



NHSN Antimicrobial Use Option – Implementation, Validation & Analysis

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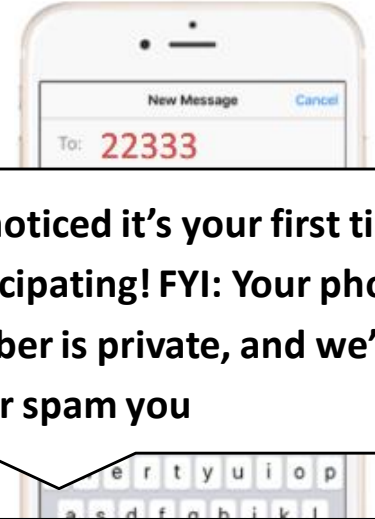
Lantana Consulting Group | Contractor for the Division of Healthcare Quality Promotion, CDC

APIC 2019 Annual Conference

Friday, June 14: 2:45-3:45pm

Joining Poll Everywhere

- A real time audience response tool
 - Participate by texting the message **NHSN** to **22333** once to join



We noticed it's your first time participating! FYI: Your phone number is private, and we'll never spam you

You've joined Cheryl Williams' session (NHSN). When you're done, reply LEAVE

Text voting

Joining Poll Everywhere

- Or, participate via any web browser on cellphone, computer or other mobile device
 - Visit the web address **PollEv.com/nhsn**



Welcome to nhsn's presentation

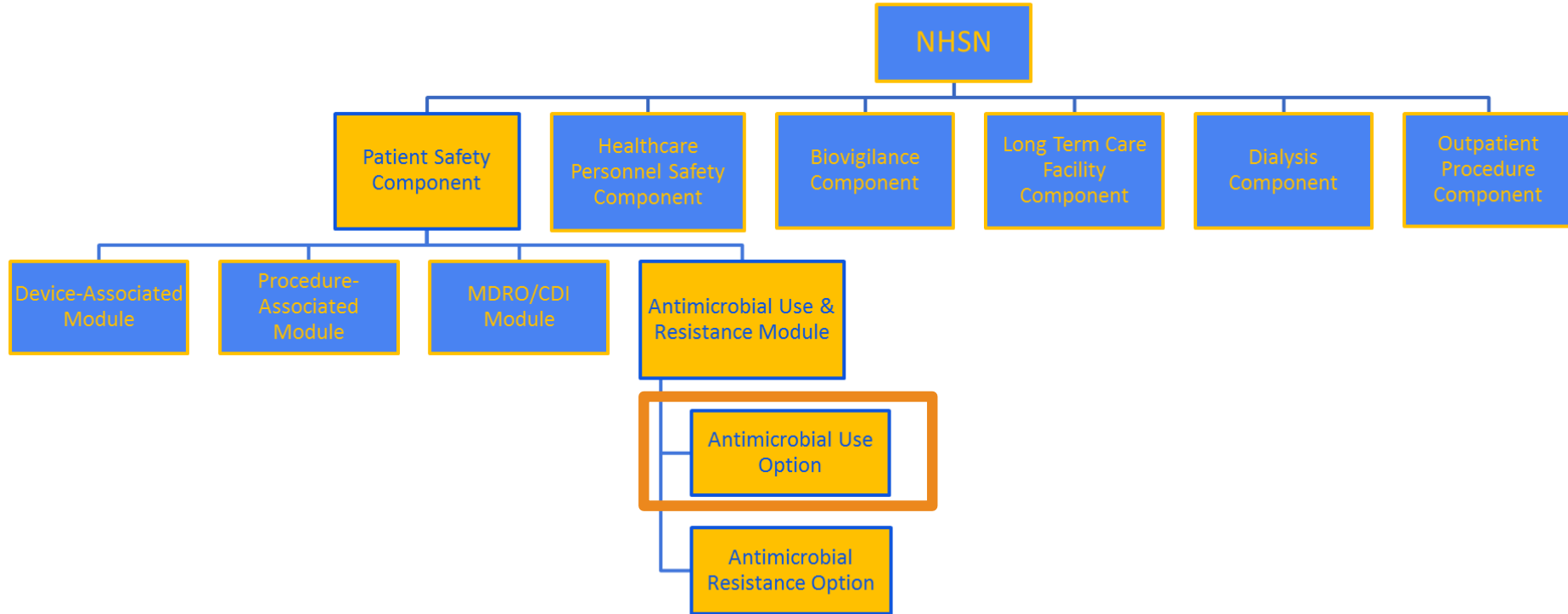
As soon as nhsn displays a poll, we'll update this area to give you the voting options.

Easy as pie. Just hang tight, you're ready to go.

Objectives

- Describe the required data elements for submission into the NHSN AU Option
- Identify ways to validate your hospital's AU data before and after submission to NHSN
- Review and interpret NHSN AU Option analysis reports including the Standardized Antimicrobial Administration Ratios (SAARs)

NHSN Structure



Antimicrobial Use (AU) Option Overview

AU Option

- Released in 2011
- Purpose:
 - Provide a mechanism for facilities to report and analyze antimicrobial usage as part of antimicrobial stewardship efforts at their facility
- Voluntary reporting
 - Not part of CMS Quality Reporting Programs
 - *Included as one option for Public Health Registry reporting for Promoting Interoperability (formerly called Meaningful Use Stage 3)

*MU 3 Final Rule: <https://www.federalregister.gov/documents/2018/08/17/2018-16766/medicare-program-hospital-inpatient-prospective-payment-systems-for-acute-care-hospitals-and-the>

*NHSN MU3 page: <https://www.cdc.gov/nhsn/cdaportal/meaningfuluse.html>

Reporting into the NHSN AU Option is required for CMS reporting.

A. True

B. False

Knowledge Check: Rationale

- False: Reporting data into the AU Option is completely voluntary
- No timeline for official inclusion in CMS Quality Reporting Programs
- Using AUR reporting for Promoting Interoperability is just one of many options to fulfill Public Health Registry reporting requirement

Requirements for AU Data Submission

Who Can Participate?

- Hospitals* that have:
 - Electronic Medication Administration Record (eMAR), or
 - Bar Coding Medication Administration (BCMA) systems and
 - Admission Discharge Transfer (ADT) System

AND

- Ability to collect and package data using HL7 standardized format: [Clinical Document Architecture](#)
 - Commercial software vendors: <http://www.sidp.org/aurvendors>
 - “Homegrown” vendors (facility’s internal IT/Informatics resources)

*General acute care hospitals, long-term acute care hospitals (LTAC), inpatient rehabilitation facilities (IRF), oncology hospitals, critical access hospitals enrolled in NHSN & participating in the Patient Safety Component

AU Option Data Elements – Numerator

- Numerator: Antimicrobial days (Days of Therapy) – sum of days for which **any** amount of specific agent was administered to a patient
 - 91 antimicrobials – includes antibacterial, antifungal, and anti-influenza agents
 - Sub-stratified by route of administration:
 - Intravenous (IV)
 - Intramuscular (IM)
 - Digestive (oral → rectal)
 - Respiratory (inhaled)
 - Only administration data (eMAR/BCMA)

Counting Antimicrobial Days

- 1 antimicrobial day per: 1 patient, 1 drug, 1 location, 1 calendar day
 - Regardless of how many administrations patient receives

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 - Regardless of how many administrations patient receives
- Example: Patient admitted to 1 South (Medical Ward) Monday 2200 & discharged Wednesday 1200

	Monday	Tuesday	Wednesday
Meropenem 1 gram IV every 8 hours			
Amikacin 1000mg IV every 24 hours			
Total Antimicrobial Days			

Counting Antimicrobial Days

- 1 antimicrobial day per: 1 patient, 1 drug, 1 location, 1 calendar day
 - Regardless of how many administrations patient receives
- Example: Patient admitted to 1 South (Medical Ward) Monday 2200 & discharged Wednesday 1200

	Monday	Tuesday	Wednesday
Meropenem 1 gram IV every 8 hours	Given: 2300		
Amikacin 1000mg IV every 24 hours	Given: 2300		
Total Antimicrobial Days	Meropenem = 1 Amikacin = 1		

Counting Antimicrobial Days

- 1 antimicrobial day per: 1 patient, 1 drug, 1 location, 1 calendar day
 - Regardless of how many administrations patient receives
- Example: Patient admitted to 1 South (Medical Ward) Monday 2200 & discharged Wednesday 1200

	Monday	Tuesday	Wednesday
Meropenem 1 gram IV every 8 hours	Given: 2300	Given: 0700 Given: 1500 Given: 2300	
Amikacin 1000mg IV every 24 hours	Given: 2300	Given: 2300	
Total Antimicrobial Days	Meropenem = 1 Amikacin = 1	Meropenem = 1 Amikacin = 1	

Counting Antimicrobial Days

- 1 antimicrobial day per: 1 patient, 1 drug, 1 location, 1 calendar day
 - Regardless of how many administrations patient receives
- Example: Patient admitted to 1 South (Medical Ward) Monday 2200 & discharged Wednesday 1200

	Monday	Tuesday	Wednesday
Meropenem 1 gram IV every 8 hours	Given: 2300	Given: 0700 Given: 1500 Given: 2300	Given: 0700
Amikacin 1000mg IV every 24 hours	Given: 2300	Given: 2300	
Total Antimicrobial Days	Meropenem = 1 Amikacin = 1	Meropenem = 1 Amikacin = 1	Meropenem = 1 Amikacin = 0

Antimicrobial Days – Total vs Sub-Stratified Routes

- 1 antimicrobial day per: 1 patient, 1 drug, 1 route, 1 location, 1 calendar day
 - 1 total antimicrobial day per drug & 1 antimicrobial day for each route per drug
 - Antimicrobial day counted on the day of administration only

Antimicrobial Days – Total vs Sub-Stratified Routes

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 - 1 total antimicrobial day per drug & 1 antimicrobial day for **each** route per drug
 - Antimicrobial day counted on the day of administration only

	Monday	Tuesday	Wednesday
Ciprofloxacin twice daily	<i>Admitted: 1200</i> <i>Given IV: 2300</i>		
Antimicrobial Day Counts	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 0		

Antimicrobial Days – Total vs Sub-Stratified Routes

- 1 antimicrobial day per: 1 patient, 1 drug, **1 route**, 1 location, 1 calendar day
 - 1 total antimicrobial day per drug & 1 antimicrobial day for **each** route per drug
 - Antimicrobial day counted on the day of administration only

	Monday	Tuesday	Wednesday
Ciprofloxacin twice daily	<i>Admitted:</i> 1200 <i>Given IV:</i> 2300	<i>Given IV:</i> 1100 <i>Given oral:</i> 2300	
Antimicrobial Day Counts	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 0	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 1	

Antimicrobial Days – Total vs Sub-Stratified Routes

- 1 antimicrobial day per: 1 patient, 1 drug, **1 route**, 1 location, 1 calendar day
 - 1 total antimicrobial day per drug & 1 antimicrobial day for **each** route per drug
 - Antimicrobial day counted on the day of administration only

	Monday	Tuesday	Wednesday
Ciprofloxacin twice daily	<i>Admitted: 1200</i> Given IV: 2300	Given IV: 1100 Given oral: 2300	Given oral: 1100 <i>Discharged: 1500</i>
Antimicrobial Day Counts	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 0	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 1	Cipro Total: 1 Cipro IV: 0 Cipro Digestive: 1

Antimicrobial Days – Sum of the Routes

- 1 patient can attribute 1 antimicrobial day to multiple routes in the same calendar day
- Routes cannot be summed to come up with the total antimicrobial days
- For drugs given more than once daily via multiple routes:
Total antimicrobial days ≤ Sum of the routes

	Monday	Tuesday	Wednesday
Ciprofloxacin twice daily	<i>Admitted: 1200</i> <i>Given IV: 2300</i>	<i>Given IV: 1100</i> <i>Given oral: 2300</i>	<i>Given oral: 1100</i> <i>Discharged: 1500</i>
Antimicrobial Day Counts	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 0	Cipro Total: 1 Cipro IV: 1 Cipro Digestive: 1	Cipro Total: 1 Cipro IV: 0 Cipro Digestive: 1

If a patient receives two administrations of Meropenem while in the Surgical Ward in a single day, that patient attributes 2 total Meropenem antimicrobial days to the Surgical Ward.

A. True

B.
False

Knowledge Check: Rationale

- False: A patient can attribute only 1 total antimicrobial day per location per drug
- 1 antimicrobial day per: 1 patient, 1 drug, 1 location, 1 calendar day
 - Regardless of how many administrations patient receives

AU Option Data Elements – Denominators

- Denominators:
 - Days Present – number of days in which a patient spent any time in specific unit or facility
 - Reported for all individual locations & FacWideIN
 - Days present \neq Patient days
 - Used for AU data only
 - Patient days throughout rest of NHSN (including HAI & AR)
 - Admissions – number of patients admitted to an inpatient location in the facility
 - Reported for FacWideIN only
 - Same definition used throughout NHSN

Which of these statements are true?

A. Days present should be lower than patient days for a given location

B. Days present should be higher than patient days for a given location

C. Days present are the same as patient days therefore they are always equal.

Knowledge Check

- B – Days present should be higher than patient days for a given location
- Days present counts the patient in the unit if they are present at any time during the calendar day
- Patient days counts the patient in the unit only if they are present for the once daily census count

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B			
Patient C			
Patient D			
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
Patient C			
Patient D			
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
Patient C	Medical ICU: 00:01-08:30 Medical Ward: 08:31-24:00	Medical ICU = 1 Medical Ward = 1	Medical ICU = 0 Medical Ward = 1
Patient D			
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
Patient C	Medical ICU: 00:01-08:30	Medical ICU = 1	Medical ICU = 0
	Medical Ward: 08:31-24:00	Medical Ward = 1	Medical Ward = 1
Patient D			
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
Patient C	Medical ICU: 00:01-08:30 Medical Ward: 08:31-24:00	Medical ICU = 1 Medical Ward = 1	Medical ICU = 0 Medical Ward = 1
Patient D	Medical ICU: 00:01-10:00 Step Down: 10:01-15:00 Medical Ward: 15:01-24:00	Medical ICU = 1 Step Down = 1 Medical Ward = 1	Medical ICU = 0 Step Down = 0 Medical Ward = 1
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
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Patient D	Medical ICU: 00:01-10:00 Step Down: 10:01-15:00 Medical Ward: 15:01-24:00	Medical ICU = 1 Step Down = 1 Medical Ward = 1	Medical ICU = 0 Step Down = 0 Medical Ward = 1
Totals:			

Counting Days Present

	Patient Movement	Days Present	Patient Days (Midnight count)
Patient A	Medical Ward: 00:01-24:00	Medical Ward = 1	Medical Ward = 1
Patient B	Medical ICU: 00:01-24:00	Medical ICU = 1	Medical ICU = 1
Patient C	Medical ICU: 00:01-08:30 Medical Ward: 08:31-24:00	Medical ICU = 1 Medical Ward = 1	Medical ICU = 0 Medical Ward = 1
Patient D	Medical ICU: 00:01-10:00 Step Down: 10:01-15:00 Medical Ward: 15:01-24:00	Medical ICU = 1 Step Down = 1 Medical Ward = 1	Medical ICU = 0 Step Down = 0 Medical Ward = 1
Totals:		Medical Ward = 3 Medical ICU = 3 Step Down = 1	Medical Ward = 3 Medical ICU = 1 Step Down = 0

AU Option: Summary Data

- Monthly aggregate, summary-level data
 - By location
 - All inpatient locations individually
 - All inpatient locations combined (Facility-wide Inpatient - aka FacWideIN)
 - 3 outpatient locations (ED, pediatric ED, 24 hour observation)
 - **Use same mapped locations throughout all of NHSN**
 - **Important:** Requires accurate/complete electronic capture of both the numerator and denominator for the given location
- Data are aggregated prior to sending to NHSN
- No patient-level data shared with NHSN for AU Option

Submitting AU Data into NHSN

Clinical Document Architecture (CDA)

- Data must be uploaded via CDA
 - Too much data to enter by hand!
- Health Level 7 (HL7) standard
- Provides facilities with standardized way to package & upload data
 - AU, AR, & HAI
- CDA ≠ CSV (Excel)
 - CDA uses XML

```
</participant>
<!-- Number of Patient-present Days -->
<entryRelationship typeCode="COMP">
  <observation classCode="OBS" moodCode="EVN">
    <templateId root="2.16.840.1.113883.10.20.5.6.69"/>
    <code codeSystem="2.16.840.1.113883.6.277"
          codeSystemName="cdcNHSN"
          code="2525-4"
          displayName="Number of Patient-present Days"/>
    <statusCode code="completed"/>
    <value xsi:type="PQ" unit="d" value="700"/>
  </observation>
</entryRelationship>
<!-- the Drug, aggregate data, no specified route of administration -->
<entryRelationship typeCode="COMP">
  <observation classCode="OBS" moodCode="EVN">
    <templateId root="2.16.840.1.113883.10.20.5.6.69"/>
    <code codeSystem="2.16.840.1.113883.6.277"
          codeSystemName="cdcNHSN"
          code="2524-7"
          displayName="Number of Therapy Days"/>
    <statusCode code="completed"/>
    <value xsi:type="PQ" unit="d" value="3"/>
    <participant typeCode="CSM"> <!-- antimicrobial Drug -->
      <participantRole classCode="MANU">
        <code codeSystem="2.16.840.1.113883.6.88"
              codeSystemName="RxNorm"
              code="620"
              displayName="Amantadine"/>
      </participantRole>
    </participant>
  </observation>
</entryRelationship>
<!-- stratified data: Drug, route -->
```

From eMAR/BCMA to CDA

1. eMAR/BCMA captures drug administration
2. Vendor or “Homegrown” system extracts & aggregates data elements
 - a) Numerator – eMAR/BCMA
 - b) Denominator – ADT (admission, discharge, transfer) system
3. Vendor or “Homegrown” system packages AU data into CDA files
 - a) 1 file per month per patient care location (unit)

If I don't have access to a CDA vendor, I can type my AU data into NHSN by hand.

A.
True

B.
False

Knowledge Check: Rationale

- **False**: AU data cannot be manually typed in by hand
 - NHSN only accepts AU data submitted via CDA file
 - Too much data to enter by hand
 - Too much room for human error

Monthly AU Data Submission

- Recommend: Upload within 30 days following the completion of the month
- 1 CDA file per location & 1 CDA file for FacWideIN
 - Each single CDA file contains numerator and denominator(s) for given location
 - All CDA files can be uploaded within 1 Zip file
 - Maximum: 1000 CDAs or file size of 2 MB per zip file
- Encourage reporting data from ALL applicable inpatient and select outpatient locations

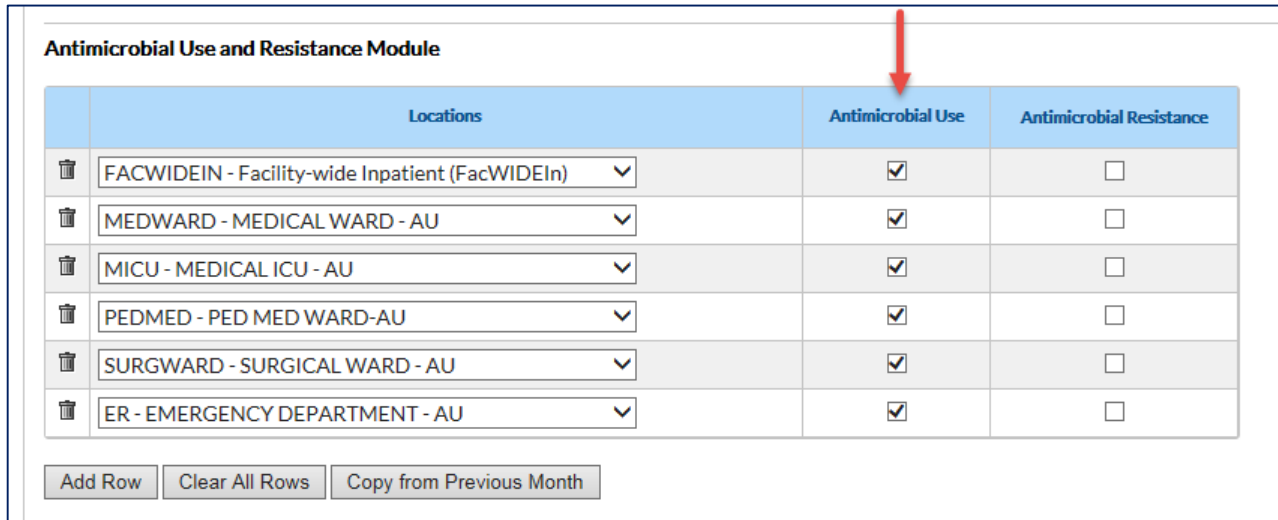
Example Monthly AU Data Submission







- Remember: 1 CDA file per location & 1 CDA file for FacWideIN
- Example for a facility with 5 patient care locations
 - 1 CDA for 1 North - Adult Medical/Surgical ICU
 - 1 CDA for 1 South - Adult Medical/Surgical Ward
 - 1 CDA for 2 North - Pediatric Medical/Surgical Ward
 - 1 CDA for 2 South - Labor & Delivery Ward
 - 1 CDA for Emergency Department
 - 1 CDA for FacWideIN (combination of all 4 NHSN-defined inpatient locations above)

Monthly Reporting Plans

- Add locations to monthly reporting plan prior to uploading data
 - Along with FacWideIN, each inpatient and outpatient location is listed separately
- Same monthly reporting plan used for HAI reporting

Antimicrobial Use and Resistance Module



	Locations	Antimicrobial Use	Antimicrobial Resistance
	FACWIDEIN - Facility-wide Inpatient (FacWIDEIn) <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MEDWARD - MEDICAL WARD - AU <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	MICU - MEDICAL ICU - AU <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	PEDMED - PED MED WARD-AU <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	SURGWARD - SURGICAL WARD - AU <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	ER - EMERGENCY DEPARTMENT - AU <input type="text"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

My facility currently reports location-specific data only for the CMS-required CLABSI and CAUTI location types. Can I report AU data from all my facility's locations?

A. Yes

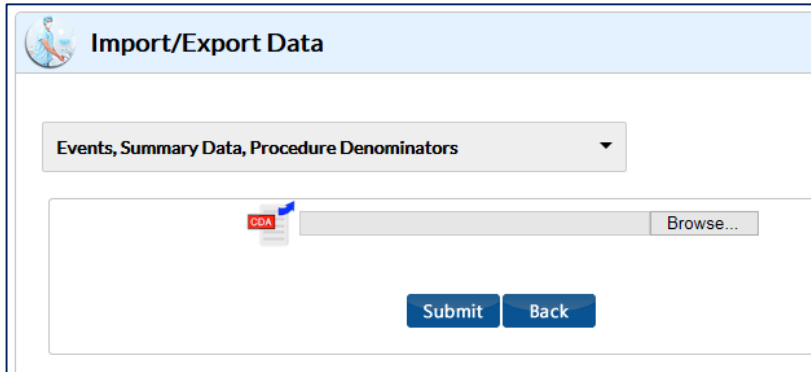
B. No

Knowledge Check: Rationale

- Can I report AU data from all my facility's locations? **YES!**
 - CLABSI & CAUTI data are required to be submitted from specific location types for CMS Quality Reporting Programs
 - AU reporting locations can exceed HAI reporting locations
 - Examples: Ortho Ward, HEM/ONC Ward, Step Down Unit, L&D Ward are all encouraged to be included in AU reporting
 - AU reporting should be from your whole facility to obtain the most accurate picture of antimicrobial use in your facility

Importing CDA Files into NHSN

- Manual upload
- Automatic upload from vendor/IT solution using DIRECT CDA Automation

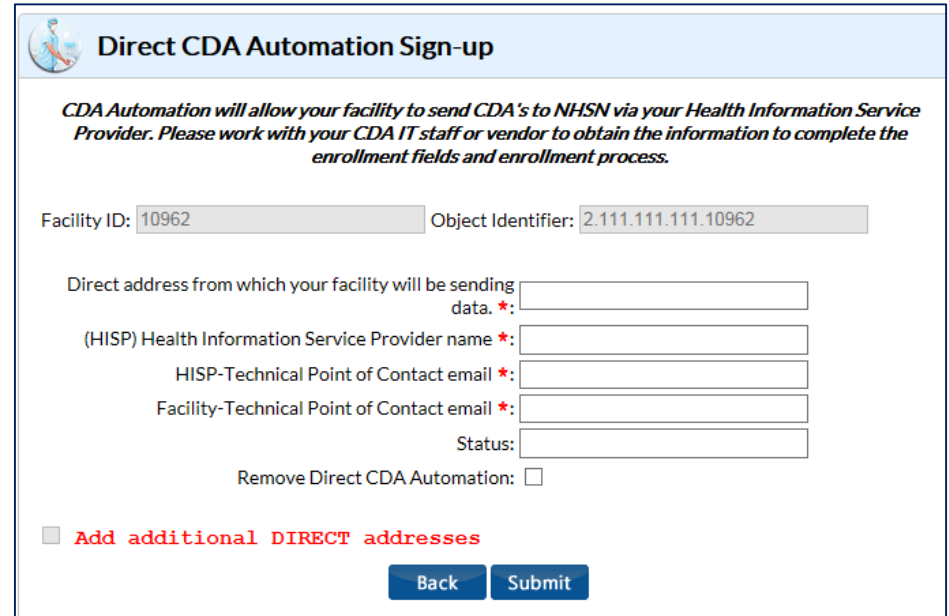


Import/Export Data

Events, Summary Data, Procedure Denominators

CDA [Text Field] Browse...

Submit Back



Direct CDA Automation Sign-up

CDA Automation will allow your facility to send CDA's to NHSN via your Health Information Service Provider. Please work with your CDA IT staff or vendor to obtain the information to complete the enrollment fields and enrollment process.

Facility ID: 10962 Object Identifier: 2.111.111.111.10962

Direct address from which your facility will be sending data. *:

(HISP) Health Information Service Provider name *:

HISP-Technical Point of Contact email *:

Facility-Technical Point of Contact email *:

Status:

Remove Direct CDA Automation:

Add additional DIRECT addresses

Back Submit

Quick Learn Video - Uploading CDA Files into NHSN:
<https://www.youtube.com/watch?v=T4DLtimpB5M>

Flow of AU Data: From Bedside to NHSN



eMAR/BCMA &
ADT



Vendor/Homegrown
System

- Monthly summary
- Location specific & FacWideIN
 - 91 antimicrobials
 - Days present & admissions



Report in standard
format



NHSN
Servers



Local access of data:
NHSN Analysis &
data sharing via
NHSN Group



Stewards can compare:

- Internally by months/locations
- Externally using Standardized Antimicrobial Administration Ratios (SAARs)

AU Option – Steps for Facility Participation

- Prerequisite: eMAR/BCMA system for inpatient locations
- Identify facility lead(s)/champion(s) for AU Option
- Gain support!
- Gather information on current CDA submission capabilities
 - Activate, obtain, or develop system for aggregating and packaging data into CDA files
- Validation
- Monthly submission & review of data





AU Data Validation

Importance of Validation

- Entire process of data capture, aggregation, and submission is electronic
 - Many connections to be made prior to successful submission
- Recommend reviewing AU data before, during, and after implementation
 - Can vary depending on available time and resources
- Not a “set and forget” system!
 - Review AU data quality at least annually after initial implementation

NHSN AU Option Data Validation Protocols

- AUR Module Webpage houses data validation resources
 - Implementation data validation
 - Annual data validation

Resources for NHSN Users Already Enrolled	
Training	+
Protocols	+
Frequently Asked Questions	+
Data Validation	-
<ul style="list-style-type: none">• NHSN AU Option Implementation Data Validation, January 2018 – Print Version  [PDF – 1 MB]<ul style="list-style-type: none">◦ Customizable Form – Print Version  [DOC – 87 KB]• NHSN AU Option Annual Data Validation, March 2018  [PDF – 410 KB]<ul style="list-style-type: none">◦ Customizable Form  [DOC – 209 KB]	

AU Option Implementation Data Validation Protocol

Validation Checklist		
	Complete	Page
Section A: Manual Validation of eMAR/BCMA Data Feeds to Vendor Software	<input type="checkbox"/>	2
Review line list for agents & routes of administration	<input type="checkbox"/>	2
Spot check for unusual routes of administration	<input type="checkbox"/>	3
Compare data in eMAR/BCMA to data in vendor software	<input type="checkbox"/>	4
Review patient-level scenarios	<input type="checkbox"/>	5
Confirm appropriate use of N/A versus 0	<input type="checkbox"/>	6
Section B: Validation of Data Aggregations & Calculations		
Review locations mapped in NHSN	<input type="checkbox"/>	7
Verify location-specific numerator & denominator aggregations	<input type="checkbox"/>	7
Verify FacWideIN numerator & denominator aggregations	<input type="checkbox"/>	8
Compare AU & HAI denominators	<input type="checkbox"/>	10
Section C: Spot Checking Data Submitted to NHSN		
Review less common routes of administration	<input type="checkbox"/>	13
Evaluate location-specific expected patterns	<input type="checkbox"/>	14
Evaluate drug-specific expected patterns	<input type="checkbox"/>	15
Review location-specific numerator aggregations	<input type="checkbox"/>	16
Review FacWideIN numerator aggregations	<input type="checkbox"/>	17
Compare AU & HAI denominators	<input type="checkbox"/>	19

Annual AU Option Data Validation

Validation Checklist		
	Complete	Page
NHSN Locations	<input type="checkbox"/>	2
Review for changes in patient mix	<input type="checkbox"/>	2
Add brand new locations	<input type="checkbox"/>	2
Inactivate permanently closed locations	<input type="checkbox"/>	2
NHSN Monthly Reporting Plans	<input type="checkbox"/>	3
Check for inactive locations	<input type="checkbox"/>	3
Add brand new locations	<input type="checkbox"/>	3
Review calendar year for completeness	<input type="checkbox"/>	3
NHSN Users	<input type="checkbox"/>	4
Confirm two active AU users	<input type="checkbox"/>	4
Deactivate former AU users	<input type="checkbox"/>	4
NHSN AU Data	<input type="checkbox"/>	4
Review location-specific SAARs	<input type="checkbox"/>	4
Examine drug-specific trends	<input type="checkbox"/>	6
Spot check data	<input type="checkbox"/>	8
Check and compare denominators	<input type="checkbox"/>	10

Three Common Data Quality Issues

1. Zero antimicrobial days for all drugs for the month
 - Could be accurate if zero patients in the location that month

Three Common Data Quality Issues

1. Zero antimicrobial days for all drugs for the month
2. Antimicrobial days reported for any drug when days present are zero
 - Never accurate
 - Cannot report antimicrobial days if no patients in the location
 - In many cases, this is a problem with the denominator (days present) data capture

Three Common Data Quality Issues

1. Zero antimicrobial days for all drugs for the month
2. Antimicrobial days reported for any drug when days present are zero
3. AU Days Present are less than HAI Patient Days
 - Never accurate
 - Could be related to either denominator
 - Are observation patients being correctly included?
 - Are all patients that spent time in the location included in the Days Present count?

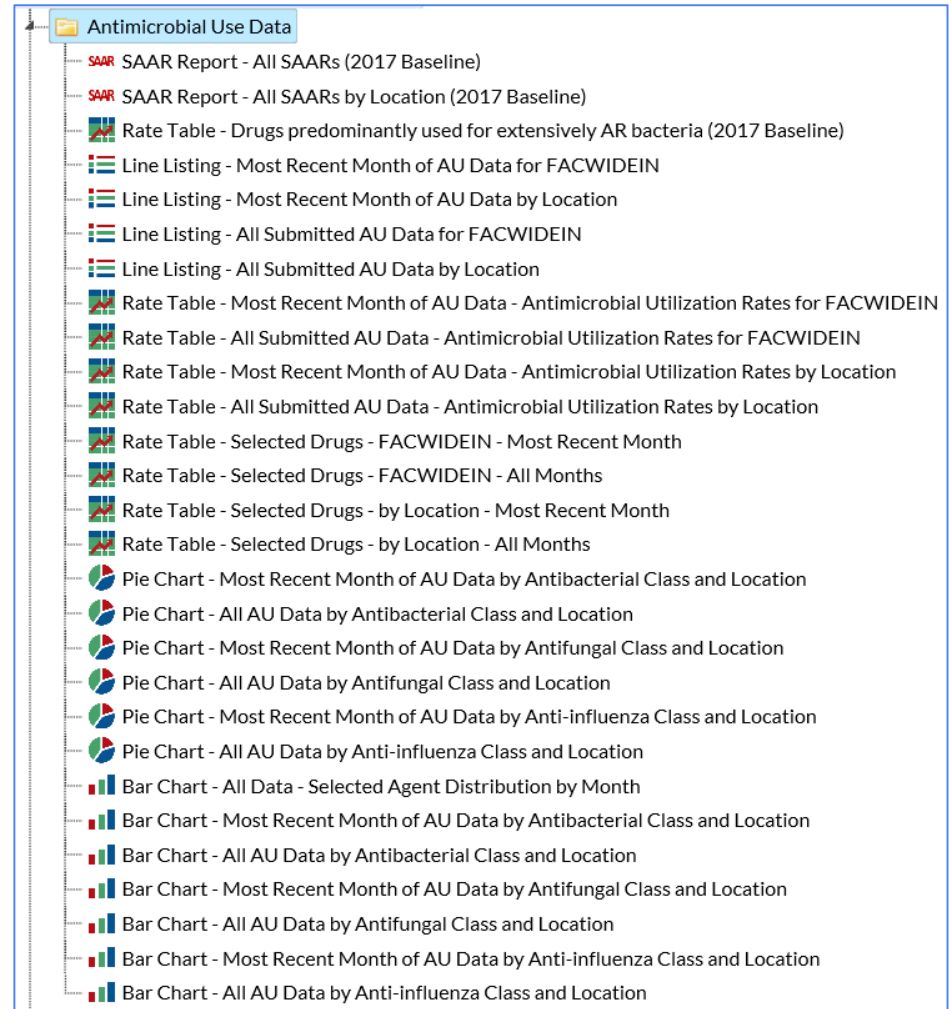
How Can IPs Help?

- Discuss location mapping; review locations annually
- Review monthly reporting plans
- Update/add AU users
- Assist with data comparison requests
 - Most often with location-specific & FacWideIN denominators

AU Option – NHSN Analysis Reports

NHSN Analysis Reports

- Basic & advanced analysis reports available
 - Line lists
 - Rate tables
 - Pie charts
 - Bar charts
 - SAARs (Standardized Antimicrobial Administration Ratio)



NHSN Analysis Reports

- Basic & advanced analysis reports available

- Line lists
- Rate tables

- Pie charts
- Bar charts

- SAARs (Standardized Antimicrobial Administration Ratio)

Antimicrobial Use Data

- SAAR SAAR Report - All SAARs (2017 Baseline)
- SAAR SAAR Report - All SAARs by Location (2017 Baseline)
- Rate Table - Drugs predominantly used for extensively AR bacteria (2017 Baseline)
- Line Listing - Most Recent Month of AU Data for FACWIDEIN
- Line Listing - Most Recent Month of AU Data by Location
- Line Listing - All Submitted AU Data for FACWIDEIN
- Line Listing - All Submitted AU Data by Location
- Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates for FACWIDEIN
- Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates for FACWIDEIN
- Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates by Location
- Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates by Location
- Rate Table - Selected Drugs - FACWIDEIN - Most Recent Month
- Rate Table - Selected Drugs - FACWIDEIN - All Months
- Rate Table - Selected Drugs - by Location - Most Recent Month
- Rate Table - Selected Drugs - by Location - All Months
- Pie Chart - Most Recent Month of AU Data by Antibacterial Class and Location
- Pie Chart - All AU Data by Antibacterial Class and Location
- Pie Chart - Most Recent Month of AU Data by Antifungal Class and Location
- Pie Chart - All AU Data by Antifungal Class and Location
- Pie Chart - Most Recent Month of AU Data by Anti-influenza Class and Location
- Pie Chart - All AU Data by Anti-influenza Class and Location
- Bar Chart - All Data - Selected Agent Distribution by Month
- Bar Chart - Most Recent Month of AU Data by Antibacterial Class and Location
- Bar Chart - All AU Data by Antibacterial Class and Location
- Bar Chart - Most Recent Month of AU Data by Antifungal Class and Location
- Bar Chart - All AU Data by Antifungal Class and Location
- Bar Chart - Most Recent Month of AU Data by Anti-influenza Class and Location
- Bar Chart - All AU Data by Anti-influenza Class and Location

Line List

- Generates a list of each antimicrobial separated by location
 - 91 rows per location per month
- Shows total antimicrobial days, days present, admissions (FacWideIN only) and sub-stratification of routes of administration for each antimicrobial

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 Description	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

Reading the Line List

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 Description	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

- In Jan. 2015, Amikacin was used for 2 total antimicrobial days in the MICU.
 - There were 2 IV route Amikacin antimicrobial days and 1 respiratory route Amikacin antimicrobial day.

Rate Table

- Rate of utilization per 1,000 days present or 100 admissions (FacWideIN only) for each antimicrobial category and class by location & time period
 - Month, quarter, half year, year, cumulative time periods

National Healthcare Safety Network
Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates for FACWIDEIN
Rate per 1,000 Days Present
 As of: February 23, 2015 at 1:44 PM
 Date Range: All AU_RATES1MONTHFACWIDEIN

Facility Org ID=13860

Summary Year/Month	Antimicrobial Category	Antimicrobial Class	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2015M01	Antibacterial	-- All --	1626	2177	746.899
2015M01	Antibacterial	Aminoglycosides	22	2177	10.106
2015M01	Antibacterial	Carbapenems	101	2177	46.394
2015M01	Antibacterial	Cephalosporins	337	2177	154.8
2015M01	Antibacterial	Fluoroquinolones	244	2177	112.081
2015M01	Antibacterial	Folate pathway inhibitors	32	2177	14.699

Reading the Rate Table

National Healthcare Safety Network
Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates for FACWIDEIN
Rate per 1,000 Days Present
 As of: February 23, 2015 at 1:44 PM
 Date Range: All AU_RATES1MONTHFACWIDEIN

Facility Org ID=13860

Summary Year/Month	Antimicrobial Category	Antimicrobial Class	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2015M01	Antibacterial	-- All --	1626	2177	746.899
2015M01	Antibacterial	Aminoglycosides	22	2177	10.106
2015M01	Antibacterial	Carbapenems	101	2177	46.394
2015M01	Antibacterial	Cephalosporins	337	2177	154.8
2015M01	Antibacterial	Fluoroquinolones	244	2177	112.081
2015M01	Antibacterial	Folate pathway inhibitors	32	2177	14.699

- In Jan. 2015, in all the inpatient locations combined (FacWideIN) all antibacterial agents were used at a rate of 747 days per 1,000 days present

Reading the Rate Table

National Healthcare Safety Network
Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates for FACWIDEIN
Rate per 1,000 Days Present
 As of: February 23, 2015 at 1:44 PM
 Date Range: All AU_RATES1MONTHFACWIDEIN

Facility Org ID=13860

Summary Year/Month	Antimicrobial Category	Antimicrobial Class	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2015M01	Antibacterial	-- All --	1626	2177	746.899
2015M01	Antibacterial	Aminoglycosides	22	2177	10.106
2015M01	Antibacterial	Carbapenems	101	2177	46.394
2015M01	Antibacterial	Cephalosporins	337	2177	154.8
2015M01	Antibacterial	Fluoroquinolones	244	2177	112.081
2015M01	Antibacterial	Folate pathway inhibitors	32	2177	14.699

- In Jan. 2015, in all the inpatient locations combined (FacWideIN) all antibacterial agents were used at a rate of 747 days per 1,000 days present
- Carbapenems were used in all the inpatient locations combined at a rate of 46 days per 1,000 days present

Rate Table by Location by Selected Antimicrobial

National Healthcare Safety Network
Rate Table - Selected Drugs from All AU Data - Antimicrobial Utilization Rates by Location
Rate per 1,000 Days Present
 As of: December 20, 2016 at 5:03 PM
 Date Range: AU_DRUGRATE\$LOCATION summaryYM 2015M01 to 2015M03
 if (((drugIngredientDesc = "LNZ")))

Facility Org ID=13860 CDC Location=IN:ACUTE:CC:MS_PED Location=PMSICU

Summary Year/Month	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2015M01	4	526	7.60
2015M02	13	350	37.14
2015M03	10	264	37.88

National Healthcare Safety Network
Rate Table - Selected Drugs from All AU Data - Antimicrobial Utilization Rates by Location
Rate per 1,000 Days Present
 As of: December 20, 2016 at 5:03 PM
 Date Range: AU_DRUGRATE\$LOCATION summaryYM 2015M01 to 2015M03
 if (((drugIngredientDesc = "LNZ")))

Facility Org ID=13860 CDC Location=IN:ACUTE:CC:M_PED Location=PMICU

Summary Year/Month	Antimicrobial Days	Days Present	Rate per 1000 Days Present
2015M01	5	420	11.90
2015M02	4	411	9.73
2015M03	9	429	20.98

- Rates generated according to modifications/filters
 - Single antimicrobial
 - Multiple antimicrobials within the same class
 - Multiple antimicrobials from multiple classes

Standardized Antimicrobial Administration Ratios (SAARs)

What is a SAAR?

- SAAR Definition

- Standardized risk-adjusted metric of antibiotic use
- Available to facilities reporting to the AU Option in NHSN
- Compares observed to predicted days of antimicrobial use

$$\frac{\textit{Observed}}{\textit{Predicted}} = \frac{100 \text{ antimicrobial days observed}}{85 \text{ antimicrobial days predicted}} = 1.176$$

SAAR Definition

1

$$\frac{\text{Observed}}{\text{Predicted}} = \frac{100 \text{ antimicrobial days observed}}{85 \text{ antimicrobial days predicted}} = 1.176$$

1

The observed number of antimicrobial days is how many days the facility administered antimicrobial agents to patients in a given location

SAAR Definition continued

2

$$\frac{\textit{Observed}}{\textit{Predicted}} = \frac{100 \textit{ antimicrobial days observed}}{85 \textit{ antimicrobial days predicted}} = 1.176$$

2

The predicted number of antimicrobial days are calculated using statistical models based on nationally aggregated data

SAAR Reports

- SAARs generated per month, quarter, half year, year, or cumulative
- Generated for specific location types for January 2017 forward

Adult Locations

- Medical Critical Care
- Surgical Critical Care
- Medical-Surgical Critical Care
- Surgical Ward
- Medical Ward
- Medical-Surgical Ward
- Oncology General Hematology-Oncology Ward
- Adult Stepdown Unit

Pediatric Locations

- Pediatric Medical Critical Care
- Pediatric Medical-Surgical Critical Care
- Pediatric Medical Ward
- Pediatric Surgical Ward
- Pediatric Medical-Surgical Ward

SAAR Reports in NHSN

National Healthcare Safety Network SAARs Table - All SAARs by Location (2017 Baseline)

As of: February 22, 2019 at 2:53 PM

Date Range: All AU_SAAAR_2017

Reported Use

SAAR Value

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

Facility Org ID	SAAR Type 2017 Baseline	Location	Summary Year/Month	CDC Location	Antimicrobial Days	Predicted Antimicrobial Days	Days Present	SAAR	SAAR p-value	95% Confidence Interval
13860	Adult_BSHO_Ward_2017	5GNORTH	2017M07	IN:ACUTE:WARD:MS	144	131.744	1145	1.093	0.3058	0.925, 1.283
13860	Adult_BSHO_Ward_2017	5GNORTH	2018M07	IN:ACUTE:WARD:MS	158	52.338	541	3.019	0.0000	2.575, 3.518
13860	Adult_BSHO_Ward_2017	700	2018M07	IN:ACUTE:WARD:S	134	108.642	1123	1.233	0.0205	1.037, 1.456
13860	Adult_BSHO_Ward_2017	MEDWARD	2017M01	IN:ACUTE:WARD:M	113	87.085	700	1.298	0.0088	1.074, 1.554
13860	Adult_BSHO_Ward_2017	MEDWARD	2018M07	IN:ACUTE:WARD:M	160	39.121	374	4.090	0.0000	3.492, 4.762

Includes data for January 2017 and forward.

The SAAR is only calculated if the number of predicted antimicrobial days (numAUDaysPredicted) is ≥ 1 .

If antimicrobial days exceed days present for a specific SAAR category, a SAAR will not be calculated and data should be validated for accuracy.

Data restricted to medical, medical-surgical, surgical, step down and oncology locations.

Source of aggregate data: 2017 NHSN AU Data

Data contained in this report were last generated on February 11, 2019 at 3:34 PM.

Predicted Use

Reading the SAAR Report

National Healthcare Safety Network

SAARs Table - All SAARs by Location (2017 Baseline)

As of: December 7, 2018 at 1:16 PM

Date Range: AU_SAAAR_2017 summaryYM After and Including 2018M07

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

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
13860	Adult_BSHO_Ward_2017	5GNORTH	2018M07	IN:ACUTE:WARD:MS	158	62.248	541	2.538	0.0000	2.165, 2.958
13860	Adult_BSHO_Ward_2017	700	2018M07	IN:ACUTE:WARD:S	134	129.213	1123	1.037	0.6967	0.872, 1.224
13860	Adult_BSHO_Ward_2017	MEDWARD	2018M07	IN:ACUTE:WARD:M	160	46.528	374	3.439	0.0000	2.936, 4.004

- 5GNorth reported 158 antimicrobial days in the BSHO category

Reading the SAAR Report

National Healthcare Safety Network

SAARs Table - All SAARs by Location (2017 Baseline)

As of: December 7, 2018 at 1:16 PM

Date Range: AU_SAAAR_2017 summaryYM After and Including 2018M07

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

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
13860	Adult_BSHO_Ward_2017	5GNORTH	2018M07	IN:ACUTE:WARD:MS	158	62.248	541	2.538	0.0000	2.165, 2.958
13860	Adult_BSHO_Ward_2017	700	2018M07	IN:ACUTE:WARD:S	134	129.213	1123	1.037	0.6967	0.872, 1.224
13860	Adult_BSHO_Ward_2017	MEDWARD	2018M07	IN:ACUTE:WARD:M	160	46.528	374	3.439	0.0000	2.936, 4.004

- 5GNorth reported 158 antimicrobial days in the BSHO category
- Based on the SAAR model, 62.248 antimicrobial days were predicted

Reading the SAAR Report

National Healthcare Safety Network

SAARs Table - All SAARs by Location (2017 Baseline)

As of: December 7, 2018 at 1:16 PM

Date Range: AU_SAAR_2017 summaryYM After and Including 2018M07

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

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
13860	Adult_BSHO_Ward_2017	5GNORTH	2018M07	IN:ACUTE:WARD:MS	158	62.248	541	2.538	0.0000	2.165, 2.958
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13860	Adult_BSHO_Ward_2017	MEDWARD	2018M07	IN:ACUTE:WARD:M	160	46.528	374	3.439	0.0000	2.936, 4.004

- 5GNorth reported 158 antimicrobial days in the BSHO category
- Based on the SAAR model, 62.248 antimicrobial days were predicted
- 5GNorth SAAR = $\frac{158 \text{ Reported Antimicrobial Days}}{62.248 \text{ Predicted Antimicrobial Days}} = 2.538$

Reading the SAAR Report

National Healthcare Safety Network

SAARs Table - All SAARs by Location (2017 Baseline)

As of: December 7, 2018 at 1:16 PM

Date Range: AU_SAAR_2017 summaryYM After and Including 2018M07

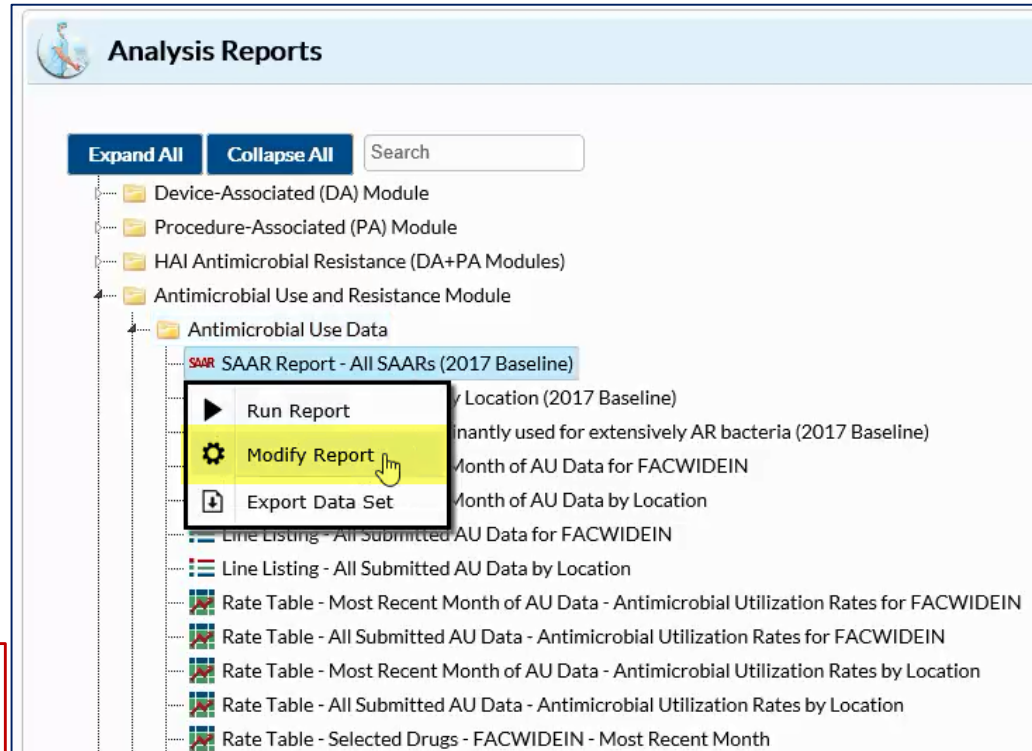
Broad spectrum antibacterial agents predominantly used for hospital-onset infections used in adult SAAR wards

orgID	SAARType_2017	location	summaryYM	locCDC	antimicrobialDays	numAUDaysPredicted	numDaysPresent	SAAR	SAAR_pval	SAAR95CI
13860	Adult_BSHO_Ward_2017	5GNORTH	2018M07	IN:ACUTE:WARD:MS	158	62.248	541	2.538	0.0000	2.165, 2.958
13860	Adult_BSHO_Ward_2017	700	2018M07	IN:ACUTE:WARD:S	134	129.213	1123	1.037	0.6967	0.872, 1.224
13860	Adult_BSHO_Ward_2017	MEDWARD	2018M07	IN:ACUTE:WARD:M	160	46.528	374	3.439	0.0000	2.936, 4.004

- 5GNorth reported 158 antimicrobial days in the BSHO category
- Based on the SAAR model, 62.248 antimicrobial days were predicted
- 5GNorth SAAR = $\frac{158 \text{ Reported Antimicrobial Days}}{62.248 \text{ Predicted Antimicrobial Days}} = 2.538$
- Based on the p-value (0.0000) & 95% CI (2.165, 2.958), the SAAR is statistically different than 1

Additional Options for Analysis

- Modify default NHSN reports



The screenshot displays the 'Analysis Reports' interface. At the top, there are buttons for 'Expand All' and 'Collapse All', and a search box. Below these, a tree view shows the following structure:

- Device-Associated (DA) Module
- Procedure-Associated (PA) Module
- HAI Antimicrobial Resistance (DA+PA Modules)
- Antimicrobial Use and Resistance Module
 - Antimicrobial Use Data
 - SAAR SAAR Report - All SAARs (2017 Baseline)
 - SAAR SAAR Report - All SAARs by Location (2017 Baseline)
 - SAAR SAAR Report - Most Frequently used for extensively AR bacteria (2017 Baseline)
 - SAAR SAAR Report - Most Recent Month of AU Data for FACWIDEIN
 - SAAR SAAR Report - Most Recent Month of AU Data by Location
 - Line Listing - All Submitted AU Data for FACWIDEIN
 - Line Listing - All Submitted AU Data by Location
 - Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates for FACWIDEIN
 - Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates for FACWIDEIN
 - Rate Table - Most Recent Month of AU Data - Antimicrobial Utilization Rates by Location
 - Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates by Location
 - Rate Table - Selected Drugs - FACWIDEIN - Most Recent Month

A context menu is open over the 'SAAR SAAR Report - All SAARs (2017 Baseline)' item, with the following options:

- Run Report
- Modify Report (highlighted)
- Export Data Set

AU Analysis Quick Reference Guides:
<https://www.cdc.gov/nhsn/acute-care-hospital/aur/index.html>

Additional Options for Analysis continued

- Export data from NHSN
 - Excel, SAS, Access, etc.

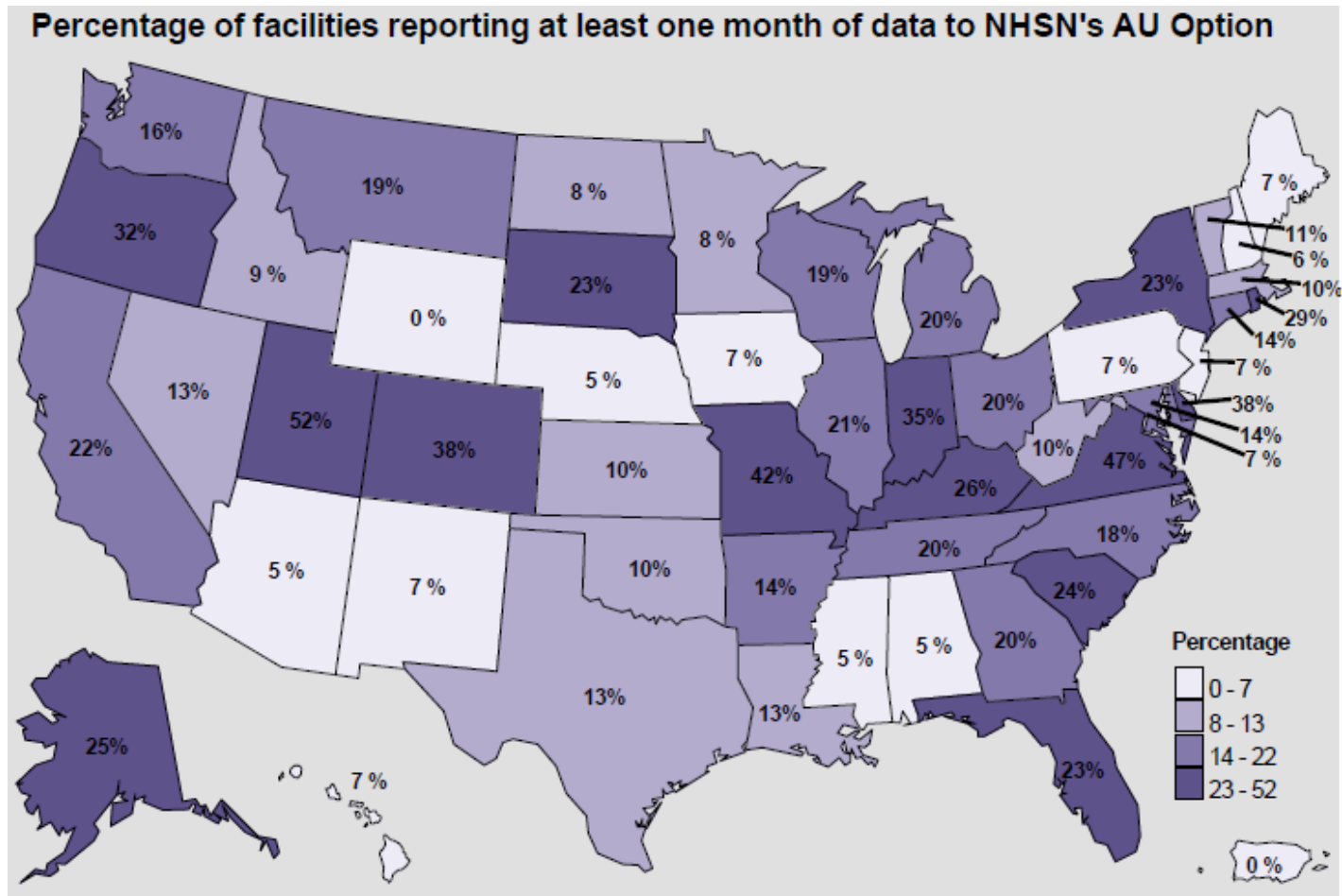
The screenshot shows the NHSN web application interface. On the left is a vertical navigation menu with the following items: NHSN Home, Alerts, Reporting Plan, Patient, Event, Procedure, Summary Data, Import/Export, Surveys, Analysis, Users, Facility, Group, and Logout. The 'Import/Export' menu item is highlighted with a yellow starburst and the number '1'. The main content area is titled 'Import/Export Data' and contains a section for 'Export Facility Data' with a yellow starburst and the number '2'. Below this is a 'Help' section with instructions: 'Please choose an export type and click Submit. Only PS related data that you have the facility you have chosen.' A note states: 'Note: All export types will result in a compressed (zip) download file.' There is a 'Save as type:' dropdown menu currently set to 'Excel spreadsheet (*.xls)', with a yellow starburst and the number '3' pointing to it. At the bottom right of the form are 'Submit' and 'Back' buttons, with a yellow starburst and the number '4' pointing to the 'Submit' button.

Submission Metrics

Submission Metrics

- 1211 facilities submitted at least one month of data
 - From 49 states (+AE & DC)
 - Bed size
 - Average = 217
 - Median = 165
 - Min/Max = 3, 1455
 - Teaching status
 - Teaching: 68%
 - (of all Teaching) Major teaching: 52%

Hospital participation in AU Option



As of
May 1, 2019

AU Option Reporting Resources

NHSN AU Option Resources

- NHSN AUR Module webpage: <http://www.cdc.gov/nhsn/acute-care-hospital/aur/index.html>

Surveillance for Antimicrobial Use and Antimicrobial Resistance Options


Resources for NHSN Users Already Enrolled

Training	←	+
Protocols	←	+
Frequently Asked Questions	←	+
Data Validation	←	+
Data Collection Forms		+
Supporting Material	←	+
Analysis Resources	←	+

Resources to Help Prevent Infections

- [HAI Prevention in Long-term Care Settings](#)
- [Resources for Patients and Healthcare Providers](#)
- [HHS Action Plan to Prevent Healthcare-associated Infections](#)
- [Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006](#)
- [Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, 2007](#)
- [Guideline for Environmental Infection Control in Healthcare Facilities, 2003](#)
 - [See: C. difficile Excerpt](#)

New Users - Start Enrollment Here





Step 1: Enroll into NHSN

Step 2: Set up NHSN

Step 3: Report

[Click here to enroll](#)



NHSN AUR Module Resources

- NHSN AUR Protocol:
 - <http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf>
- NHSN Analysis Quick Reference Guides:
 - <http://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html>
- NHSN CDA Submission Support Portal
 - <https://www.cdc.gov/nhsn/cdaportal/index.html>

Thank you!

NHSN Helpdesk
(protocol & submission questions)
NHSN@cdc.gov

NHSN CDA Helpdesk
(technical CDA related questions)
NHSNCDA@cdc.gov

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.

