category
  - All antibacterial agents
  - Narrow spectrum beta-lactam agents
  - Broad spectrum for hospital-onset infections
  - Broad spectrum for community-acquired infections
  - Anti-MRSA agents
  - High-risk CDI agents
  - Anti-fungals for invasive candidiasis

NHSN – SAAR

Standardized Antimicrobial Administration Ratio

\[ SAAR = \frac{Observed\ antimicrobial\ use}{Predicted\ antimicrobial\ use} \]

- **SAAR > 1**
  - Observed > Predicted
  - + statistical significance = over-use?

- **SAAR = 1**
  - Observed = Predicted
  - Appropriate use?

- **SAAR < 1**
  - Observed < Predicted
  - + statistical significance = under-use?

SAAR alone not definitive

Statistically significant ≠ clinically significant
NHSN - SAAR

National SAAR distributions

- Inform benchmarking decisions
- Ex: Antifungals in step-down units – set goal at 0.8?

Table 3. Pooled mean SAAR values by adult location type & SAAR antimicrobial agent category*

<table>
<thead>
<tr>
<th>Adult SAAR Antimicrobial Agent Categories</th>
<th>Medical ICUs</th>
<th>Medical-Surgical ICUs</th>
<th>Surgical ICUs</th>
<th>Medical Wards</th>
<th>Medical-Surgical Wards</th>
<th>Surgical Wards</th>
<th>Step Down Units</th>
<th>General Hematology-Oncology Wards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult SAAR Location Type</td>
<td>All</td>
<td>BSHO</td>
<td>BSCA</td>
<td>GramPos</td>
<td>NSBL</td>
<td>CDI</td>
<td>Antifungal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Antibacterial</td>
<td>0.985</td>
<td>0.979</td>
<td>0.900</td>
<td>1.009</td>
<td>0.915</td>
<td>1.126</td>
<td>0.868</td>
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<td></td>
<td>BSHO</td>
<td>0.971</td>
<td>1.007</td>
<td>0.873</td>
<td>0.915</td>
<td>0.959</td>
<td>0.958</td>
<td>0.890</td>
</tr>
<tr>
<td></td>
<td>BSCA</td>
<td>0.947</td>
<td>0.943</td>
<td>0.977</td>
<td>0.896</td>
<td>0.817</td>
<td>1.087</td>
<td>1.102</td>
</tr>
<tr>
<td></td>
<td>GramPos</td>
<td>0.983</td>
<td>0.983</td>
<td>0.942</td>
<td>0.941</td>
<td>1.024</td>
<td>0.992</td>
<td>0.905</td>
</tr>
<tr>
<td></td>
<td>NSBL</td>
<td>0.999</td>
<td>1.088</td>
<td>0.910</td>
<td>0.943</td>
<td>1.078</td>
<td>0.979</td>
<td>0.948</td>
</tr>
<tr>
<td></td>
<td>CDI</td>
<td>0.985</td>
<td>1.044</td>
<td>0.988</td>
<td>0.963</td>
<td>0.873</td>
<td>1.046</td>
<td>1.022</td>
</tr>
<tr>
<td></td>
<td>Antifungal</td>
<td>1.043</td>
<td>1.051</td>
<td>0.991</td>
<td>1.011</td>
<td>1.055</td>
<td>1.078</td>
<td>1.009</td>
</tr>
</tbody>
</table>

*Refer to technical tables for 2019 SAAR distributions for each SAAR antimicrobial agent category by location type. Abbreviations: BSHO - Broad spectrum antibacterial agents predominantly used for hospital-onset infections; BSCA - Broad spectrum antibacterial agents predominantly used for community-acquired infections; GramPos - Antibacterial agents predominantly used for resistant Gram-positive infections (e.g., MRSA); NSBL - Narrow spectrum beta-lactam agents; CDI - Antibacterial agents posing the highest risk for CDI; Antifungal - Antifungal agents predominantly used for invasive candidiasis.

NHSN - SAAR

Can use NHSN Statistics Calculator to determine statistical significance between 2 SAAR values.

Note: Data for example only.

Cannot calculate statistical significance when comparing more than 2 SAAR values.

DeAnthony is evaluating the SAAR value for anti-MRSA agents used in the medical ICUs at his hospital, Top Health Medical Center. The local SAAR value is 0.73 (p-value 0.003, 95% confidence interval 0.433, 0.867), while the 2019 pooled mean SAAR is 1.009. Which of the following is the most accurate interpretation of this data?

A. A SAAR value significantly lower than the national SAAR distribution may be concerning for under-use
B. The use of significantly fewer anti-MRSA agents at Top Health is indicative of successful stewardship efforts
C. A statistically significant SAAR value less than 1 indicates overuse of antibiotics
D. The SAAR value is not statistically significant, and doesn’t allow for meaningful interpretation of anti-MRSA agents at Top Health
UNIFYING FACTORS

- Developing overarching system structure
- Maximizing/creating resources
- Optimizing technology
- Reporting
- Education/Training
EDUCATION/TRAINING

New Initiative

- Policy & workflow
- Quick reference/FAQs
- CE training modules
- System-level team

General

- Institution tuition support for conference attendance, certificates
- Internal CE
- Direct feedback to pharmacists
Summary

- System Structure
- Optimizing Technology
- Maximizing Resources
- Reporting
- Education
Summary

System Structure

- Bimonthly meetings
- Monthly coaching calls
- Site visits
- Pharmacy specific committee
- Corporate structure providing stewardship support

Maximizing Resources

- Physician
- Contract ASP MD
- Telemed ID
- Hospitalist as ASP champion
- ASP incorporated into staff RPh workflow
- System-level resources support hospitals without dedicated ID resources
- Split system/local level position
## Summary

### Optimizing Technology
- CDS
- Web-conferencing technology
- Use data for performance improvement

### Reporting
- Local benchmarking
  - Tableau dashboard
  - Vendor supported analytics
- National benchmarking
  - NHSN AU/AR
  - GPO database

### Education
- Institution tuition support
- Local/regional/national conferences
- Online certificates
- Annual symposium
- Newsletter
- Internally developed CE
ANTIMICROBIAL STEWARDSHIP

SYSTEM-LEVEL INTERVENTIONS

Clara Ni, PharmD, BCIDP
Clinical Pharmacist – Antimicrobial Stewardship
MedStar Georgetown University Hospital