DEPARTMENT OF HEALTH

Actionable Data for Antibiotic Stewardship: Case Examples

May 8, 2018

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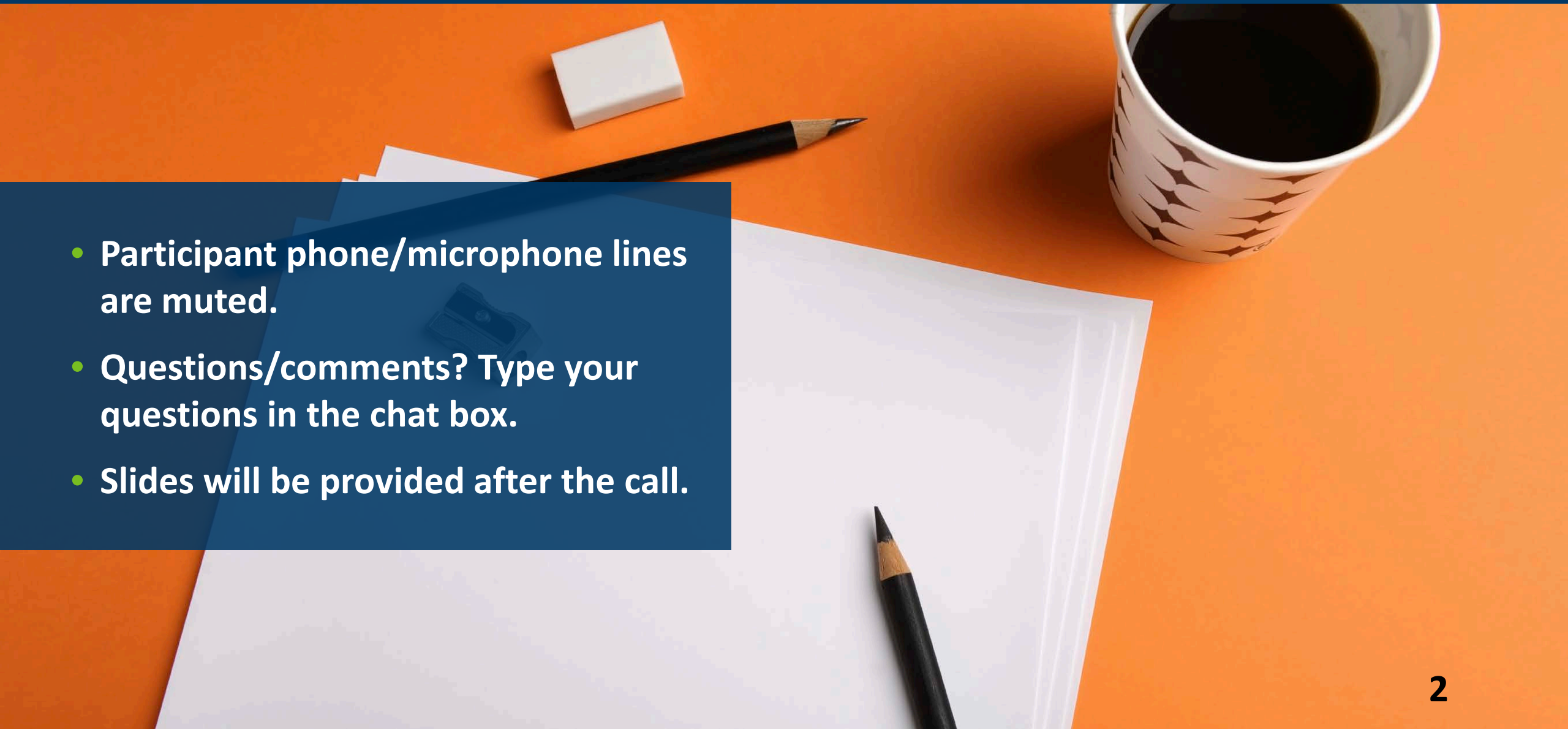
Housekeeping



- Participant phone/microphone lines are muted.
- Questions/comments? Type your questions in the chat box.
- Slides will be provided after the call.

Agenda

1. View on Antibiotic Use Reporting from the CDC

Melinda Neuhauser, PharmD, MPH, Centers for Disease Control and Prevention

2. Introduction to the Antimicrobial Use and Resistance Module for Antimicrobial Use Reporting

Catherine Lexau, PhD, MPH, RN, Minnesota Department of Health

3. Antibiotic Use Visualization and Assessment at the Unit Level Using an Excel-based tool

Erik Stensgard, PharmD, BCPS, Minneapolis Veterans Affairs Health Care System

4. Practical Application of NHSN Antimicrobial Use Data

Clark Force, RPh, BCPS, Tucson Medical Center

5. Wrap-Up and Questions

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View on Antibiotic Use Reporting from the CDC

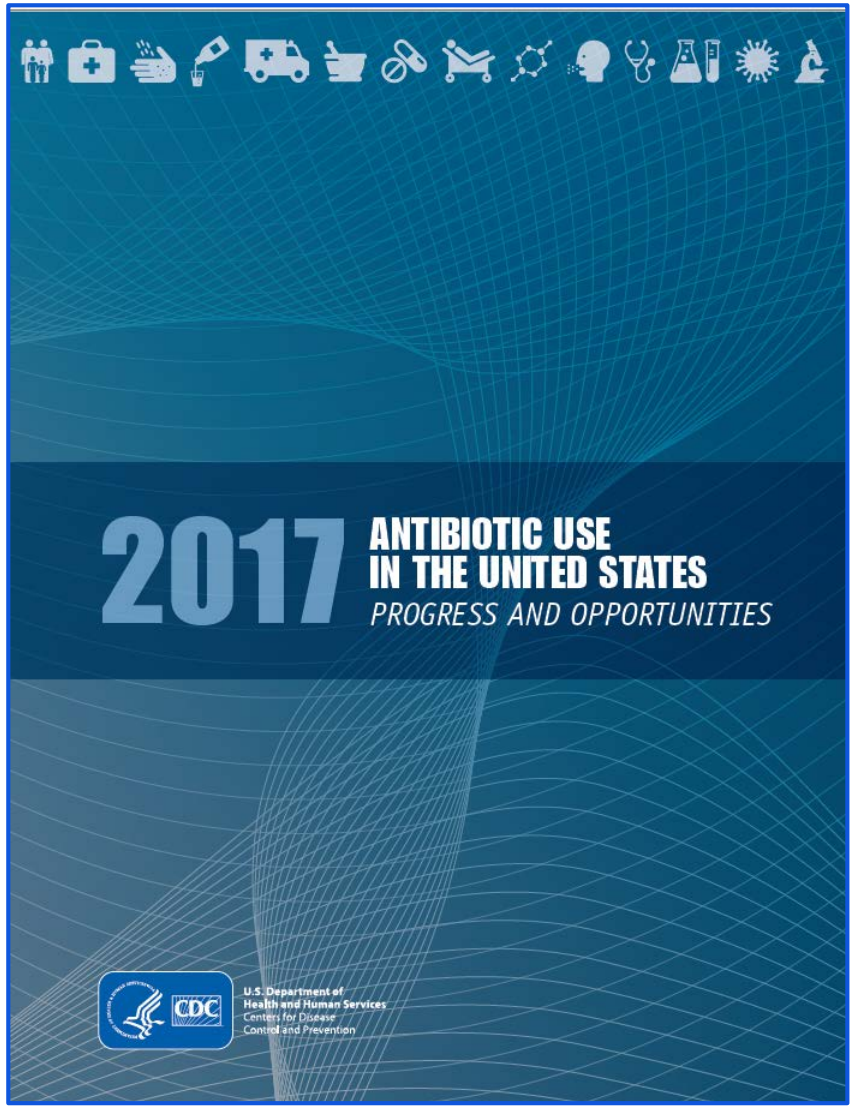
Melinda Neuhauser, PharmD, MPH, Centers for Disease Control and Prevention

CDC Updates: NHSN AU Option

Melinda Neuhauser, PharmD, MPH
Pharmacist and Acute Care Lead
Office of Antibiotic Stewardship
Division Quality Healthcare Promotion

May 8, 2018

CDC's Approach in Improving Antibiotic Use



EXAMPLES OF CDC'S APPROACH TO IMPROVING ANTIBIOTIC USE

DATA FOR ACTION

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

IMPLEMENTATION

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

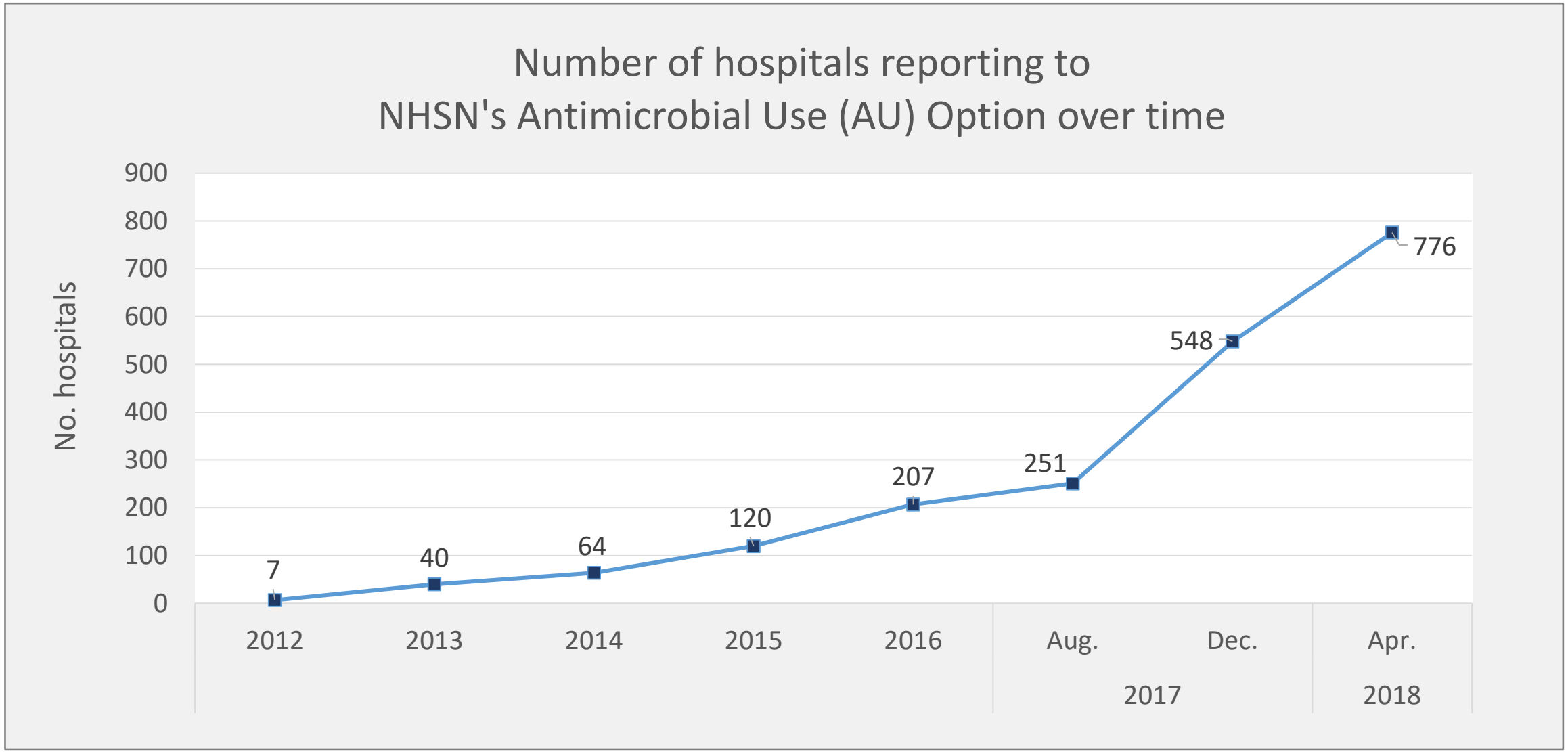
INNOVATION

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

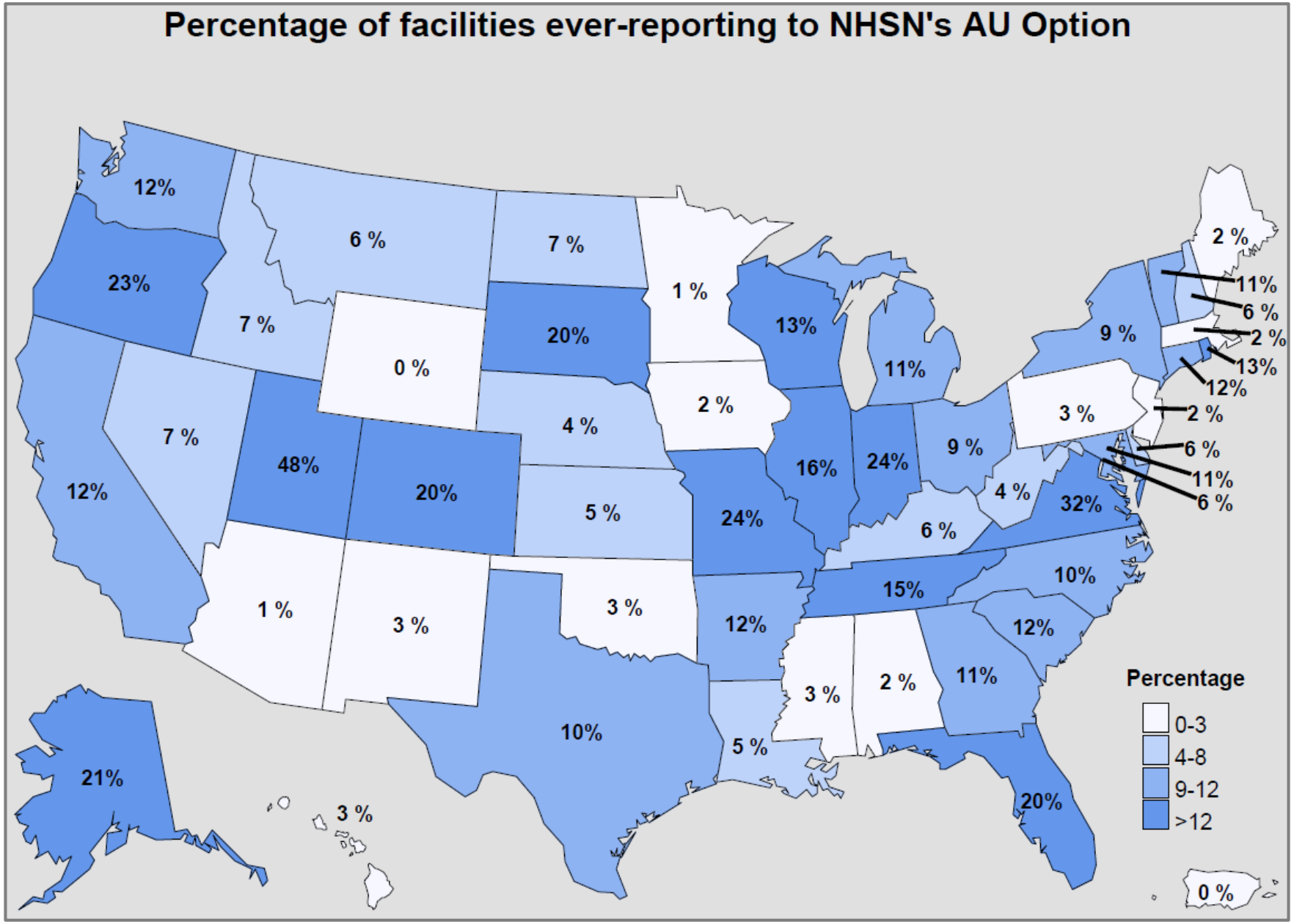
EDUCATION

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

https://www.cdc.gov/antibiotic-use/stewardship-report/index.html



*As of April 1, 2018



*As of April 1, 2018

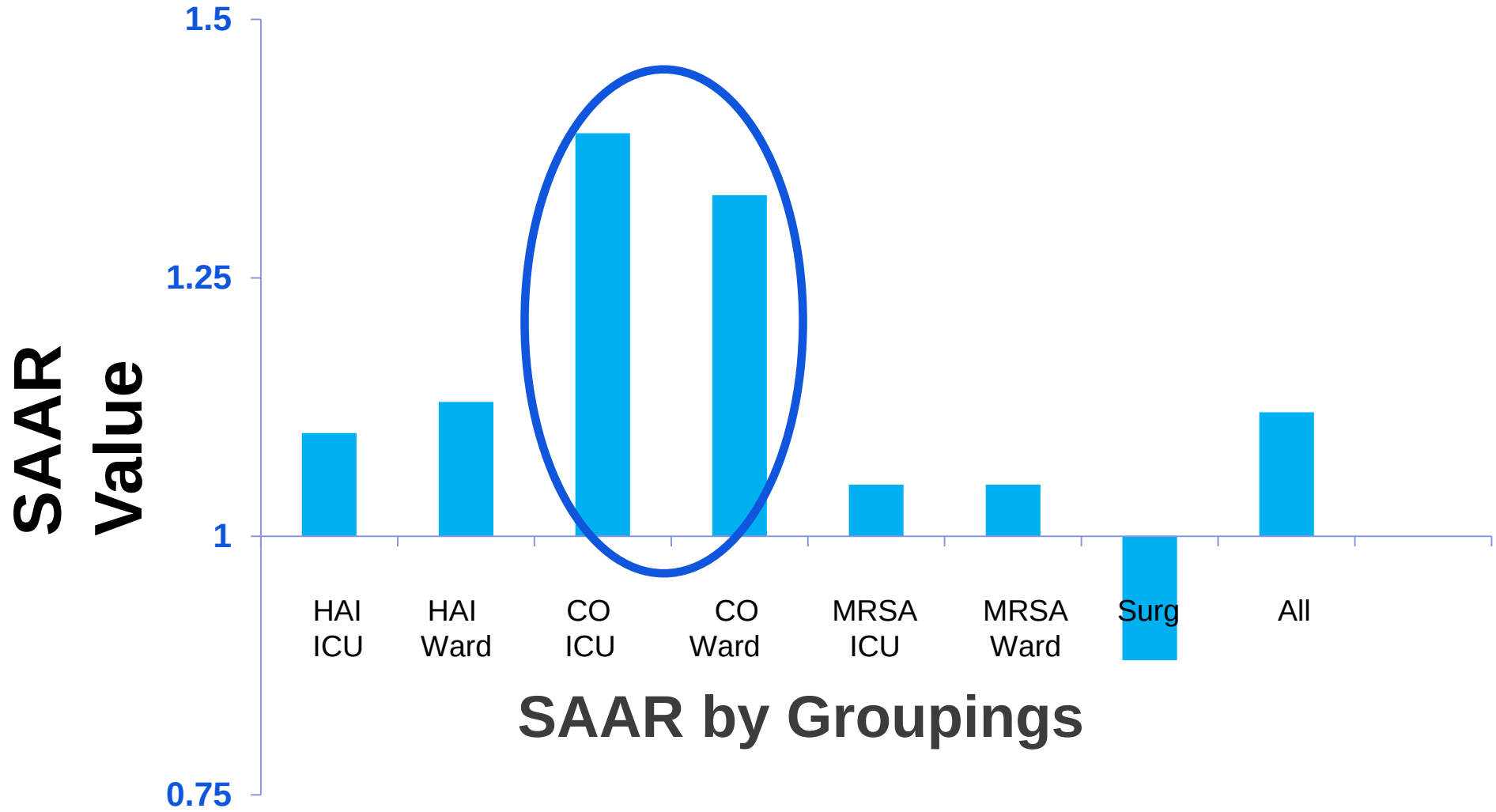
Standardized Antimicrobial Administration Ratio (SAAR)

- SAAR expresses observed to expected antibiotic use where expected use is calculated based on models using facility characteristics.

- SAARs for different groups of antibiotics:
  - HAI: Agents mainly for healthcare associated pathogens
  - CO: Agents mainly for community pathogens
  - MRSA: Agents active against MRSA
  - Surg: Agents frequently use for surgical prophylaxis
  - All antibacterial agents

https://www.cdc.gov/nhsn/acute-care-hospital/aur/index.html

SAAR Analysis within a Given Facility



Example data only

SAAR Updates

- Adult and Pediatric SAARs being updated with 2017 AU data
  - Seeking input from adult and pediatric experts to optimize SAAR categories
  - Anticipated launch ~January 2019

- NICU SAARs being developed
  - Seeking input from Vermont Oxford Network
  - Anticipated launch ~ January 2020

Advancing the SAAR Measure

- The Duke Antimicrobial Stewardship Outreach Network (DASON) was awarded funding to enroll a group of hospitals in NHSN AU option and then implement and/or expand stewardship efforts.
  - Does the SAAR help find improvement opportunities?
  - Does the SAAR change in response to stewardship?

- Duke University was awarded funding to identify patient- and facility-level factors predictive of antimicrobial use that can be used in risk adjustment strategies for benchmarking antimicrobial use.

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Introduction to the Antimicrobial Use and Resistance Module for Antimicrobial Use Reporting

Catherine Lexau, PhD, MPH, RN, Minnesota Department of Health

What is the National Healthcare Safety Network?

The National Healthcare Safety Network (NHSN) is the CDC system for tracking and reporting health care-associated infections (HAIs)

NHSN establishes standard definitions and detailed protocols for each metric

After submission, CDC securely stores data on its servers and facilities maintain access to their own data.

What is the National Healthcare Safety Network?

Neither NHSN nor CDC "requires" any data submission, but the Centers for Medicare and Medicaid Services (CMS) requires submission of some data to NHSN as a condition for participation in programs like Value Based Purchasing.

NHSN Antimicrobial Use data discussed today are not publically reported nor is reporting mandated by CMS.

NHSN Antimicrobial Use and Resistance (AUR) Module

Purpose:

- Track hospital antimicrobial use (AU) and antimicrobial resistance (AR)
- Highlight patient care areas for possible intervention
- Facilitate benchmarking with other hospitals

Key Features:

- Data useable by multiple entities, including submitting hospitals, CDC and state public health agencies
- Single set of technical specifications and standard definitions

AUR Module: Antimicrobial Use Option

Data sources: Electronic

- **Medication administration data**
- **Admission and transfer data**

Data submission to NHSN

- **Unlike HAI/other NHSN data, electronic file submission only**
- **No personal identifiers**

Flow of Antimicrobial Use Data - AUR Module

Medication administration record data

Health IT Vendor Services/Software

Extracted along with admission, discharge and transfer data

Formatted and submitted electronically

NHSN National Healthcare Safety Network

Stored on NHSN Servers

Hospital staff can access and analyze using NHSN-platform tools, and/or download data for further analysis

Data Entered

- Antibiotic administration data
  - Drug and route of administration
  - Date given
  - Patient location
- Patient census information from electronic admission, discharge, transfer (ADT) system
  - Inpatient wards
  - Emergency Department
  - Outpatient observation units

How is Antimicrobial Use Measured?

“Antibiotic Day”

One antibiotic, one or more doses, to one patient on one day

“Days present”

Similar to patient days

A count of patients spending any time in a patient care location on a given day

Antibiotic Use Rates:

Antibiotic Days/Days Present

Antibiotic Days/Admissions

Retrievable Antimicrobial Use Data

Antibiotic days by:

- **Drug**
- **Drug class**

Grouped by:

- **Single patient care areas**
- **Facility-wide inpatient**

Benchmark Measure: Standardized Antimicrobial Administration Ratio (SAAR)

Standardized Antimicrobial Administration Ratio (SAAR)

A ratio measure:

$$\frac{\text{Observed (actual) antimicrobial days}}{\text{Expected (predicted) antimicrobial days}}$$

SAAR is risk adjusted with expected number calculated from statistical model*

Adjusted for:

- **Hospital characteristics**
- **Ward type (general vs. ICU)**
- **Patient group (adult/pediatric)**

*Katharina L van Santen, Jonathan R Edwards, Amy K Webb, Lori A Pollack, Erin O'Leary, Melinda M Neuhauser, Arjun Srinivasan, Daniel A Pollock; The Standardized Antimicrobial Administration Ratio: A New Metric for Measuring and Comparing Antibiotic Use, *Clinical Infectious Diseases*, ciy075, https://doi.org/10.1093/cid/ciy075

Standardized Antimicrobial Administration Ratio (SAAR)

$$\frac{\text{Observed (actual) antimicrobial days}}{\text{Expected (predicted) antimicrobial days}}$$

If statistically significant, a SAAR

- Higher than 1 signals more antibiotic use than peers
- Lower than 1 signals less antibiotic use than peers
- Does not in itself assess whether prescribing is appropriate or not

Clinical Categories for SAAR Measures

Antibacterials by Common Clinical Use:	Agents Included:
Broad-spectrum agents, used primarily for hospital-onset or multi-drug resistant (MDR) infections	aminoglycosides, carbapenems (except ertapenem), 4th and 5th generation cephalosporins, penicillin B-lactam/b-lactamase inhibitor combinations, and others
Broad-spectrum agents, used primarily for community-acquired infections	ertapenem, some cephalosporins, and some fluroquinolones
Antibiotics used primarily to treat MRSA	ceftaroline, dalbavancin, daptomycin, linezolid, oritavancin, quinupristin/dalfopristin, tedizolid, telavancin, and IV vancomycin
Antibiotics used primarily for surgical site infection (SSI) prophylaxis	cefazolin (IV), cefotetan (IV), cefoxitin (IV), cefuroxime (IV), and cephalexin (PO)
All antibacterial agents	All 74 antibacterial agents included in NHSN AUR protocol

Requirements for Antimicrobial Use Data Submission

- Hospitals/care areas using Electronic Medication Administration Records (eMARs) or Bar Coded Medication Administration (BCMA) systems
- Ability to collect and package data using standardized format via 3rd party vendors:
  - Self reported information for AU: http://www.sidp.org/aurvendors
  - 25 certified EHR/other vendors listed here: https://chpl.healthit.gov/#/search
    - Search under Certification Criteria >
    - 170.315 (f)(6): Transmission to Public Health Agencies - Antimicrobial Use and Resistance Reporting
- "Homegrown" submission discouraged

Antimicrobial Use Data Reported from NHSN Platform

National Healthcare Safety Network

Line Listing - Most Recent Month of AU Data by Location

As of: February 20, 2015 at 5:01 PM

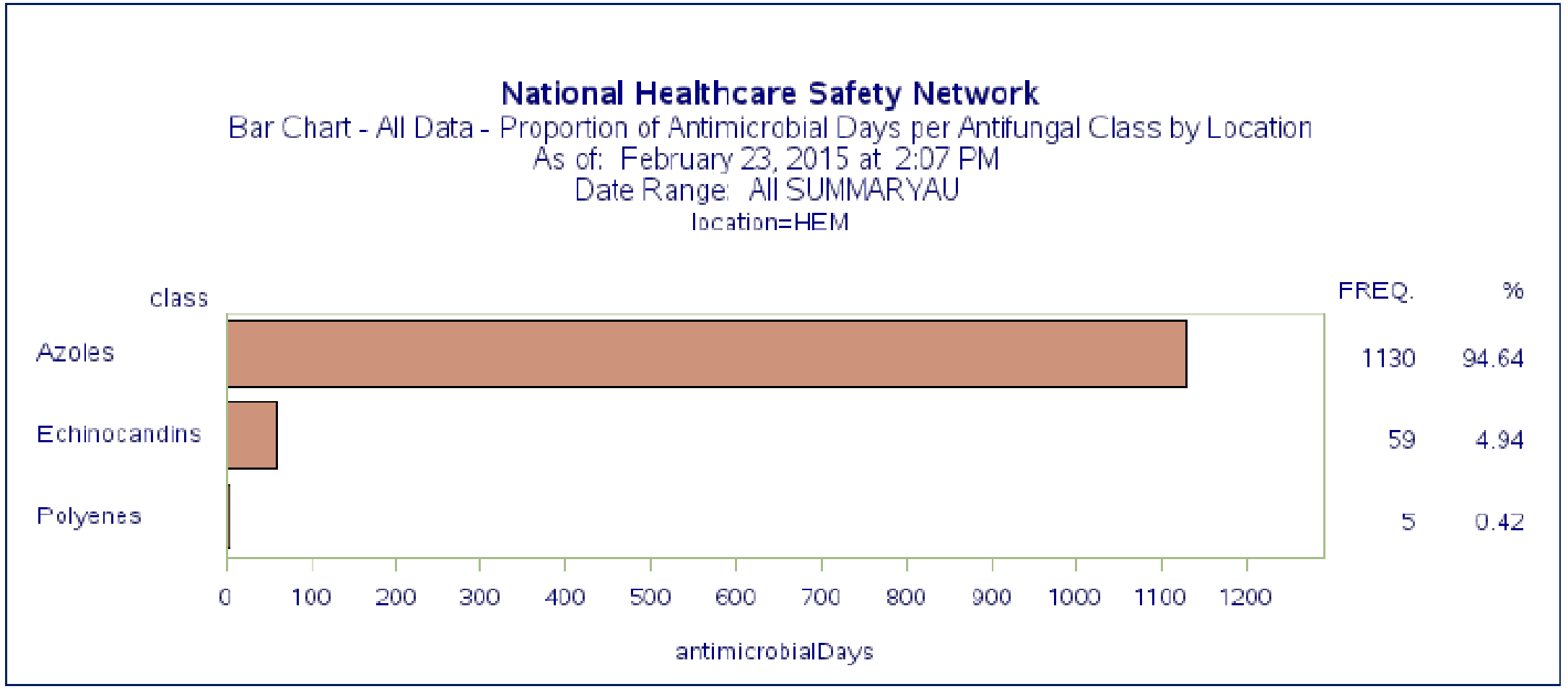
Date Range: All SUMMARYAU1MONTH

Location=MICU

Facility Org ID	Summary Year/Month	Antimicrobial Agent Decription	Location	Days Present	Antimicrobial Days	Route: IM	Route: IV	Route: Digestive	Route: Respiratory
13860	2015M01	AMAN - Amantadine	MICU	421	0	0	0	0	0
13860	2015M01	AMK - Amikacin	MICU	421	2	0	2	0	1
13860	2015M01	AMOX - Amoxicillin	MICU	421	0	0	0	0	0
13860	2015M01	AMOXWC - Amoxicillin with Clavulanate	MICU	421	0	0	0	0	0
13860	2015M01	AMP - Ampicillin	MICU	421	4	0	4	0	0

Source: CDC Data for example only

Antimicrobial Use Data Visualization from NHSN Platform



Source: CDC Data for example only

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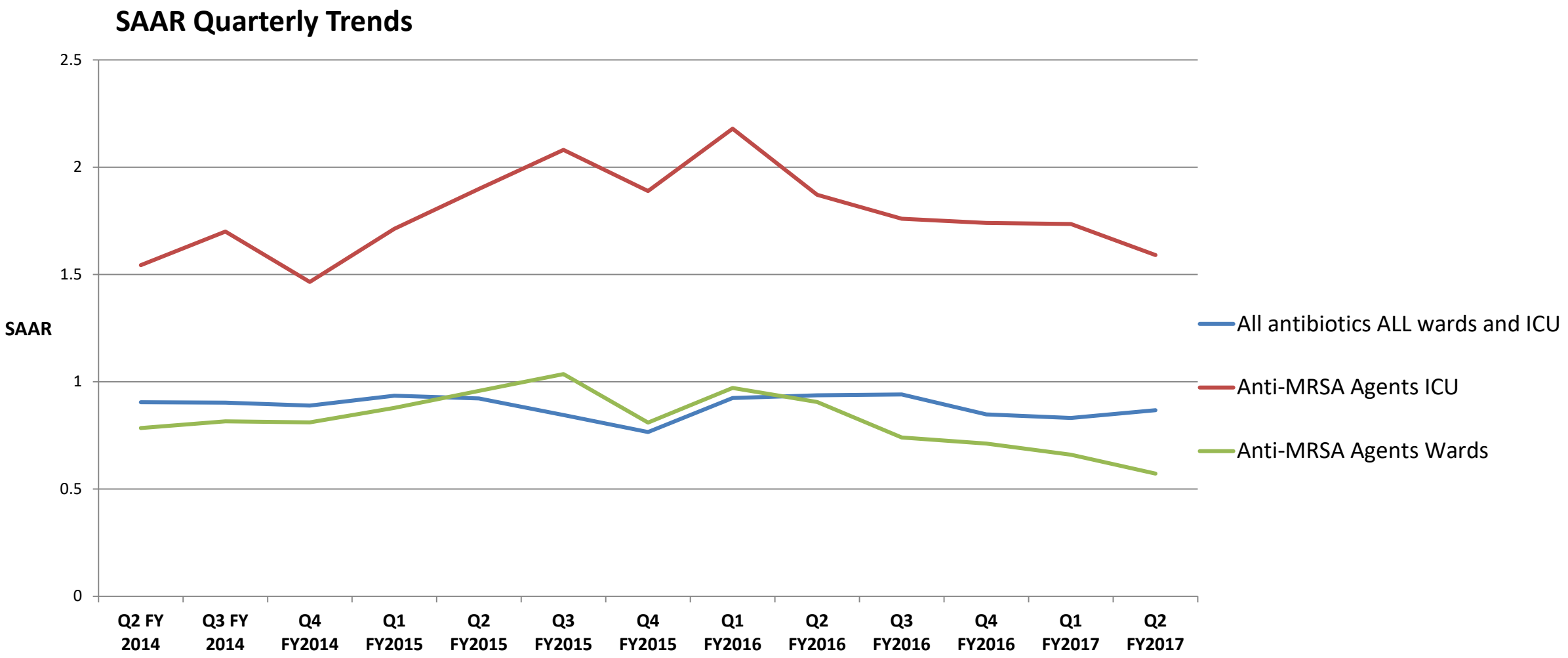
Antibiotic Use Data Visualization and Assessment at the Unit level Using Excel-based tool

Erik Stensgard, PharmD, BCPS

Antimicrobial CDSS Program Manager

Minneapolis Veterans Affairs Health Care System

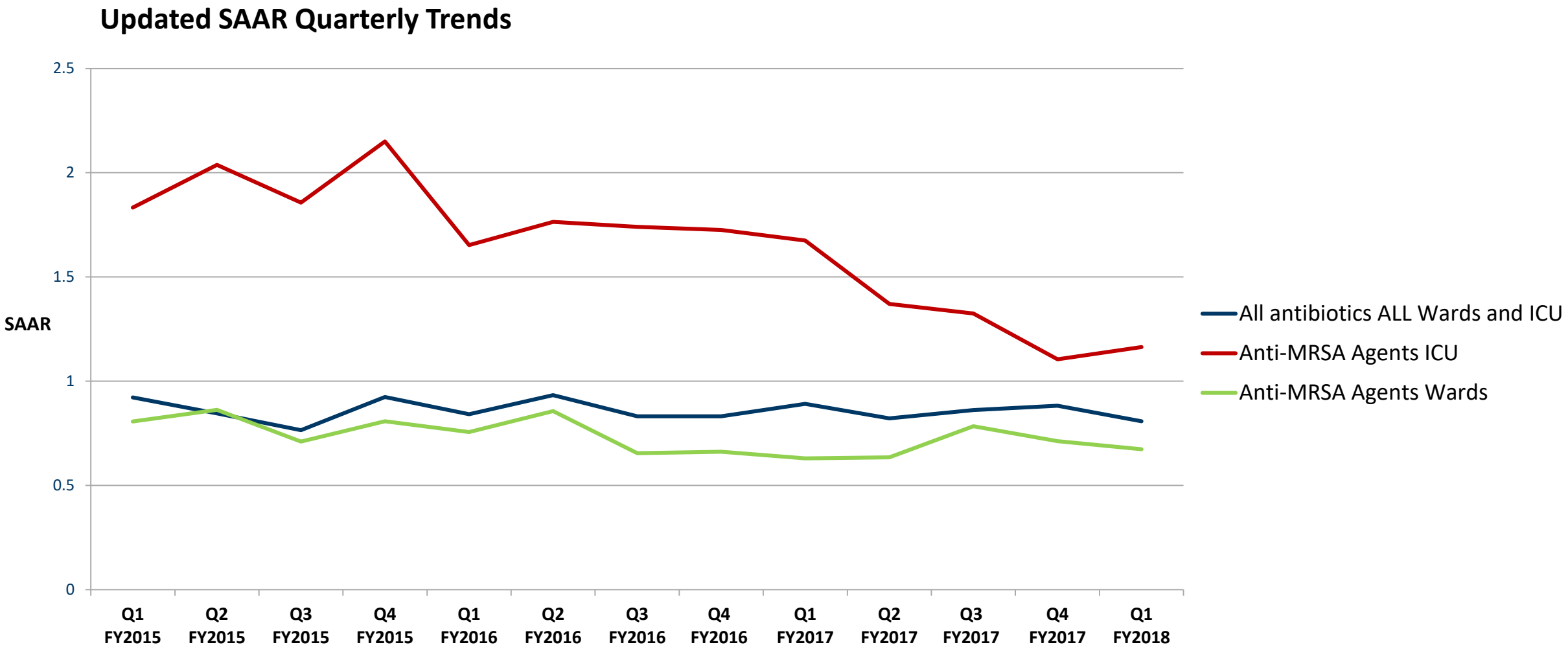
Utilizing NHSN Data to Identify Areas for Quality Improvement - Minneapolis VA



Minneapolis VA Cardiothoracic Surgery History

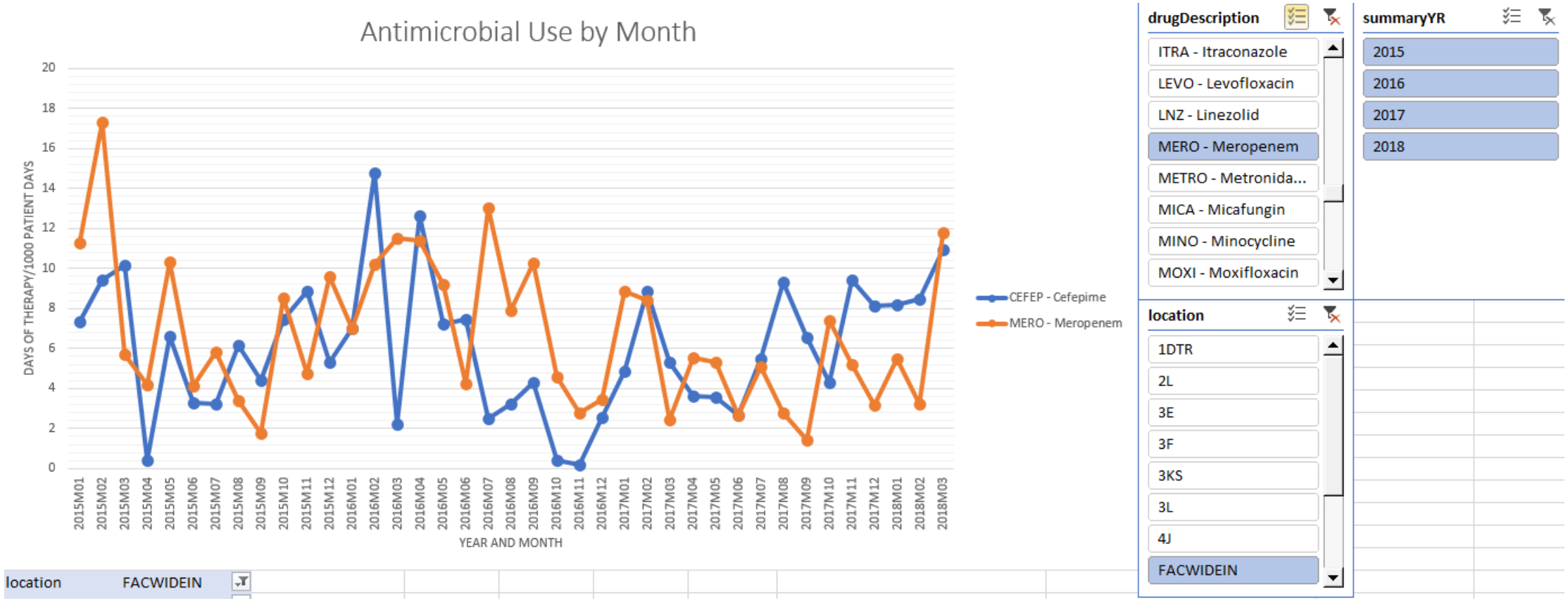
- Cluster of MRSA post-operative infections/mediastinitis 2006-2007
- Several changes to peri-op care made at that time:
  - Reduced OR temperature
  - Better blood glucose control
  - Vancomycin + cefuroxime for all open-heart surgery patients: pre-op, intra-op, post-op x 24h (counted as 2 antimicrobial days - SAAR 1.5-2 times predicted)
- Changes resulted in significant reduction in MRSA post-op infections
- Time to re-evaluate our practice?
  - Intervention: Post-operative antibiotics decreased to one dose

Results of Reducing to One Dose Post-Op

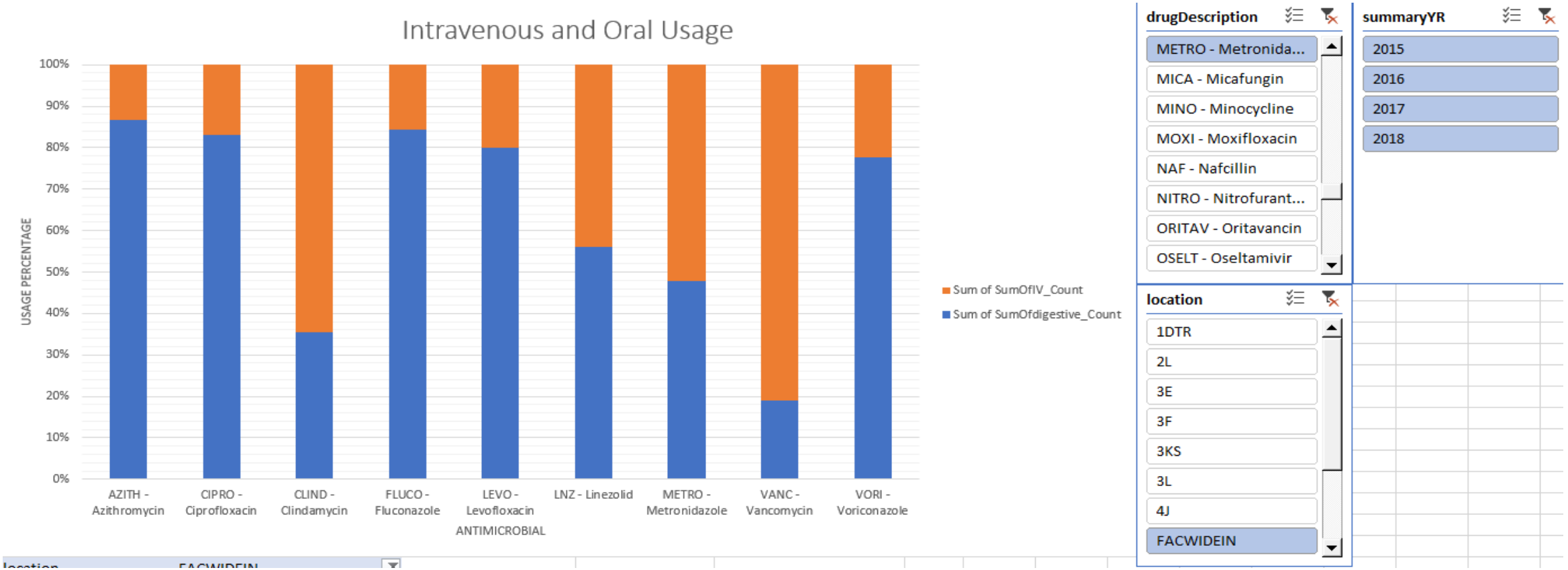


Visualizing NHSN Data

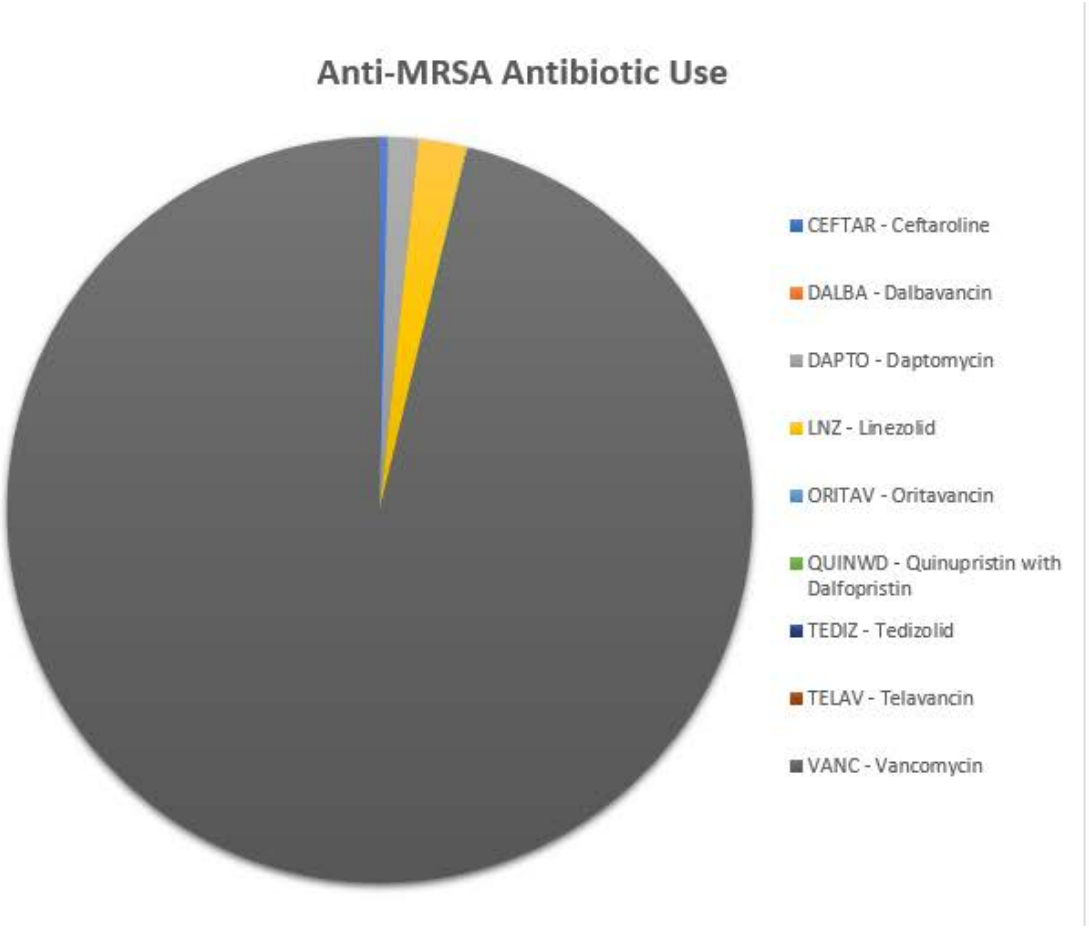
- Raw data downloaded from NHSN
- Imported into Microsoft® Access® database
  - Perform queries to parse data
- Queries incorporated into Microsoft® Excel® data model
  - Create PivotCharts in Excel® workbook
- PivotCharts updated by importing new NHSN reports
  - Data is appended to Access® database
  - All historic data is stored

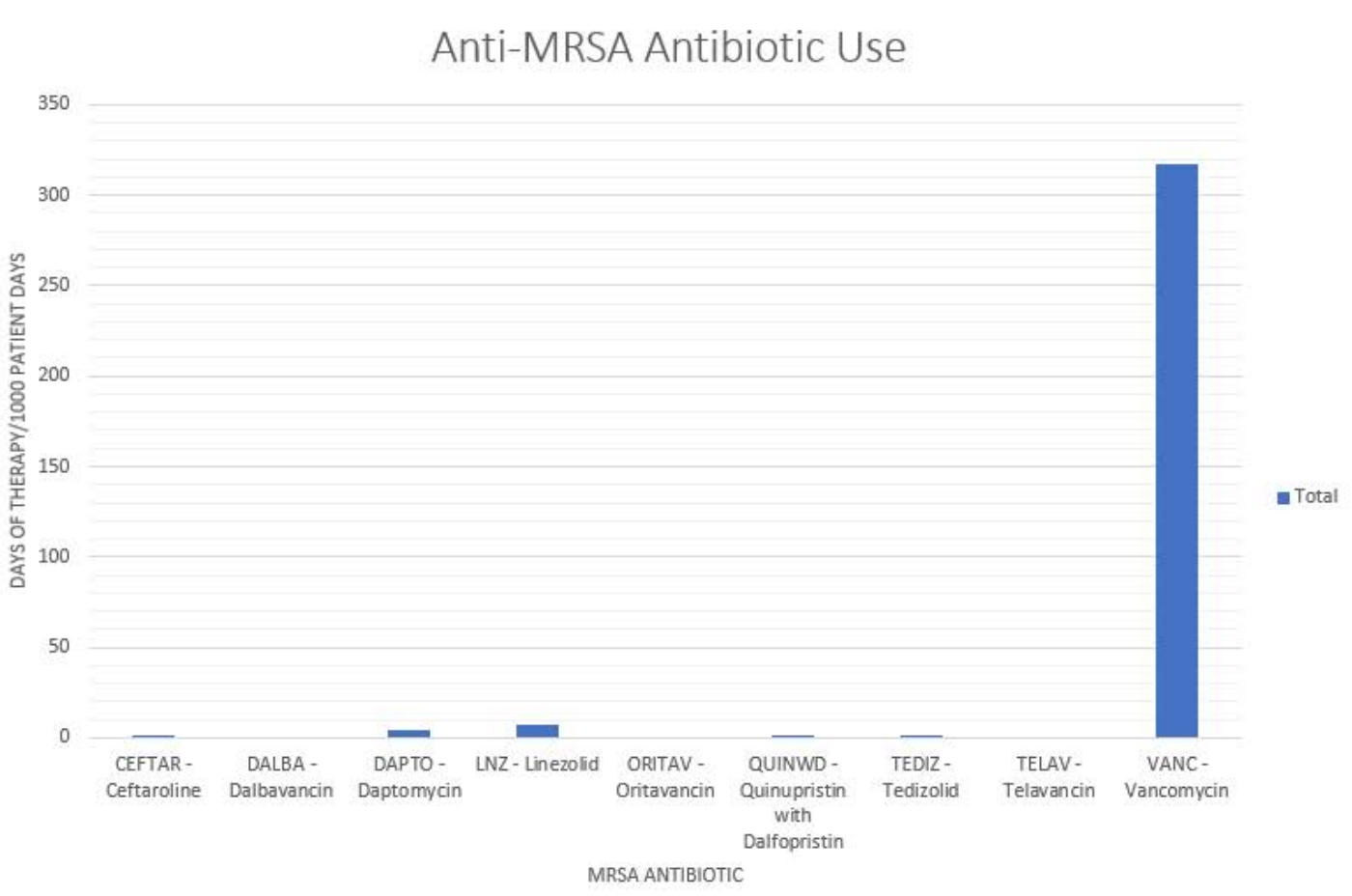


- Track and compare usage of antimicrobials over time
- Slicers can be used to change antimicrobial, time frame and ward

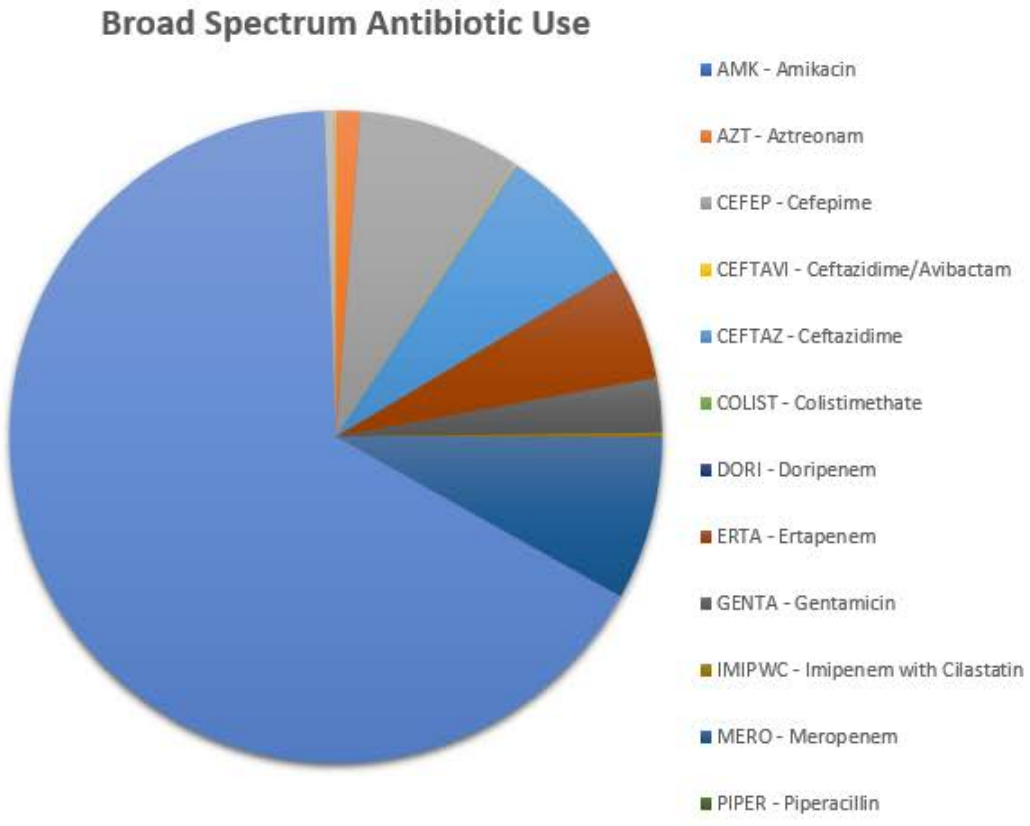


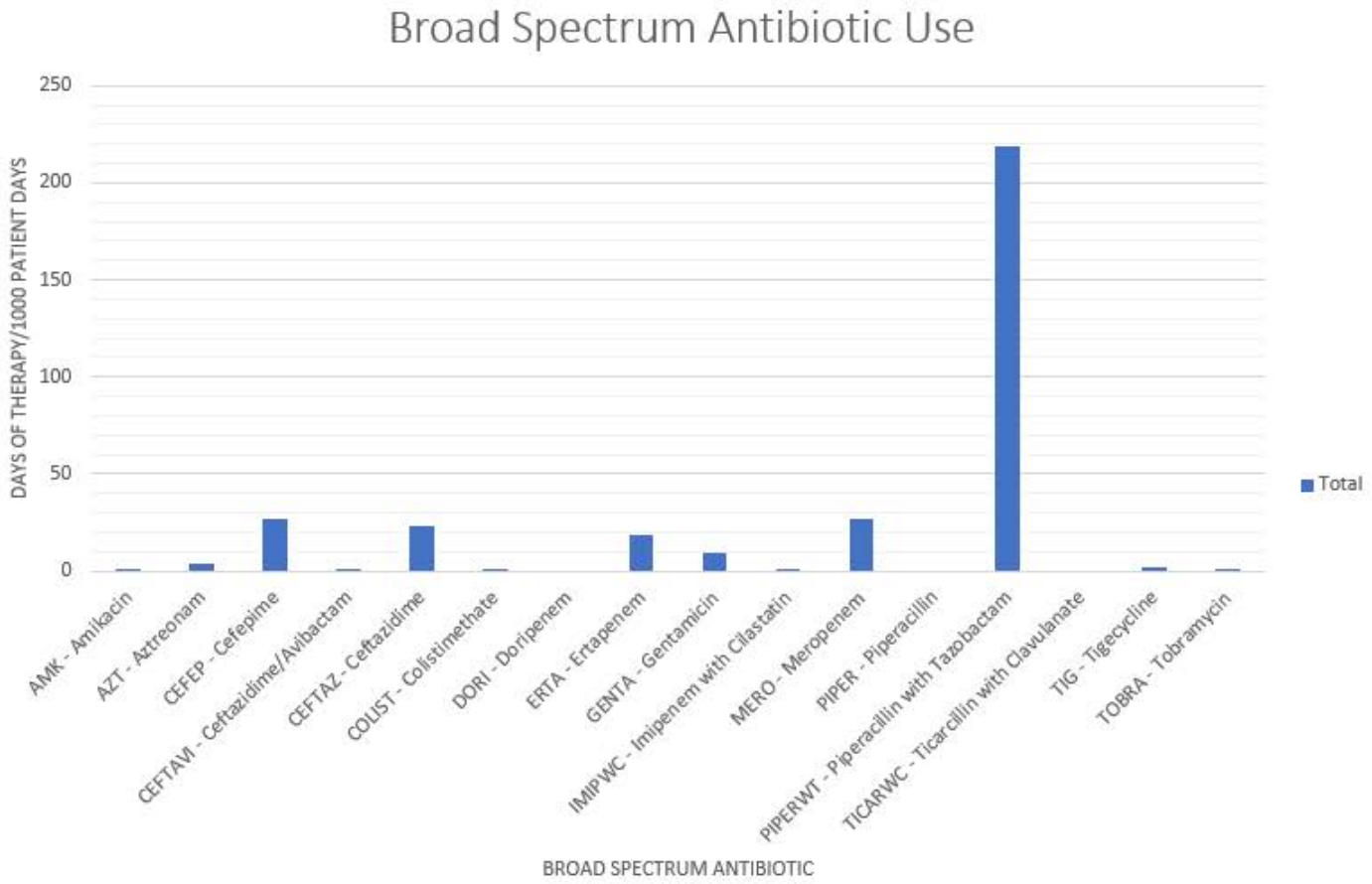
- Target IV or PO use for interventions
- Identify wards with high PO or IV usage



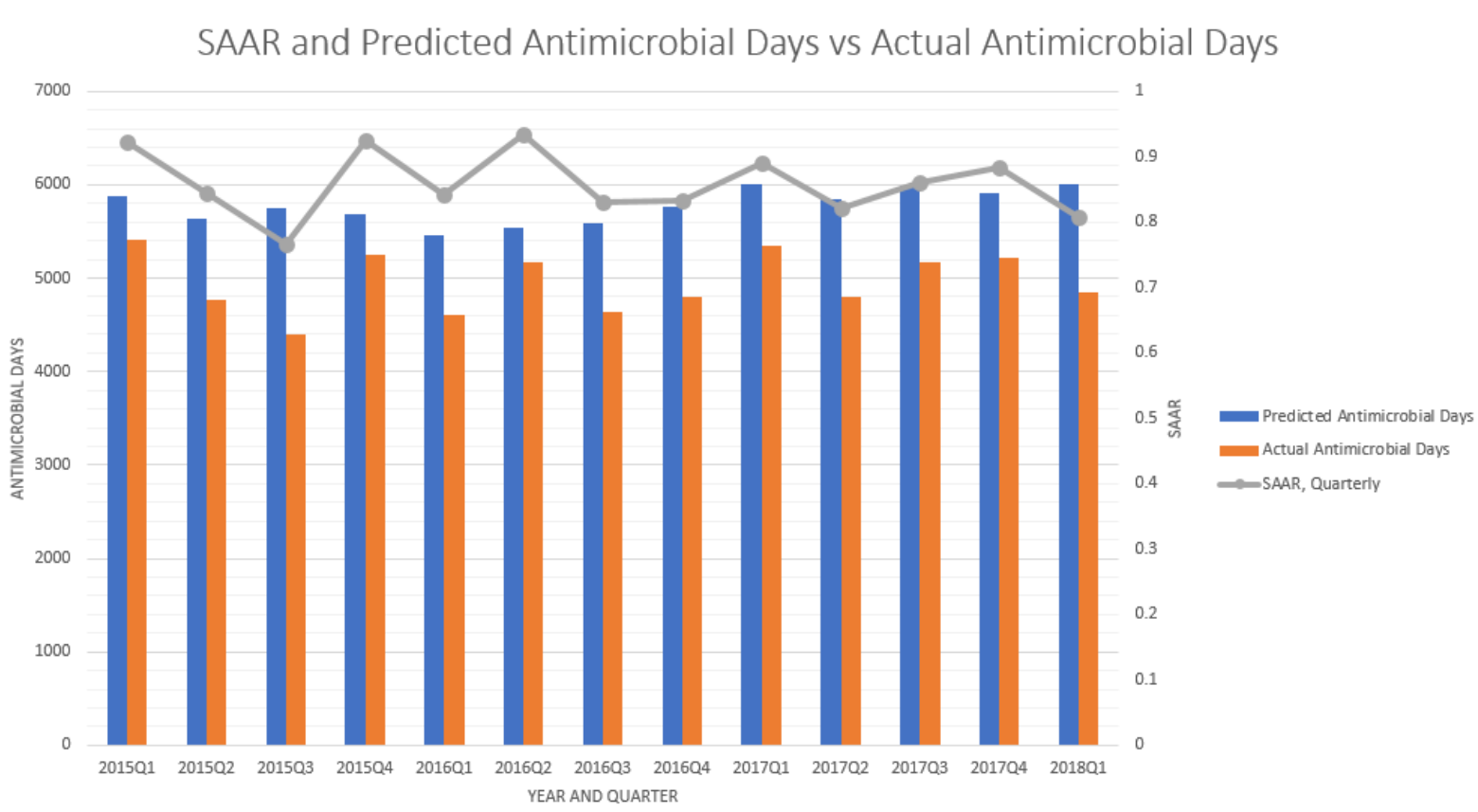


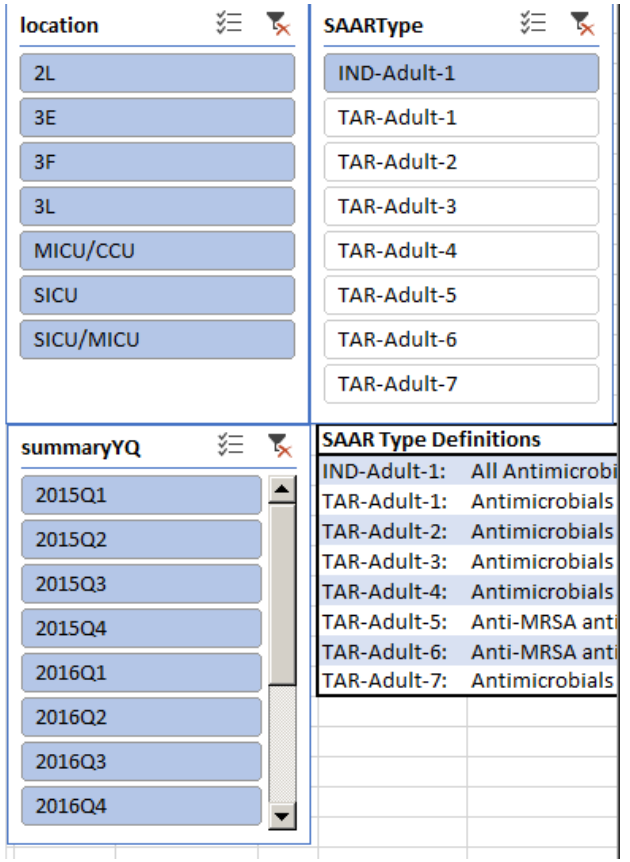
- Target Anti-MRSA antimicrobials for intervention





- Target broad spectrum antimicrobials for intervention





- Track SAAR over time by type and location
- Identify SAAR type and wards for intervention

Credits

- Andrea Aylward, PharmD, NHSN Dashboard Developer
- Dimitri Drekonja, MD, Chief of ID MVAHCS
- Makoto Jones, MD, VA NHSN Support Group Salt Lake City
- Bobbie Masoud, PharmD, NHSN Administrator VISN 23
- Lauren Rademacher, Antimicrobial Stewardship Pharmacist MVAHCS
- Micheal Vasek, MBA, NHSN Dashboard Developer

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Practical Application of NHSN Antimicrobial Use Data

Clark Force, RPh, BCPS

Antimicrobial Stewardship Pharmacist

Tucson Medical Center

Tucson Medical Center (TMC)

Nonprofit, community teaching hospital
600+ licensed beds
Average census: 375

Specialty areas include:

- Critical care for adults, pediatrics, and newborns
- Cardiovascular
- Orthopedic Surgery

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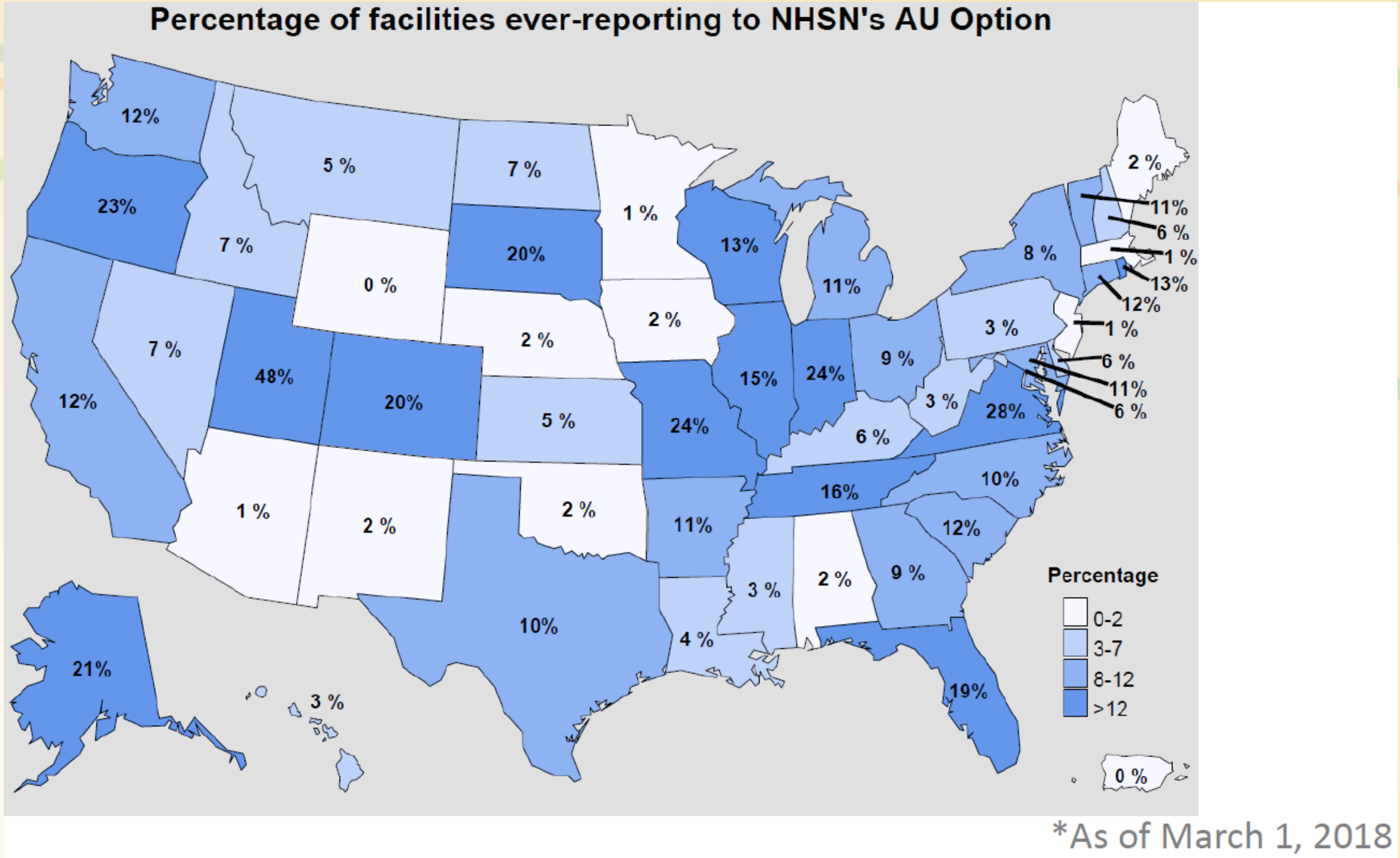

*As of March 1, 2018

Background:

Spring 2016:

Request from TMC Administration and Infection Control for the Antimicrobial Stewardship Program (ASP) to initiate an improvement project to help meet the hospital goal of reducing the incidence of Hospital-Onset *C. difficile* Infections (HO-CDI)

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Background:

- Multiple meetings with Director of Pharmacy and ASP Medical Director to plan initiative
  - Needs to be attainable
  - Needs to be easily measurable

- Early 2016 TMC ASP
  - NHSN SAAR data released
  - ASP/Pharmacy added indications to antibiotic orders
  - UTI indications identified as a “gold mine” of ASP interventions
  - Daily antibiotic indications reports were built for ASP

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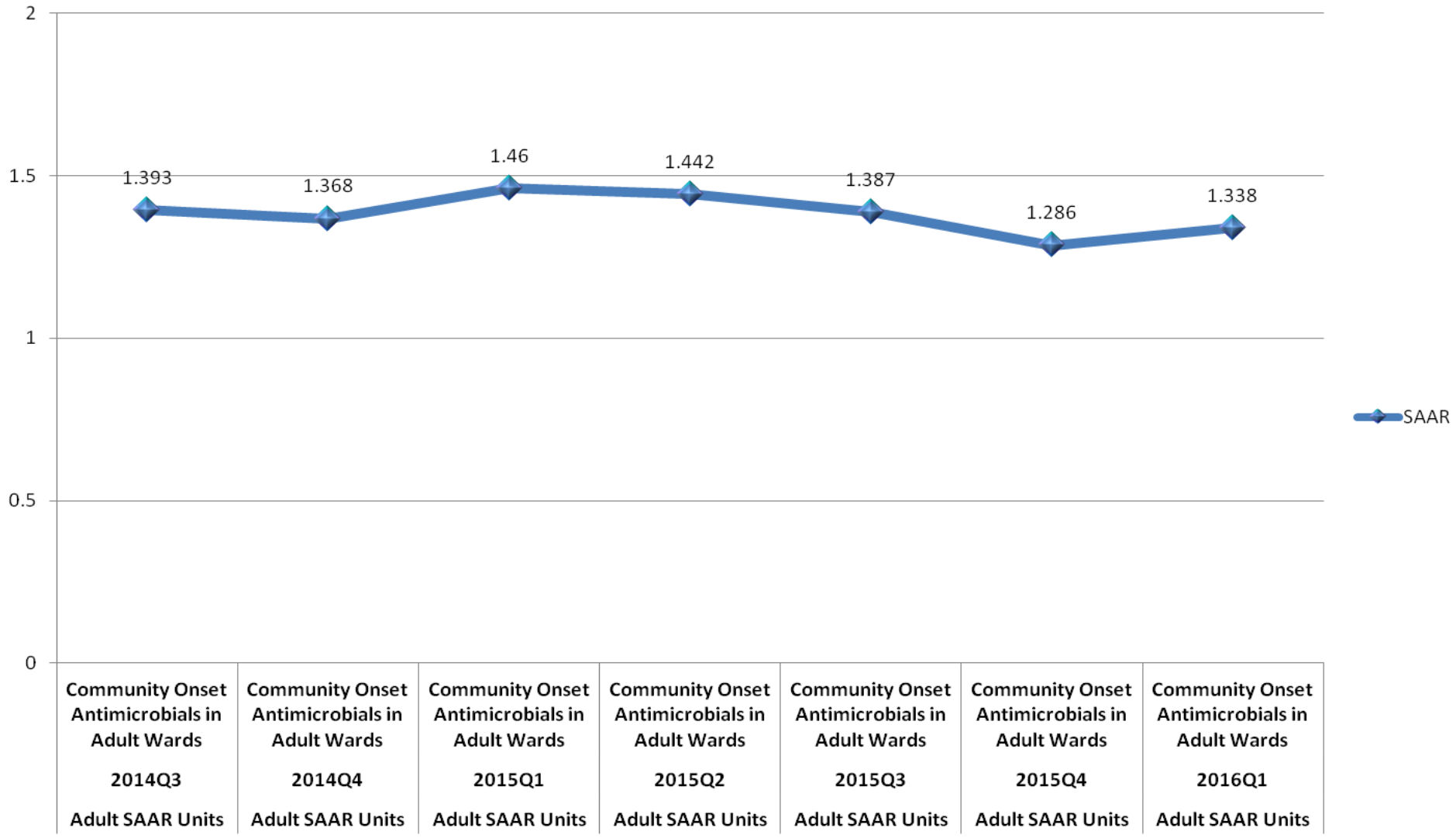
SAAR - Standardized Antimicrobial Administration Ratio
Community Onset Antimicrobials in Adult Wards

Data restricted to medical, medical/surgical and surgical locations.
Source of aggregate data: 2014 NHSN AU Data



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NHSN AU Option
SAAR - Five Antibacterial Agent Groupings
(TMC formulary antibiotics listed)

High value targets for antimicrobial stewardship programs
SAAR Groupings designated by NHSN

1. **Broad spectrum agents predominantly used for hospital-onset/multi-drug resistant bacteria –CEFEPIME, CEFTAZIDIME, MEROPENEM, PIPERACILLIN/TAZOBACTAM**

2. **Broad spectrum agents predominantly used for community-acquired infection – CEFTRIAXONE, CIPROFLOXACIN, ERTAPENEM, LEVOFLOXACIN**

3. **Anti-MRSA agents – CEFTAROLINE, DAPTOMYCIN, LINEZOLID, VANCOMYCIN** (IV route only)

4. **Agents predominantly used for surgical site infection prophylaxis – CEFAZOLIN, CEPHALEXIN**

5. **All antibacterial agents –** Includes all antibacterial agents reported into the AU Option including the agents listed in the category specific SAARs.

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Top 20 Antibiotic Indications Ordered 2016 Q1

Rank	Indication	Total
1	SURGICAL PROPHYLAXIS	3856
2	COMMUNITY ACQUIRED PNEUMONIA (CAP)	1395
3	INTRA-ABDOMINAL INFECTION	1043
4	UTI (SYMPTOMATIC)	972
5	SKIN AND SOFT TISSUE INFECTION	892
6	HEALTHCARE-ASSOCIATED PNEUMONIA	714
7	GROUP B STREP NEONATAL TRANSMISSION PPX	692
8	ABSCESS	299
9	CLOSTRIDIUM DIFFICILE	284
10	BACTEREMIA	188
11	ASPIRATION PNEUMONIA	154
12	SEPTIC SHOCK	146
13	FEMALE PELVIC INFECTION	135
14	PYELONEPHRITIS	98
15	POSTOPERATIVE INFECTION	96
16	OSTEOMYELITIS	82
17	MENINGITIS	68
18	BONE AND JOINT INFECTION	48
19	BACTERIAL PERITONITIS	36
20	FEBRILE NEUTROPENIA	28

Orders entered by pharmacists were deleted

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Plan:

- Needs to be easily measurable
  - Antibiotic Use (AU) rates, SAAR
  - ASP Pharmacist interventions

- Needs to be attainable
  - **Plan**: Reduce AU rate by 10% for:
    - Ceftriaxone
    - Ciprofloxacin
    - Levofloxacin
    - (baseline = 2015 AU rate)

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Method:

- July 2016, presented formalized plan with UTI and CAP guidelines at Medicine Department Meeting

- Conduct patient reviews w/ prospective audit and feedback on patients with orders for UTI and CAP

- Pharmacy Interventions:
  - De-escalate antibiotics and PPI
  - Set antibiotic duration
  - Dose adjustment per hospital protocols
  - IV to PO conversion per hospital protocol

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Results:

Summary of ASP Pharmacist Activity	Monthly Avg.
CAP and UTI Patients Reviewed	182
Stop Antibiotic Interventions Accepted	27
Stop Antibiotic Interventions Declined	3.5
Intervention % Acceptance	88.5%
# of Patients Reviewed per Stop Intervention	7

July 2016 to June 2017

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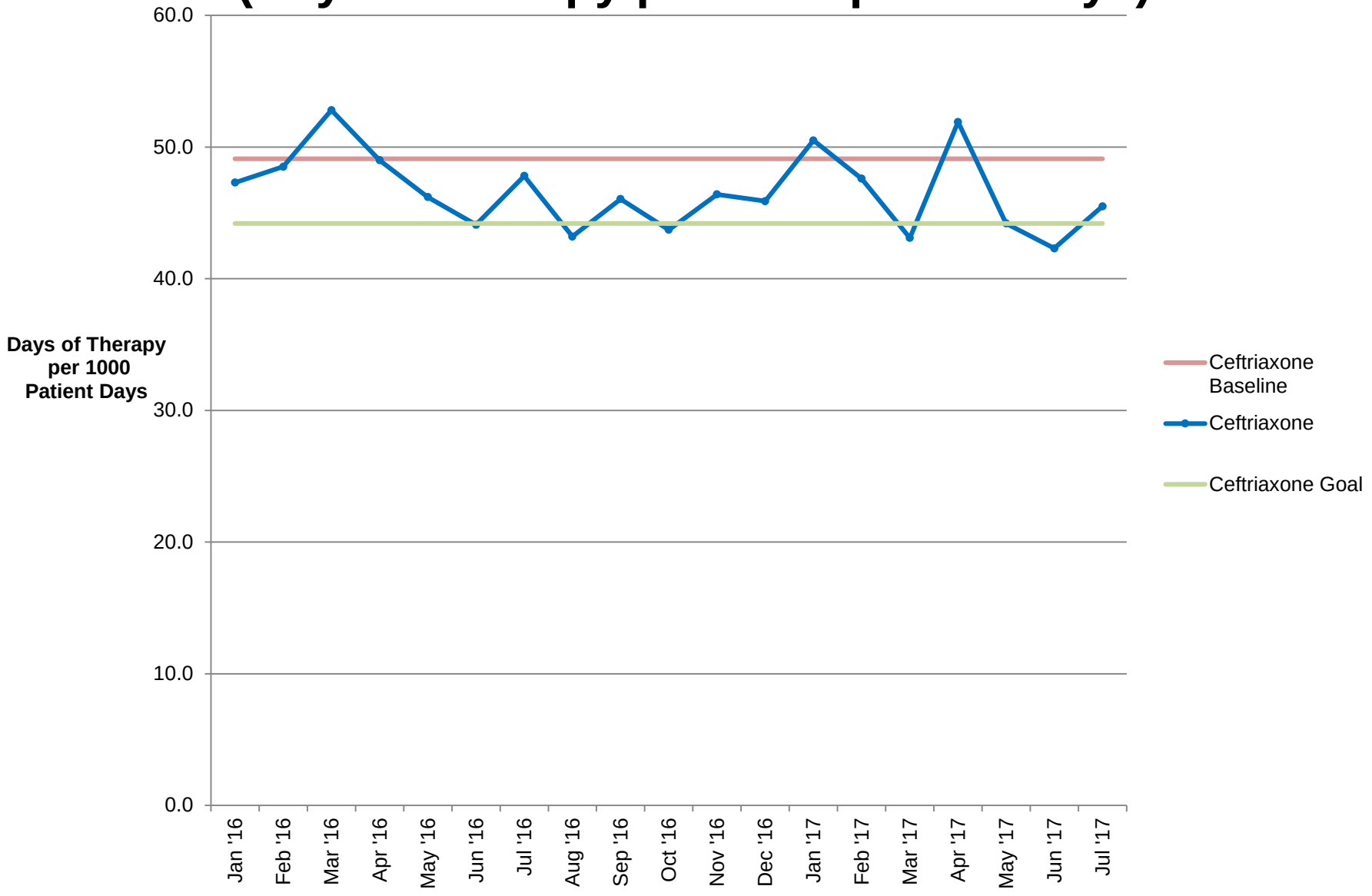
Ceftriaxone Use Rate for Adult Wards (Days of therapy per 1000 patient days)



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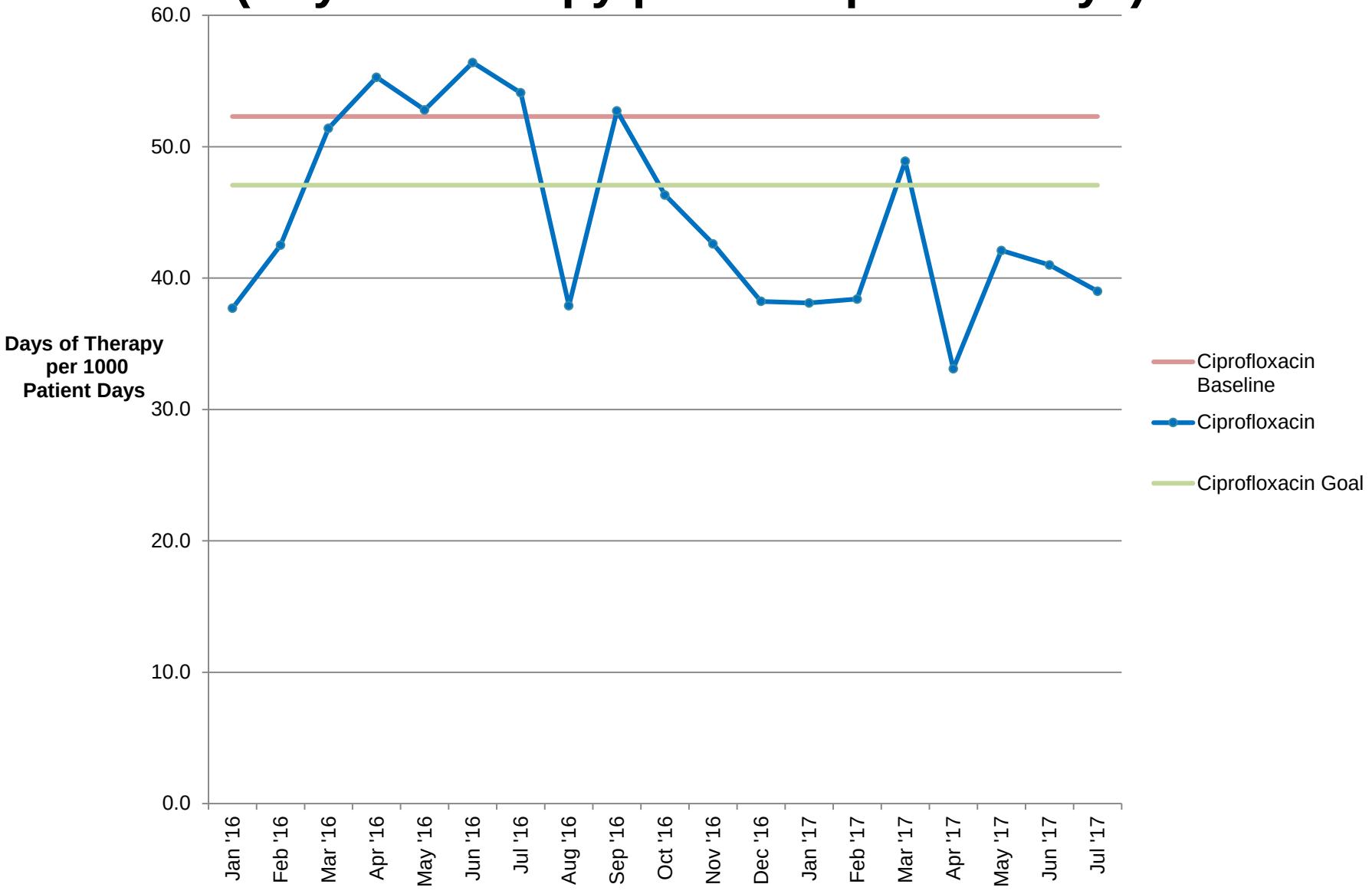
Ciprofloxacin Use Rate for Adult Wards (Days of therapy per 1000 patient days)



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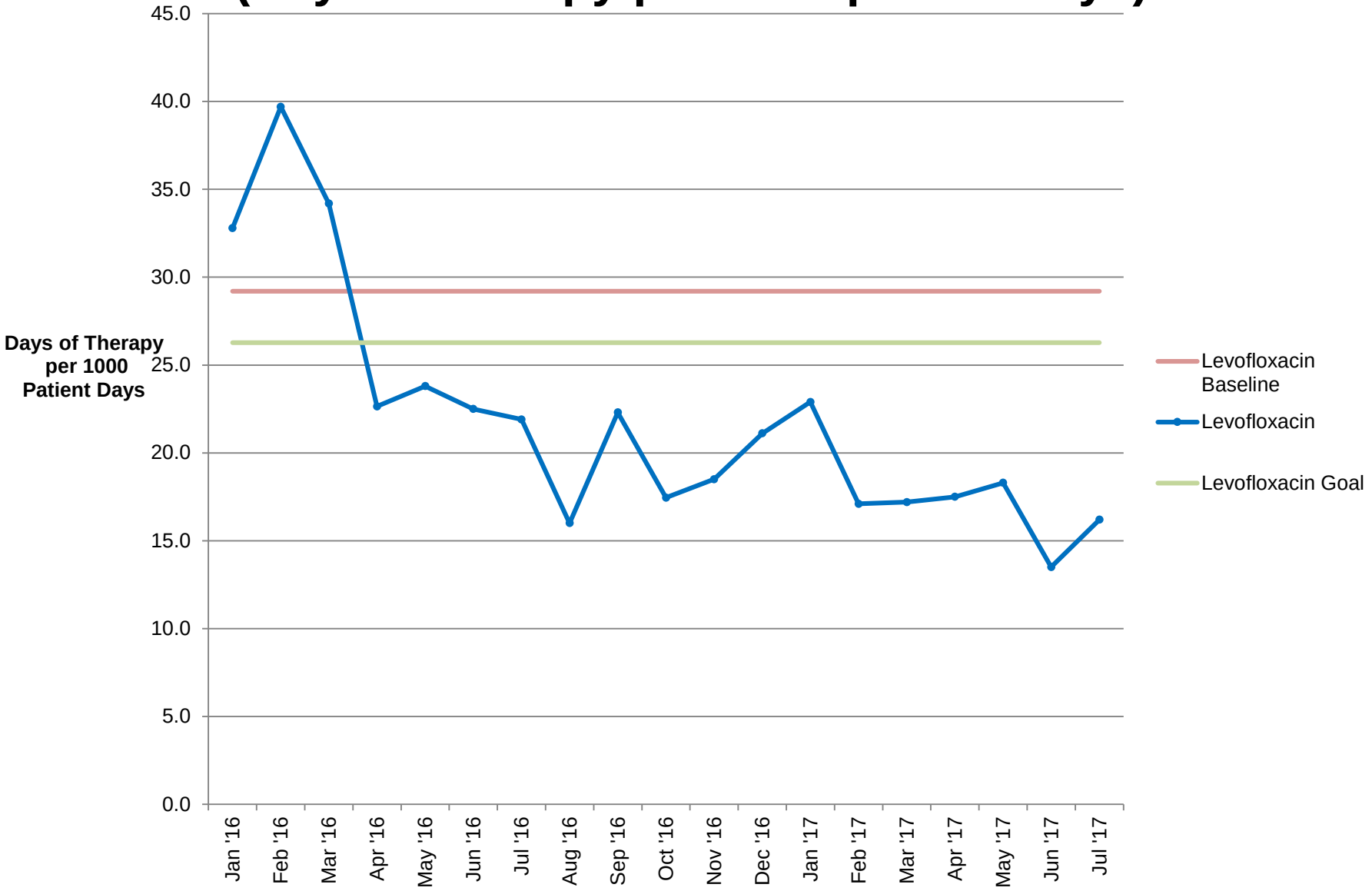
Levofloxacin Use Rate for Adult Wards (Days of therapy per 1000 patient days)



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Results:

Antibiotic	2015 AU Rate (Baseline)	AU Rate (for Initiative Time Period)	% Reduction
Ceftriaxone	49.1	46.1	6.1%
Ciprofloxacin	52.3	42.7	18.4%
Levofloxacin	29.2	18.7	36.1%

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Results:

ASP initiative was part of the 2016 hospital-wide *C diff* reduction program which also included changes to:

- Environmental cleaning
- Hand hygiene
- *C diff* testing

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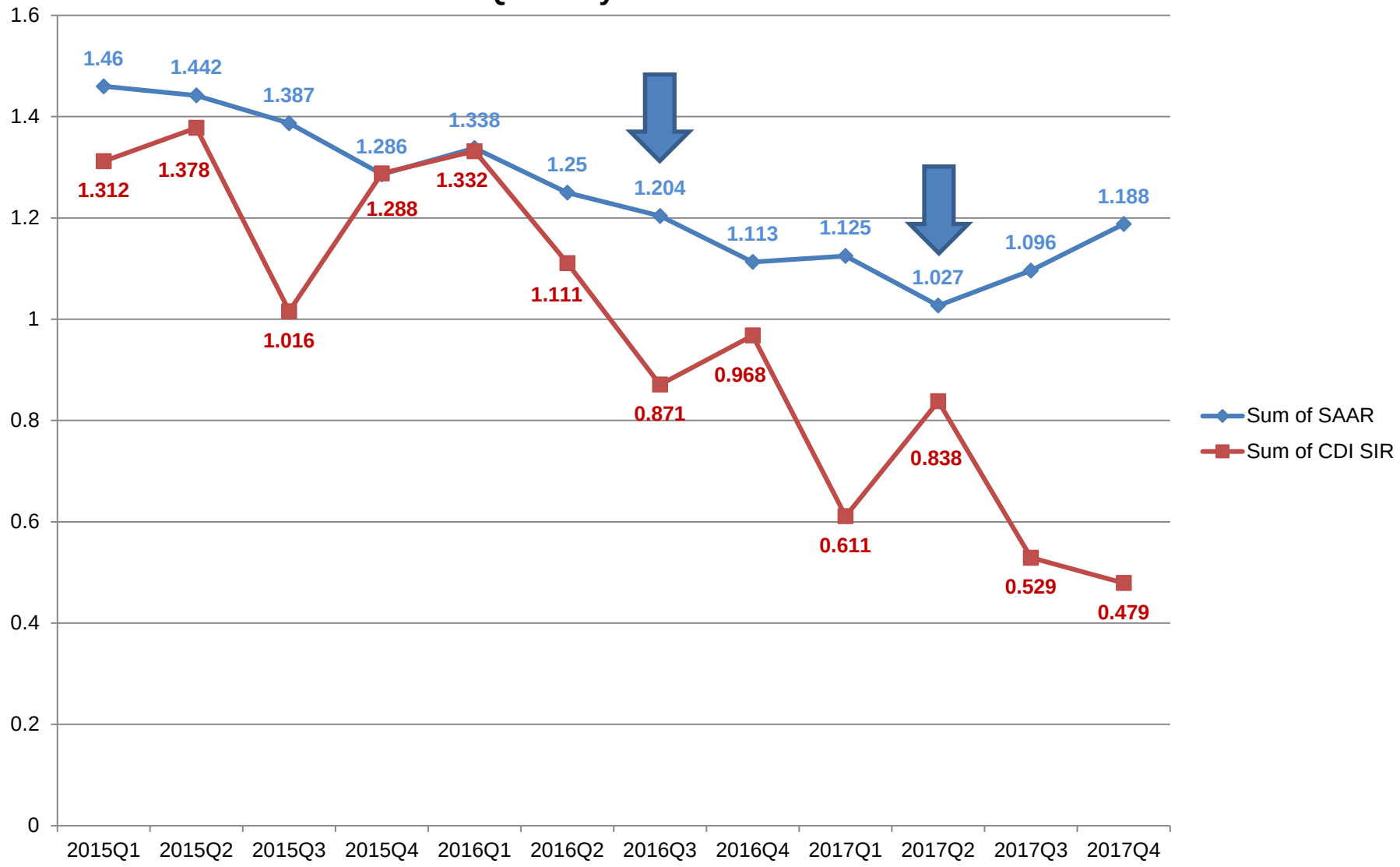
SAAR Antimicrobials used for community-onset infections in adult wards and SIR for CDI FacwideIN

Quarterly Data



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Conclusions:

- With prospective audit and feedback, over a 12 month period we applied downward pressure on the Ward SAAR for Community Onset Infections and saw reduction in use of the targeted antibiotics. Although it is part of a multi-pronged approach, we feel it is an important contributor towards the decrease in HO-CDI at our institution.

- Access to NHSN AU data
  - Directed us to target an improvement
  - Allowed for easy tracking of progress

- Antibiotic indications reporting helped us focus on specific patients/orders.

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Lessons Learned:

- This initiative includes the following CDC ASP (Joint Commission) core elements of:
  - **Tracking:** AU data
  - **Action**: Prospective audit and feedback, improve AU
  - **Education:** Providers
  - **Reporting**: Hospital administration, ASP
- UTI and CAP guidelines are a good starting point to “train” providers to de-escalate and set durations
- SAAR has no seasonal variation

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Next Steps:

- In November 2017, we rotated to new indications group:
  - Intra-abdominal infections
  - Healthcare-associated pneumonia
  - Skin and soft tissue infections

- Will progress be from CAP and UTI reviews sustained?

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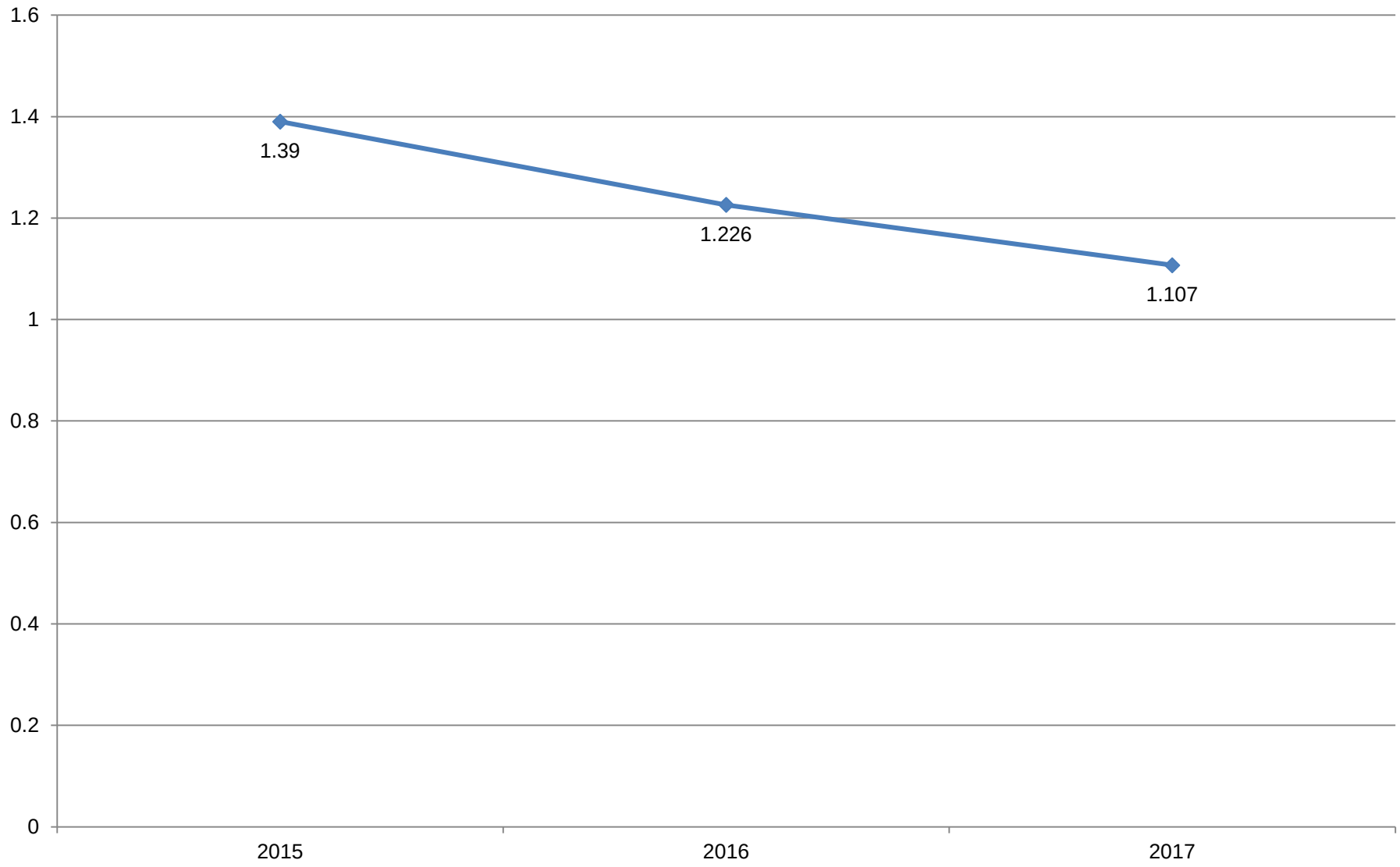
Annual SAAR - Antimicrobials used for community-onset infections in adult wards (Ceftriaxone, Ciprofloxacin, Ertapenem, Levofloxacin)



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AU Reporting:

TMC AU Reporting

- Began reporting in June of 2014
- Homegrown extraction from Epic
  - Pharmacy IS Analyst
  - Antimicrobial Stewardship Pharmacist
  - Assistance from CDC

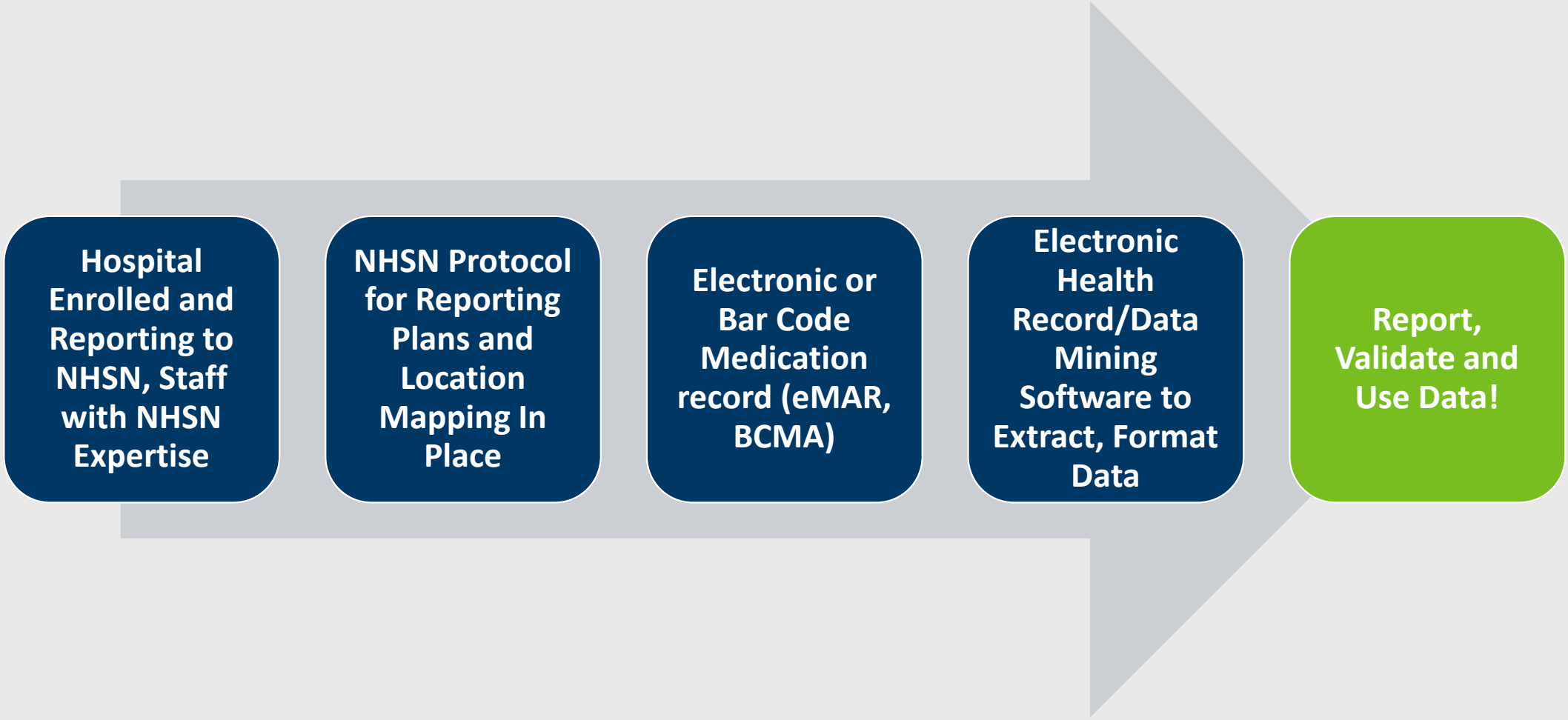
Reporting AU to NHSN is highly recommended

Tucson Medical Center

Wrap-up

Catherine Lexau, PhD, MPH, RN, Minnesota Department of Health

Antibiotic Use Reporting: Implementation Steps



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Dawn Chen, Amanda Beaudoin and Ashley Fell from MDH

Amy Webb, Wendy Wise and Chaity Naik from CDC

Questions!

Please Enter Your Questions in the Chat Box

More detailed information on NHSN AUR Module:

Protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf

AUR Toolkit from this site: https://www.cdc.gov/nhsn/cdaportal/toolkits.html

AU Option FAQs: https://www.cdc.gov/nhsn/faqs/faq-au.html

DEPARTMENT OF HEALTH

Thank you!

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