NHSN Antimicrobial Use and Resistance (AUR) Module

January 2017
Overview of NHSN
Purposes of NHSN

- NHSN is a secure, Internet-based surveillance system managed by the CDC’s Division of Healthcare Quality Promotion (DHQP) that is used to:
  - Collect mandated and voluntarily reported data on:
    - Healthcare-associated infections (HAIs)
    - Antimicrobial use and resistance
    - Healthcare personnel influenza vaccination
    - Blood safety
  - Analyze and report collected data to permit recognition of trends
  - Provide facilities with data that can be used for inter-facility comparisons and local quality improvement activities
Purposes of NHSN

- Enable healthcare facilities to report healthcare-associated infections (HAI) and prevention practice adherence data via NHSN to fulfill CMS’s quality reporting program requirements, state mandate reporting requirements, and/or voluntary collaborative initiatives
  - Over 20,000 healthcare facilities enrolled in NHSN
    - Acute care hospitals (Gen, ONC, CAH)
    - Long term acute care hospitals
    - Inpatient rehabilitation facilities
    - Dialysis facilities
    - Ambulatory surgical centers
    - Long term care facilities (NHs/SNFs)
NHSN Structure

- NHSN
  - Patient Safety Component
  - Healthcare Personnel Safety Component
  - Biovigilance Component
  - Long Term Care Facility Component
  - Dialysis Component
    - Antimicrobial Use & Resistance Module
      - Antimicrobial Use Option
      - Antimicrobial Resistance Option
    - MDRO/CDI Module
    - Procedure-Associated Module
    - Device-Associated Module
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

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

Who Can Participate?

- Hospitals* that have:
  - Electronic Medication Administration Record (eMAR), or
  - Bar Coding Medication Administration (BCMA) systems
  AND
  - Ability to collect and package data using HL7 standardized format: Clinical Document Architecture
    - Participating 3rd 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
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
  - 89 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)
    - Pharmacy orders, billing data, etc. are not acceptable data sources
AU Option Data Elements – Denominators

- **Denominators:**
  - **Days Present** - number of days in which a patient spent *any* time in specific unit or facility
    - Days present ≠ Patient days
    - Reported for all individual locations & FacWideIN
  
  - **Admissions** - number of patients admitted to an inpatient location in the facility
    - Reported for FacWideIN only
AU Option Data Elements (continued)

- 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
  - Data are aggregated prior to sending to NHSN
  - No patient-level data shared with NHSN for AU Option

- **Important:** Requires accurate/complete electronic capture of both the numerator and denominator for the given location
Clinical Document Architecture (CDA)

- Too much data to enter by hand!
  - Data must be uploaded via CDA
- Health Level 7 (HL7) standard format
- Provides facilities with standardized way to package & upload data
  - Used by NHSN for 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 location (unit)
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 locations
    - 1 CDA for Adult Medical/Surgical ICU
    - 1 CDA for Adult Medical/Surgical Ward
    - 1 CDA for Pediatric Medical/Surgical Ward
    - 1 CDA for Labor & Delivery Ward
    - 1 CDA for Emergency Department
    - 1 CDA for FacWideIN (combination of all 4 inpatient locations above)
  - Each single CDA file contains numerator and denominator(s) for the given location
  - All CDA files are 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
Importing CDA Files into NHSN

- Manual upload
- Automatic upload from vendor/IT solution using DIRECT CDA Automation
Flow of AU Data: From Bedside to NHSN

eMAR/BCMA & ADT

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

Local access of data: NHSN web interface – analysis, visualization and data sharing

Pharmacists & Physicians compare and target education/interventions

Risk adjusted comparisons for specific locations, groupings of antimicrobials

Report in standard format

NHSN Servers
AU Option – NHSN Analysis Reports

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

- Sample line list of the most recent month of AU data by location
  - Generates a list of each antimicrobial separated by location
  - Shows total antimicrobial days, days present 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

<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>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMOX - Amoxicilin</td>
<td>MICU</td>
<td>421</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13860</td>
<td>2015M01</td>
<td>AMOXWC - Amoxicilin 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*
AU Option – Rate Table by Facility-Wide Inpatient

- Sample rate table for all submitted AU data by FacWideIN (all inpatient locations reporting AU data)
  - Generates a rate of utilization per 1,000 days present for each antimicrobial class for all inpatient locations combined
  - Report includes separate rates for each antimicrobial class for each month of data submitted

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**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 1:14 PM
Date Range: All AU_RATE91MONTHFACWIDEIN

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 1,000 Days Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015M01</td>
<td>Antibacterial</td>
<td>-- All --</td>
<td>1625</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>Cephalosporins</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>

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

- Sample rate table for selected antimicrobial(s) by location
  - Generates a rate of utilization per 1,000 days present for each antimicrobial selected on the modification screen separated by location
  - Report can be generated to include any number of antimicrobials from multiple antimicrobial 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 20, 2016 at 5:03 PM  
Date Range: AU_DRUGRATES:LOCATION summary YM 2015M01 to 2015M03  
*Data for example only*

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

<table>
<thead>
<tr>
<th>Summary Year/Month</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1000 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>

### 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_DRUGRATES:LOCATION summary YM 2016M01 to 2016M03  
*Data for example only*

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

<table>
<thead>
<tr>
<th>Summary Year/Month</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1000 Days Present</th>
</tr>
</thead>
<tbody>
<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>
Sample pie chart by location

- Shows proportion of antimicrobial days per antibacterial class

*Data for example only*
AU Option – Bar Chart by Location

- Sample bar chart by location
  - Shows proportion of antimicrobial days per antifungal class

*Data for example only*
Standardized Antimicrobial Administration Ratio (SAAR)
Standardized Antimicrobial Administration Ratio (SAAR)

SAAR is an Observed-to-Expected/Predicted (O-to-E) ratio

- **Numerator** – Observed days of therapy reported by a healthcare facility for a specified category of antimicrobial agents used in a patient care location or group of locations

- **Denominator** – Days of therapy predicted for a healthcare facility’s use of a specified category of antimicrobial agents in a patient care location or group of locations, calculated by applying negative binomial regression modeling to nationally aggregated AU data

- SAAR values can serve as a starting point for medication use evaluations by antimicrobial stewardship programs, but SAAR values are not definitive measures of judiciousness or appropriateness
  
  - Detailed information on the SAAR 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).
Interpreting the SAAR

The SAAR is a ratio with values greater than or equal to 0.

- A high SAAR (above 1.0) that achieves statistical significance (i.e., different from 1.0) indicates more antimicrobial use than expected (predicted)
- A low SAAR (below 1.0) that achieves statistical significance indicates antimicrobial use is less than expected (predicted)
- A SAAR that is not statistically different from 1.0 indicates antibacterial use is equivalent to the referent population’s antibacterial use

Note: A SAAR alone is not a definitive measure of the appropriateness or judiciousness of antibacterial use, and any SAAR may warrant further investigation. For example, a SAAR that is not statistically significant may still indicate under or over use. Likewise, investigation into a statically significant SAAR may not yield actionable results.
Patient Care Locations Used for the SAARs

- SAARs are generated for antimicrobial use in six specified groupings of adult and pediatric patient care locations:
  1. Adult medical, surgical, and medical/surgical ICUs
  2. Adult medical, surgical, and medical/surgical wards
  3. Pediatric medical, surgical, and medical/surgical ICUs
  4. Pediatric medical, surgical, and medical/surgical wards
  5. All adult medical, medical/surgical, and surgical ICUs and wards
  6. All pediatric medical, medical/surgical, and surgical ICUs and wards
Antibacterial Agent Categories Used for SAAR Calculations*

- High value targets for antimicrobial stewardship programs:
  1. Broad spectrum agents predominantly used for hospital-onset/multi-drug resistant bacteria – aminoglycosides, carbapenems (except ertapenem), 4th and 5th gen. cephalosporins, penicillin B-lactam/b-lactamase inhibitor combinations, and other agents
  2. Broad spectrum agents predominantly used for community-acquired infection – Ertapenem, some cephalosporins, and some fluoroquinolones
  3. Anti-MRSA agents – Ceftaroline, Dalbavancin, Daptomycin, Linezolid, Oritavancin, Quinupristin/Dalfopristin, Tedizolid, Telavancin, and Vancomycin (IV only)
  4. Agents predominantly used for surgical site infection prophylaxis (IV only) – Cefazolin, Cefotetan, Cefoxitin, Cefuroxime, and Cephalexin

- High level indicators for antimicrobial stewardship programs:
  5. All antibacterial agents – All antibacterial agents included in NHSN AUR protocol

*A complete list of all antimicrobials used in each SAAR can be found here: http://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf
SAARs for High Value Targets

SAARs for broad spectrum antibacterial agents predominantly used for hospital-onset/multidrug resistant infections:
1. Adult medical, medical/surgical, and surgical ICUs
2. Adult medical, medical/surgical, and surgical wards
3. Pediatric medical, medical/surgical, and surgical ICUs
4. Pediatric medical, medical/surgical, and surgical wards

SAARs for broad spectrum antibacterial agents predominantly used for community-acquired infections:
5. Adult medical, medical/surgical, and surgical ICUs
6. Adult medical, medical/surgical, and surgical wards
7. Pediatric medical, medical/surgical, and surgical ICUs
8. Pediatric medical, medical/surgical, and surgical wards
SAARs for High Value Targets (continued)

SAARs for anti-MRSA antibacterial agents:
9. Adult medical, medical/surgical, and surgical ICUs
10. Adult medical, medical/surgical, and surgical wards
11. Pediatric medical, medical/surgical, and surgical ICUs
12. Pediatric medical, medical/surgical, and surgical wards

SAARs for antibacterial agents predominantly used for surgical site infection prophylaxis:
13. Adult ICUs and wards (medical, medical/surgical, and surgical)
14. Pediatric ICUs and wards (medical, medical/surgical, and surgical)
High Level Indicator SAARs

SAARs for all antibacterial agents:

15. Adult ICUs and wards (medical, medical/surgical, and surgical)
16. Pediatric ICUs and wards (medical, medical/surgical, and surgical)
SAAR Report in NHSN

- Sample SAAR table for antimicrobials hospital-onset/multi-drug resistant infections used in adult medical, surgical, and medical/surgical ward locations submitting AU data from the facility
  - SAARs generated per month, quarter, half year, year, or cumulative time periods
  - Includes observed antimicrobial days and predicted antimicrobial days used to calculate SAAR values

*Data for example only*
SAARs by Location

Sample SAAR table by individual location

- Shows SAAR for each specific location (included in SAAR calculations) submitting AU data
- SAARs can be generated by location for month, quarter, half year, year, and cumulative time periods

National Healthcare Safety Network
SAARs Table - All SAARs by Location
As of: December 20, 2010 at 5:26 PM
Date Range: AU_SAAR summary YM After and Including 2010M09

Antimicrobials used for community-onset 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>13660</td>
<td>TAR-Adult-4</td>
<td>MEDWARD</td>
<td>2016M09</td>
<td>IN ACUTE:WARD M</td>
<td>129</td>
<td>103.159</td>
<td>599</td>
<td>1.251</td>
<td>0.0156</td>
<td>1.048, 1.481</td>
</tr>
<tr>
<td>13660</td>
<td>TAR-Adult-4</td>
<td>MEDWARD</td>
<td>2016M10</td>
<td>IN ACUTE:WARD M</td>
<td>142</td>
<td>104.363</td>
<td>606</td>
<td>1.381</td>
<td>0.0005</td>
<td>1.150, 1.599</td>
</tr>
<tr>
<td>13660</td>
<td>TAR-Adult-4</td>
<td>SURGWARD</td>
<td>2016M09</td>
<td>IN ACUTE:WARD S</td>
<td>125</td>
<td>100.059</td>
<td>581</td>
<td>1.249</td>
<td>0.0179</td>
<td>1.044, 1.483</td>
</tr>
<tr>
<td>13660</td>
<td>TAR-Adult-4</td>
<td>SURGWARD</td>
<td>2016M10</td>
<td>IN ACUTE:WARD S</td>
<td>126</td>
<td>103.158</td>
<td>599</td>
<td>1.221</td>
<td>0.0322</td>
<td>1.022, 1.449</td>
</tr>
</tbody>
</table>

Includes data for January 2014 and forward.
Data restricted to medical, medical/surgical and surgical locations.
Source of appropriate data: 2014 NHSN AU Data
Data contained in this report were last generated on December 20, 2010 at 3:43 PM.

*Data for example only
Additional Options for Analysis

- Modify default NHSN reports
- Export data from NHSN
  - Excel, SAS, Access, etc.
Antimicrobial Resistance (AR) Option
## Antimicrobial Resistance Data in NHSN

<table>
<thead>
<tr>
<th>Events reported</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>CLABSI, CAUTI, pedVAP, VAE, SSI Events</td>
</tr>
<tr>
<td><strong>Type of susceptibility data</strong></td>
<td>Over 19 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>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 (%resistance)</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 (AR) Option

- Released in July 2014

- Purpose:
  - Facilitate evaluation of antimicrobial resistance data using standardized approach
  - Provide facilities with improved awareness of a variety 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


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, inpatient rehabilitation facilities, oncology hospitals, critical access hospitals enrolled in NHSN
AR Data Elements
What Data Are Collected?

- **Numerator**: Isolate-level susceptibility results for specific organisms
  - Patient DOB, gender, date admitted to facility, location during specimen collection
  - Specimen collection date, specimen source
    - Blood, cerebral spinal fluid (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

- **Denominator**: patient days & admissions (facility-wide only)
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

<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</td>
</tr>
<tr>
<td>(All <em>Acinetobacter</em> species noted in the IDM/Pathogen Codes tab listed in the ARO Pathogen column)</td>
<td>Respiratory, CSF</td>
<td>Ampicillin-sulbactam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cefepime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cefotaxime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cefazidime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ceftriaxone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ciprofloxacin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doxycycline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gentamicin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imipenem with cilastatin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Levofoxacin</td>
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<tr>
<td></td>
<td></td>
<td>Meropenem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minocycline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Piperacillin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Piperacillin-tazobactam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tetracycline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ticarcillin-clavulanate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tobramycin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trimethoprim-sulfamethoxazole</td>
</tr>
<tr>
<td>Additional Agents for Urine</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>


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 – Non-Invasive Sources

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

AR Option CDA

- Too much data to enter by hand!
- Two CDA file types for AR Option:
  - Numerator: 1 CDA file per AR Event
  - Denominator: 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 organism (AR Event) & 1 CDA file for denominator
  - Example:
    - 50 separate CDA files for 50 separate AR Events identified per NHSN definitions in that month
    - 1 CDA for facility-wide denominators (patient days and admissions for all inpatient locations combined)
  - All CDA files are uploaded within 1 Zip file
    - Maximum: 500 CDAs or file size of 1 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
Importing CDA Files into NHSN

- Manual upload
- Automatic upload from vendor/IT solution using DIRECT CDA Automation
AR Option – Output Options

- Basic analysis output options available
  - Line listing
  - Facility-wide antibiogram
AR Option – Line List

- Sample line list of AR events by pathogen
  - Lists patient ID, location, specimen collection date, specimen source, pathogen, antimicrobial, and final interpretation

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Patient ID</th>
<th>Location</th>
<th>Date Specimen Collected</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>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</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>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>CASPO - Caspofungin</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>FLUCO - Fluconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>FLUCY - Flucytosine</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>ITRA - Itraconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>MICA - Micafungin</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</td>
<td>123456-7</td>
<td>Blood</td>
<td>Candida auris - CAUR</td>
<td>POSAC - Posaconazole</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>59582</td>
<td>123-45-6709</td>
<td>MICU</td>
<td>09/13/2016</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>

*Data for example only*
AR Option – Line List

- Each event lists 1 row for susceptibility results showing each required drug
  - Patient ID ‘123-45-6789’ had a blood specimen collected on 09/13/2016 while in the MICU
  - *Candida auris* was identified and susceptibility results were reported for the 8 required drugs (8 separate rows of data for this single AR Event)

*Data for example only*
AR Option – Line List

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

```
National Healthcare Safety Network
Line Listing - Antimicrobial Resistance Events by Pathogen
As of January 17, 2017 at 12:31 PM
Data Range: AUR_DETAIL SpecimenDateYr After and Including 2016

Pathogen Description = Klebsiella pneumoniae - KP

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Patient ID</th>
<th>Location</th>
<th>Date Specimen Collected</th>
<th>Isolate ID</th>
<th>Specimen Group</th>
<th>Specimen Source</th>
<th>Pathogen Description</th>
<th>Drug Description</th>
<th>MIC sign</th>
<th>MIC value</th>
<th>Interpretation of MIC test Description</th>
<th>Final Interpretation Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>62407</td>
<td>321456</td>
<td>MEDWARD</td>
<td>02/08/2016</td>
<td>160295</td>
<td>LRS</td>
<td>SPUTSPEC</td>
<td>Klebsiella pneumoniae - KP</td>
<td>AMK - Amikacin</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S - Susceptible</td>
<td>S - Susceptible</td>
</tr>
<tr>
<td>62410</td>
<td>789654</td>
<td>MEDWARD</td>
<td>05/02/2016</td>
<td>160502</td>
<td>Blood</td>
<td>BLDSPC</td>
<td>Klebsiella pneumoniae - KP</td>
<td>AMK - Amikacin</td>
<td>&lt;=</td>
<td>0.100</td>
<td>S - Susceptible</td>
<td>S - Susceptible</td>
</tr>
</tbody>
</table>
```

Data contained in this report were last generated on January 18, 2017 at 5:41 PM.
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.

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

- Sample facility-wide antiobiogram
  - 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 to the pathogen
  - 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 to Ciprofloxacin.
  - In January 2014, 0% of Staphylococcus aureus isolates were non-susceptible to Ciprofloxacin.

*Data for example only*
Additional Resources
### NHSN AUR Module Resources

NHSN AUR Module Resources (cont.)

- AU & AR Option CDA Toolkits
  - https://www.cdc.gov/nhsn/cdaportal/toolkits.html
NHSN AUR Module Important Links

- 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.