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Antimicrobial Stewardship

Syndromic and System-Level Interventions

Collaborators

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More resources available at:
https://dchealth.dc.gov/dcrx

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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

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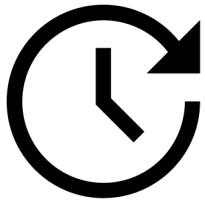
Conflicts of Interest

- None of the speakers or advisors have a conflict of interests to declare.

Important Information



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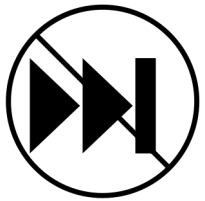

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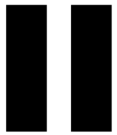

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Antibiotic Overuse in Our Community;

A call to action

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

- The information disseminated in this lecture is given in my personal capacity and not in my capacity as a VA employee nor does it necessarily reflect the views of the United States Department of Veterans Affairs or the Rhode Island Department of Health
- **This presentation <u>will not</u> 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

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ANTIBIOTIC OVERUSE
Preserving a shared resource

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

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

GOAL: Increase the number of antibiotic stewardship champions in DC

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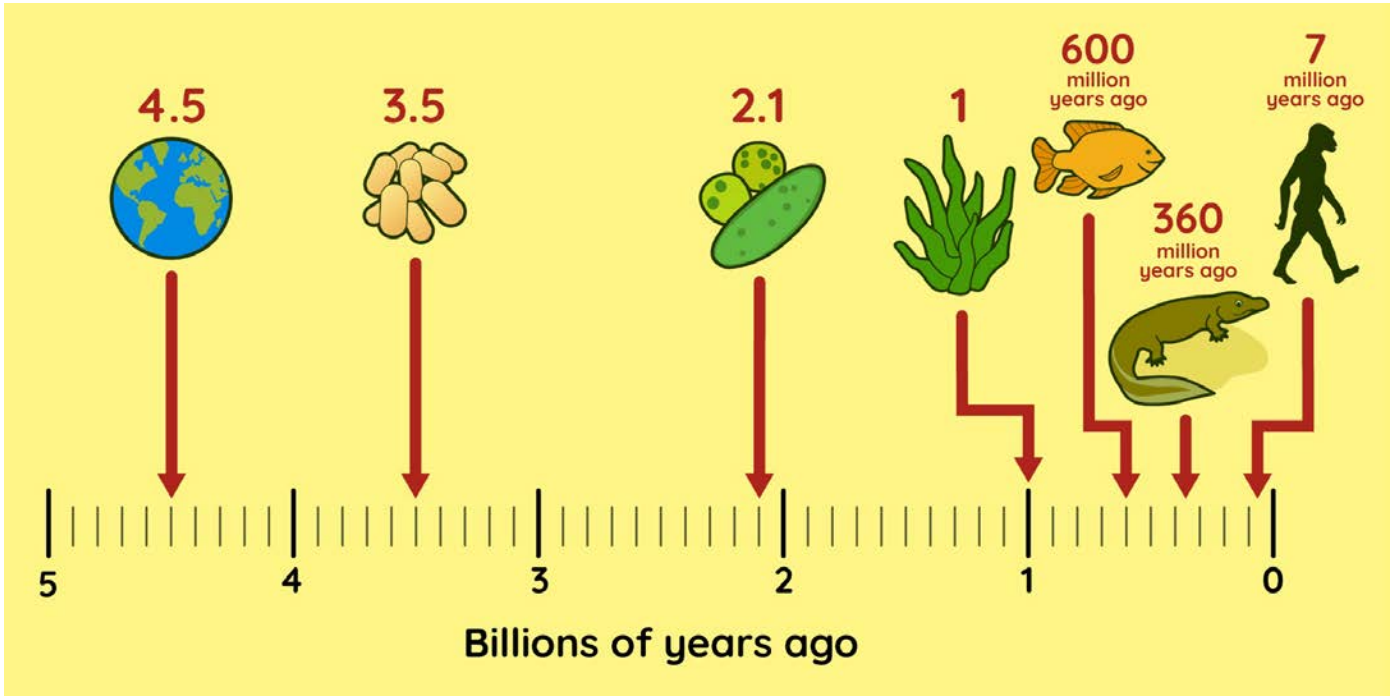
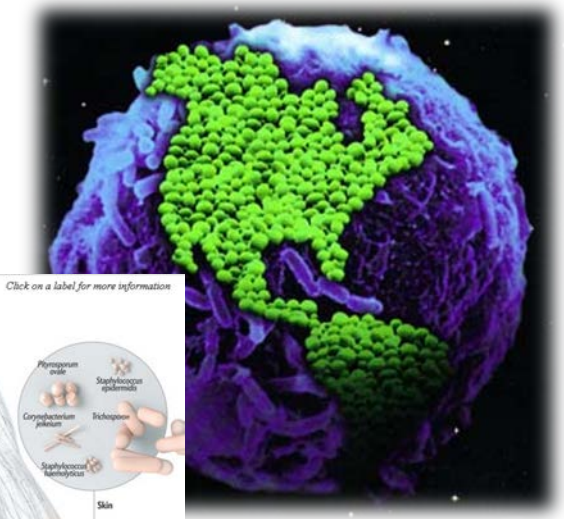
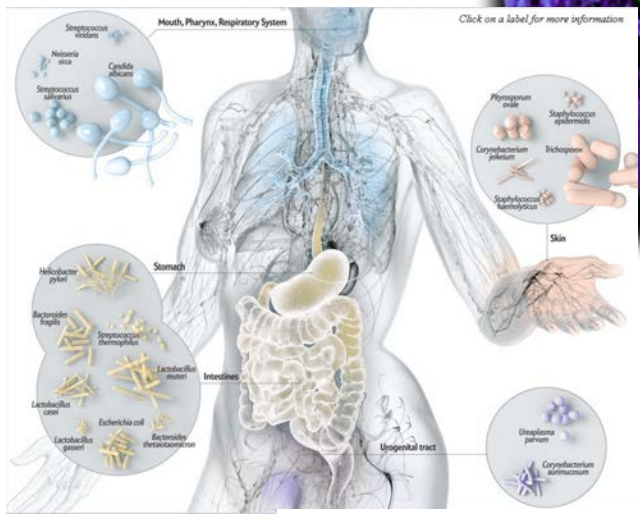
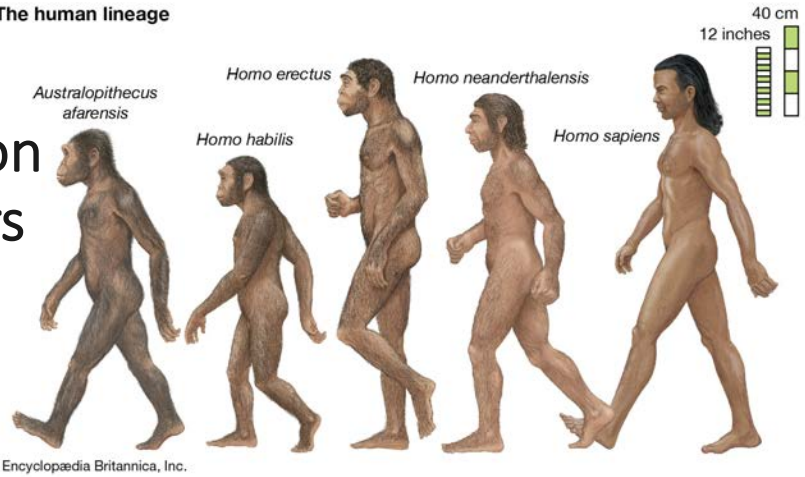
Bacteria evolved 3.5 BILLION years ago…







The human lineage



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

150 YEARS | AMERICAN MUSEUM OF NATURAL HISTORY

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“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 ~

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One of the most important medical events of medical history discovery and use of antibiotics…

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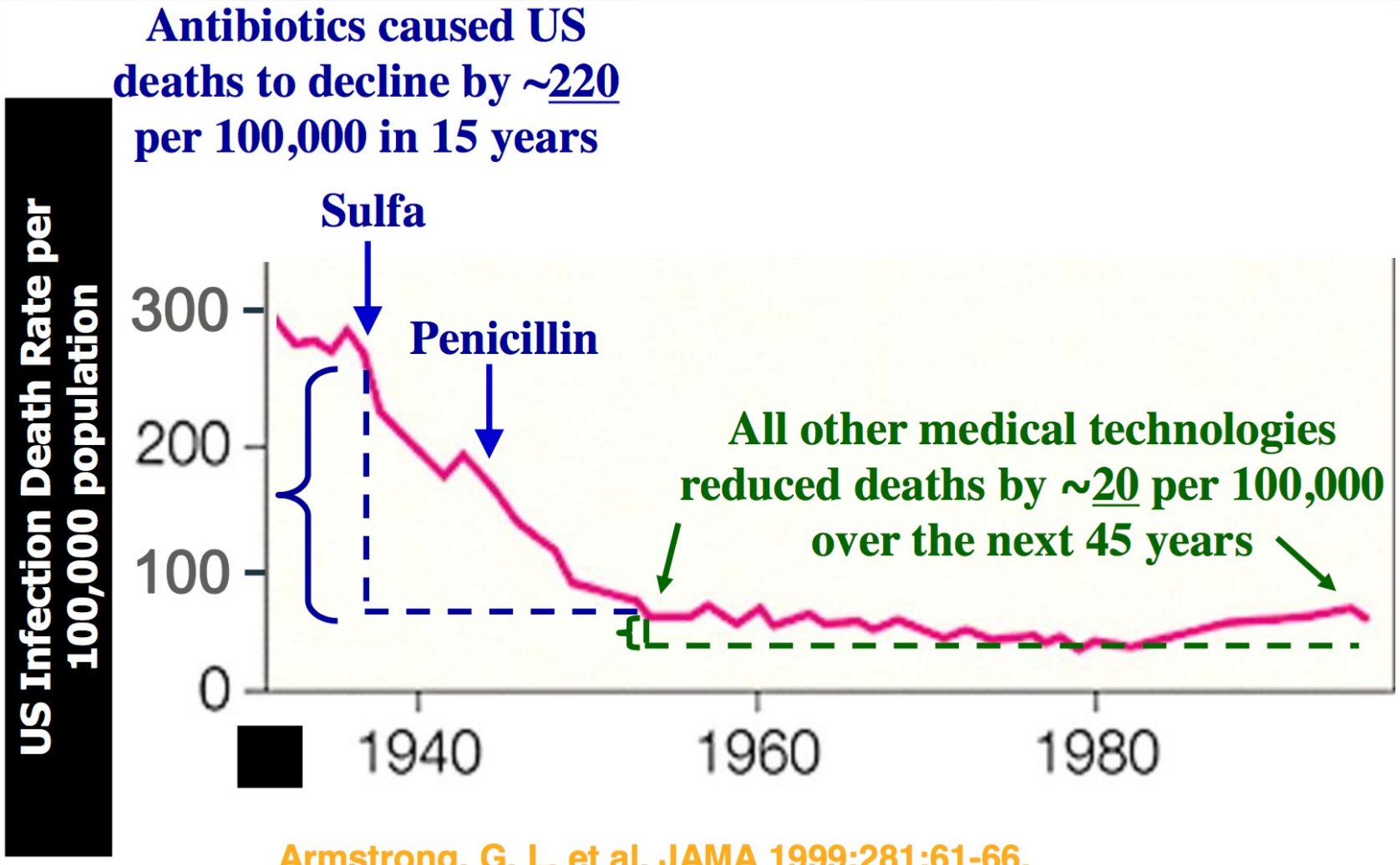
Antibiotics' Effectiveness



Armstrong, G. L. et al. JAMA 1999;281:61-66.

Slide credit: IDSA, Public Policy & Government Relations

The Power of Antibiotics

Disease	Death Pre-Antibiotics	Death With Antibiotics	Change in Death
Community Pneumonia[1]	~35%	~10%	-25%
Hospital Pneumonia[2]	~60%	~30%	-30%
Heart Valve Infection[3]	~100%	~25%	-75%
Brain Infection[4]	>80%	<20%	-60%
Skin Infection[5]	11%	<0.5%	-10%
By comparison…treatment of myocardial infarction with aspirin or streptokinase[6]			*-3%*

[1]IDSA Position Paper '08 Clin Infect Dis 47(S3):S249-65; [2]IDSA/ACCP/ATS/SCCM Position Paper '10 Clin Infect Dis In Press; [3]Kerr AJ. Subacute Bacterial Endocarditis. Springfield IL: Charles C. Thomas, 1955 & Lancet 1935 226:383-4; [4]Lancet '38 231:733-4 & Waring et al. '48 Am J Med 5:402-18; [5]Spellberg et al. '09 Clin Infect Dis 49:383-91 & Madsen '73 Infection 1:76081
[6]Lancet 2:349-60

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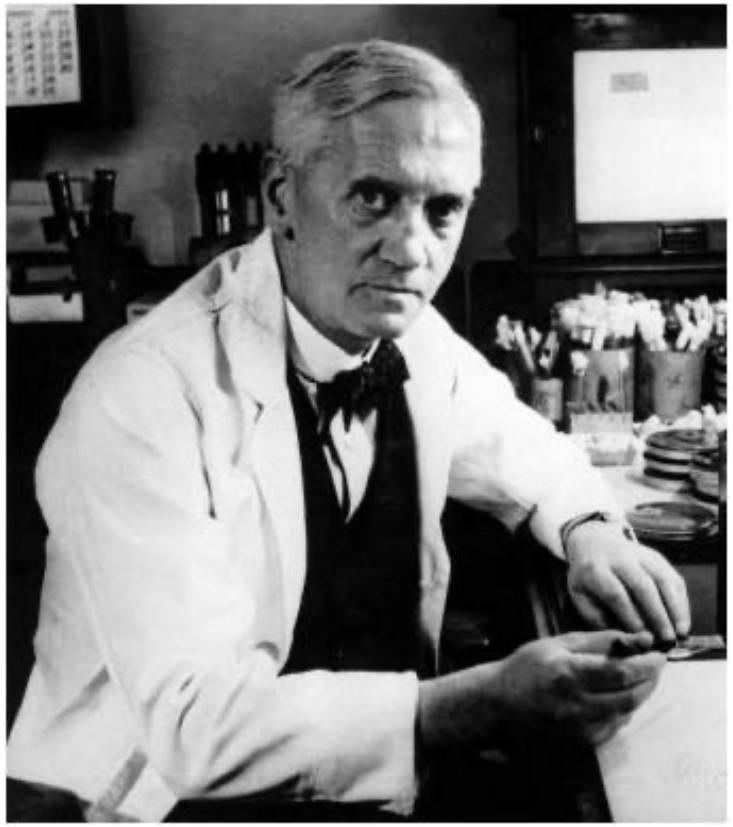
Slide credit: IDSA, Public Policy & Government Relations

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."

Penicillin finder assays its future. New York Times 26 June 1945: 21..

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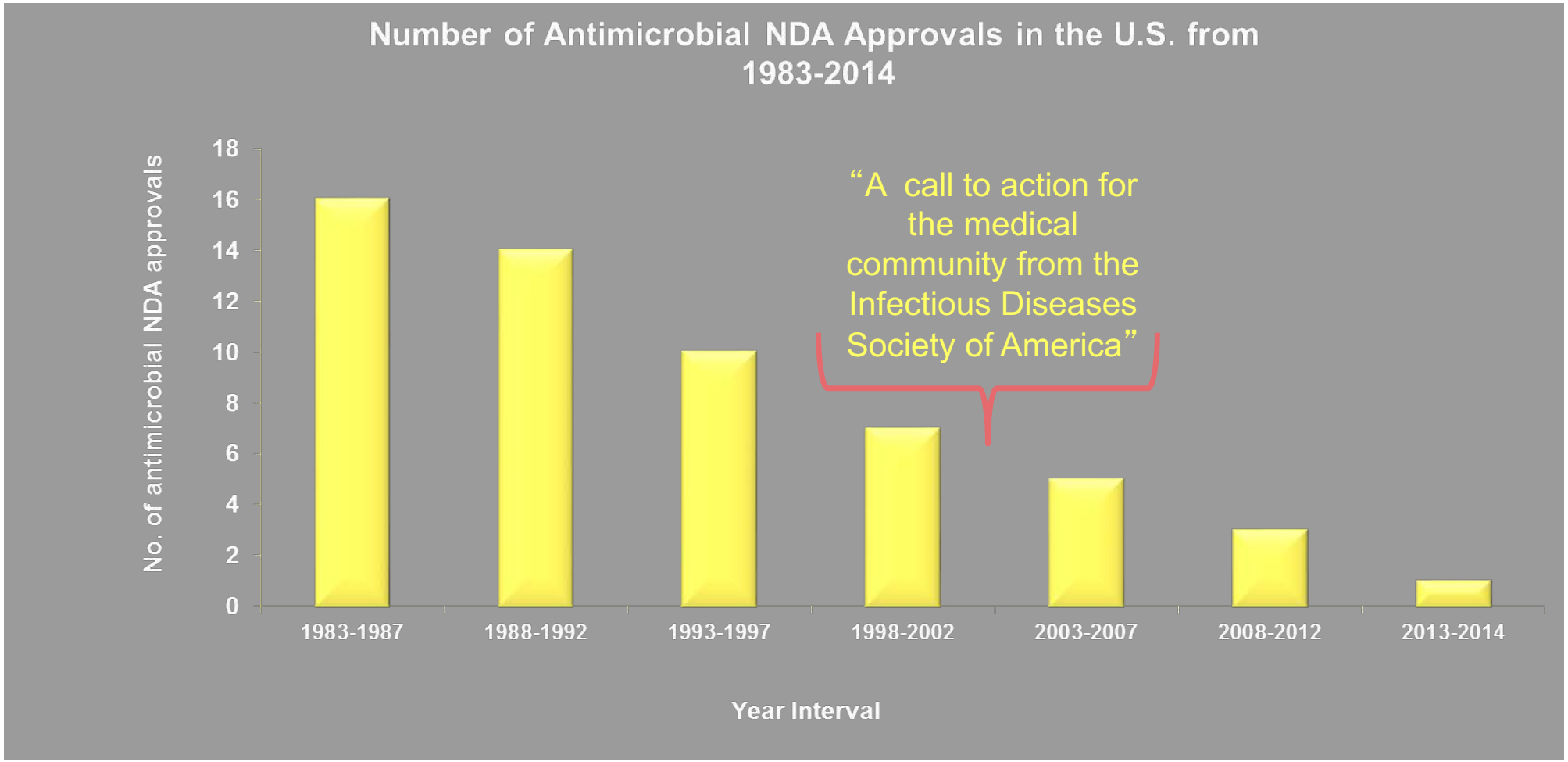
Antibiotic Pipeline

A steady decline in new antibiotics



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Spellberg et al., The epidemic of antibiotic-resistant infections: Clin Infect Dis 2008, 46:155-164
United States Centers for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2013. URL: http://www.cdc.gov/drugresistance/threat-report-2013/ [Accessed 2014 April 18]

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."

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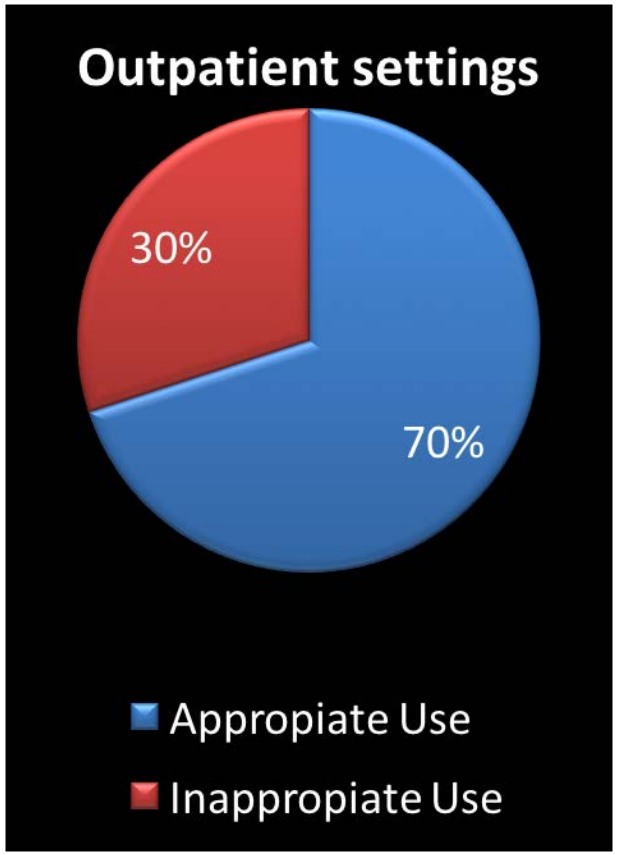
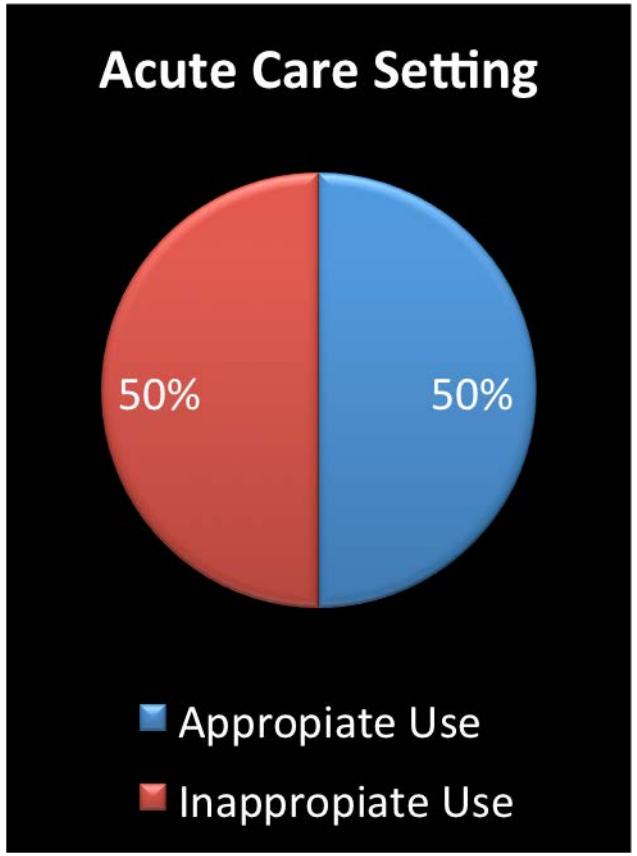
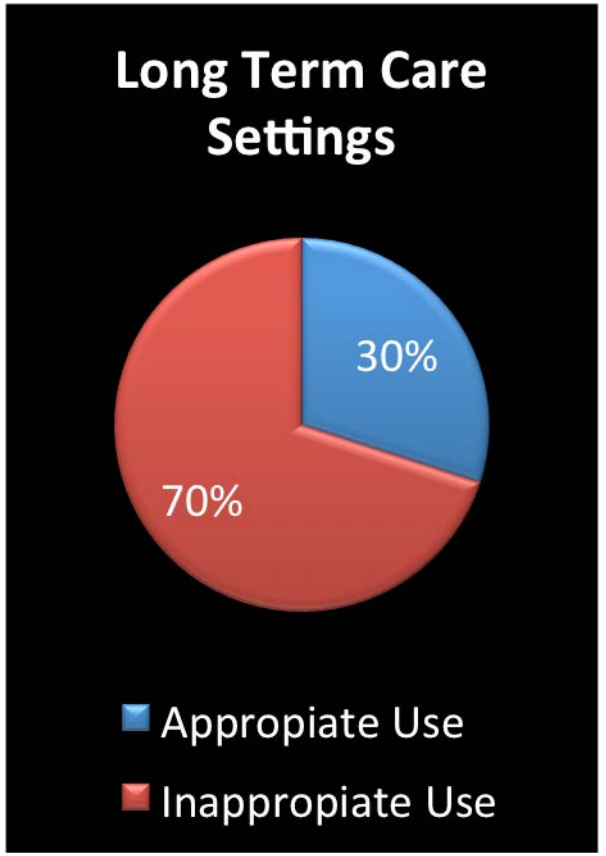
IDSA AMS Guidelines, Clin Infect Dis 2007 and 2016

Antibiotic "Misuse" Across Settings







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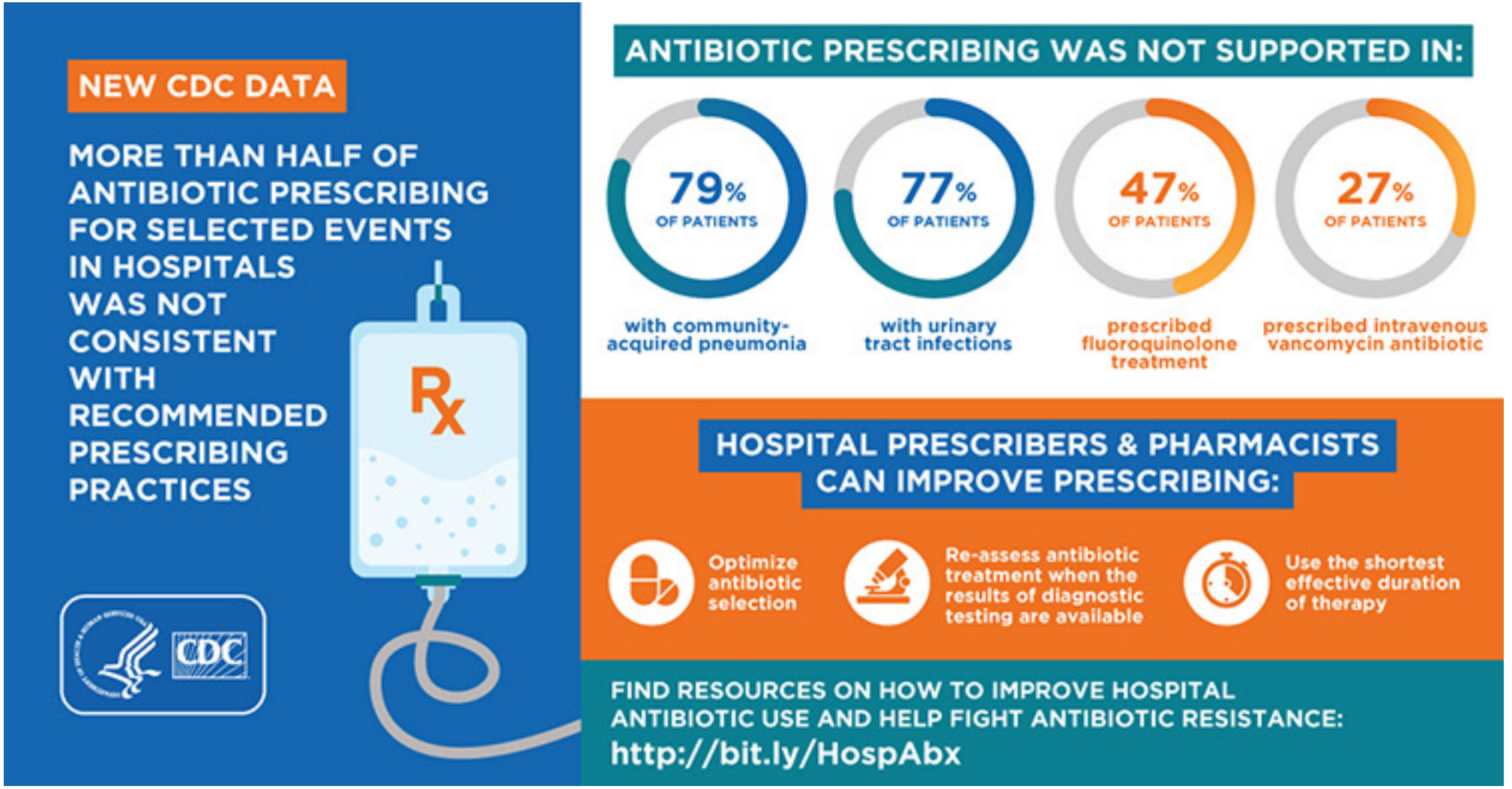
Fridkin S, et al. Morbidity and Mortality Weekly Report. United States Center for Disease Control and Prevention. 2014; 63(09):194-200. and http://www.cdc.gov Data accessed: May 2017



BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

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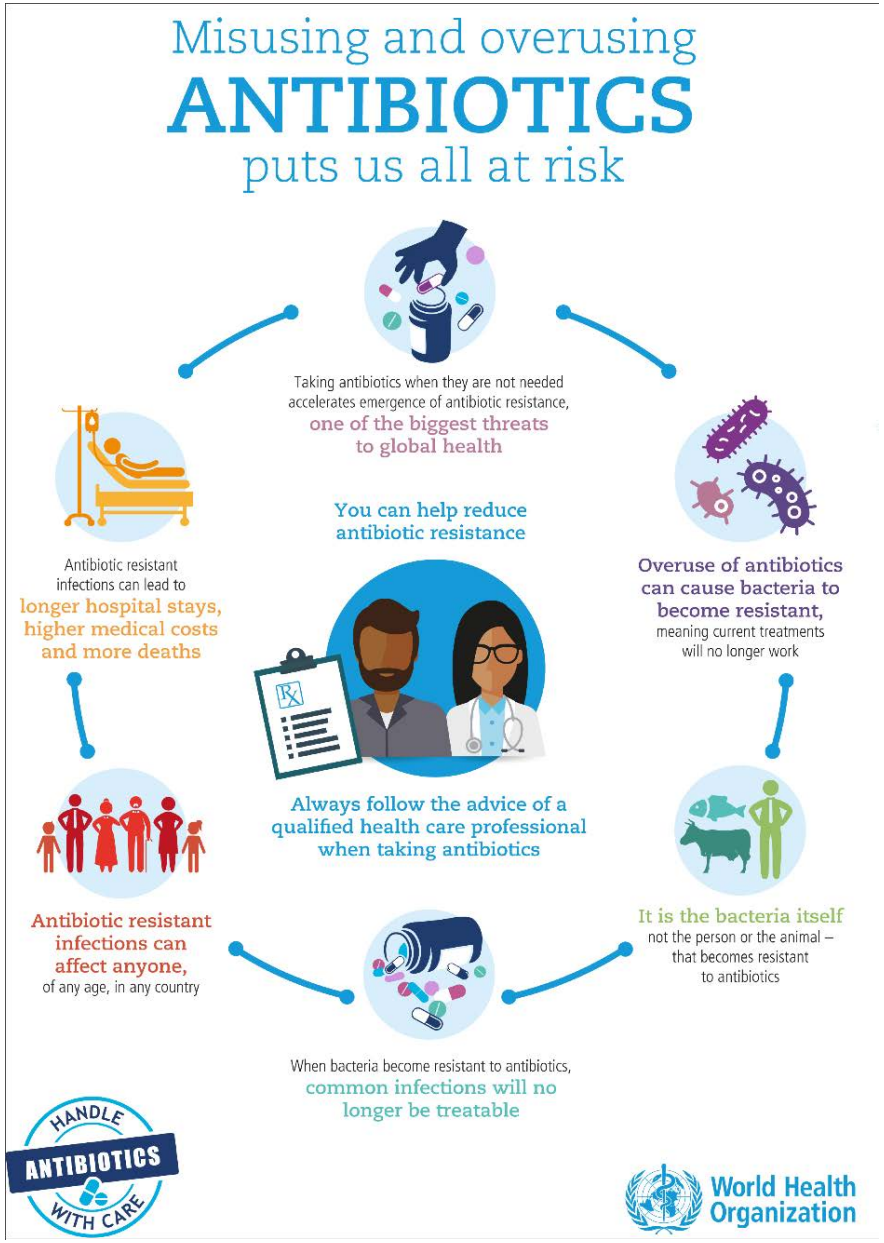
Antibiotic Misuse

- 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



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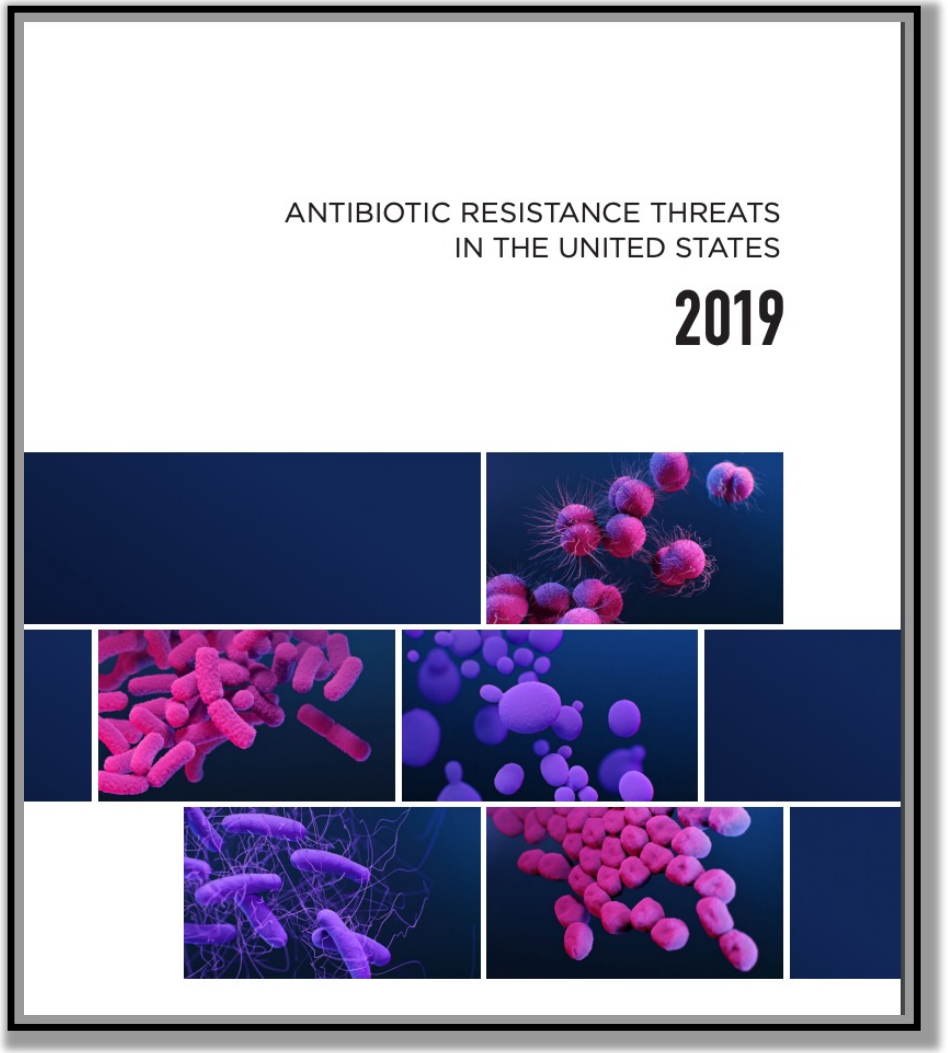

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SYNDROMIC STEWARDSHIP

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

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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

Respiratory

Blood Culture Identification

Gastrointestinal

Meningitis/ Encephalitis

Pneumonia

Disease-based antimicrobial stewardship emphasizes improving patient outcomes by optimizing antimicrobial use and increasing compliance with performance measures

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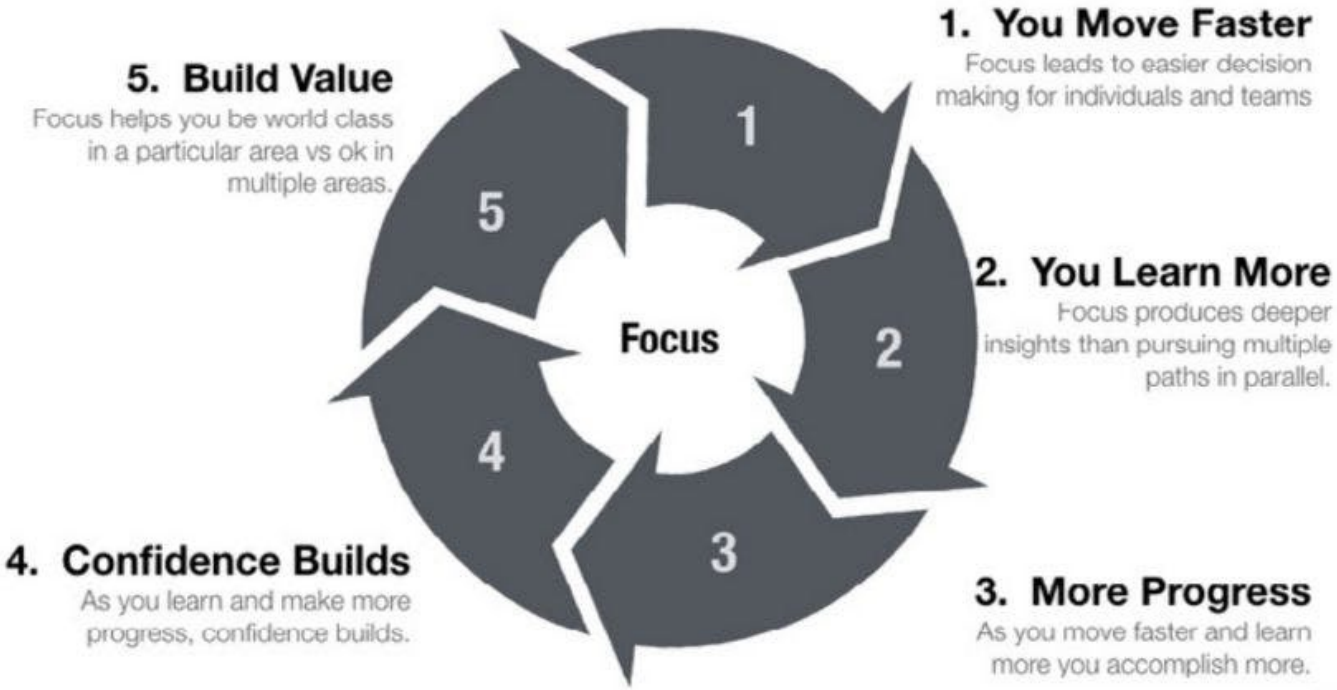
Advantages of Syndromic Stewardship

FOCUS

Define an area of need…

Multi-disciplinary

- Physicians (diagnosis)
- Laboratory (diagnostics)
- Pharmacy (antibiotics & order sets)
- Nursing (administration and assessment)



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Disease Specific Stewardship

IMPROVED CLINICAL OUTCOMES

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

WHY?
Mortality is already extremely high

LIMITED IMPACT ON CLINICAL OUTCOMES

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

WHY?
Mortality is lower

BUT…
Associated with increased antibiotic use

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~ *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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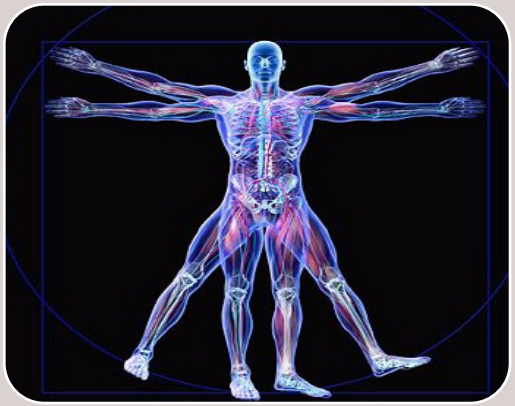

Pharmacy

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

Most Commonly Associated with CDI
Clindamycin
Fluoroquinolones
Piperacillin/Tazobactam
Cephalosporins

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

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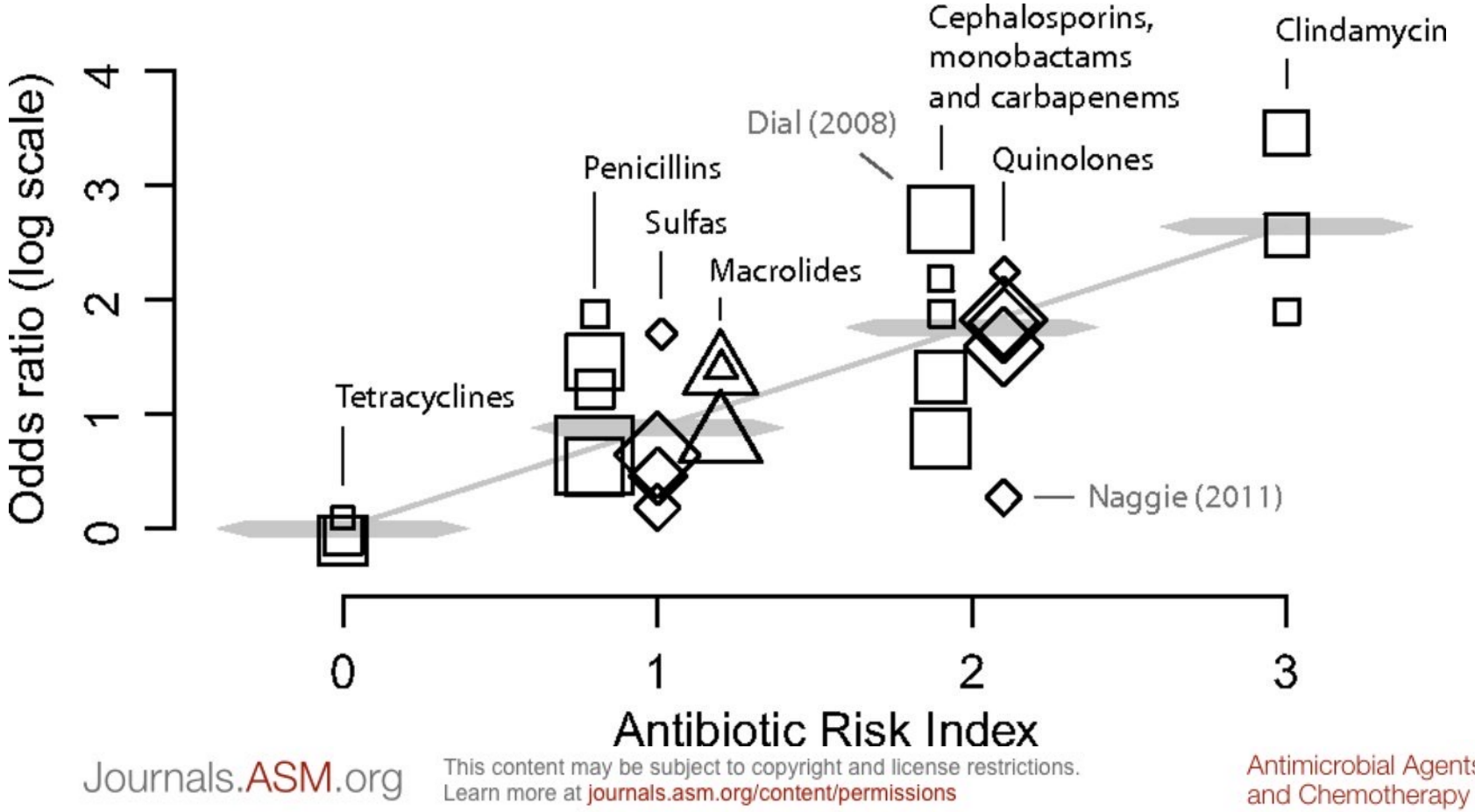
Olson MM, et al Infect Control Hosp Epidemiol 1994
Cohen SH, Infect Control Hosp Epidemiol 2010

Linear association between a 4-point antibiotic risk index and community-associated CDI risks.



Kevin A. Brown et al. Antimicrob. Agents Chemother. 2013; doi:10.1128/AAC.02176-12

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Open Forum Infectious Diseases

MAJOR ARTICLE

Predictors of Mortality Among a National Cohort of Veterans With Recurrent *Clostridium difficile* Infection

Haley J. Appaneal,[1,2,3] Aisling R. Caffrey,[1,2,3,4] Maya Beganovic,[1,2] Sanja Avramovic,[5] and Kerry L. LaPlante[1,2,3,6]

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

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

Proton Pump Inhibitors….

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

FDA U.S. FOOD & DRUG ADMINISTRATION

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[3], hypomagnesemia[2], and fractures of the hip, wrist, and spine[1]. 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. [1-3] 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.

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

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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.

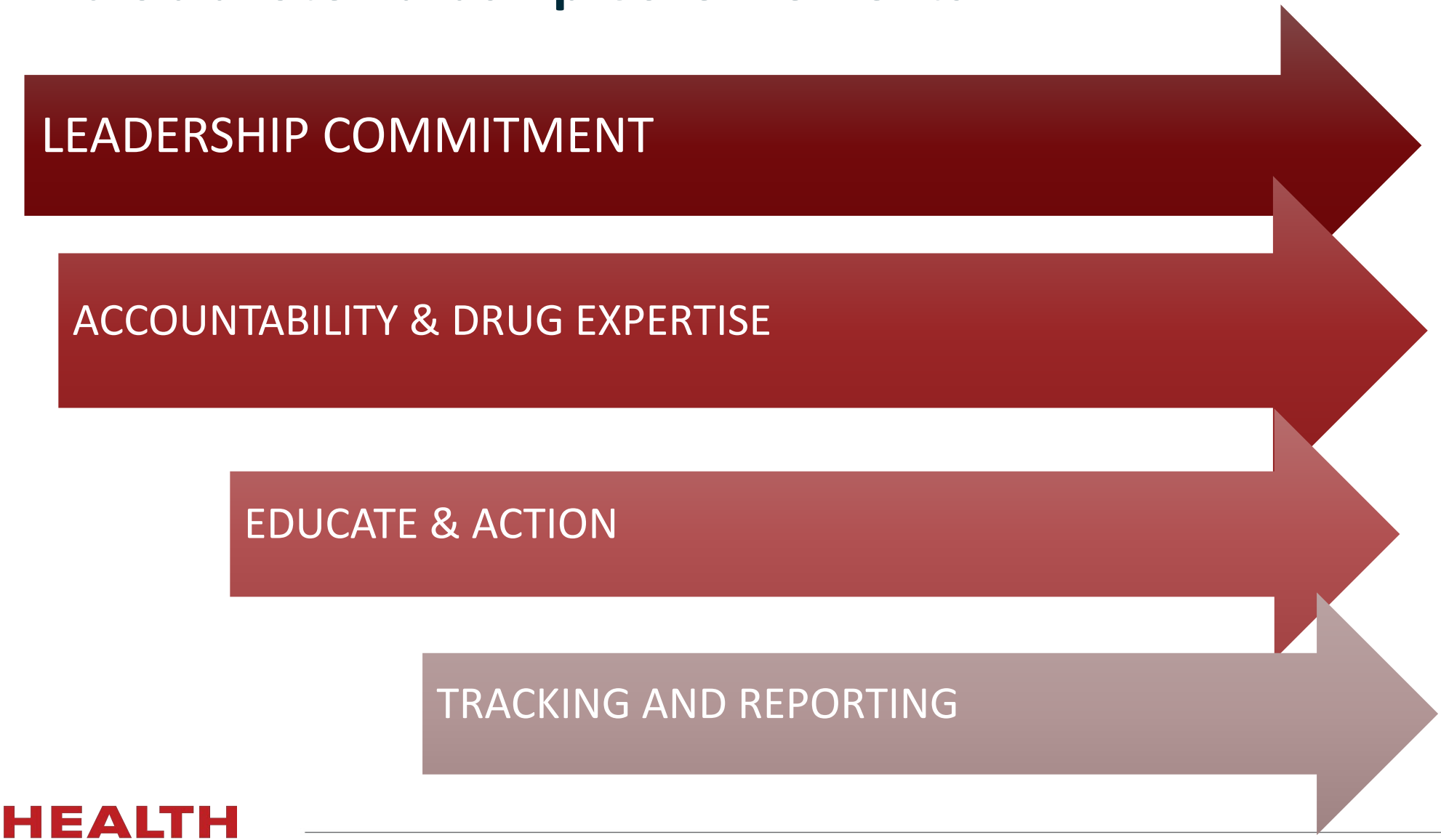
Core Elements of Hospital Antibiotic Stewardship Programs

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



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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

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https://www.cdc.gov/antibiotic-use/data/outpatient-prescribing/index.html, accessed September 2021

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

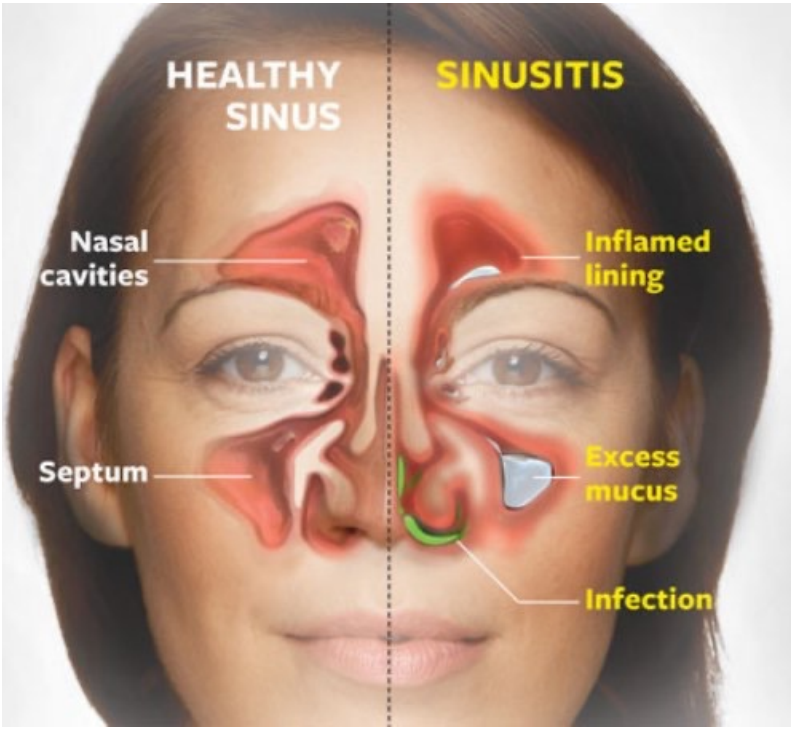
- Alert the provider if the indication of an antibiotic order is not provided

"Core Elements of Antibiotic Stewardship for Nursing Homes." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 30 Oct, 2018, https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html

Appendix PP State Operations Manual. Centers for Medicare and Medicaid Services, Revised 11/22/2017, https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/GuidanceforLawsAndRegulations/Downloads/Appendix-PP-State-Operations-Manual.pdf

Adult Treatment Recommendations

Condition	Epidemiology	Diagnosis	Management
Acute rhinosinusitis[1,2]	• 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.



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https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html Accessed: September 10, 2021

Adult Treatment Recommendations

Condition	Epidemiology	Diagnosis	Management
Pharyngitis[8,9]	• Group A beta-hemolytic streptococcal (GAS) infection is the only common indication for antibiotic therapy for sore throat cases. • Only 5–10% of adult sore throat cases are caused by GAS.	• Clinical features alone do not distinguish between GAS and viral pharyngitis; a rapid antigen detection test (RADT) is necessary to establish a GAS pharyngitis diagnosis • 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.	• Antibiotic treatment is NOT recommended for patients with negative RADT results. • Amoxicillin and penicillin V remain first-line therapy due to their reliable antibiotic activity against GAS. • For penicillin-allergic patients, cephalexin, cefadroxil, clindamycin, or macrolides are recommended. • GAS antibiotic resistance to azithromycin and clindamycin are increasingly common. • Recommended treatment course for all oral beta lactams is 10 days.

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https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/index.html Accessed: September 10, 2021

Viruses or Bacteria
What's got you sick?

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.

Common Condition	Common Cause			Are Antibiotics Needed?
	Bacteria	Bacteria or Virus	Virus	
Strep throat	✓			Yes
Whooping cough	✓			Yes
Urinary tract infection	✓			Yes
Sinus infection		✓		Maybe
Middle ear infection		✓		Maybe
Bronchitis/chest cold (in otherwise healthy children and adults)*		✓		No*
Common cold/runny nose			✓	No
Sore throat (except strep)			✓	No
Flu			✓	No

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

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https://www.cdc.gov/antibiotic-use/community/pdfs/aaw/AU_viruses-or-bacteria-chart_508.pdf

#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

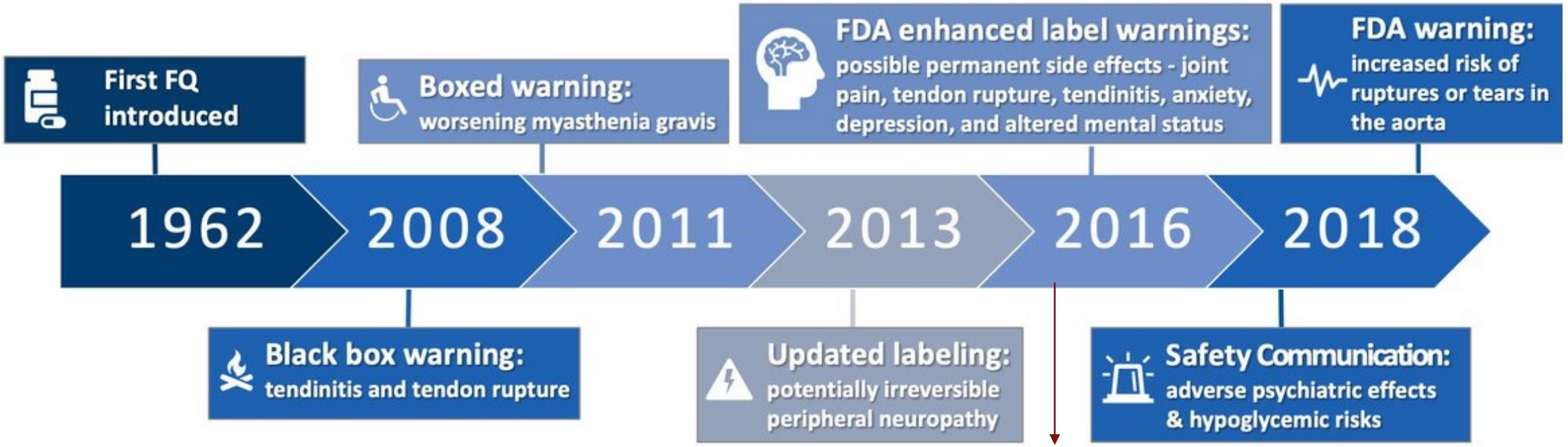
Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis. 2007;44 Suppl 2:S27-72.
Kalil AC, Metersky ML, Klompas M, et al. Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. Clin Infect Dis. 2016
Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2014;59(2):e10-52.

#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." U.S. Food and Drug Administration, Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 26 Oct. 2017, https://www.fda.gov/Drugs/DrugSafety/ucm511530.htm

The History of Fluoroquinolones



Risks outweigh the benefits for certain conditions including patients with uncomplicated **UTI**

https://www.fda.gov/Drugs/DrugSafety/ucm628753.htm
https://www.fda.gov/Drugs/DrugSafety/ucm511530.htm

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#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

Nicolle LE, Bradley S, Colgan R, et al. Clin Infect Dis. 2005;40(5):643-54.
Loeb M, Bentley DW, Bradley S, et al.. Infect Control Hosp Epidemiol. 2001; 22(2): 120-124.
"Suspected UTI SBAR Form, June 2014, https://www.ahrq.gov/sites/default/files/wysiwyg/nhguide/4_TK1_T1-SBAR_UTI_Final.pdf
Loeb M, Brazil K, Lohfield L et al.. BMJ. 2005 Sep 24;331(7518):669.

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Adult Treatment Recommendations

Condition	Epidemiology	Diagnosis	Management
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 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

Thompson ND, LaPlace L, Epstein L, et al.. J Am Med Dir Assoc. 2016 Dec 1;17(12):1151-1153.
Albert X, Huertas I, Pereiró II, et al. Cochrane Database Syst Rev. 2004;(3):CD001209.
Giannella M, Tedeschi S, Bartoletti M, et al. Expert Rev Anti Infect Ther. 2016;14(2):219-30.
Ahmed H, Davies F, Francis N, et al. BMJ Open. 2017 May 29;7(5):e015233.

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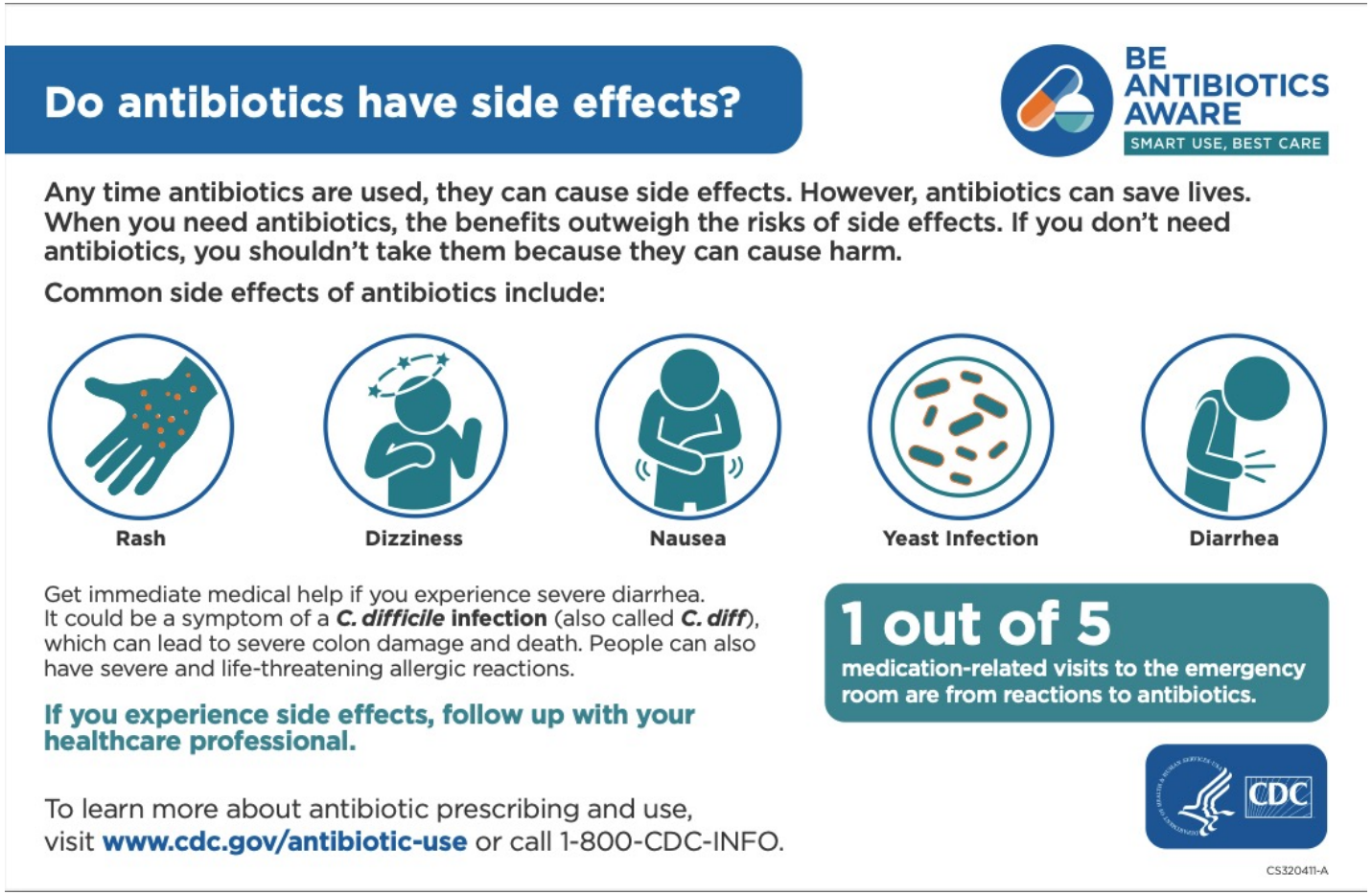
Patients requesting Antibiotics?

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



Do antibiotics have side effects?

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

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. difficile* infection** (also called ***C. 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.

1 out of 5
medication-related visits to the emergency room are from reactions to antibiotics.

To learn more about antibiotic prescribing and use, visit **www.cdc.gov/antibiotic-use** or call 1-800-CDC-INFO.

CDC

CS320411-A

KNOWLEDGE CHECKS

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

Question 2

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

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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

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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

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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
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

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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

CDC. Core Elements of Hospital Antibiotic Stewardship Programs. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. Available at https://www.cdc.gov/antibiotic-use/core-elements/hospital.html.

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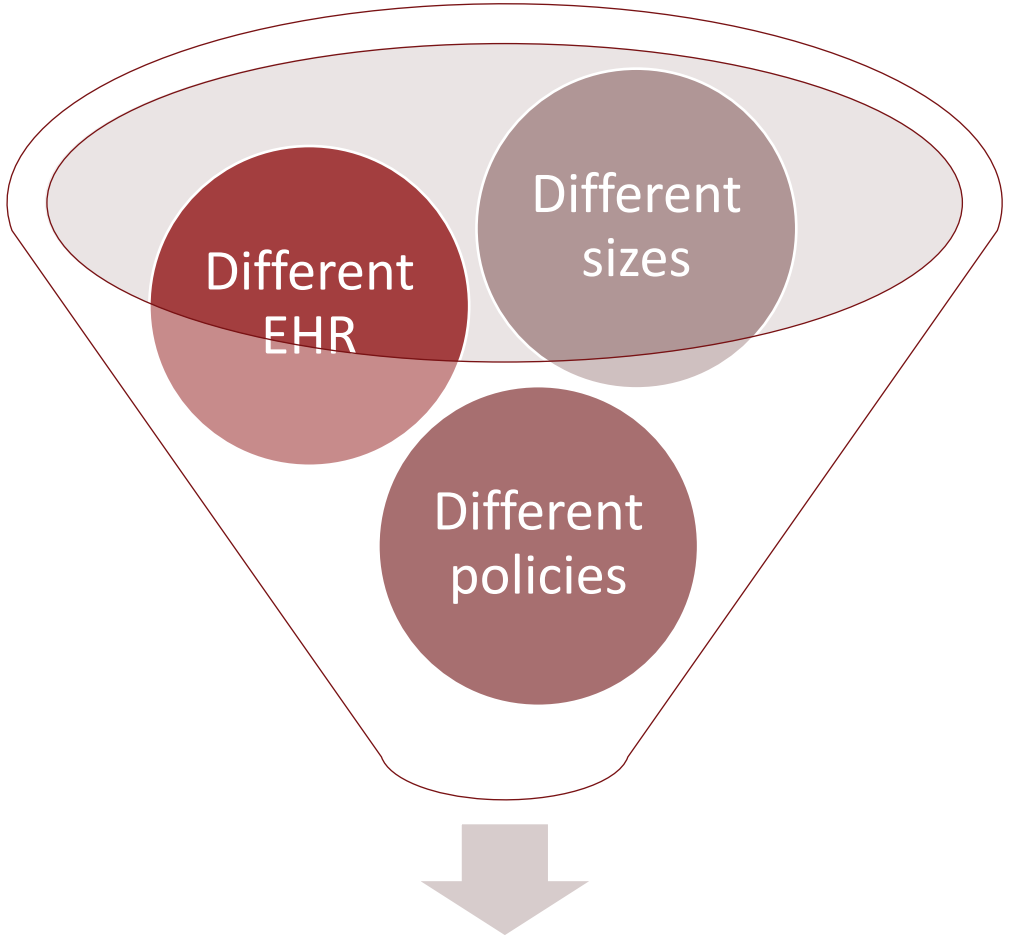
GENERAL CHALLENGES OF SYSTEM-LEVEL WORK



EHR: electronic health record

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ATRIUM HEALTH

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

FTE: full time equivalent

Logan, et al. *The Joint Commission journal on quality and patient safety*. 2019; 45:591–599

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

Logan, et al. *The Joint Commission journal on quality and patient safety*. 2019; 45:591–599

ATRIUM HEALTH - Outcomes

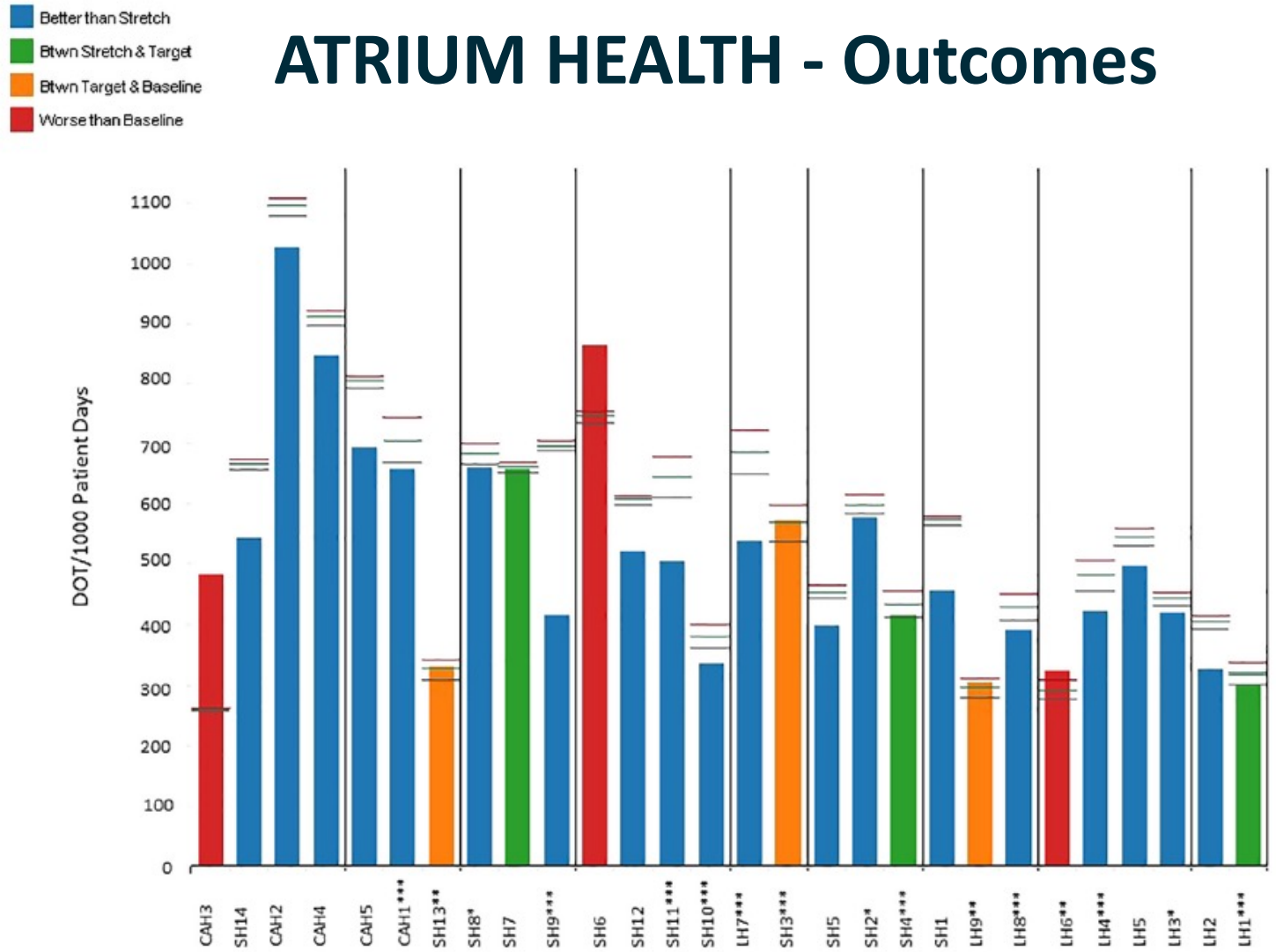

Figure 1: Bar graph of cumulative antibiotic days of therapy (DOT) for 2016 by facility in relation to baseline (red line), target goal (green line), and stretch goal (blue line). Bar graphs are color coded by goal achievements (blue: stretch goal achieved; green: target goal achieved; orange: decreased 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.

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Logan, et al. *The Joint Commission journal on quality and patient safety*. 2019; 45:591–599

BJC HEALTHCARE

Location	Midwest
System	13 acute care facilities 46.2% ≤200 beds
System-Level Resources	0.35 FTE ID physician 0.6 FTE clinical pharmacist 0.5 FTE RN • 60 members system-wide

Lane MA, et al. *Am J Health Syst Pharm*. 2019;76(1):34-43.

Table 1. BJC HealthCare System Hospitals

Hospital	Type	No. Staffed Beds	Approximate Pharmacist FTE[a]	Approximate Physician FTE[a]
A	Urban academic adult tertiary care	1,342	1.0	0.5
B	Suburban community	497	0.2	0.01
C	Suburban community	485	0.8	0.01
D	Suburban community	397	0.2	0.05
E	Urban academic pediatric tertiary care	280	1.0	0.5
F	Suburban community	216	0.5	0.05
G	Suburban community	206	0.03	0.01
H	Rural critical access	133	0.05	0.01
I	Suburban community	127	0.25	0.01
J	Suburban community	113	0.2	0.05
K	Suburban community	72	0.25	0.01
L	Suburban community	67	0.5	0.05
M	Rural critical access	35	0.02	0.01

[a]FTE = full-time equivalent.

Lane MA, et al. *Am J Health Syst Pharm*. 2019;76(1):34-43.

BJC HEALTHCARE

System-Level Structure	Bimonthly system wide meeting
Opportunities	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

DRG: diagnosis related group

Lane MA, et al. *Am J Health Syst Pharm*. 2019;76(1):34-43.

AVERA HEALTH

Location	Midwest (rural)
System	33 acute care facilities
System-Level Resources	ID physician (medical director) ID pharmacist (pharmacy lead) AVP Hospital Pharmacy (administrative lead)

AVP: assistant vice president

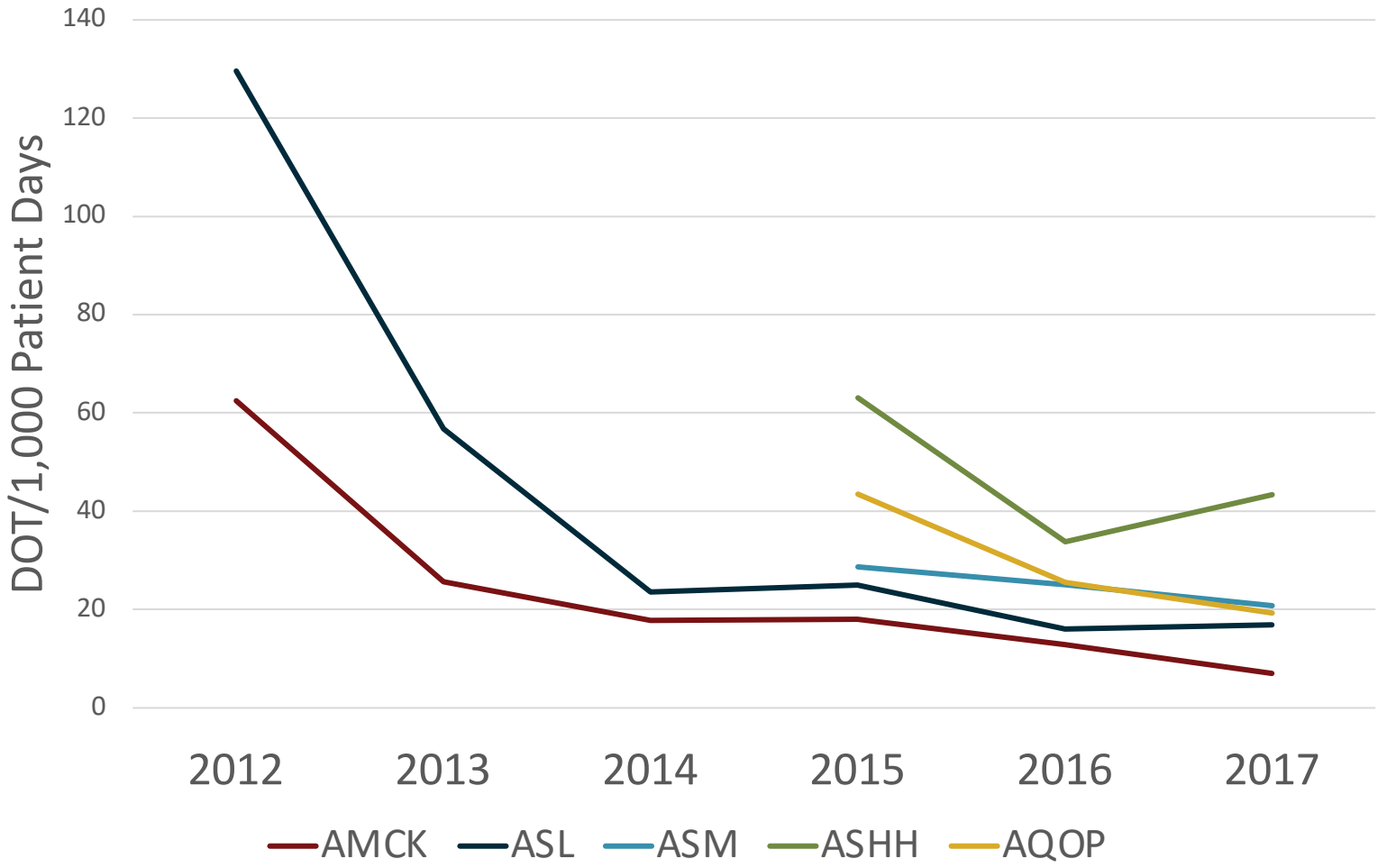
Laible BR, et al. *Am J Health Syst Pharm*. 2019;76(2):108-113.

AVERA HEALTH

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

Laible BR, et al. *Am J Health Syst Pharm*. 2019;76(2):108-113.

Levofloxacin DOT/1,000 Patient Days



[a]AMCK = Avera McKennan Hospital and University Health Center, ASL = Avera St. Luke's, ASM = Avera St. Mary's, ASHH = Avera Sacred Heart, AQOP = Avery Queen of Peace, NA = not available.

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Laible BR, et al. *Am J Health Syst Pharm*. 2019;76(2):108-113.

UNIFYING FACTORS

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

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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

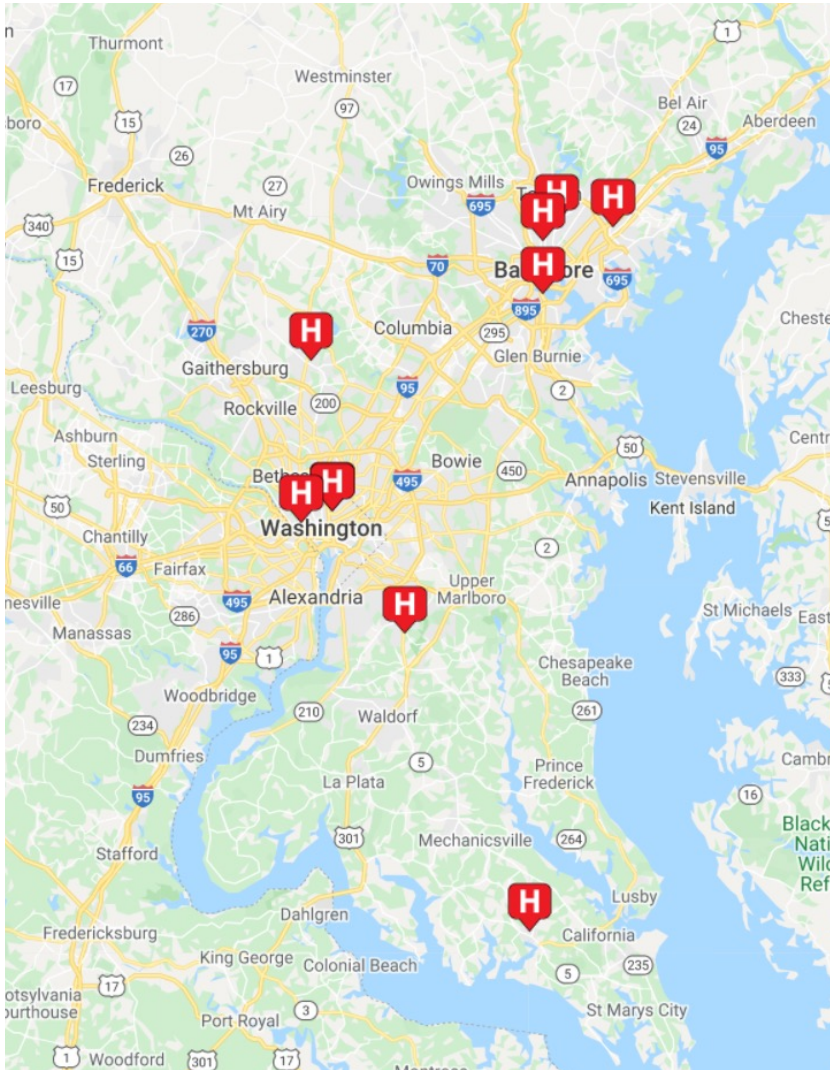
MEDSTAR HEALTH

Not-for-profit

Baltimore-Washington, D.C.

10 hospitals

- 9 acute care
- 1 rehabilitation facility



MEDSTAR HEALTH

Acute Care Hospital	Type	No. Staffed Beds
1	Suburban teaching	338
2	Urban teaching	394
3	Suburban community teaching	214
4	Urban teaching	131
5	Suburban community	104
6	Rural	93
7	Rural	178
8	Urban teaching	185
9	Urban teaching	769

UNIFYING FACTORS

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

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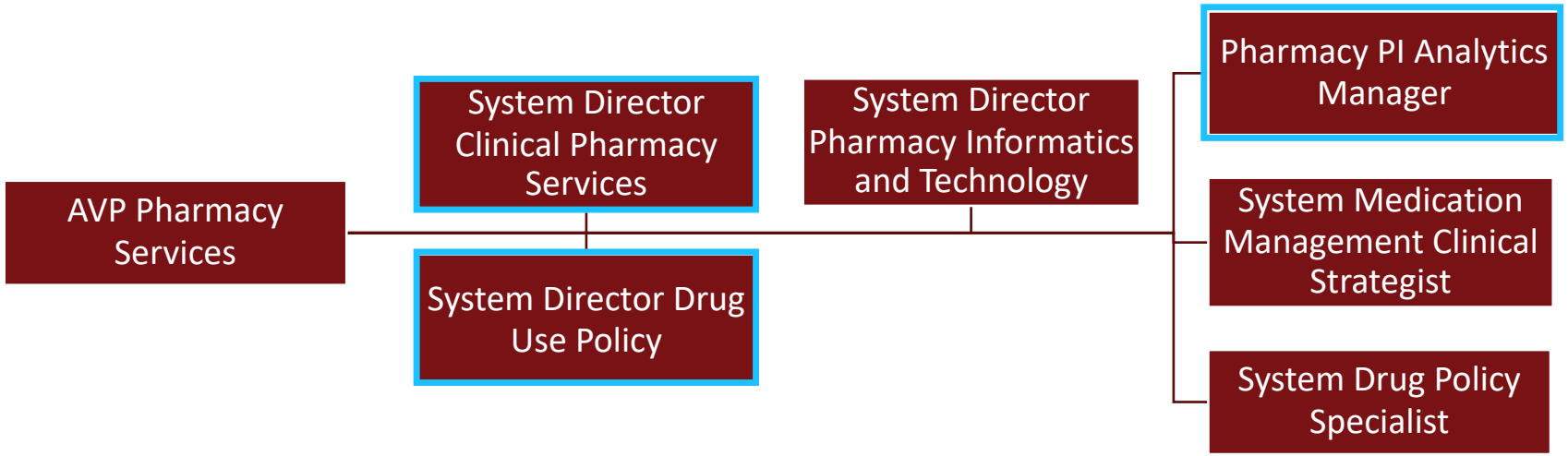
CORPORATE PHARMACY STRUCTURE



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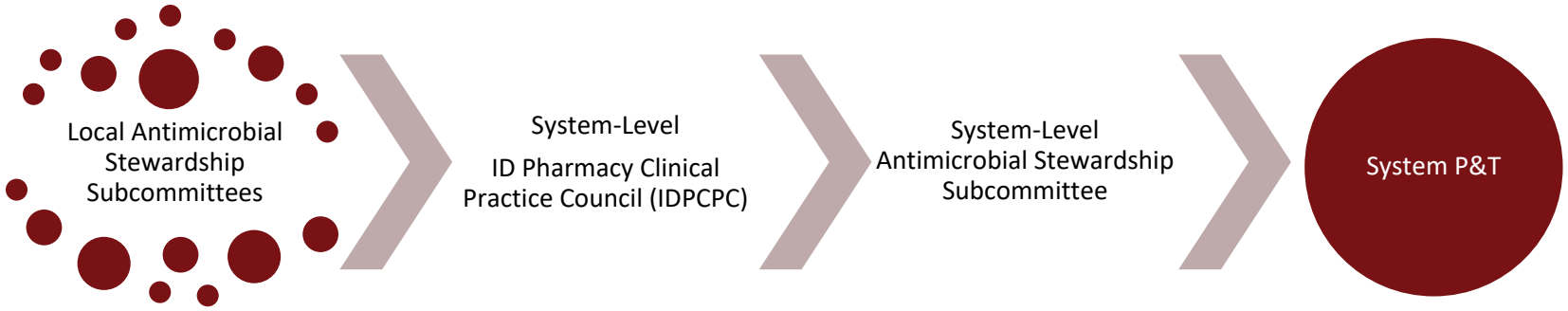
SYSTEM ASP STRUCTURE



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

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

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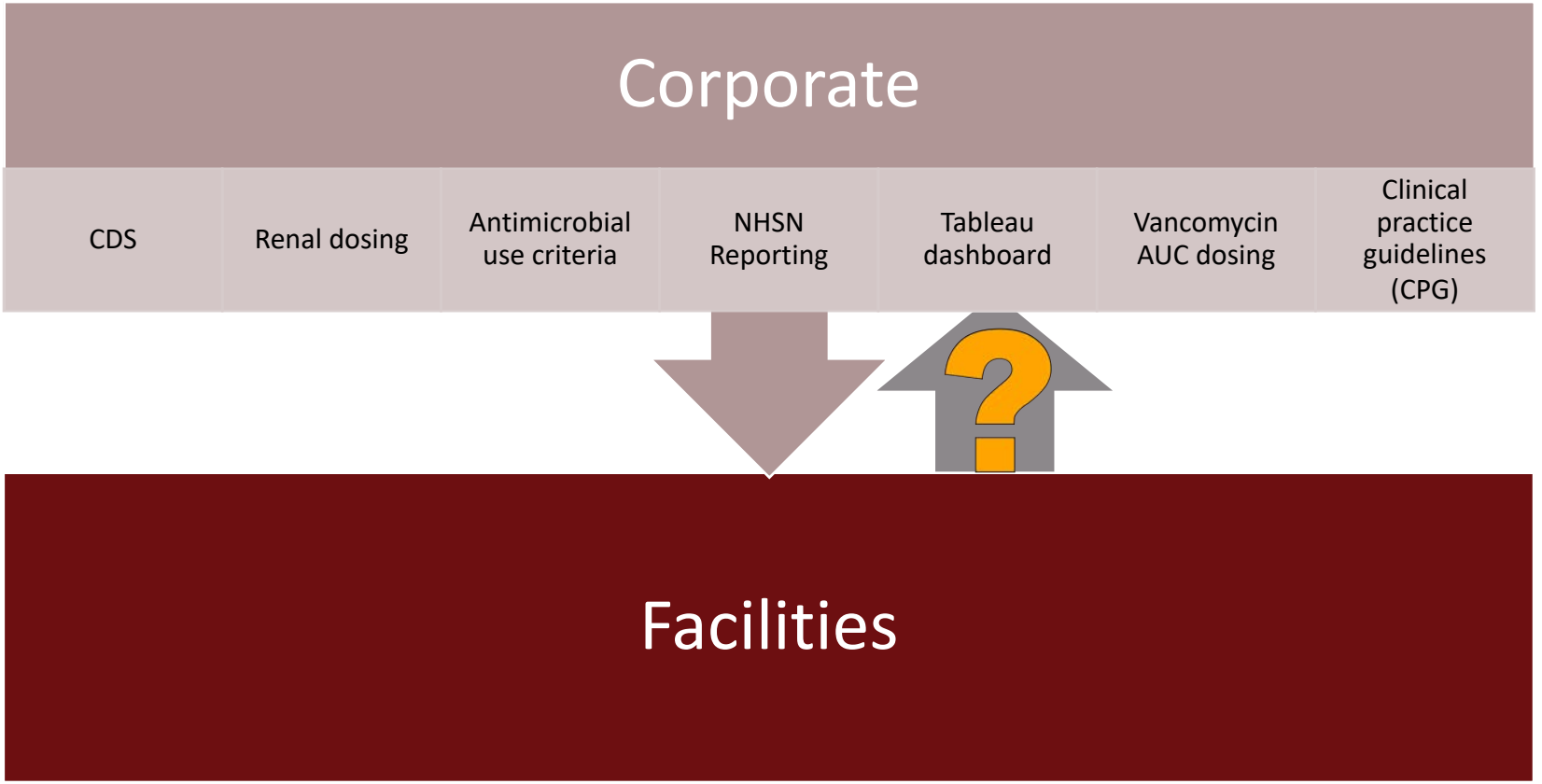
CORPORATE TO FACILITIES



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UNIFYING FACTORS

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

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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

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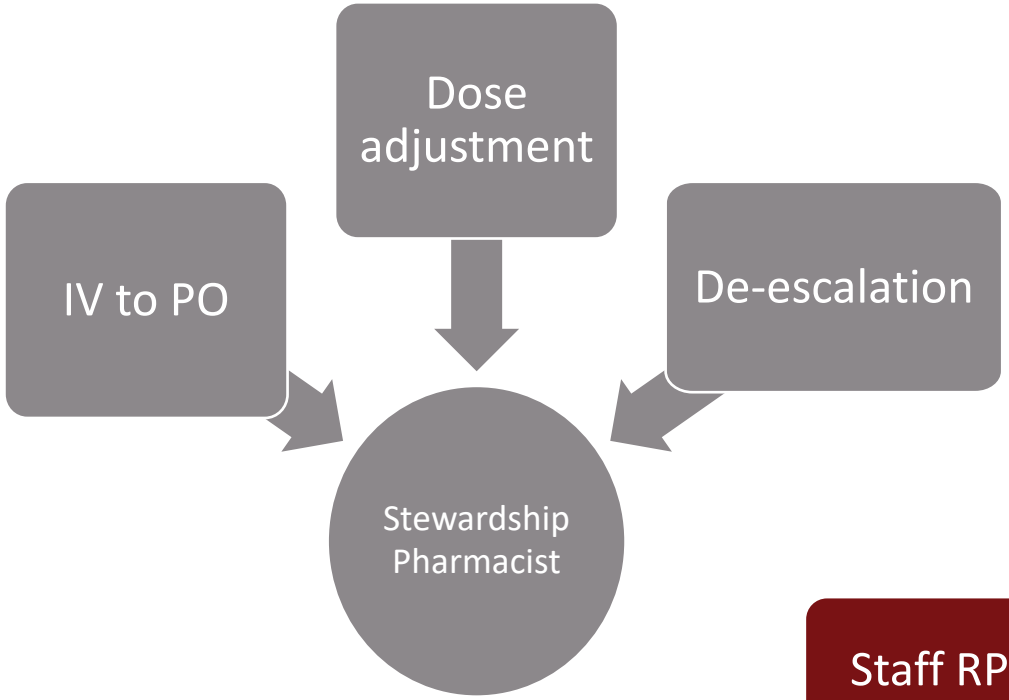
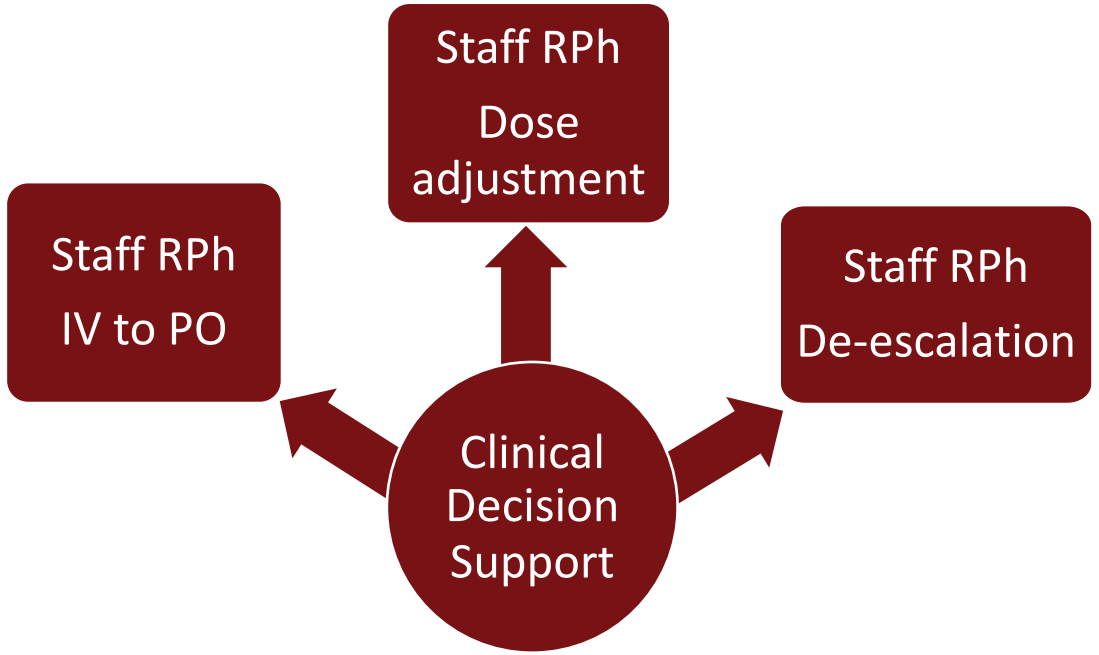
MAXIMIZING/CREATING RESOURCES





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UNIFYING FACTORS

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

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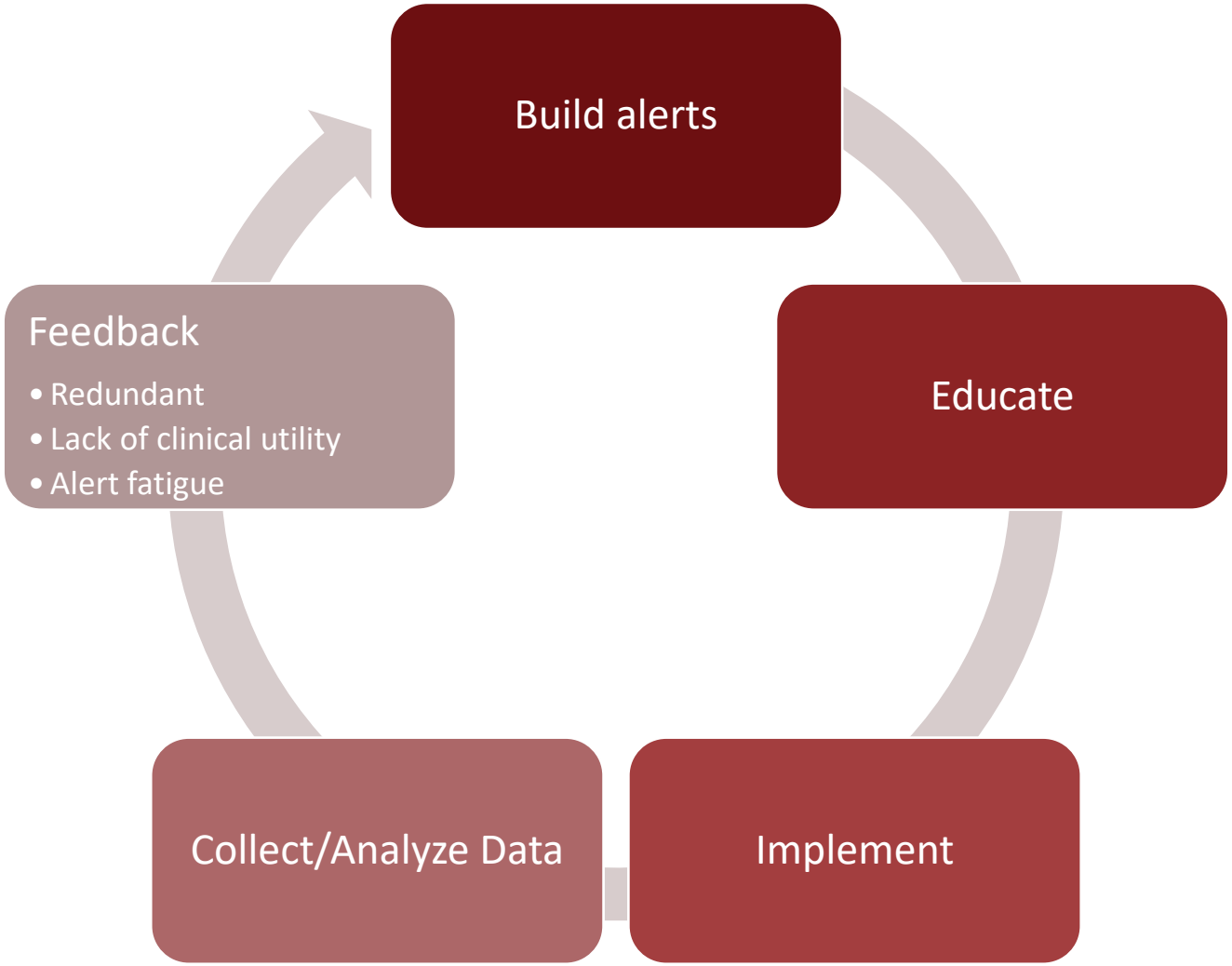
OPTIMIZING TECHNOLOGY



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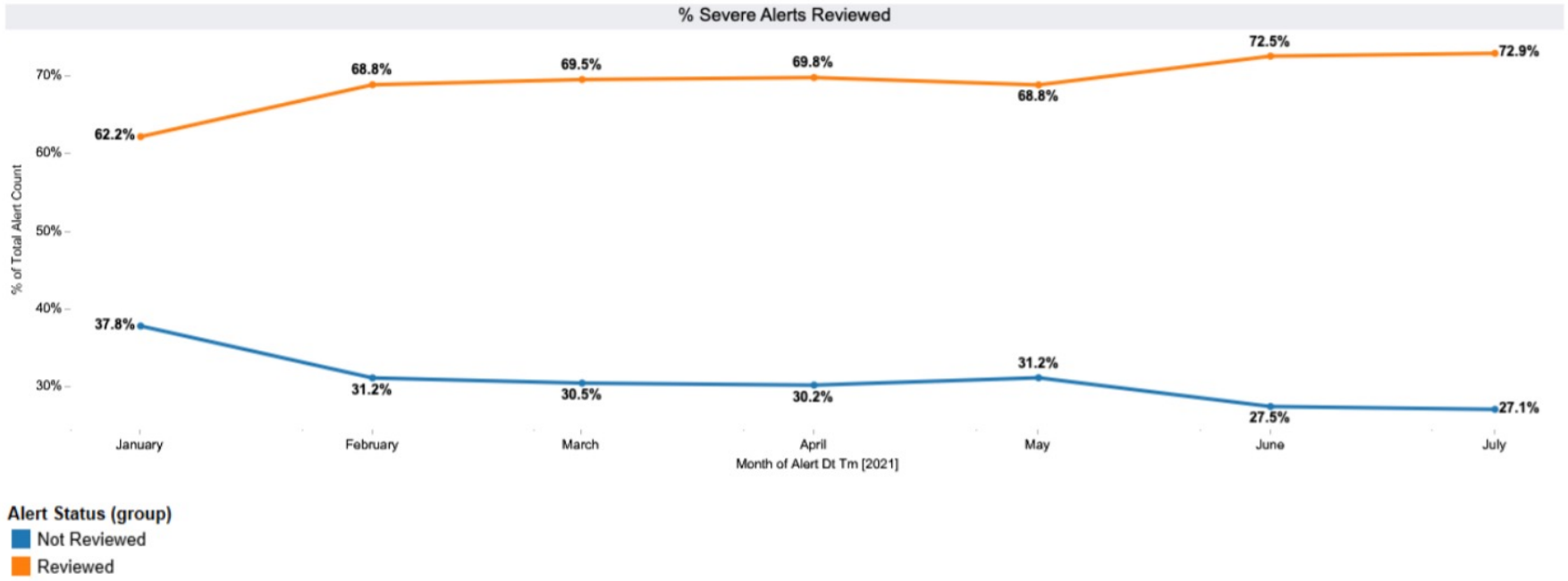
OPTIMIZING TECHNOLOGY



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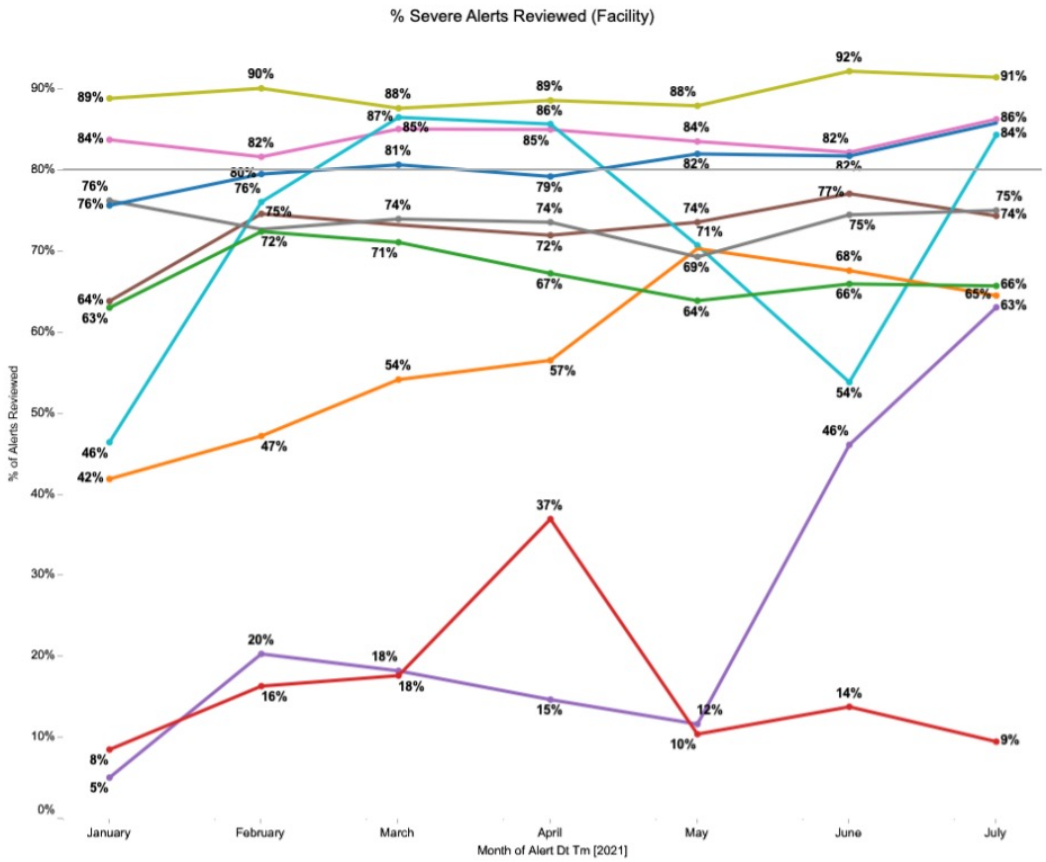
OPTIMIZING TECHNOLOGY

Improvements made when held accountable with data



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UNIFYING FACTORS

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

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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

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AUC: area under the curve; GPO: group purchasing organization

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Vancomycin Dosing: Patient Demographics

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

Facility
(All)

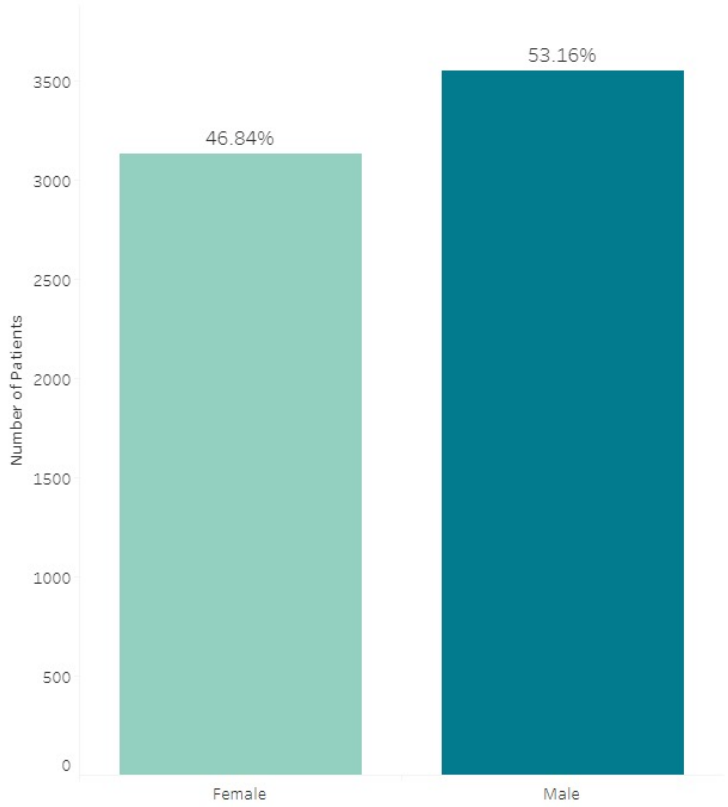
Days of Therapy
>1 DOT

Days Between
Last Dose & Max SCr
-98 3

Initial SCr and Post Outcomes
(All)

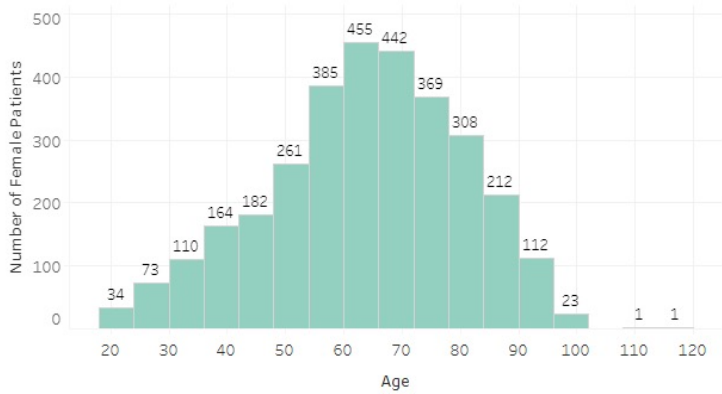
Patient Gender Distribution

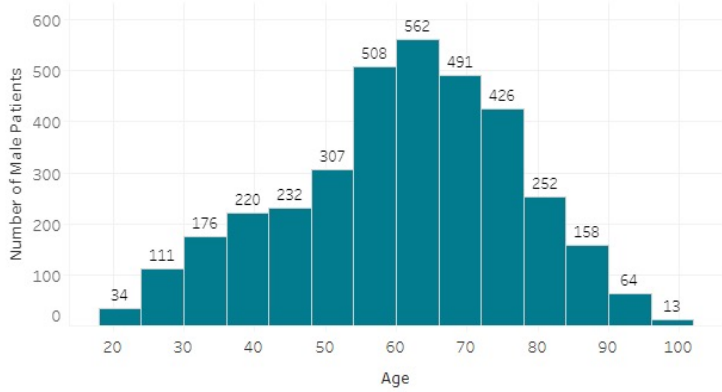
Sex	Min Age	Average Age	Median Age	Max Age	# Patients
Female	18	63	64	118	3,132
Male	18	60	62	99	3,554
Grand Total	18	62	63	118	6,686



Summary of Vancomycin Levels Taken

Property	Value
Number of Levels	15,247
Levels Per Patient	2.3
Number of Patients with 1 Level	1,992
Number of Patients with 2+ Levels	3,295





Patient BMI Distibution

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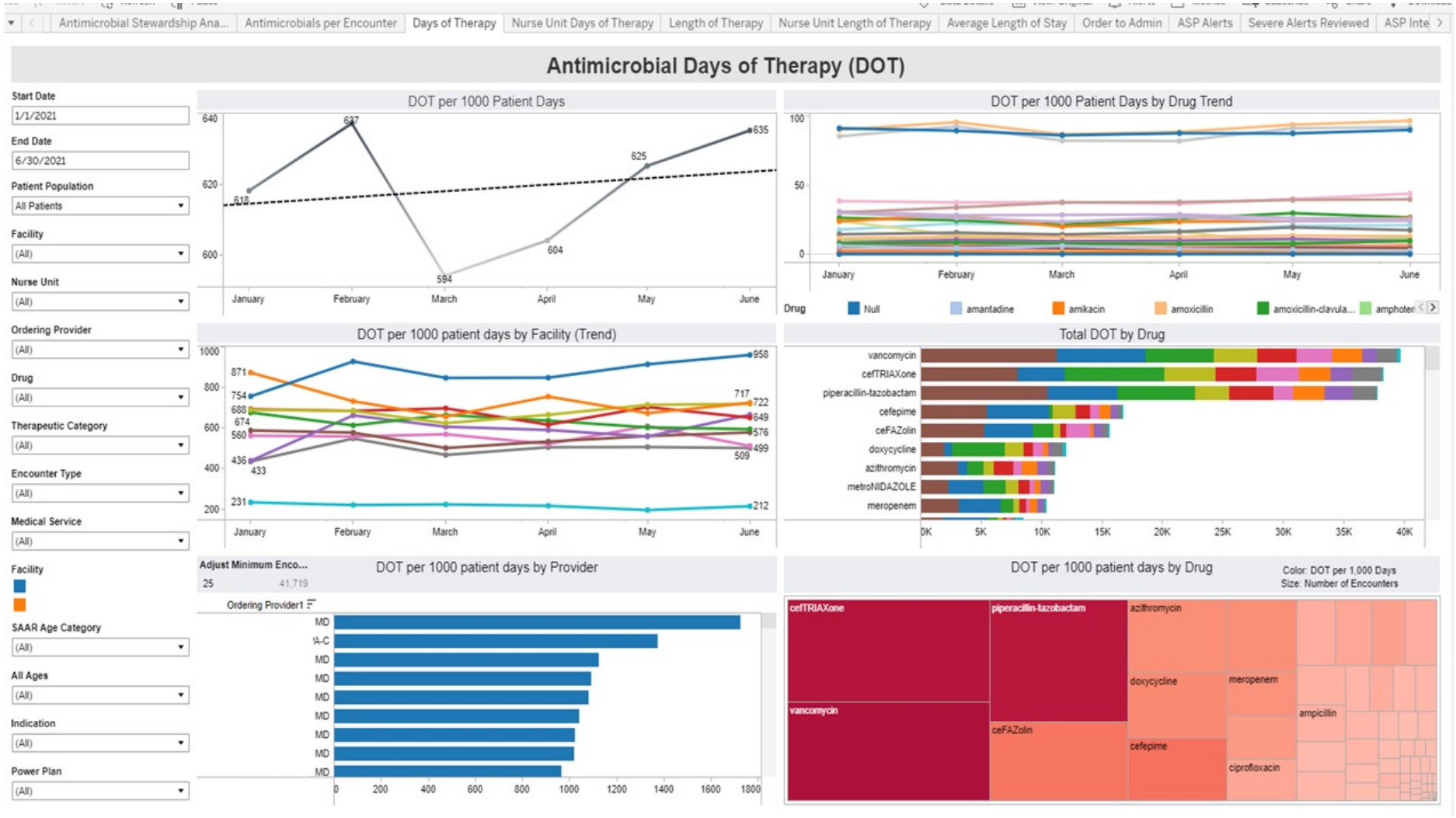
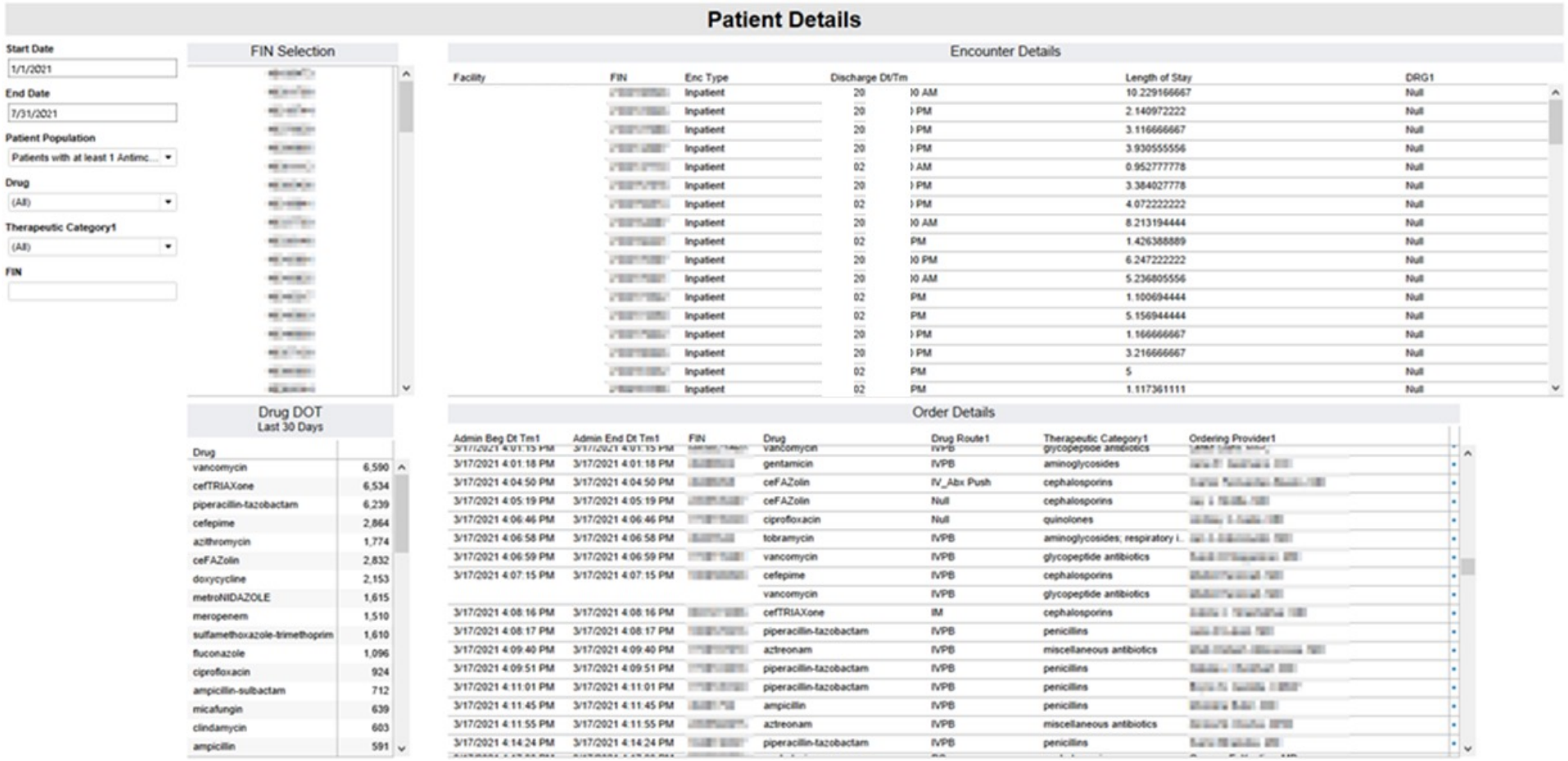




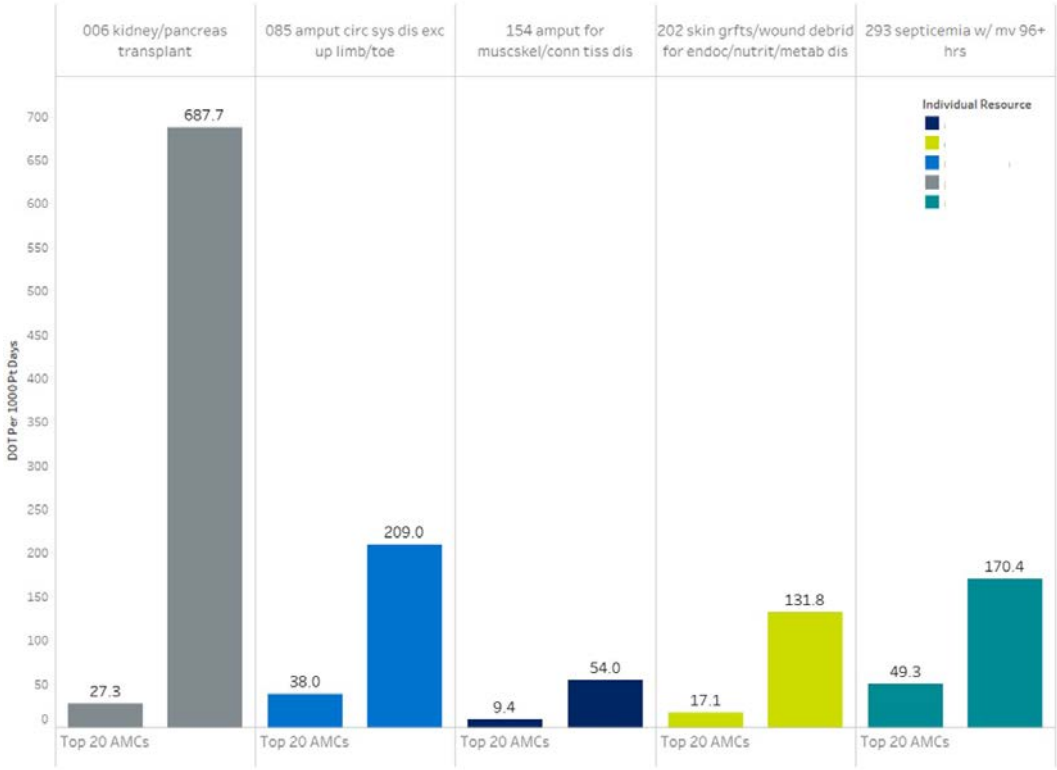
External Benchmarking

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



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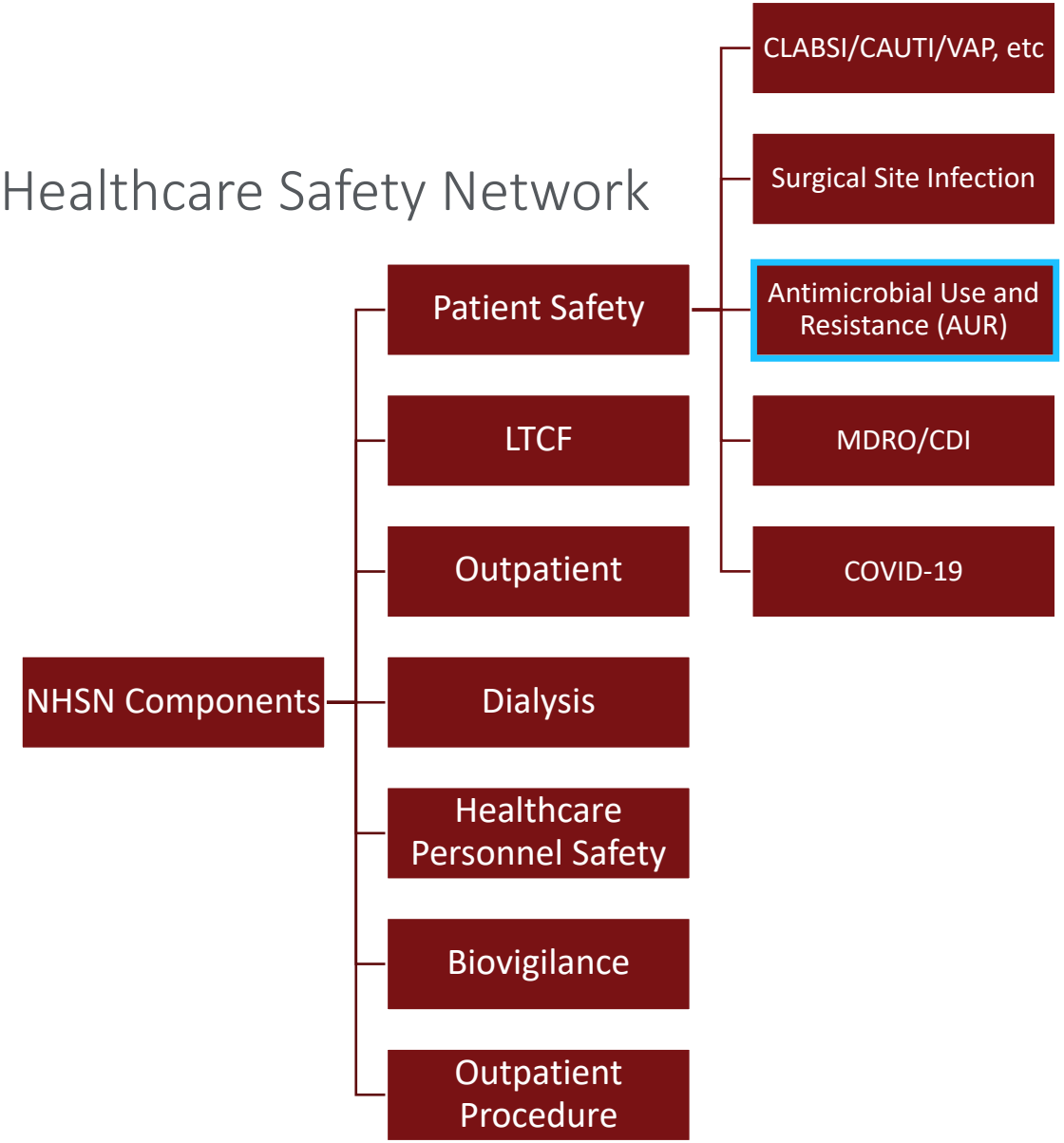
NHSN

National Healthcare Safety Network



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

https://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf

NHSN - Metrics

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

$$\frac{Drug\ specific\ antimicrobial\ days\ per\ patient\ care\ location\ per\ month}{Days\ present\ per\ \boldsymbol{patient\ care\ location}\ per\ month} \times 1000$$

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

Antimicrobial days per 100 admissions

$$\frac{Drug\ specific\ antimicrobial\ days\ for\ inpatient\ units\ in\ a\ facility\ per\ month}{Admissions\ per\ \boldsymbol{facility\ wide\ inpatient}\ per\ month} \times 100$$

https://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf

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

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

https://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf. Version Feb 2021.

NHSN – SAAR

Standardized Antimicrobial Administration Ratio

$$SAAR = \frac{Observed\ antimicrobial\ use}{Predicted\ antimicrobial\ use}$$

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

https://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf. Version Feb 2021.

NHSN – SAAR

Standardized Antimicrobial Administration Ratio

$$SAAR = \frac{Observed\ antimicrobial\ use}{Predicted\ antimicrobial\ use}$$

$SAAR > 1$	$SAAR = 1$	$SAAR < 1$
• Observed > Predicted • + statistical significance = over-use?	• Observed = Predicted • Appropriate use?	• 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*

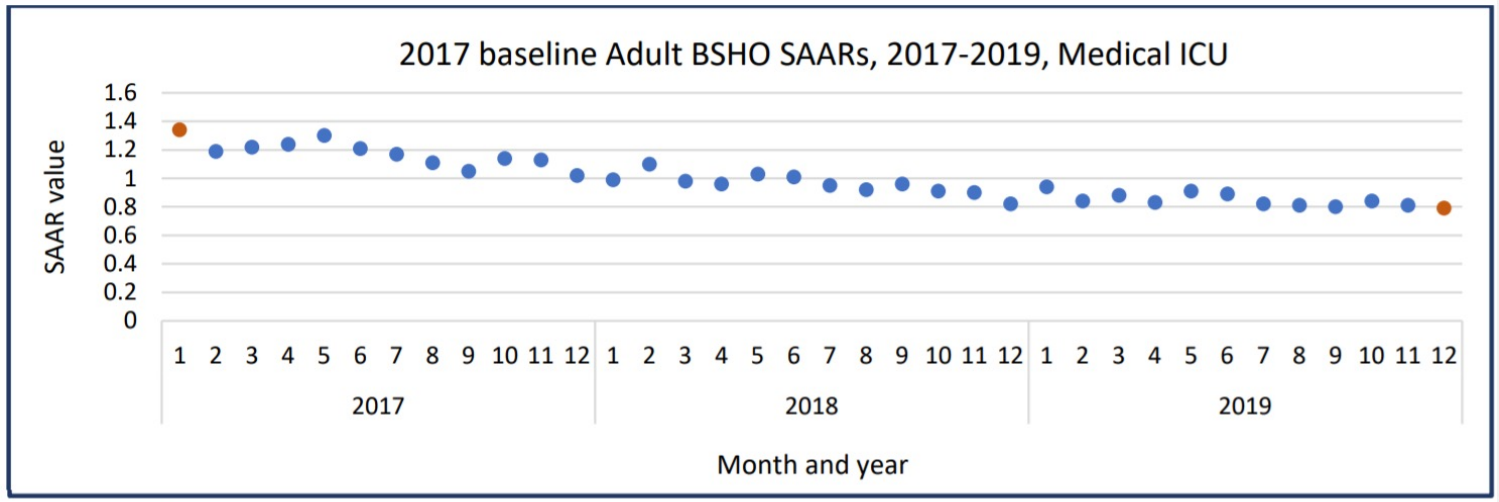
Adult SAAR Location Type	Adult SAAR Antimicrobial Agent Categories						
	All Antibacterial	BSHO	BSCA	GramPos	NSBL	CDI	Antifungal
Medical ICUs	0.985	0.979	0.900	1.009	0.915	1.126	0.868
Medical-Surgical ICUs	0.971	1.007	0.873	0.915	0.959	0.958	0.890
Surgical ICUs	0.947	0.943	0.977	0.896	0.817	1.087	1.102
Medical Wards	0.983	0.983	0.942	0.941	1.024	0.992	0.905
Medical-Surgical Wards	0.999	1.088	0.910	0.943	1.078	0.979	0.948
Surgical Wards	0.985	1.044	0.988	0.963	0.873	1.046	1.022
Step Down Units	0.934	0.933	0.879	0.900	0.972	0.938	0.834
General Hematology-Oncology Wards	1.043	1.051	0.991	1.011	1.055	1.078	1.009

*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.

https://www.cdc.gov/nhsn/pdfs/datastat/2019-AU-Report-508.pdf
https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

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.

https://www.cdc.gov/nhsn/pdfs/datastat/2019-AU-Report-508.pdf
https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf

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Knowledge Check

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?

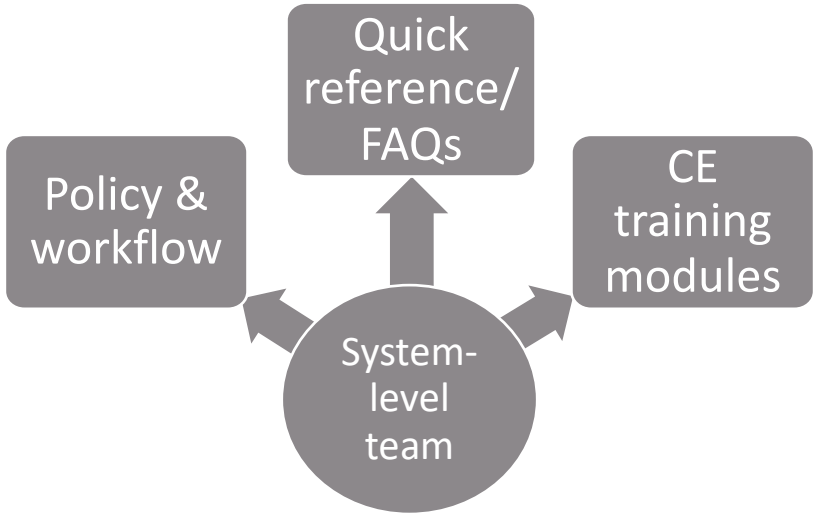
A. A SAAR value significantly lower than the national SAAR distribution may be concerning for under-use
B. The use of significantly fewer anti-MRSA agents at Top Health is indicative of successful stewardship efforts
C. A statistically significant SAAR value less than 1 indicates overuse of antibiotics
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

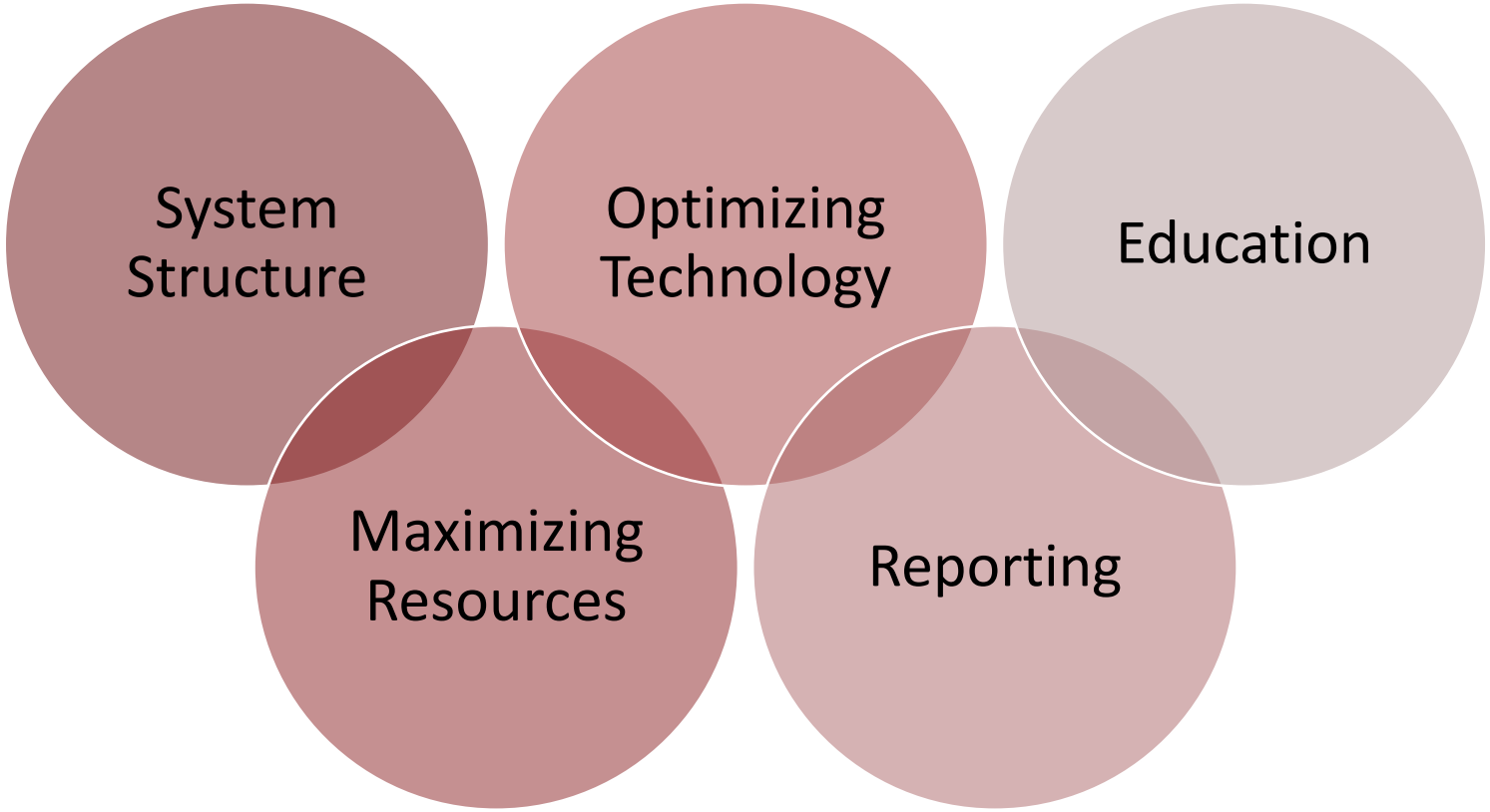
New Initiative



General

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

Summary



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	Reporting	Education

• CDS
• Web-conferencing technology
• Use data for performance improvement
	• Local benchmarking
	  • Tableau dashboard
	  • Vendor supported analytics
	• National benchmarking
	  • NHSN AU/AR
	  • GPO database
		• Institution tuition support
		• Local/regional/national conferences
		• Online certificates
		• Annual symposium
		• Newsletter
		• Internally developed CE

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ANTIMICROBIAL STEWARDSHIP

SYSTEM-LEVEL INTERVENTIONS

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