NHSN Antimicrobial Use & Resistance Module

Annual NHSN Training – March 2, 2018

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Objectives

- Outline the requirements for participation in the NHSN AUR Module
- Discuss the data elements collected in the NHSN AUR Module
- Describe the analysis reports currently available within the NHSN AUR Module
NHSN Structure

- NHSN
  - Patient Safety Component
  - Healthcare Personnel Safety Component
  - Biovigilance Component
  - Long Term Care Facility Component
  - Dialysis Component
  - Device-Associated Module
  - Procedure-Associated Module
  - MDRO/CDI Module
    - Antimicrobial Use & Resistance Module
      - Antimicrobial Use Option
      - Antimicrobial Resistance Option
Antimicrobial Use (AU) Option
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 Meaningful Use Stage 3
  - Missouri state requirement (SB 579)

* NHSN MU3 page: https://www.cdc.gov/nhsn/cdaportal/meaningfuluse.html
Meaningful Use Stage 3 (MU3)

- Data for **both** AU and AR Options required
- Steps for participation
  - Prerequisite – have a certified vendor: [https://chpl.healthit.gov/#/search](https://chpl.healthit.gov/#/search)
  - Step 1: Register intent to submit within NHSN application
  - Step 2: Testing and validation of CDA files
  - Step 3: Reporting production data
- Resource guide: [https://www.cdc.gov/nhsn/pdfs/cda/MU3-Facility-Guidance.pdf](https://www.cdc.gov/nhsn/pdfs/cda/MU3-Facility-Guidance.pdf)
- **Important note:** AUR Module is only part of NHSN that qualifies for MU3
Knowledge Check:
Reporting into the NHSN AU (and AR) Option is required for CMS reporting.

A. True
B. False
Knowledge Check: Rationale

- **False**: Reporting into the NHSN AU (and AR) Option is *required* for CMS reporting.

- Reporting is completely voluntary!
- No timeline for official inclusion in CMS Quality Reporting Programs
- Using AUR reporting for MU3 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
  - 90 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
- Example: Patient admitted to 1 South - Medical Ward Monday 2200 & discharged Wednesday 1200

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meropenem 1 gram</td>
<td>Given: 2300</td>
<td>Given: 0700</td>
<td>Given: 0700</td>
</tr>
<tr>
<td>IV every 8 hours</td>
<td></td>
<td>Given: 1500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Given: 2300</td>
<td></td>
</tr>
<tr>
<td>Amikacin 1000mg</td>
<td>Given: 2300</td>
<td>Given: 2300</td>
<td></td>
</tr>
<tr>
<td>IV every 24 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Antimicrobial Days</strong></td>
<td><strong>Meropenem = 1</strong></td>
<td><strong>Meropenem = 1</strong></td>
<td><strong>Meropenem = 1</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Amikacin = 1</strong></td>
<td><strong>Amikacin = 1</strong></td>
<td><strong>Amikacin = 1</strong></td>
</tr>
</tbody>
</table>
## 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

<table>
<thead>
<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ciprofloxacin</strong></td>
<td><strong>Admitted: 1200</strong></td>
<td><strong>Given IV: 1100</strong></td>
<td><strong>Given oral: 1100</strong></td>
</tr>
<tr>
<td>twice daily</td>
<td><strong>Given IV: 2300</strong></td>
<td></td>
<td><strong>Discharged: 1500</strong></td>
</tr>
<tr>
<td><strong>Antimicrobial Day Counts</strong></td>
<td><strong>Cipro Total: 1</strong></td>
<td><strong>Cipro Total: 1</strong></td>
<td><strong>Cipro Total: 1</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Cipro IV: 1</strong></td>
<td><strong>Cipro IV: 1</strong></td>
<td><strong>Cipro IV: 0</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Cipro Digestive: 0</strong></td>
<td><strong>Cipro Digestive: 1</strong></td>
<td><strong>Cipro Digestive: 1</strong></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Antimicrobial Day Counts</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin twice daily</td>
<td>Admitted: 1200</td>
<td>Given IV: 1100</td>
<td>Given oral: 1100</td>
</tr>
<tr>
<td></td>
<td>Given IV: 2300</td>
<td>Given oral: 2300</td>
<td>Discharged: 1500</td>
</tr>
<tr>
<td></td>
<td>Cipro Total: 1</td>
<td>Cipro Total: 1</td>
<td>Cipro Total: 1</td>
</tr>
<tr>
<td></td>
<td>Cipro IV: 1</td>
<td>Cipro IV: 1</td>
<td>Cipro IV: 0</td>
</tr>
<tr>
<td></td>
<td>Cipro Digestive: 0</td>
<td>Cipro Digestive: 1</td>
<td>Cipro Digestive: 1</td>
</tr>
</tbody>
</table>
Knowledge Check: 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**: 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.

- 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 ≠ 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
Knowledge Check:
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 submitted only on the FacWideIN record

D. None are true
Knowledge Check: Rationale

Which of these statements are true?

- Days present should be **higher** than patient days for a given location

<table>
<thead>
<tr>
<th>Patient Movement</th>
<th>Days Present</th>
<th>Patient Days (Midnight count)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient A</td>
<td>Medical Ward: 00:01-24:00</td>
<td>Medical Ward = 1</td>
</tr>
<tr>
<td>Patient B</td>
<td>Medical ICU: 00:01-24:00</td>
<td>Medical ICU = 1</td>
</tr>
<tr>
<td>Patient C</td>
<td>Medical ICU: 00:01-08:30, Medical Ward: 08:31-24:00</td>
<td>Medical ICU = 1, Medical Ward = 1</td>
</tr>
<tr>
<td>Patient D</td>
<td>Medical ICU: 00:01-10:00, Step Down: 10:01-15:00, Medical Ward: 15:01-24:00</td>
<td>Medical ICU = 1, Step Down = 1, Medical Ward = 1</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>Medical Ward = 3, Medical ICU = 3, Step Down = 1</td>
<td>Medical Ward = 3, Medical ICU = 1, Step Down = 0</td>
</tr>
</tbody>
</table>
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
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
  - Participating 3\textsuperscript{rd} party 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
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
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)
Knowledge Check:
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

- If I don’t have access to a CDA vendor, I can type my AU data into NHSN by hand: False
  - 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
  - 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 FacWideIN (combination of all 4 inpatient locations above)
    - 1 CDA for Emergency Department
  - Each single CDA file contains numerator and denominator(s) for the given location
  - All CDA files can be uploaded within 1 Zip file
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
Knowledge Check: Can I report AU data from more locations than I report CLABSI & CAUTI data?

A. Yes

B. No
Knowledge Check: Rationale

- Can I report AU data from more locations than I report CLABSI & CAUTI data? **YES!**
  - CLABSI & CAUTI data are required to be submitted from specific location types for CMS Quality Reporting Programs
  - AU (and AR) reporting locations can exceed HAI reporting locations
    - Examples: Orthopedic Ward, HEM/ONC Ward, Telemetry Ward, Step Down Unit, Labor & Delivery Ward are all allowed and encouraged to be included in AU reporting
  - AU (and AR) reporting should be from your whole facility to obtain the most accurate picture of antimicrobial use in your facility
Importing CDA Files into NHSN – Option #1: Manual Upload
Importing CDA Files into NHSN – Option #1: Manual Upload (cont.)

![Import Events, Procedures and/or Summary Data](image)

**Records Processed**

<table>
<thead>
<tr>
<th>Record Type</th>
<th># of Records</th>
<th># Passed</th>
<th># of Updates*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Summary Data</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Procedures</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*CDA SetID already exists in the database; existing data will be overwritten.

**Validation Results**

<table>
<thead>
<tr>
<th>Events</th>
<th>Summary Data</th>
<th>Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Month</td>
<td>Year</td>
</tr>
<tr>
<td>AU</td>
<td>10</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>10</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>10</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>10</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>9</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>9</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>9</td>
<td>2016</td>
</tr>
<tr>
<td>AU</td>
<td>9</td>
<td>2016</td>
</tr>
</tbody>
</table>
## Importing CDA Files into NHSN – Option #1: Manual Upload (cont.)


**FACILITY:** CDA-XYZ_qa_Test Facility  
**Date of Import:** 13/Apr/2017 01:46:42 EDT

### Summary:

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Total # attempted</th>
<th>Total # Passed Validation</th>
<th>Total # of Updates*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

### ImportDetails - Valid

Line listing for each record that passed the validation.

<table>
<thead>
<tr>
<th>Facility ID:</th>
<th>Event Type</th>
<th>Event Date</th>
<th>NHSN ID</th>
<th>CDA File Name</th>
<th>setId</th>
<th>*setld Already Exists in the Database</th>
<th>CDA Processing Date/Time Stamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>AU</td>
<td>10/2016</td>
<td>10364</td>
<td>Oct -2016 AU R6 MICU.xml</td>
<td>2.18.840.1.1138.83.3.117.1.1.5.2.1.1.1-CDAT_MICU9zz</td>
<td>No</td>
<td>13/Apr/2017 13:46:42 EDT</td>
</tr>
<tr>
<td>13860</td>
<td>AU</td>
<td>10/2016</td>
<td>10365</td>
<td>Oct -2016 AU R6 MSICU.xml</td>
<td>2.18.840.1.1138.83.3.117.1.1.5.2.1.1.1-AUzzwkII12</td>
<td>No</td>
<td>13/Apr/2017 13:46:42 EDT</td>
</tr>
<tr>
<td>13860</td>
<td>AU</td>
<td>10/2016</td>
<td>10366</td>
<td>Oct -2016 AU R6 M EDWARD.xml</td>
<td>2.16.840.1.1138.83.3.117.1.1.5.2.1.1.1-DEzwe2HE</td>
<td>No</td>
<td>13/Apr/2017 13:46:42 EDT</td>
</tr>
</tbody>
</table>
Importing CDA Files into NHSN – Option #2: Automated Upload

- Automatic upload from vendor/IT solution using DIRECT CDA Automation
- Must get approval from vendor prior to signing up
Flow of AU Data: From Bedside to NHSN

Vendor/Homegrown System
- Monthly summary
- Location specific & FacWideIN
  - 90 antimicrobials
  - Days present & admissions

Report in standard format

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

NHSN Servers

Stewards can compare:
- Internally by months/locations
- Externally using Standardized Antimicrobial Administration Ratios (SAARs)
AU Option – NHSN Analysis Reports

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

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

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**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

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Summary Year/Month</th>
<th>Antimicrobial Agent Description</th>
<th>Location</th>
<th>Days Present</th>
<th>Antimicrobial Days</th>
<th>Route: IM</th>
<th>Route: IV</th>
<th>Route: Digestive</th>
<th>Route: Respiratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMAN - Amantadine</td>
<td>MICU</td>
<td>421</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMK - Amikacin</td>
<td>MICU</td>
<td>421</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMOX - Amoxicillin</td>
<td>MICU</td>
<td>421</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMOXWC - Amoxicillin with Clavulanate</td>
<td>MICU</td>
<td>421</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMP - Ampicillin</td>
<td>MICU</td>
<td>421</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Data for example only*
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.
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.

Ampicillin was used for 4 total antimicrobial days in the MICU & all four days were via the IV route.

*Data for example only*
**AU Option – 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

*Data for example only*

### 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**

<table>
<thead>
<tr>
<th>Summary Year/Month</th>
<th>Antimicrobial Category</th>
<th>Antimicrobial Class</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1000 Days Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>-- All --</td>
<td>1626</td>
<td>2177</td>
<td>746.899</td>
</tr>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>Aminoglycosides</td>
<td>22</td>
<td>2177</td>
<td>10.106</td>
</tr>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>Carbapenems</td>
<td>101</td>
<td>2177</td>
<td>46.394</td>
</tr>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>Cephelosporins</td>
<td>337</td>
<td>2177</td>
<td>154.8</td>
</tr>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>Fluoroquinolones</td>
<td>244</td>
<td>2177</td>
<td>112.081</td>
</tr>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>Folate pathway inhibitors</td>
<td>32</td>
<td>2177</td>
<td>14.699</td>
</tr>
</tbody>
</table>
AU Option – Reading the Rate Table

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.
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.

*Data for example only*
AU Option – Rate Table by Location by Selected Antimicrobial

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

### 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 29, 2016 at 5:03 PM
Date Range: AU_DRUGRATELOCATION summaryYM 2015M01 to 2015M03

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>CDC Location</th>
<th>IN:ACUTE:CC:MS_PED Location</th>
<th>PMSICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Year/Month</td>
<td>Antimicrobial Days</td>
<td>Days Present</td>
<td>Rate per 1000 Days Present</td>
</tr>
<tr>
<td>2015M01</td>
<td>4</td>
<td>526</td>
<td>7.60</td>
</tr>
<tr>
<td>2015M02</td>
<td>13</td>
<td>350</td>
<td>37.14</td>
</tr>
<tr>
<td>2015M03</td>
<td>10</td>
<td>264</td>
<td>37.88</td>
</tr>
</tbody>
</table>

### 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 29, 2016 at 5:03 PM
Date Range: AU_DRUGRATELOCATION summaryYM 2016M01 to 2016M03

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>CDC Location</th>
<th>IN:ACUTE:CC:M_PED Location</th>
<th>PMICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Year/Month</td>
<td>Antimicrobial Days</td>
<td>Days Present</td>
<td>Rate per 1000 Days Present</td>
</tr>
<tr>
<td>2015M01</td>
<td>5</td>
<td>420</td>
<td>11.90</td>
</tr>
<tr>
<td>2015M02</td>
<td>4</td>
<td>411</td>
<td>9.73</td>
</tr>
<tr>
<td>2015M03</td>
<td>9</td>
<td>429</td>
<td>20.98</td>
</tr>
</tbody>
</table>

*Data for example only*
AU Option – Reading the Rate Table

In March 2015, the PMSICU had a higher rate of Linezolid use than the PMICU (38 days per 1,000 days present vs 21 days per 1,000 days present respectively)

<table>
<thead>
<tr>
<th>Summary Year/Month</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1,000 Days Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015M01</td>
<td>4</td>
<td>526</td>
<td>7.60</td>
</tr>
<tr>
<td>2015M02</td>
<td>13</td>
<td>350</td>
<td>37.14</td>
</tr>
<tr>
<td>2015M03</td>
<td>10</td>
<td>264</td>
<td>37.88</td>
</tr>
</tbody>
</table>

*Data for example only*
AU Option – Pie Chart

- Shows proportion of antimicrobial days per class
- Modified to show proportions by:
  - Category
  - Drug
  - Time period
  - Location

*Data for example only*
In Jan. 2015, Fluoroquinolones were used for 64 antimicrobial days or 16% of total antibacterial use in 5GNorth.

*Data for example only*
AU Option – Bar Chart

- Shows proportion of antimicrobial days per class by location
- Modified to show proportions by:
  - Category
  - Drug
  - Time period
  - Location

*Data for example only*
AU Option – Reading the Bar Chart

- For all months of data reported, Azoles were used for 1130 antimicrobial days or 95% of the total antifungal use in the HEM location.

*Data for example only*
AU Option – Bar Chart by Selected Agent Distribution

- Shows distribution of specific agent use within a location by month
  - Generated according to modifications/filters
  - Provides helpful visual for SAAR agent categories

*Data for example only*
AU Option – Reading the Bar Chart

- The highest use of broad spectrum agents predominantly used for HO/MDR infections was in July 2016.

*Data for example only*
The highest use of broad spectrum agents predominantly used for HO/MDR infections was in July 2016.

Piperacillin/Tazobactam is the most commonly used drug in this group across all months.
SAAR Report in NHSN

- Includes observed and predicted antimicrobial days, days present, SAAR, P-value, & 95% CI
- SAARs generated per month, quarter, half year, year, or cumulative
- Generated for location groupings for January 2014 forward
  - Adult & pediatric Medical, Surgical and Medical/Surgical ICUs & Wards

*Data for example only*
Reading the SAAR Report

- In the *adult wards* in Sept. 2016 drugs in the HO/MDR Infections SAAR category were used for 251 antimicrobial days.
Reading the SAAR Report

- In the *adult wards* in Sept. 2016 drugs in the HO/MDR Infections SAAR category were used for 251 antimicrobial days
- Based on the SAAR models, the adult wards were predicted to have only 130 antimicrobial days

### National Healthcare Safety Network
**SAARs Table - All Standardized Antimicrobial Administration Ratios (SAARs) High-Level Indicators and High-Value Targets**

As of: January 25, 2018 at 6:04 PM
Data Range: AU_SAAR summaryYM 2016M09 to 2016M12

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Summary Year/Month</th>
<th>SAAR Type</th>
<th>Antimicrobial Days</th>
<th>Predicted Antimicrobial Days</th>
<th>Days Present</th>
<th>SAAR</th>
<th>SAAR p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>2016M09</td>
<td>TAR-Adult-2</td>
<td>251</td>
<td>130.430</td>
<td>1180</td>
<td>1.924</td>
<td>0.0000</td>
<td>1.697, 2.174</td>
</tr>
<tr>
<td>13860</td>
<td>2016M10</td>
<td>TAR-Adult-2</td>
<td>291</td>
<td>133.120</td>
<td>1205</td>
<td>2.186</td>
<td>0.0000</td>
<td>1.945, 2.448</td>
</tr>
<tr>
<td>13860</td>
<td>2016M11</td>
<td>TAR-Adult-2</td>
<td>126</td>
<td>79.915</td>
<td>684</td>
<td>1.577</td>
<td>0.0000</td>
<td>1.319, 1.871</td>
</tr>
<tr>
<td>13860</td>
<td>2016M12</td>
<td>TAR-Adult-2</td>
<td>123</td>
<td>69.984</td>
<td>599</td>
<td>1.758</td>
<td>0.0000</td>
<td>1.467, 2.090</td>
</tr>
</tbody>
</table>

Includes data for January 2014 and forward.
Data restricted to medical, medical/surgical and surgical locations.
Source of aggregate data: 2014 NHSN AU Data
Data contained in this report were last generated on January 17, 2018 at 2:01 PM.

*Data for example only*
Reading the SAAR Report

- In the *adult wards* in Sept. 2016 drugs in the HO/MDR Infections SAAR category were used for 251 antimicrobial days
- Based on the SAAR models, the adult wards were predicted to have only 130 antimicrobial days
- The SAAR for Sept. 2016 is 251/130.430 = 1.924
  - This SAAR is statistically significantly higher than 1 based on the p-value (0.0000) and 95% CI (which does not include 1.0)

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Summary Year/Month</th>
<th>SAAR Type</th>
<th>Antimicrobial Days</th>
<th>Predicted Antimicrobial Days</th>
<th>Days Present</th>
<th>SAAR</th>
<th>SAAR p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>2016M09</td>
<td>TAR-Adult-2</td>
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<td>130.430</td>
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<td>599</td>
<td>1.758</td>
<td>0.0000</td>
<td>1.467, 2.090</td>
</tr>
</tbody>
</table>

*Data for example only*
SAARs by Location

- SAAR for each specific location (included in SAAR calculations) submitting AU data
- Generated for month, quarter, half year, year, or cumulative time periods

### National Healthcare Safety Network
**SAARs Table - All SAARs by Location**
*As of: January 20, 2019 at 4:51 PM*
*Date Range: AU_SAAR summary YM 2016M09 to 2016M10*

#### Antimicrobials used for hospital-onset/multi-drug resistant infections in adult wards

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>SAAR Type</th>
<th>Location</th>
<th>Summary Year/Month</th>
<th>CDC Location</th>
<th>Antimicrobial Days</th>
<th>Predicted Antimicrobial Days</th>
<th>Days Present</th>
<th>SAAR</th>
<th>SAAR p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>13650</td>
<td>TAR-Adult-2</td>
<td>MEDWARD</td>
<td>2016M09</td>
<td>IN:ACUTE:WARD:M</td>
<td>121</td>
<td>59.984</td>
<td>599</td>
<td>1.729</td>
<td>0.0000</td>
<td>1.441, 2.058</td>
</tr>
<tr>
<td>13680</td>
<td>TAR-Adult-2</td>
<td>MEDWARD</td>
<td>2016M10</td>
<td>IN:ACUTE:WARD:M</td>
<td>120</td>
<td>70.801</td>
<td>606</td>
<td>1.695</td>
<td>0.0000</td>
<td>1.411, 2.019</td>
</tr>
<tr>
<td>13680</td>
<td>TAR-Adult-2</td>
<td>SURGWARD</td>
<td>2016M09</td>
<td>IN:ACUTE:WARD:S</td>
<td>130</td>
<td>50.646</td>
<td>581</td>
<td>2.151</td>
<td>0.0000</td>
<td>1.804, 2.546</td>
</tr>
<tr>
<td>13856</td>
<td>TAR-Adult-2</td>
<td>SURGWARD</td>
<td>2016M10</td>
<td>IN:ACUTE:WARD:S</td>
<td>171</td>
<td>52.319</td>
<td>599</td>
<td>2.744</td>
<td>0.0000</td>
<td>2.355, 3.179</td>
</tr>
</tbody>
</table>

Includes data for January 2014 and forward.
Data restricted to medical, medical/surgical and surgical locations.
Source of aggregate data: 2014 NHSN AU Data
Data contained in this report were last generated on January 20, 2019 at 4:28 PM.

*Data for example only*
Reading the SAAR by Location Report

- Two wards reported AU data for Sept & Oct 2016: MEDWARD & SURGWARD

### National Healthcare Safety Network
#### SAARs Table - All SAARs by Location

As of: January 29, 2018 at 4:01 PM
Date Range: AU_SAAR summaryYM 2016M09 to 2016M10

#### Antimicrobials used for hospital-onset/multi-drug resistant infections in adult wards

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>SAAR Type</th>
<th>Location</th>
<th>Summary Year/Month</th>
<th>CDC Location</th>
<th>Antimicrobial Days</th>
<th>Predicted Antimicrobial Days</th>
<th>Days Present</th>
<th>SAAR</th>
<th>SAAR p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860 TAR-Adult-2</td>
<td>MEDWARD</td>
<td>2016M09</td>
<td>IN.ACUTE:WARD.M</td>
<td>121</td>
<td>69.984</td>
<td>599</td>
<td>1.729</td>
<td>0.0000</td>
<td>1.441, 2.058</td>
<td></td>
</tr>
<tr>
<td>13860 TAR-Adult-2</td>
<td>MEDWARD</td>
<td>2016M10</td>
<td>IN.ACUTE:WARD.M</td>
<td>120</td>
<td>70.801</td>
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<td>0.0000</td>
<td>1.411, 2.019</td>
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<td>2016M09</td>
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<td>60.446</td>
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<td>2.151</td>
<td>0.0000</td>
<td>1.804, 2.545</td>
<td></td>
</tr>
<tr>
<td>13860 TAR-Adult-2</td>
<td>SURGWARD</td>
<td>2016M10</td>
<td>IN.ACUTE:WARD.S</td>
<td>171</td>
<td>62.319</td>
<td>599</td>
<td>2.744</td>
<td>0.0000</td>
<td>2.355, 3.179</td>
<td></td>
</tr>
</tbody>
</table>

Includes data for January 2014 and forward.
Data restricted to medical, medical/surgical and surgical locations.
Source of aggregate data: 2014 NHSN AU Data
Data contained in this report were last generated on January 29, 2018 at 4:28 PM.

*Data for example only*
Reading the SAAR by Location Report

- Two wards reported AU data for Sept & Oct 2016: MEDWARD & SURGWARD
- Despite having similar antimicrobial day counts for the HO/MDR Infection SAAR category in Sept 2016, the SURGWARD has a higher SAAR
Additional Options for Analysis

- Modify default NHSN reports
- Export data from NHSN
  - Excel, SAS, Access, etc.
Submission Metrics

- 678 facilities submitted at least one month of data
  - From 49 states (+AE & DC)
  - Bed size
    - Average = 222
    - Median = 177
    - Min/Max = 6, 1458
  - Teaching status
    - Teaching: 65%
      - (of all Teaching) Major teaching: 45%

*As of February 1, 2018*
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 – [https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/AU-Option-Implementation-Data-Validation-P.pdf](https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/aur/AU-Option-Implementation-Data-Validation-P.pdf)
- Monthly submission
Antimicrobial Resistance (AR) Option
<table>
<thead>
<tr>
<th></th>
<th>AR Option</th>
<th>MDRO Module</th>
<th>Device &amp; Procedure-Associated Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Events reported</strong></td>
<td>AR Events from blood, CSF, urine, &amp; lower respiratory specimens</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Type of susceptibility data</strong></td>
<td>Over 20 specific organisms; detailed lab test results &amp; final interpretation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Denominator; Metric(s)</strong></td>
<td># Isolates tested; facility antibiogram with %NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Wide-spread, ‘whole-house’ coverage; no manual entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drawbacks</strong></td>
<td>Requires set-up by vendor/homegrown system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Antimicrobial Resistance Data in NHSN

<table>
<thead>
<tr>
<th><strong>Events reported</strong></th>
<th><strong>AR Option</strong></th>
<th><strong>MDRO Module</strong></th>
<th><strong>Device &amp; Procedure-Associated Modules</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>AR Events reported</td>
<td>AR Events from blood, CSF, urine, &amp; lower respiratory specimens</td>
<td>Laboratory Identified (LabID) &amp; Infection Surveillance Events</td>
<td></td>
</tr>
<tr>
<td><strong>Type of susceptibility data</strong></td>
<td>Over 20 specific organisms; detailed lab test results &amp; final interpretation</td>
<td>Positive specimens (i.e., MRSA, CDI, CRE) defined by NHSN criteria</td>
<td></td>
</tr>
<tr>
<td><strong>Denominator; Metric(s)</strong></td>
<td># Isolates tested; facility antibiogram with %NS</td>
<td># Patient days; rates # Predicted; SIRs (LabID Only)</td>
<td></td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Wide-spread, ‘whole-house’ coverage; no manual entry</td>
<td>Simplified reporting; LabID MRSA &amp; CDI national benchmarks</td>
<td></td>
</tr>
<tr>
<td><strong>Drawbacks</strong></td>
<td>Requires set-up by vendor/homegrown system</td>
<td>Small number of organisms followed</td>
<td></td>
</tr>
</tbody>
</table>
# Antimicrobial Resistance Data in NHSN

<table>
<thead>
<tr>
<th></th>
<th>AR Option</th>
<th>MDRO Module</th>
<th>Device &amp; Procedure-Associated Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Events reported</strong></td>
<td>AR Events from blood, CSF, urine, &amp; lower respiratory specimens</td>
<td>Laboratory Identified (LabID) &amp; Infection Surveillance Events</td>
<td>CLABS, CAUTI, pedVAP, VAE, SSI Events</td>
</tr>
<tr>
<td><strong>Type of susceptibility data</strong></td>
<td>Over 20 specific organisms; detailed lab test results &amp; final interpretation</td>
<td>Positive specimens (i.e., MRSA, CDI, CRE) defined by NHSN criteria</td>
<td>Susceptibility results for specific antibiotics</td>
</tr>
<tr>
<td><strong>Denominator; Metric(s)</strong></td>
<td># Isolates tested; facility antibiogram with %NS</td>
<td># Patient days; rates # Predicted; SIRs (LabID Only)</td>
<td># Isolates tested; facility &amp; national %R</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Wide-spread, ‘whole-house’ coverage; no manual entry</td>
<td>Simplified reporting; LabID MRSA &amp; CDI national benchmarks</td>
<td>Infection control software; data can be manually entered; national AR data published (%R)</td>
</tr>
<tr>
<td><strong>Drawbacks</strong></td>
<td>Requires set-up by vendor/homegrown system</td>
<td>Small number of organisms followed</td>
<td>Only get susceptibility info for events that meet NHSN definitions</td>
</tr>
</tbody>
</table>

**Antimicrobial Resistance Data in NHSN**

- **Events reported**: AR Events from blood, CSF, urine, & lower respiratory specimens
- **Type of susceptibility data**: Over 20 specific organisms; detailed lab test results & final interpretation
- **Denominator; Metric(s)**: # Isolates tested; facility antibiogram with %NS
- **Benefits**: Wide-spread, ‘whole-house’ coverage; no manual entry
- **Drawbacks**: Requires set-up by vendor/homegrown system
Antimicrobial Resistance (AR) Option

- Released in July 2014
- Purpose:
  - Facilitate evaluation of AR data using standardized approach & definitions
  - Provide facilities with improved awareness of AR issues to aid in clinical decision making and prioritize transmission prevention efforts
- Voluntary reporting
  - Not part of CMS Quality Reporting Programs
  - *Included as one option for Public Health Registry reporting for Meaningful Use Stage 3
  - Missouri state requirement (SB 579)

*NHSN MU3 page: https://www.cdc.gov/nhsn/cdaportal/meaningfuluse.html
Requirements for AR Data Submission

Who Can Participate?

- Hospitals* that have:
  - Electronic Laboratory Information System (LIS) and
  - Admission Discharge Transfer (ADT) System
  - Or electronic access to required data elements

AND

- Ability to collect and package data using HL7 standardized format: Clinical Document Architecture

*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
Knowledge Check: Does my facility have to report data into the AR Option if we are reporting data into the AU Option?

A. Yes: Both AU and AR data have to be reported together
B. No: AU data submission is completely separate from AR data submission and we can do one or the other or both
Knowledge Check: Rationale

- No: AU data submission is completely separate from AR data submission and we can do one or the other or both
AR Data Elements
What Data Are Collected?

- Two separate file types (similar to MDRO FacWideIN LabID reporting):
  - AR Event files – contain all information associated with the individual isolate
    • Reported from all inpatient locations & 3 outpatient location types: ED, pediatric ED & 24-hour observation area
  - AR Summary files – contain patient day and admission counts for FacWideIN
    • Summary files are not submitted for individual locations
AR Events – What Qualifies?

- Event-level data: Isolate-level susceptibility results for specific organisms
- Qualifying isolate criteria for an AR Event:
  - Collected from one of four specimen types:
    - Invasive: Blood & cerebral spinal fluid (CSF)
    - Non-invasive: Urine & lower respiratory
  - One of over 20 organisms identified (see list on next slide)
  - Antimicrobial susceptibility testing must be completed
    - Regardless of susceptibility results
AR Option – Eligible Organisms

- All *Acinetobacter* species
- *Candida albicans*
- *Candida auris*
- *Candida glabrata*
- *Citrobacter freundii*
- All *Enterobacter* species
- *Enterococcus faecalis*
- *Enterococcus faecium*
- *Enterococcus* spp. (when not specified to the species level)
- *Escherichia coli*

- Group B *Streptococcus*
- *Klebsiella oxytoca*
- *Klebsiella pneumoniae*
- *Morganella morganii*
- *Proteus mirabilis*
- *Pseudomonas aeruginosa*
- *Serratia marcescens*
- *Staphylococcus aureus*
- *Stenotrophomonas maltophilia*
- *Streptococcus pneumoniae*
AR Option – Organism/Agent Combinations

- Selected antimicrobial agents are required to be reported/included in the CDA file for each of the organisms per specimen type
  - Full list can be found in the NHSN AUR Module Protocol: [http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf](http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf)

<table>
<thead>
<tr>
<th>Organism</th>
<th>Specimen Type</th>
<th>Antimicrobial Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acinetobacter</em></td>
<td>Blood, Urine, Lower</td>
<td>Amikacin, Ampicillin-sulbactam, Cefepime, Cefotaxime, Cefazidime, Ceftriaxone, Ciprofloxacin, Doxycycline, Gentamicin, Imipenem with Cilastatin, Levofloxacin, Meropenem, Minocycline, Piperacillin, Piperacillin-tazobactam, Tetracycline, Ticarcillin-clavulanate, Tobramycin, Trimethoprim-sulfamethoxazole</td>
</tr>
<tr>
<td><em>(All Acinetobacter species noted in the IDM/Pathogen Codes tab listed in the ARO Pathogen column)</em></td>
<td>Respiratory, CSF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional Agents for Urine</td>
<td>None</td>
</tr>
</tbody>
</table>
AR Event Required Fields

- Patient DOB, gender, date admitted to facility, location during specimen collection
- Specimen collection date, specimen source
  - Blood, CSF, urine, lower respiratory
- Organism & antimicrobial susceptibility data for each antimicrobial required for the isolated organism/specimen type
  - Sign, value and interpretation for E-test, MIC, and/or Disk diffusion (KB)*
  - Final lab interpretation
    • S, S-DD, I, R, NS, N

*If available
AR Option Reporting Rules – Invasive Sources

- Same organism from invasive specimen source (blood & CSF) reported once per patient per 14 day period

### AR Option Reporting Rules – Invasive Sources Example

- **14 day rule for invasive sources:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lab Result</th>
<th>Reported to NHSN?</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1</td>
<td>Staph aureus isolated from blood culture</td>
<td>Yes</td>
<td>Patient’s first blood culture of admission; <em>Staph aureus</em> is isolated; AR event reported</td>
</tr>
<tr>
<td>January 4</td>
<td>Staph aureus isolated from blood culture</td>
<td>No</td>
<td>&lt;14 days since last positive culture (Jan 1) of <em>Staph aureus</em></td>
</tr>
<tr>
<td>January 16</td>
<td>Staph aureus isolated from CSF culture</td>
<td>No</td>
<td>&lt;14 days since last positive culture (Jan 4) of <em>Staph aureus</em></td>
</tr>
<tr>
<td>January 31</td>
<td>Staph aureus isolated from blood culture</td>
<td>Yes</td>
<td>&gt;14 days since last positive culture (Jan 16) of <em>Staph aureus</em>; AR event reported</td>
</tr>
</tbody>
</table>
AR Option Reporting Rules – Non-Invasive Sources

- Same organism from non-invasive source (urine & lower respiratory) reported once per patient per month

Please see NHSN AUR Module Protocol for further details: http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf
AR Option Reporting Rules – Non-Invasive Sources

Example

- 1 per month rule for non-invasive sources:

<table>
<thead>
<tr>
<th>Date</th>
<th>Lab Result</th>
<th>Reported to NHSN?</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1</td>
<td><em>E.Coli</em> isolated from urine culture</td>
<td>Yes</td>
<td>Patient’s first urine culture of admission; <em>E.Coli</em> is isolated; AR event reported</td>
</tr>
<tr>
<td>January 4</td>
<td><em>E.Coli</em> isolated from urine culture</td>
<td>No</td>
<td>Only 1 AR event from non-invasive source per organism per month submitted</td>
</tr>
<tr>
<td>January 16</td>
<td><em>E.Coli</em> isolated from lower respiratory culture</td>
<td>No</td>
<td>Only 1 AR event from non-invasive source per organism per month submitted</td>
</tr>
</tbody>
</table>
Knowledge Check: A urine specimen was collected and *E*. coli was isolated but it was susceptible to all drugs tested. Does this isolate still get reported?

A. Yes

B. No
Knowledge Check: Rationale

- **Yes** – A urine specimen was collected and E.coli was isolated but it was susceptible to all drugs tested. Does this isolate still get reported?

- Isolate was from a urine specimen and E.coli was found
- Reported to the AR Option even if it tested susceptible to all drugs tested by the lab
AR Summary Files

- Summary record: patient days & admissions (facility-wide only)
  - Use same definitions as rest of NHSN
  - Summary records are not submitted for individual locations
  - Summary data are not submitted for outpatient locations
  - Only 1 AR Summary file submitted per facility, per month
Requirements for AR Data Submission
Who Can Participate?

- Hospitals* that have:
  - Electronic Laboratory Information System (LIS) and
  - Admission Discharge Transfer (ADT) System
  - *Or electronic access to required data elements

AND

- Ability to collect and package data using HL7 standardized format:
  - Clinical Document Architecture

*General acute care hospitals, long-term acute care hospitals, inpatient rehabilitation facilities, oncology hospitals, critical access hospitals enrolled in NHSN
AR Option CDA

- Data must be submitted via CDA
- Two CDA file types for AR Option:
  - Event: 1 CDA file per AR Event (patient & susceptibility data)
  - Summary: 1 CDA file with FacWideIN patient day & admission counts
Monthly AR Data Submission

- Recommend: Upload within 30 days following the completion of the month
- 1 CDA file per AR Event & 1 CDA file for summary
  - Example:
    - 50 separate CDA files for 50 separate AR Events identified per NHSN definitions in that month
    - 1 CDA for facility-wide summary (patient days and admissions for all inpatient locations combined)
  - All CDA files can be uploaded within 1 Zip file
    - Maximum: 1000 CDAs or file size of 2 MB per zip file
Monthly Reporting Plans

- Add locations to monthly reporting plan prior to uploading data
  - Selecting FacWideIN allows AR Events to be reported from all mapped inpatient locations
  - Each outpatient location is listed separately
- Same monthly reporting plan used for HAI reporting
Monthly Reporting Plans (cont.)

### Device-Associated Module

<table>
<thead>
<tr>
<th>Locations</th>
<th>CLABSI</th>
<th>VAE</th>
<th>CAUTI</th>
<th>CLIP</th>
<th>Pneumonia (+18 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDWARD - MEDICAL WARD ON THE 5TH FLOOR</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU - MED/SURG</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>NICU - NICU-2/3</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ONCGEN - ONC-HEM - GENERAL WARD</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

**Add Row** | **Clear All Rows** | **Copy from Previous Month**

### Procedure-Associated Module

<table>
<thead>
<tr>
<th>Procedures</th>
<th>SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IN:</td>
</tr>
</tbody>
</table>

**Add Row** | **Clear All Rows** | **Copy from Previous Month**

### Antimicrobial Use and Resistance Module

<table>
<thead>
<tr>
<th>Locations</th>
<th>Antimicrobial Use</th>
<th>Antimicrobial Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACWIDEIN - Facility-wide Inpatient (FacWIDEIn)</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MEDWARD - MEDICAL WARD ON THE 5TH FLOOR</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>ICU - MED/SURG</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>NICU - NICU-2/3</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>ONCGEN - ONC-HEM - GENERAL WARD</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>24HRBS - 24-HR OBS.</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>EMERG - EMERGENCY DEPT</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

**Add Row** | **Clear All Rows** | **Copy from Previous Month**
Knowledge Check:
When reporting data into NHSN for the AUR Module, I should use the exact same locations already set up for my HAI reporting.

A. True
B. False
Knowledge Check: Rationale

- When reporting data into NHSN for the AUR Module, I should use the exact same locations already set up for my HAI reporting: True
  - Same locations should be used for all NHSN reporting
    - Includes HAI and AUR
    - 1 NHSN location per 1 physical patient care location in the facility
    - Do not have “3 North_HAI” and “3 North_AUR”
  - AU/AR reporting locations in reporting plan can/will often exceed HAI reporting locations since AU/AR reporting is completed for the entire facility
Knowledge Check:
My NHSN PS Monthly Reporting Plan is used for both HAI and AUR data.

A. True
B. False
Knowledge Check: Rationale

- My NHSN PS Monthly Reporting Plan is used for both HAI and AUR data: **True**
  - It is okay to report from a different amount of locations for HAI vs AUR reporting
Importing CDA Files into NHSN*

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

*See slides 31-34 for additional details
Flow of AR Data: From Bedside to NHSN

Specimen is collected

LIS & ADT

Vendor/Homegrown System
- Isolate level susceptibility results
- Summary data from FacWideIN
  - Patient days & admissions

Report in standard format

Receive line list of all AR Events & Facility-wide Antibiogram

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

NHSN Servers
AR Option – Analysis Reports

- Basic analysis reports available
  - Line listing
  - Facility-wide antibiogram
# AR Option – Line List

- Lists AR events by pathogen
  - Includes patient, specimen, organism, & susceptibility testing variables

## National Healthcare Safety Network
**Line Listing - Antimicrobial Resistance Events by Pathogen**

As of: January 26, 2016 at 3:15 PM
Date Range: All AUR DETAIL

### Pathogen Description = Candida auris - CAUR

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Event ID</th>
<th>Patient ID</th>
<th>Fac Admission Date</th>
<th>Date Specimen Collected</th>
<th>Location</th>
<th>Isolate ID</th>
<th>Specimen Group</th>
<th>Pathogen Description</th>
<th>Drug Description</th>
<th>Final Interpretation Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/12/2016</td>
<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>ANID - Anidulafungin</td>
<td>NS - Non-Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>CASPO - Caspofungin</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>FLUCO - Fluconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
<td>MICU</td>
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<td>Candida auris - CAUR</td>
<td>FLUCY - Fluconazole</td>
<td>S - Susceptible</td>
</tr>
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<td>13860</td>
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<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>ITRA - Itraconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
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<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>MICA - Micafungin</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>POSAC - Poseconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>123-45-56789</td>
<td>09/01/2016</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>VORI - Voriconazole</td>
<td>N - Not Tested</td>
</tr>
</tbody>
</table>

This line list shows a limited number of variables by default. To expand the number of variables shown, export the data out of NHSN or use the "modify" option to edit the line list. Sorted by PathogenDesc specimenDate

Data contained in this report were last generated on January 17, 2018 at 2:01 PM.

*Data for example only*
AR Option – Line List

- Line lists can be modified to show additional variables included in the AR Event
  - Examples: individual lab test sign, value and interpretation

<table>
<thead>
<tr>
<th>Facility Org ID</th>
<th>Event ID</th>
<th>Date Specimen Collected</th>
<th>Location</th>
<th>Specimen Group</th>
<th>Pathogen Description</th>
<th>Drug Description</th>
<th>MIC sign</th>
<th>MIC value</th>
<th>Interpretation of MIC test</th>
<th>Final Interpretation Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13860</td>
<td>59582</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>ANID - Anidulafungin</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S</td>
<td>NS - Non-Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>CASPO - Caspofungin</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
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<td>MICU</td>
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<td>FLUCO - Fluconazole</td>
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<td>S - Susceptible</td>
</tr>
<tr>
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<td>59582</td>
<td>09/13/2016</td>
<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>FLUCY - Flucytosine</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
<td>59582</td>
<td>09/13/2016</td>
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<td>ITRA - Itraconazole</td>
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<tr>
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<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>MICA - Micafungin</td>
<td>&lt;=</td>
<td>0.100</td>
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<tr>
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<td>09/13/2016</td>
<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>POSAC - Posaconazole</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>13860</td>
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<td>MICU</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
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<td>N</td>
<td></td>
<td>N</td>
<td>N - Not Tested</td>
</tr>
</tbody>
</table>

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Data contained in this report were last generated on January 17, 2018 at 2:01 PM.

*Data for example only*
Candida auris was isolated from a blood specimen collected in the MICU.
**AR Option: Reading the Line List**

- *Candida auris* was isolated from a blood specimen collected in the MICU.
- This isolate was non-susceptible to anidulafungin; susceptible to caspofungin, fluconazole, flucytosine, itraconazole, micafungin, posaconazole; and not tested against voriconazole.
AR Option – Facility-wide Antibiogram

- Facility-wide antibiogram
  - Shows the pathogens from the specimens reported into the AR Option for a given month
  - Lists all antimicrobials and the percent of isolates that were non-susceptible (R, I, or NS) to the pathogen

\[
\text{Total isolates R} + \text{Total isolates I} + \text{Total isolates NS} \div \text{Total isolates tested} \times 100
\]

*Data for example only*
AR Option – Facility-wide Antibiogram

- Facility-wide antibiogram
  - Percent non-susceptible only calculated when ≥ 30 isolates have been tested for a particular drug. Cells with "." represent pathogen-drug combinations for which there were less than 30 isolates tested.
  - Cells shaded in grey represent non-valid pathogen/drug combinations (see protocol for details)

*Data for example only*
AR Option – Facility-wide Antibiogram

- Reading the antibiogram:
  - In January 2014, 33.0% of *Acinetobacter* spp. isolates tested were non-susceptible (R, I or NS) to Ciprofloxacin
  - In January 2014, 0% of *Staphylococcus aureus* isolates were non-susceptible to Ciprofloxacin

*Data for example only*
Submission metrics*

- 254 facilities submitted at least 1 AR Event or AR Summary
  - From 33 states (+AP): AK, AL, AR, AZ, CA, CO, FL, GA, ID, IL, IN, KS, KY, LA, MD, MI, MO, MS, MT, NC, NH, NV, NY, OH, OR, PA, SC, TN, TX, UT, VA, VT, WI
  - Bed size:
    • Average = 212
    • Median = 184
    • Min/Max = 12, 797
  - Teaching status:
    • Teaching: 66%
      - Major teaching: 75%

*As of February 1, 2018
AR Option – Steps for Facility Participation

- Prerequisite: Electronic LIS or electronic access to lab data
- Identify facility lead(s)/champion(s) for AR 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
AUR Module Reporting Resources
NHSN AUR Module Resources

NHSN AUR Module Resources

- NHSN AUR Protocol:

- NHSN Analysis Quick Reference Guides:

- NHSN CDA Submission Support Portal
  - [https://www.cdc.gov/nhsn/cdaportal/index.html](https://www.cdc.gov/nhsn/cdaportal/index.html)

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

- NHSN CDA Helpdesk (technical CDA related questions):
  - NHSNCDA@cdc.gov
Thank you!

For more information, contact CDC
1-800-CDC-INFO (232-4636)

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.