All Aboard the (Steward)Ship!

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WVU Medicine

APIC Conference
September 2024

Let’s get to know one another!

- In which setting do you work?
  A. Inpatient Acute Care Hospital
  B. Inpatient Critical Access Hospital
  C. Long-Term Acute Care Hospital
  D. Skilled Nursing Facility
  E. Other

I am a…

A. Nurse
B. Advanced Practice Provider
C. Physician
D. Pharmacist
E. Other

How much of your time is dedicated to direct antimicrobial stewardship activities?

A. 100% - I lead AMS efforts at my practice sites
B. 75%
C. 50%
D. 25%
E. I do not practice in AMS efforts

What do you hope to learn today?

A. The fundamentals of antimicrobial stewardship
B. How to start an antimicrobial stewardship program
C. How to maintain & improve existing antimicrobial strategies
D. How to collaborate with existing antimicrobial stewardship programs
E. Everything!

Objectives

- Define antimicrobial stewardship
- Review the importance and role of antimicrobial stewardship in various healthcare settings
- Describe effective strategies for implementing and maintaining antimicrobial stewardship programs
- Discuss collaboration efforts of antimicrobial stewardship and infection prevention programs

The 5W1H of the Steward*ship*

Who

What

When

Where

How

What is Antimicrobial Stewardship?

Stewardship:

the job of supervising or taking care of something

Antimicrobial Stewardship:

Consensus definition (IDSA, SHEA, PIDS):

"Coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen including dosing, duration of therapy, and route of administration."

Fishman N. *Infect Control Hosp Epidemiol* 2012; 33:322-7.

What is Antimicrobial Stewardship?

Right antimicrobial for the right pathogen, at the right dose & route, for the right duration

Promoting <u>appropriate</u> use of antimicrobials

Dellit TH,. *Clin Infect Dis.* 2007 Jan 15;44(2):159-77.

Benefits of antimicrobial stewardship

Reduces:

- Development of multi-drug resistant organisms
- Adverse drug events
- Hospital length of stay
- Collateral damage (including *Clostridiodies difficile* infections)
- Healthcare costs

Baroudi. *Fed Pract* 2015 Sep; 32(9): 20-24

What's the problem?

Lackluster antimicrobial prescribing

- **~30%** of antibiotics prescribed in U.S hospitals are unnecessary or suboptimal

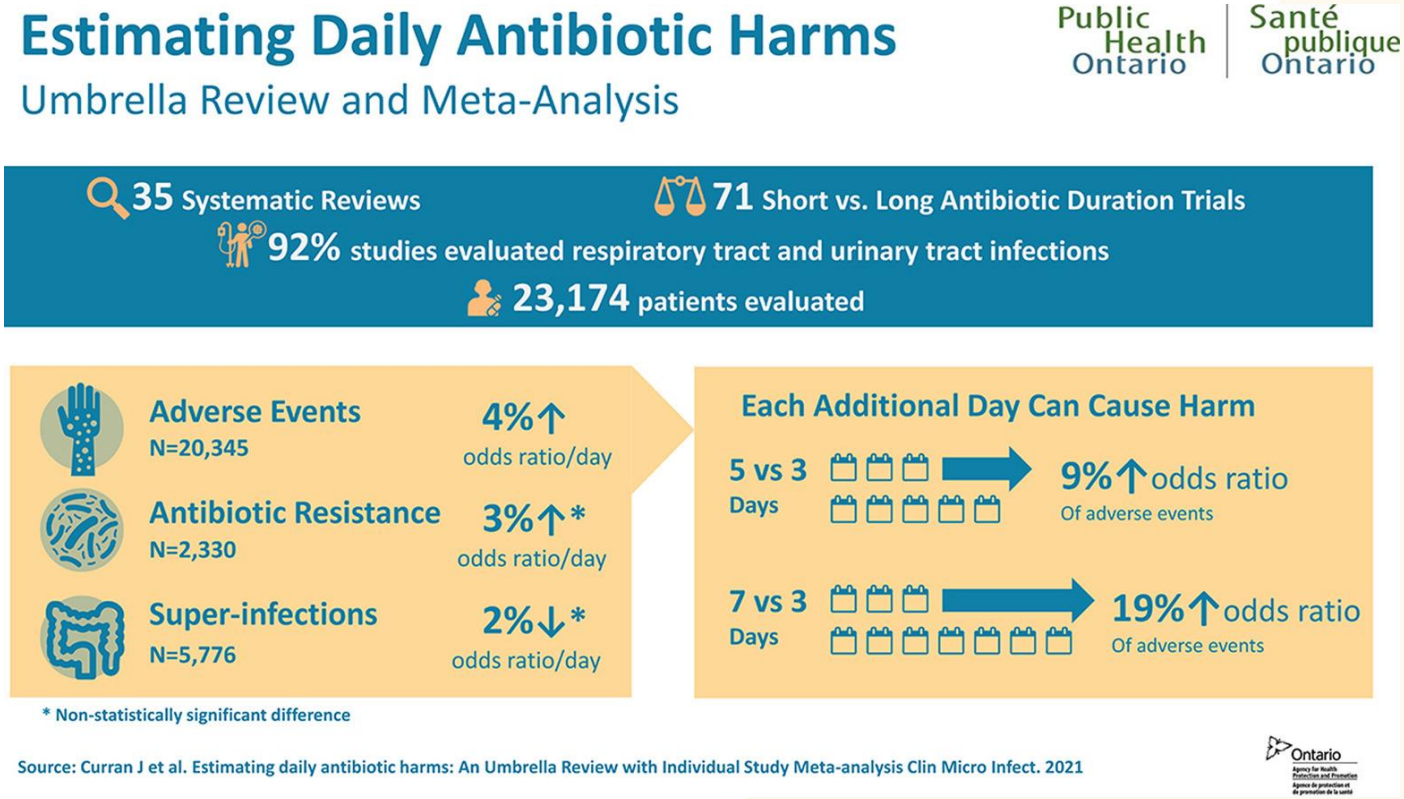
Increasing antimicrobial resistance

- Antimicrobial resistance is a **global** threat
  - > 2.8 million AR infections/year
- In 2019, U.S observed decrease in AR deaths by 18% overall and 30% in hospitals
- Lost progress due to COVID-19, but rebounding

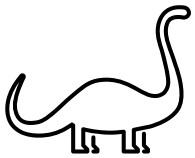
Dellit TH,. *Clin Infect Dis.* 2007 Jan 15;44(2):159-77.
Teshome. *Pharmacotherapy*. 2018; 39(3) 261-270
CDC. COVID-19: U.S. Impact on Antimicrobial Resistance, Special Report 2022.
CDC. Antibiotic Resistance Threats in the United States, 2019.

What's the problem?

Adverse drug events



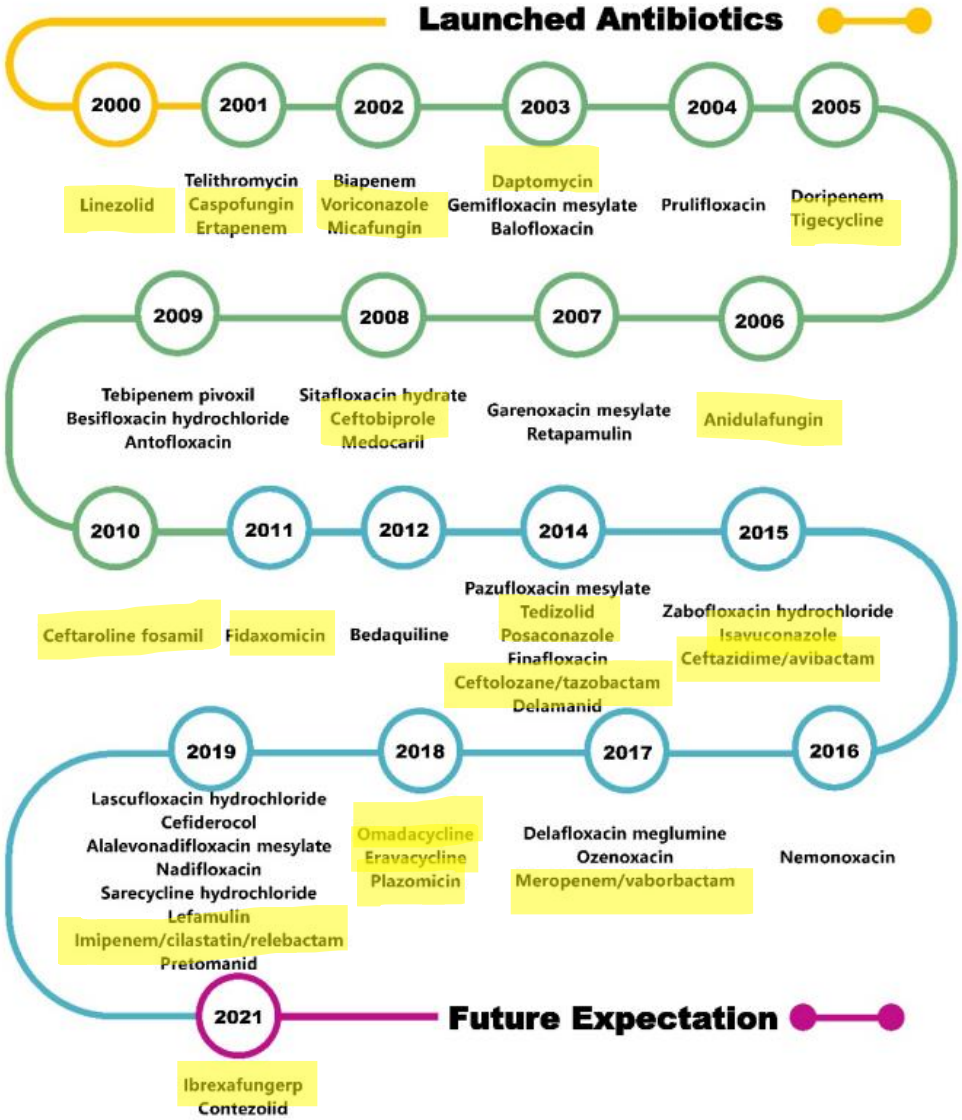
What's the problem?



Decreased resources for the future

"*We must perceive antimicrobials as they are: a non-renewable and endangered resource*"

Huttner et al. *Antimicrob Resist Infect Control*. 2013 doi: 10.1186/2047-2994-2-31



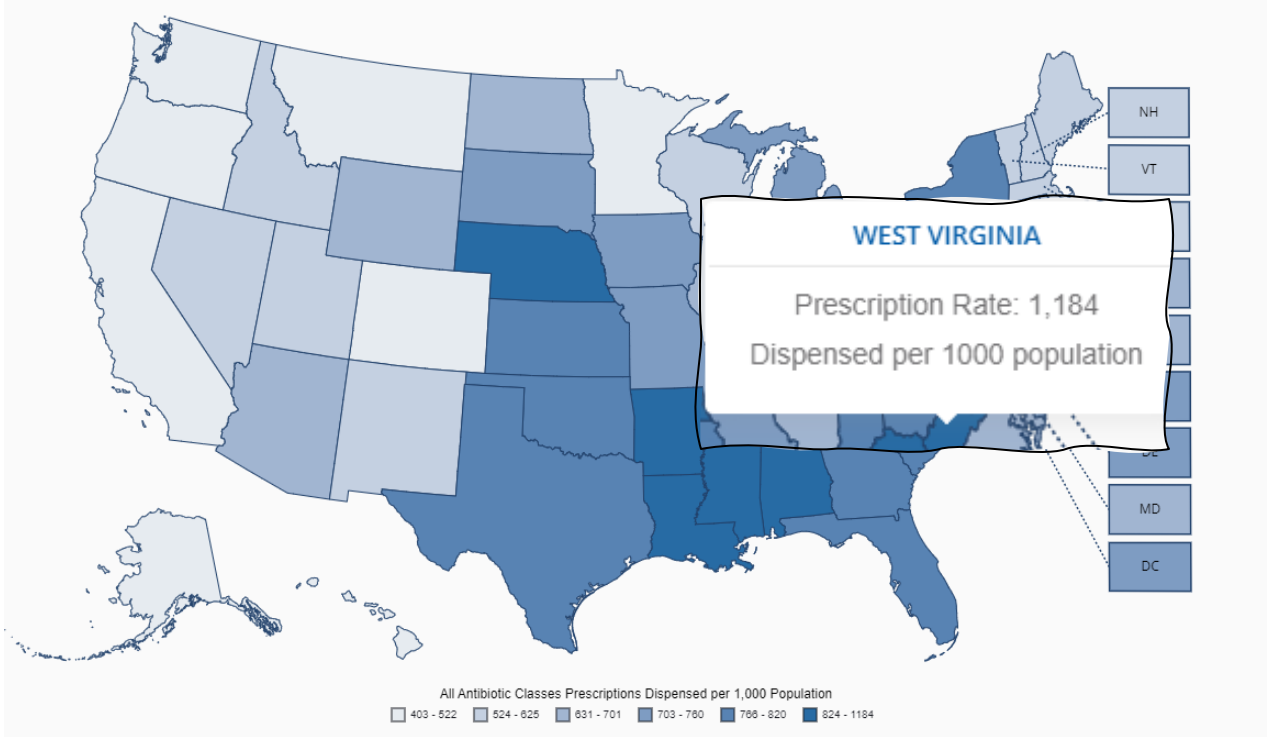
2022 – 2024:

- Ceftobiprole (U.S.)
- Pevmecillinam (U.S.)
- Sulbactam-durlobactam
- Cefepime-enmetazobactam

Shi. *Molecules.* 2023 Feb; 28(4): 1762

What about our state of West Virginia?

Outpatient antibiotic prescription rates: 2022

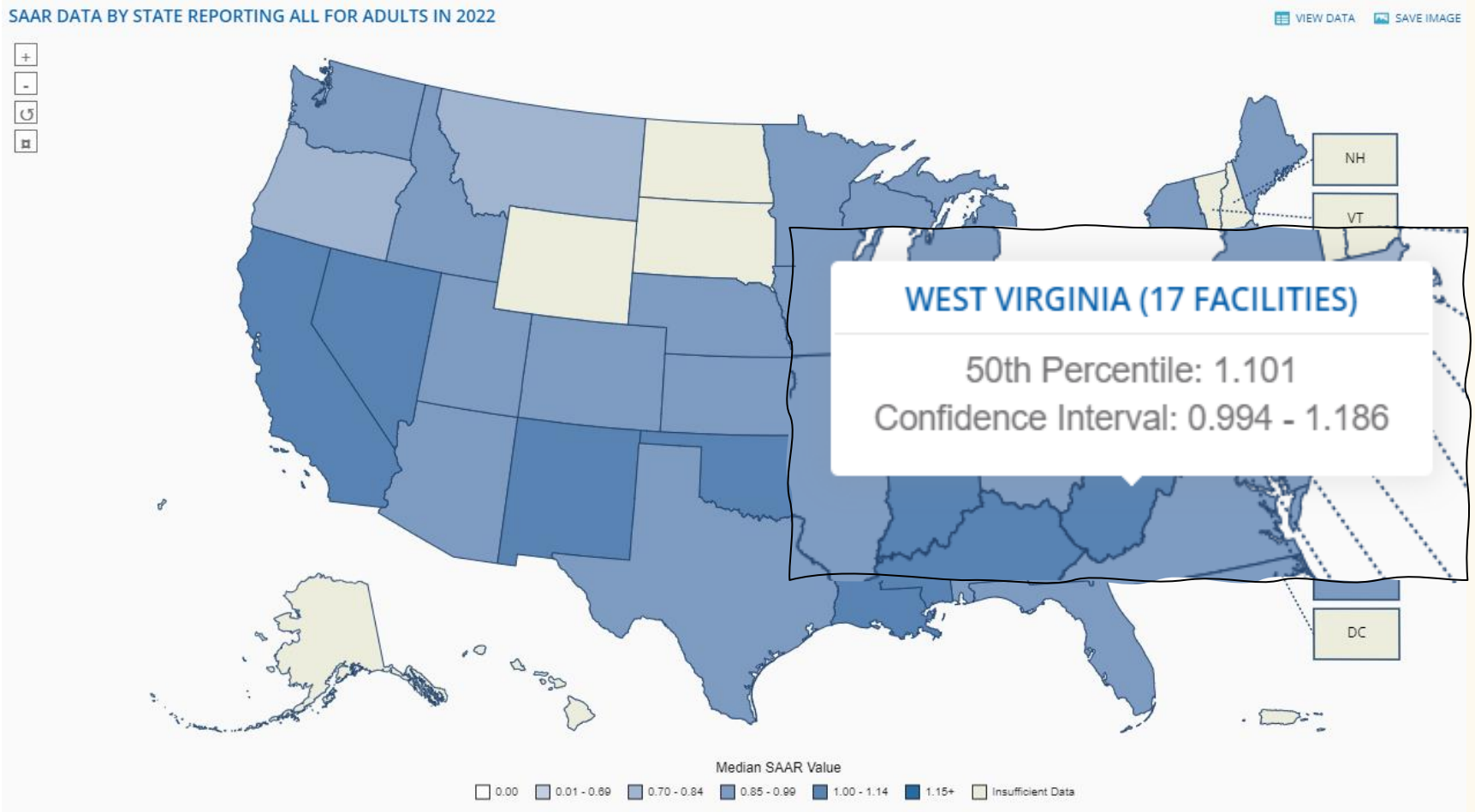


National average:
709/1000

1 – WV 1,184/1,000 population
2 – MS 1,149/1,000 population
3 – LA 1,066/1,000 populations

Centers for Disease Control and Prevention (CDC). Antibiotic Prescribing and Use. Available at: https://arpsp.cdc.gov/profile/antibiotic-use/all-classes. [accessed July 10, 2024]

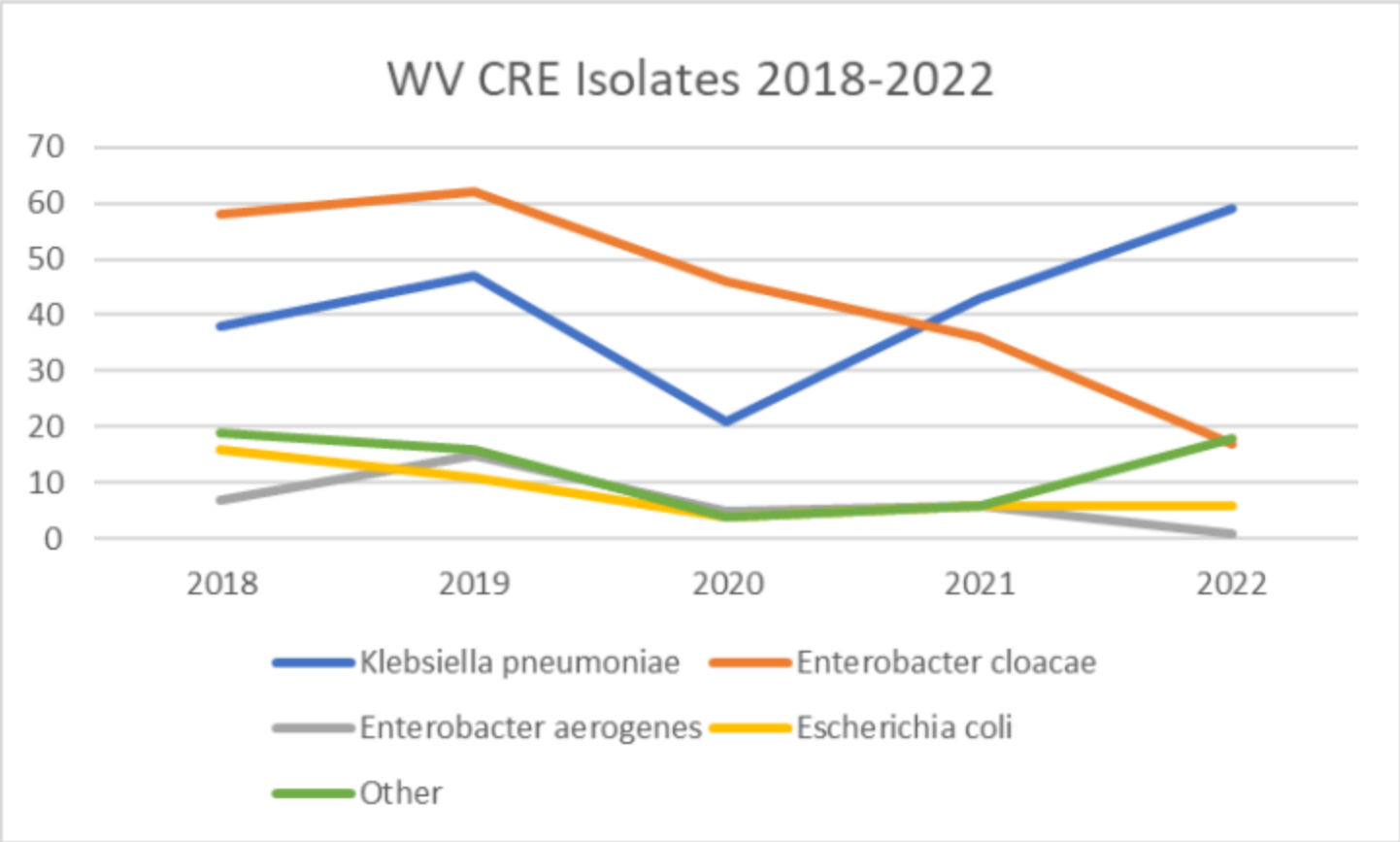
Inpatient antimicrobial use: 2022



Centers for Disease Control and Prevention (CDC). Antibiotic Prescribing and Use. Available at: https://arpsp.cdc.gov/profile/inpatient-antibiotic-use/all. [accessed July 10, 2024]

Carbapenem Resistant Organisms in West Virginia

Figure 2.1, CRE Isolates Statewide, West Virginia, 2018-2022



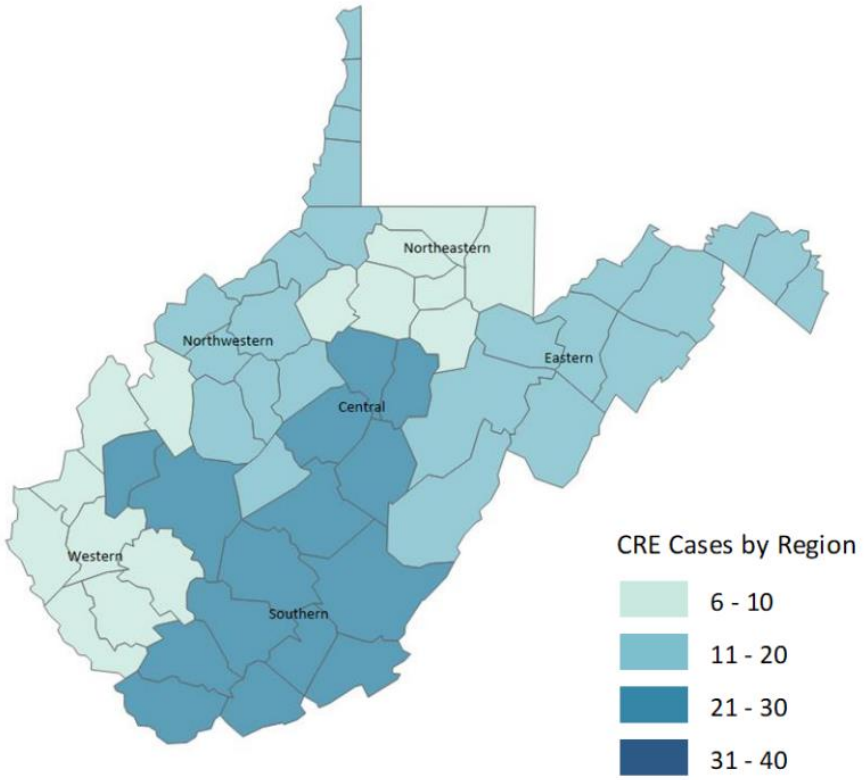
West Virginia Department of Health. CRE Surveillance Report. https://oeps.wv.gov/cre/Documents/Data/2018_2022_cre_report.pdf [Accessed July 10, 2024].

Carbapenem Resistant Organisms in West Virginia

Table 2.1, CRE Incidence Statewide, West Virginia, 2018-2022

	Total Cases	Population in 2020	Incidence Rates (Per 100,000)
2018	N = 133	1,793,716	0.74
2019	N = 150	1,793,716	0.84
2020	N = 80	1,793,716	0.45
2021	N = 97	1,793,716	0.54
2022	N = 101	1,793,716	0.56

Figure 3.5, CRE Incidence by Surveillance Region, 2022 (N=101)



WVUMedicine

West Virginia Department of Health. CRE Surveillance Report. https://oeps.wv.gov/cre/Documents/Data/2018_2022_cre_report.pdf [Accessed July 10, 2024].

The 5W1H of the Steward*ship*

Who

What

When

Where

How

Who is responsible for antimicrobial stewardship?

Everyone is an antimicrobial steward!

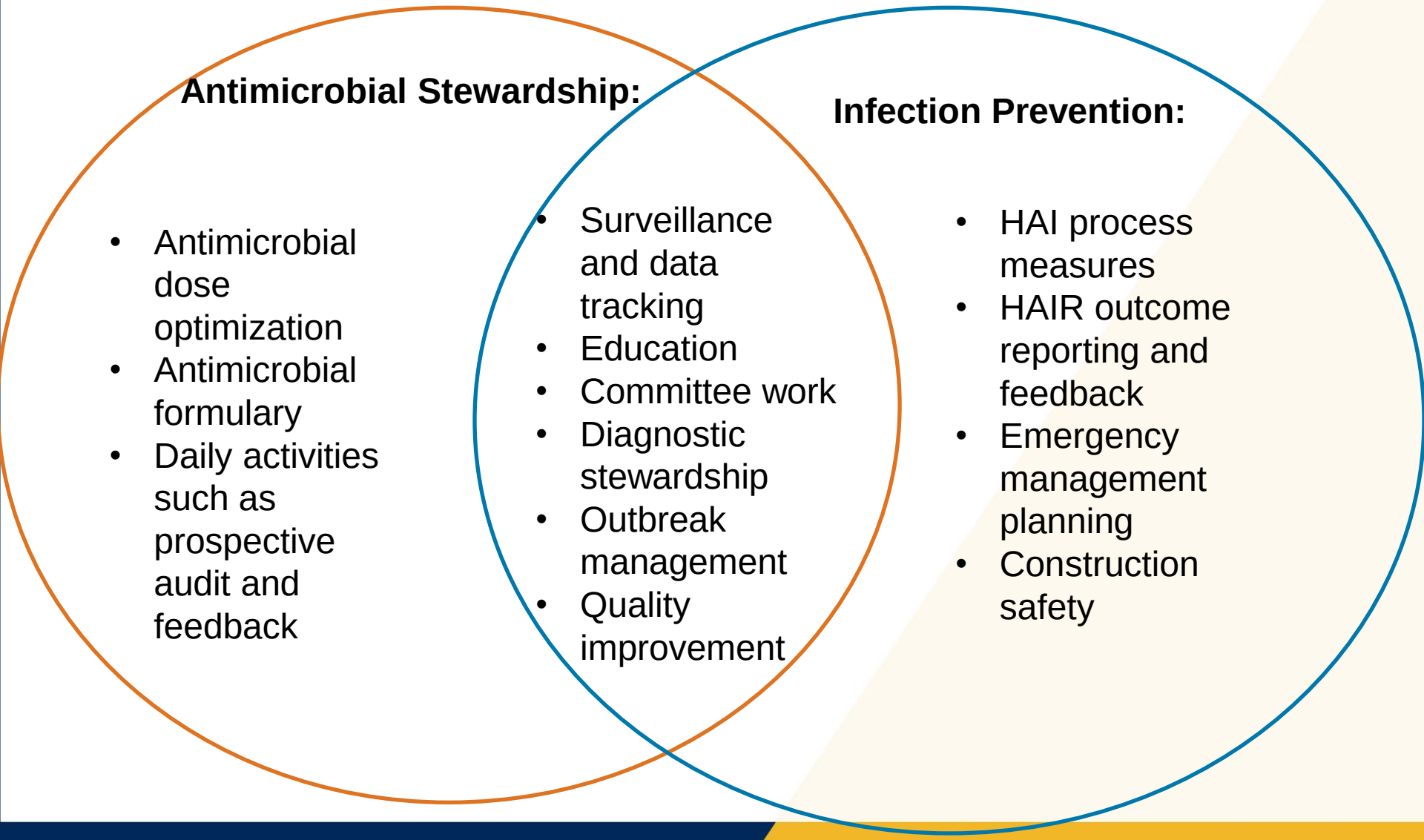
Interdisciplinary team

Interdisciplinary team

- Team depending on practice site.
- May include:
  - Infectious diseases physician
  - Clinical pharmacist with infectious diseases training
  - Infection preventionist
  - Clinical microbiologist
  - Information system specialist
  - Epidemiologist
  - Collaboration with administration, medical staff leadership, and local providers

Medication Management Standards 09.01.01. (2023) Joint Commission Resources. Retrieved from https://e-dition.jcrinc.com/MainContent.aspx.

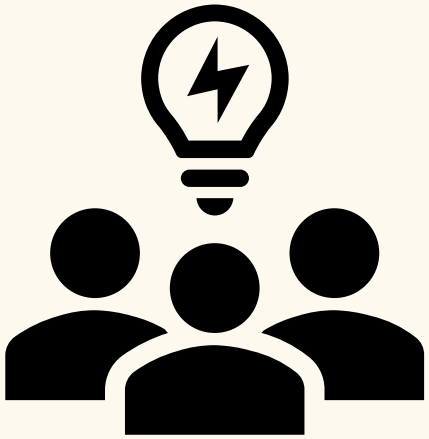
Intersection of AMS and IP



Gentry. *Infect Dis Clin N Am* 34 (2020) 17-30

Synergist work results

- Preventing MDROs
- Preventing surgical site infections
- Reducing *Clostridioides difficile* infections
- Reducing suboptimal testing and treatment of asymptomatic bacteriuria



Gentry. *Infect Dis Clin N Am* 34 (2020) 17-30

Collaboration Results

American Journal of Infection Control 44 (2016) 352-4

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief report

Multidisciplinary performance improvement team for reducing health care–associated *Clostridium difficile* infection

Sana Waqar MD [a,*], Kathy Nigh RN [b], Lori Sisler MSN, RN, BC [b], Mary Fanning DNP, RN, NEA-BC [c], Steven Tancin [b], Erin Brozik RN, MSN [b], Rebekah Jones PharmD [d], Frank Briggs PharmD, MPH [b], Lisa Keller BCPS, PharmD [b], P. Rocco LaSala MD [e], Sam Krautz [f], Rashida Khakoo MD, MACP [g]

Collaboration Results

American Journal of Infection Control 44 (2016) 352-4

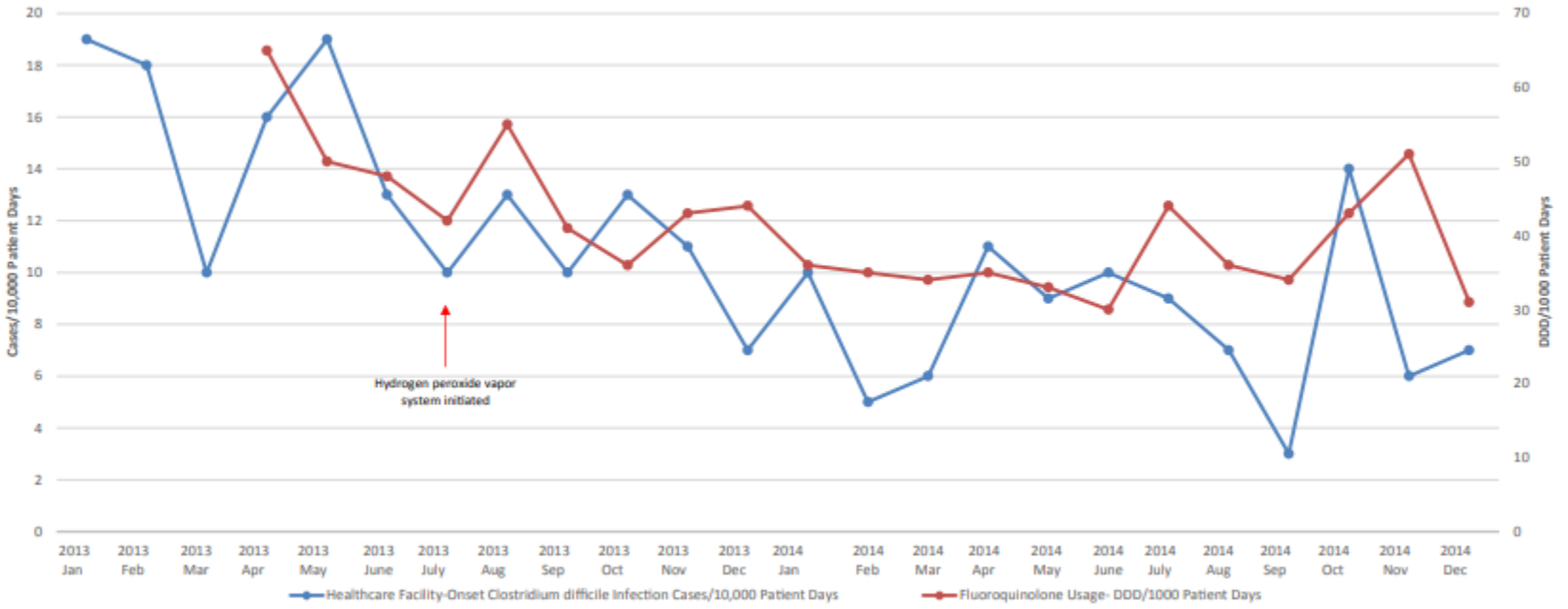


Fig 1. Monthly health care–associated *Clostridium difficile* infections and monthly data for fluoroquinolone use. *DDD*, defined daily dose.

Waqar. *AJIC* 22 (2016) 352-4.

The 5W1H of the Stewards*hip*

Who

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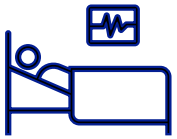
WVUMedicine

https://thenounproject.com/photo/wide-shot-of-vast-ocean-4mpde5/

Where can you be a steward?

Outpatient



LTACH

Acute Care Hospital

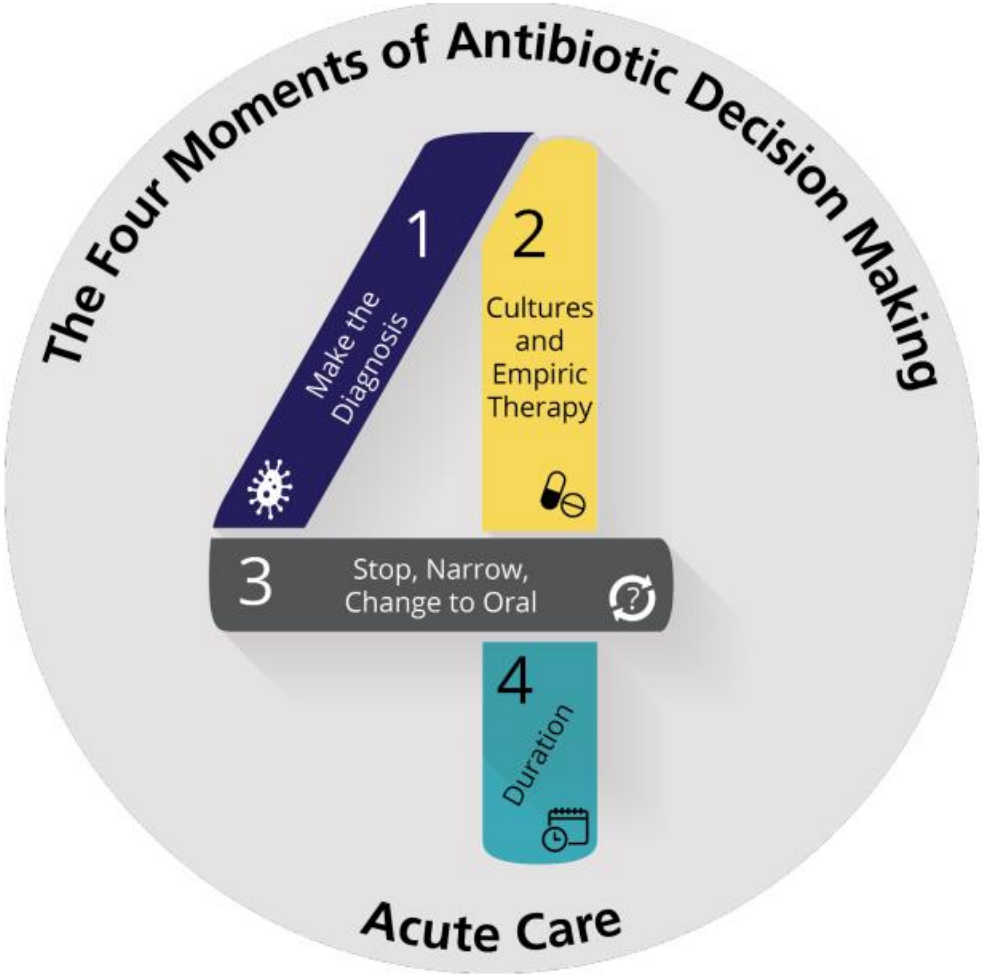
Critical Access Hospital

Nursing Home

EVERYWHERE!

CDC. Antibiotic Prescribing and Use. Core Elements of Antibiotic Stewardhip. https://www.cdc.gov/antibiotic-use/hcp/core-elements/index.html [Accessed July 1 2024]

When can you be a steward?



AHRQ Pub. No. 17(20) -0028 -EF November 2019

The 5W1H of the Stewards*hip*

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So you want to implement a stewardship program… where to start?!

Get to know your resources!

AHRQ Agency for Healthcare Research and Quality

CDC Antibiotic Prescribing and Use

EXPLORE TOPICS

SHEA/IDSA Clinical Practice Guidelines for Implementing an Antibiotic Stewardship Program

Published CID, 4/13/2016

Antimicrobial Stewardship Standards

2014: CDC Core Elements of **Hospital** Antibiotic Stewardship released

2015: CDC Core Elements of Antibiotic Stewardship for **Nursing Homes**

2016: CDC Core Elements of **Outpatient** Antibiotic Stewardship

2017: Joint Commission requires hospitals to establish antibiotic stewardship programs (MM.09.01.01)

Sanchez. *MMWR Recomm Rep* 2016;65(No. RR-6):1–12.
Medication Management Standards 09.01.01. (2023) Joint Commission Resources. Retrieved from https://e-dition.jcrinc.com/MainContent.aspx..

Core Elements

Core Elements of Antibiotic Stewardship for Health Departments

Core Elements of Antibiotic Stewardship for Health Departments and how to implement them.

Core Elements of Hospital Antibiotic Stewardship Programs

Core elements, priorities, and implementation resources for Hospital Antibiotic Stewardship Programs...

Priorities for Hospital Core Element Implementation

Priorities & resources for implementing the Core Elements of Antibiotic Stewardship in hospitals.

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

Implement Core Elements of Antibotic Stewardship at Small and Critical Access Hospitals.

Core Elements of Outpatient Antibiotic Stewardship

Priorities & resources for implementing the Core Elements of Antibiotic Stewardship in outpatient fa...

Antibiotic Stewardship in Outpatient Telemedicine

Priorities for implementing the Core Elements of Antibiotic Stewardship in outpatient telemedicine.

Core Elements of Antibiotic Stewardship for Nursing Homes

Priorities for implementing the Core Elements of Antibiotic Stewardship in nursing homes.

Core Elements of Human Antibiotic Stewardship Programs in Resource-Limited Settings

Priorities for implementing the Core Elements of Antibiotic Stewardship in resource-limited settings...

Resources for all?

- In 2015, more than 50% of hospitals with > 50 beds reported meeting all 7 core elements vs. 26% of hospitals with ≤ 25 beds

CDC. Antibiotic Prescribing and Use. https://www.cdc.gov/antibiotic-use/hcp/core-elements/small-and-critical-access-hospitals.html [Accessed July 1 2024]

What about Long Term Care facilities?

Toolkit To Improve Antibiotic Use in Long-Term Care

The Long-Term Care Toolkit explains the Four Moments of Antibiotic Decision Making, and has tools to support their implementation and improve prescribing in three areas: developing and improving an antibiotic stewardship program, creating a safety culture around antibiotic prescribing, and disseminating best practices for common infectious diseases.

Toolkit To Improve Antibiotic Use in Long-Term Care. Content last reviewed October 2022. Agency for Healthcare Research and Quality, Rockville, MD. https://www.ahrq.gov/antibiotic-use/long-term-care/index.html

Antimicrobial Stewardship Strategies

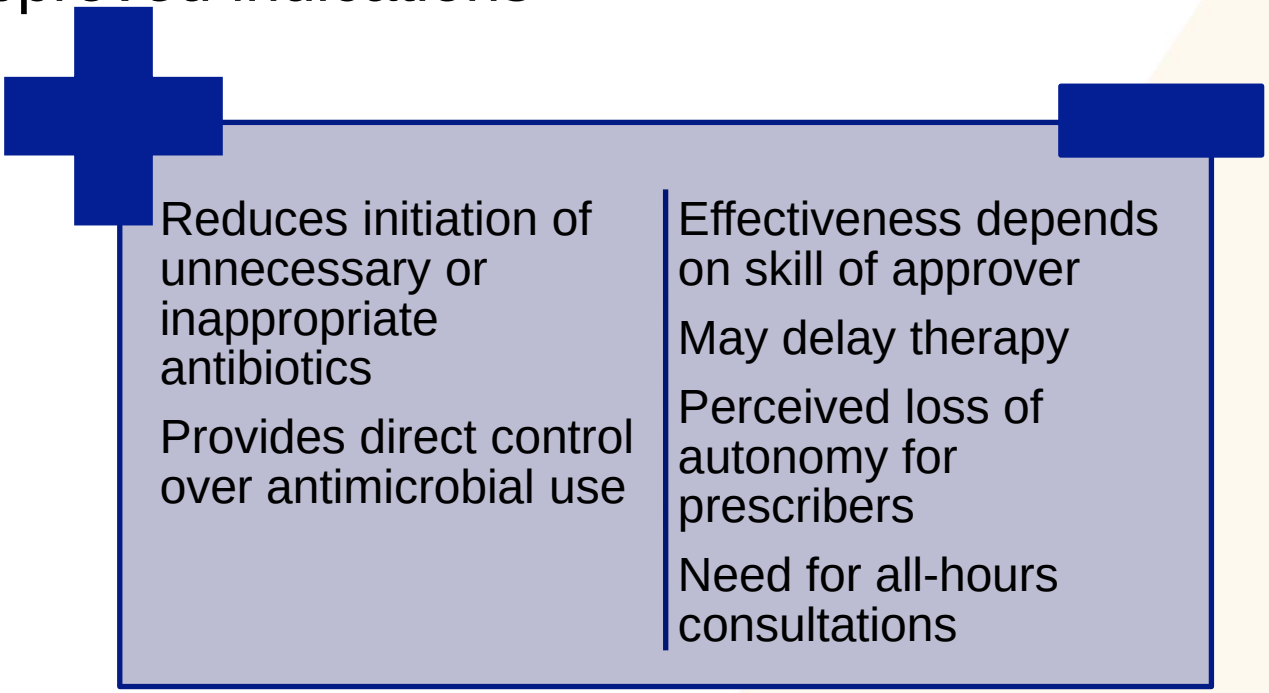
Antimicrobial Stewardship Strategies

- Daily strategies (Inpatient settings)
  - Preauthorization
  - Prospective audit and feedback
- Education
  - Facility-specific clinical practice guidelines
- Tracking and trending data
  - Antimicrobial use data
  - Antimicrobial resistance data (antibiogram)

Barlam. *Clin Infect Dis*, 62(10), 15 May 2016, Pages e51–e77,
https://doi.org/10.1093/cid/ciw118

Preauthorization

- Procedure:
  - Requires clinicians to get approval to use antibiotic before it is dispensed
  - Restrict dispensing of targeted antimicrobials to approved indications

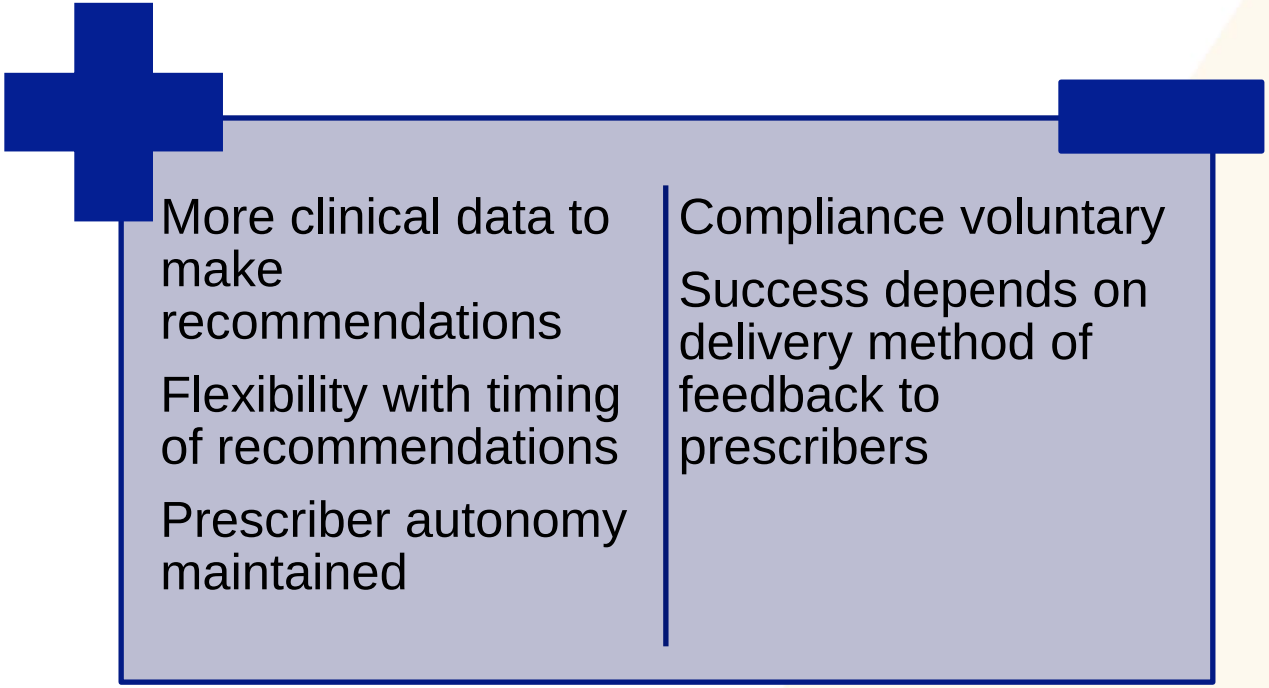


Patient Example

- MM is a 23 YOF presenting with a urinary tract infection. She has no known antibiotic allergies and has not received antibiotics in the past.
- The physician would like to start meropenem for her UTI. This is a restricted drug at your hospital.
- The physician must page the Antimicrobial Stewardship Team for approval before ordering.

Prospective Audit and Feedback

- Procedure:
  - Scheduled review of targeted antimicrobials for appropriateness
  - Contact prescribers with recommendations for alternative therapy
  - Engages the provider after the antibiotic has been prescribed



Patient Example

- MM is a 23 YOF presenting with a urinary tract infection. She has no known antibiotic allergies and has not received antibiotics in the past.
- The physician would like to start meropenem for her UTI. This is a restricted drug at your hospital.
- The verifying pharmacist must check to ensure meets restriction criteria.
- The antimicrobial stewardship team will review the patient and reach out to the physician with a more optimal recommendation if one exists

Let the data talk!

Antimicrobial Utilization

- Days of Therapy (DOT/1000 patient days)
- Standardized antimicrobial administration ratio (SAAR)
- Utilization by indication

Antimicrobial Resistance

- Antibiogram
- CRE rate
- ESBL rate
- *Pseudomonas aeruginosa* resistance

Outcomes

- *C. diff* rates
- Length of stay
- Disease specific outcomes

Barlam TF, et al. *Clin Infec Dis* 2016;62(10):e51-E77
Ibrahim O, et al. *Infect Dis Clin N Am* 2014;28:195-214

Why does benchmarking matter?

- Measure impact of antimicrobial stewardship program and efforts
- Identify target areas for future antimicrobial stewardship initiatives
- Demonstrate sustainability of antimicrobial stewardship program
- Garner approval for additional dedicated resources
- Improve Processes
- Better patient outcomes

Barlam TF, et al. *Clin Infec Dis* 2016;62(10):e51-E77
Ibrahim O, et al. *Infect Dis Clin N Am* 2014;28:195-214

What is DOT?

- 1 dose of antibiotic given in a day = 1 DOT
  - Example: If a patient receives ceftriaxone 2 gm IVPB daily and metronidazole 500 mg PO twice daily for 7 days = 14 DOT total
  - If cefepime 2 gm IVPB every 12 hours is ordered and a patient only receives 1 dose, that still equals 1 DOT
- Patient days (PD) are calculated via the following:
  - (number of admissions) x (average length of stay) = *x* PD
  - X 1000 to provide comparable ratio over time
  - This allows for incorporation of length of stay
- What is a significant change?
  - No base standard as what is considered significant

Ibrahim O, et al. *Infect Dis Clin N Am* 2014;28:195-214

Example DOT Tracking

ANTIMICROBIAL	2018	2019	2020	2021	2022 (%Δ from 2021)
Gram Positive Agents					
Cefazolin	64.9	61.6	66.4	66.4	67.6 (2)
Nafcillin/oxacillin	9.9	9.8	7.8	4.8	3.6 (-25)
Daptomycin	18.9	15.0	17.3	12.6	15.6 (24)
Linezolid	17.6	15.9	12.3	13.5	13.7 (2)
Ceftaroline	2.1	2.8	4.0	2.1	1.9 (-10)
Vancomycin	110.6	86.4	98.2	82.8	67.8 (-18)
Cephalosporins					
Ceftriaxone	31.5	36.7	51.8	50.9	47.2 (-7)
Ceftazidime	4.5	4.7	4.2	5.6	5.0 (-10)
Cefepime	76.5	70.7	70.6	64.3	57.5 (-11)
Carbapenems					
Meropenem	11.5	10.0	10.3	10.1	9.1 (-10)
Ertapenem	21.4	12.3	7.5	5.8	5.1 (-11)
Fluoroquinolones					
Ciprofloxacin	7.7	5.6	5.7	5.5	5.3 (-4)
Levofloxacin	8.9	7.0	8.2	8.2	7.8 (-4)
Micafungin		7.3	9.2	9.7	7.1 (-27)

NHSN AUR Module

- NHSN Antimicrobial Use and Resistance (AUR) Module provides a mechanism for facilities to report and to analyze antimicrobial use and resistance data

- Allows for “external” and internal benchmarking to strengthen stewardship programs

NHSN = National Healthcare Safety Network

CDC. National Healthcare Safety Network AUR Module. NHSN AUR Protocol (cdc.gov). [Accessed June 1 2024]

What is AUR?

- Antimicrobial Use (AU) and Antimicrobial Resistance (AR)
  - AUR is both AU and AR
- **Per CMS, required to in active engagement with CDC/NHSN to submit AUR data for CY 2024.**
  - If your hospital participates in the CMS Promoting Interoperability (previously Meaningful Use) program
- Attestation based

CDC. National Healthcare Safety Network AUR Module. FAQs: AUR Reporting for the CMS Promoting Interoperability Program https://www.cdc.gov/nhsn/cms/cms-faq-aur.html [Accessed June 1 2024]

Two ways to be in active engagement

Option 1

- Registration with NHSN
- Testing and validation of CDA files

Option 2

- Registration with NHSN
- Submitting AUR production data continuously during 180 EHR reporting period

CDC. National Healthcare Safety Network AUR Module. FAQs: AUR Reporting for the CMS Promoting Interoperability Program https://www.cdc.gov/nhsn/cms/cms-faq-aur.html [Accessed June 1 2024]

What does submitting AUR data give us?

- Standardized Antimicrobial Administration Ratio (SAAR)

$$SAAR = \frac{Observed\ Antimicrobial\ Use}{Predicted\ Antimicrobial\ Use}$$

- SAAR interpretation
  - 1: Actual use = predicted use
  - < 1: Actual use < predicted use
  - > 1: Actual use > predicted use

CDC. National Healthcare Safety Network AUR Module. FAQs: AUR Reporting for the CMS Promoting Interoperability Program https://www.cdc.gov/nhsn/cms/cms-faq-aur.html [Accessed June 1 2024]

Antimicrobial Grouping Examples

Broad spectrum agents for hospital-onset infections	Broad-spectrum agents for community-acquired infections	Antibacterial agents for MRSA	Narrow spectrum beta-lactam agents	Antibacterial agents posing the highest risk of C-diff
Aztreonam	Cefdinir	Ceftaroline	Amoxicillin	Cefepime
Cefepime	Cefotaxime	Dalbavancin	Augmentin	Cefotaxime
Ceftazidime	Cefpodoxime	Daptomycin	Ampicillin	Cefpodoxime
Meropenem	Ceftriaxone	Linezolid	Unasyn	Ceftazidime
Zosyn	Fluoroquinolones	Vancomycin	Cefazolin	Ceftriaxone
Aminoglycosides	Cefuroxime		Cefoxitin	Clindamycin
	Ertapenem		Keflex	Fluroquinolones
			Oxacillin	
			Penicillin	

CDC NHSN AU: A Guide to the SAAR. Link: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf. Date accessed May 7, 2023.

Broad spectrum antibacterial agents predominantly used for hospital-onset infections used in adult SAAR wards

orgID	summaryYM	SAARType_2017	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
11296	2022M01	Adult_BSHO_Ward_2017	291	331.234	2539	0.879	0.0264	0.782, 0.984
11296	2022M02	Adult_BSHO_Ward_2017	261	310.358	2379	0.841	0.0045	0.743, 0.948
11296	2022M03	Adult_BSHO_Ward_2017	255	340.227	2609	0.749	0.0000	0.662, 0.846
11296	2022M04	Adult_BSHO_Ward_2017	299	333.370	2555	0.897	0.0603	0.799, 1.003
11296	2022M05	Adult_BSHO_Ward_2017	345	328.215	2518	1.051	0.3677	0.945, 1.167
11296	2022M06	Adult_BSHO_Ward_2017	283	330.929	2535	0.855	0.0077	0.760, 0.959
11296	2022M07	Adult_BSHO_Ward_2017	332	342.892	2627	0.968	0.5789	0.868, 1.077
11296	2022M08	Adult_BSHO_Ward_2017	383	351.579	2693	1.089	0.1021	0.984, 1.203
11296	2022M09	Adult_BSHO_Ward_2017	388	340.225	2605	1.140	0.0119	1.031, 1.258
11296	2022M10	Adult_BSHO_Ward_2017	377	354.864	2716	1.062	0.2518	0.959, 1.174
11296	2022M11	Adult_BSHO_Ward_2017	331	348.050	2662	0.951	0.3760	0.853, 1.058
11296	2022M12	Adult_BSHO_Ward_2017	364	338.747	2590	1.075	0.1809	0.968, 1.189

AU: A Guide to the SAAR. Link: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/au-saar-guide-508.pdf. Date accessed May 7, 2023.

What has been successful for WVU Medicine?

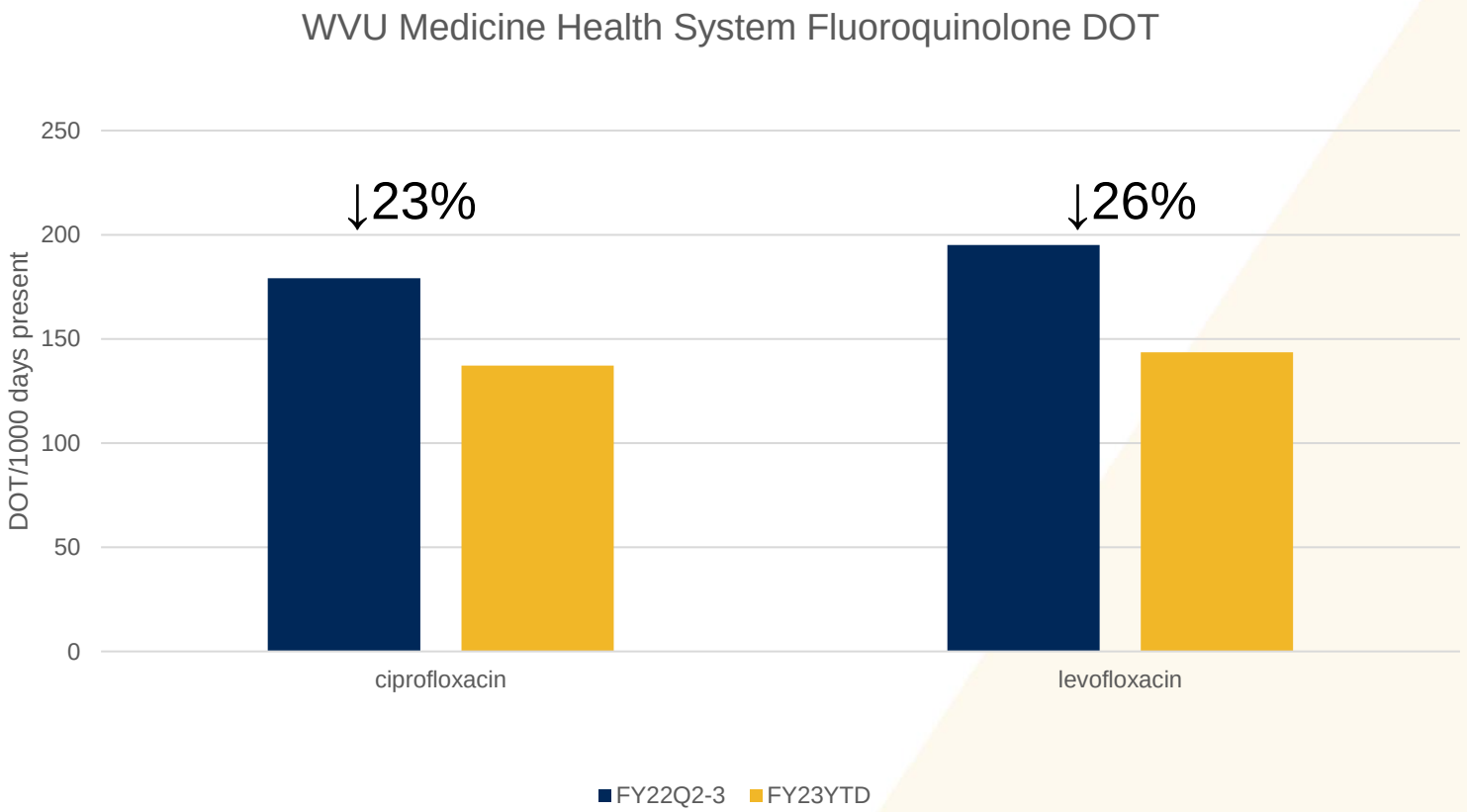
- Harnessing the power of the health-system
  - System antimicrobial stewardship leaders
  - Enterprise antimicrobial stewardship committee
- Collaboration with other disciplines
- Setting forth criteria for use for certain antimicrobials
- Accessibility of guidelines
- Branding

What has been successful for WVU Medicine?

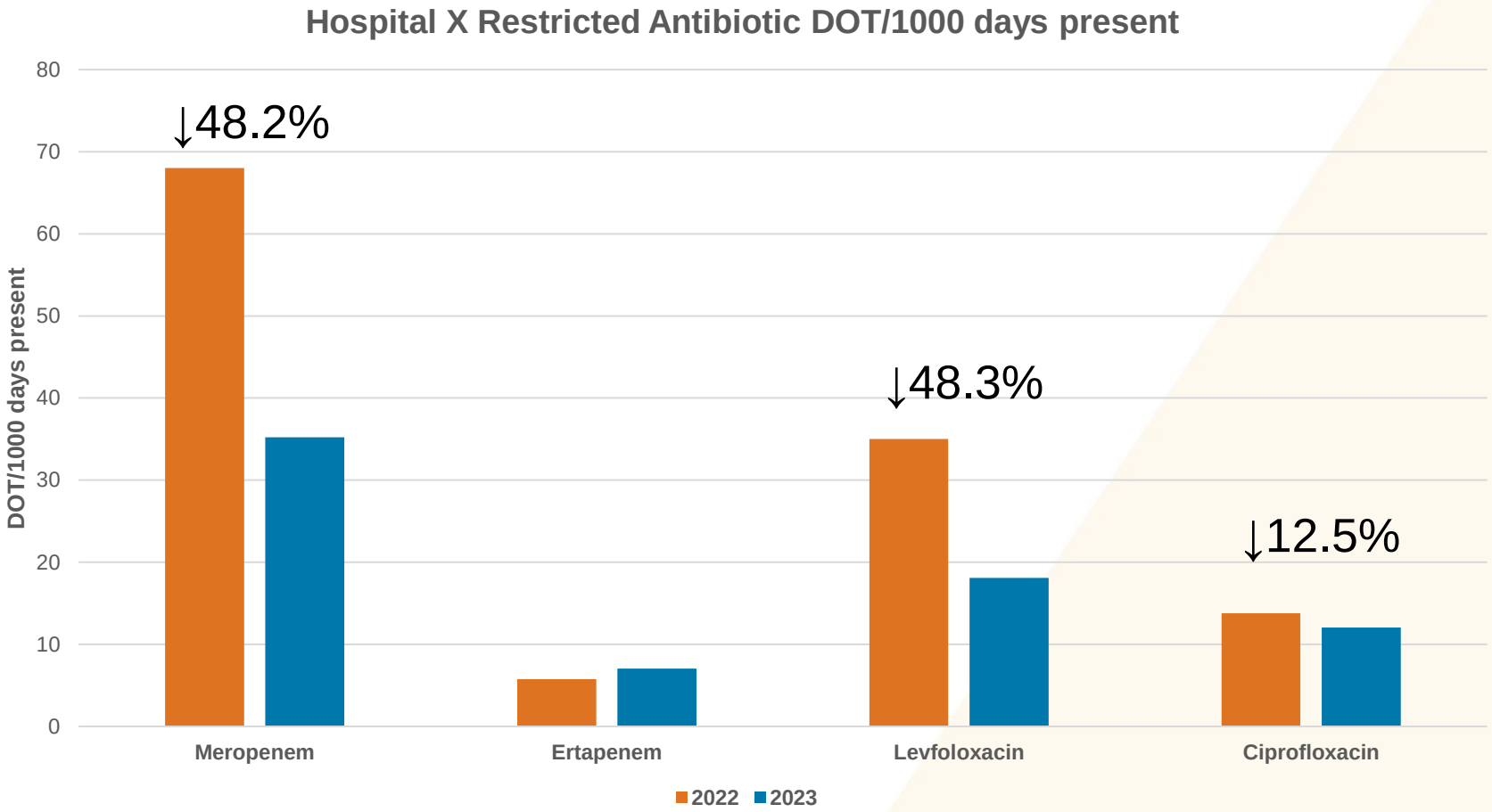
- Lessons learned

- Harnessing the power of the health-system
  - Centrally coordinated/led program
    - System antimicrobial stewardship leaders
    - Enterprise antimicrobial stewardship committee
    - Standardized antimicrobial restriction criteria

Results of blinded benchmarking initiative



Example of Antimicrobial DOT



Ertapenem DOT/1000 days present increased by 20% but solely due to use in FY23Q3, (average DOT/1000 days present FY23Q1 1.52 and FY23Q2 2.57). Will continue to monitor closely in FY23Q4.

What has been successful for WVU Medicine?

- Collaboration with other disciplines
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  antir
- Accessibility of guidelines
- Branding

JOURNAL ARTICLE ACCEPTED MANUSCRIPT

Ceftriaxone Versus Cefazolin Susceptibility as a Surrogate Marker for Cefpodoxime Susceptibility in Enterobacterales

Kaitlyn V Lambert ✉, Ryan Demkowicz, Amanda Murray, Catessa Howard, Douglas Slain ✉

Open Forum Infectious Diseases, ofae377, https://doi.org/10.1093/ofid/ofae377

Published: 03 July 2024 **Article history** ▾

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Ant

Azit

Dox

What has been successful for WVU Medicine?

- Collaboration with other disciplines
  - Infection prevention & AMS at Wheeling Hospital

Antimicrobial	Q4FY23 (DOT/1000 days present)	Q1FY24
Azithromycin	31.6	19.5
Doxycycline	27.2	44.1

  - Microbiology lab

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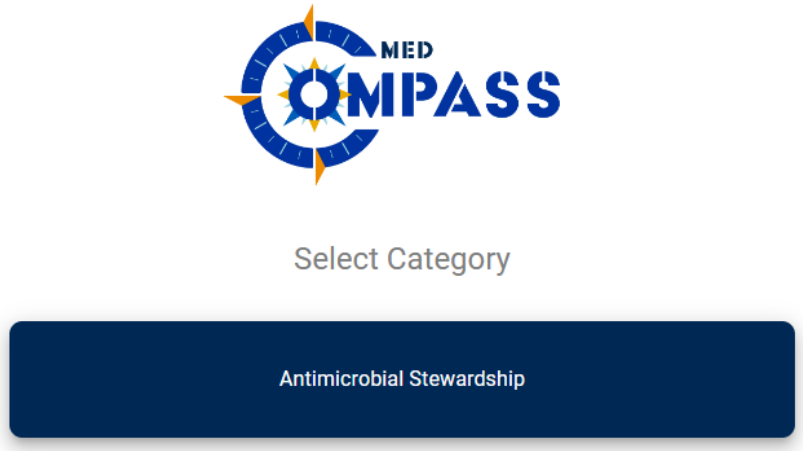
What has been successful for WVU Medicine?

- Accessibility of system antimicrobial stewardship guidelines



- Branding

What has been successful for WVU Medicine?

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Summary

- AMS is a coordinated program that promotes the appropriate use of antimicrobials, improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms
- AMS is a necessity in all healthcare settings to optimize patient care
- There are many resources and effective strategies available to implement and maintain a successful AMS program, however there is no one size fits all
- Infection prevention plays a vital and important role in AMS given common shared goals

All Aboard the (Steward)Ship!

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