

NHSN Antimicrobial Use and Resistance Module Reporting Basics

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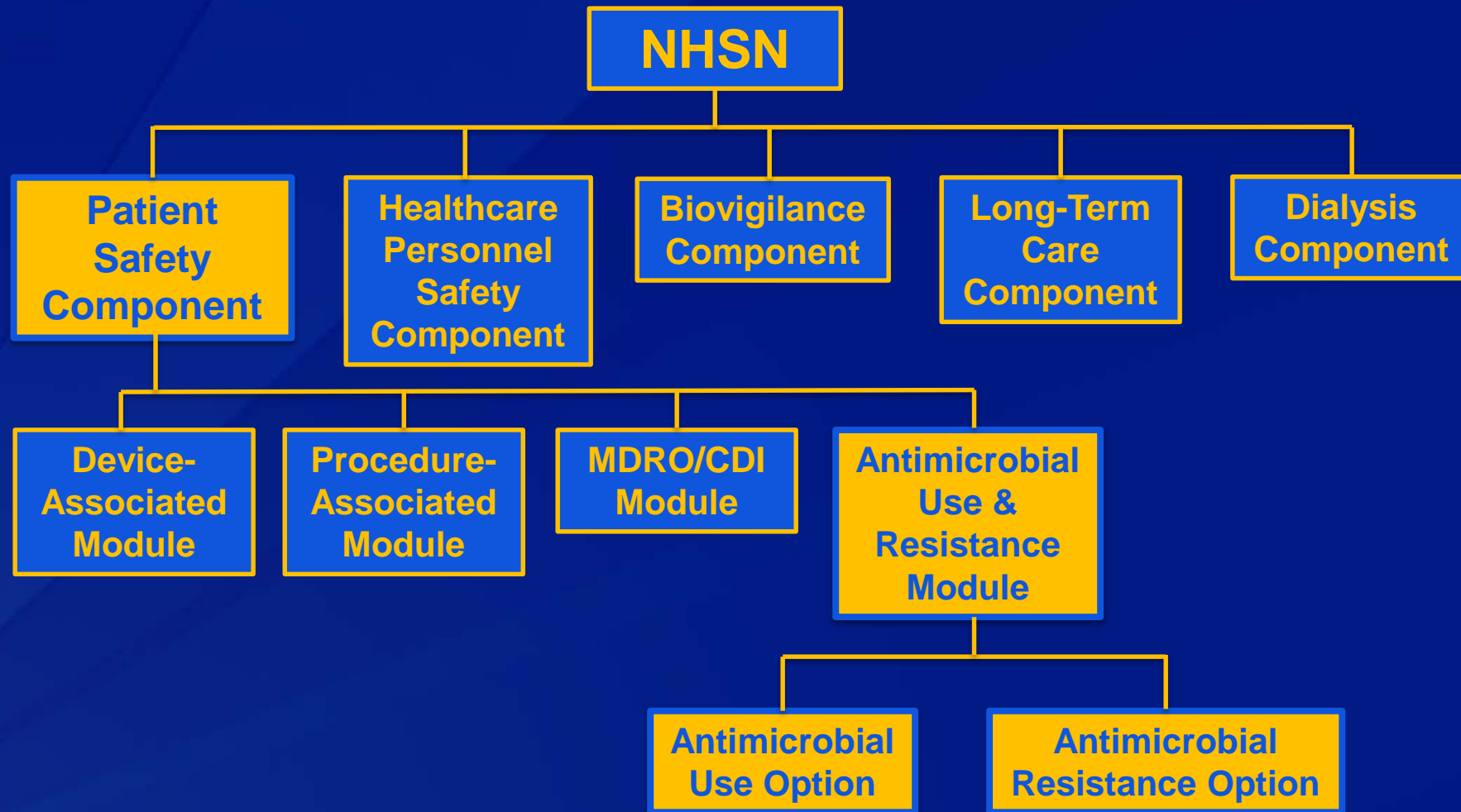
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Division of Healthcare Quality Promotion

National Center for Emerging and Zoonotic Infectious Diseases



NHSN Structure



ANTIMICROBIAL USE (AU) OPTION

NHSN Antimicrobial Use (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
 - Allow for risk-adjusted comparison of antimicrobial use to a national aggregate

- ❑ **Voluntary reporting***

*Missouri SB 579 signed into law 6/2016.

Meaningful Use (MU) Stage 3

- ❑ NHSN AUR Module listed as *an option* for public health registry reporting in MU 3
- ❑ Data for both AU and AR Option required
- ❑ **Timeline**
 - Summer 2016: NHSN declaration of readiness
 - January 2017: MU 3 Option Year 1
 - January 2017: NHSN facilities can register intent & begin submitting data
 - January 2018: Submission required for MU 3 participants
- ❑ **Important note: AUR Module is only part of NHSN that qualifies for MU 3**

MU 3 Final Rule: <https://www.federalregister.gov/articles/2015/10/16/2015-25595/medicare-and-medicaid-programs-electronic-health-record-incentive-program-stage-3-and-modifications>

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

*General acute care hospitals, long-term acute care hospitals (LTAC), inpatient rehabilitation facilities (IRF), oncology hospitals, critical access hospitals enrolled in NHSN

AU Data Elements

What Data Are Collected?

- ❑ **Monthly aggregate, summary-level data**
 - All inpatient locations individually & combined (FacWideIN)
 - 3 outpatient locations (ED, pediatric ED, 24 hour observation)
- ❑ **Numerator: Antimicrobial days (Days of Therapy)**
 - 89 antimicrobials – includes antibacterial, antifungal, and anti-influenza agents
 - Sub-stratified by route of administration:
 - Intravenous (IV)
 - Intramuscular (IM)
 - Digestive (oral)
 - Respiratory (inhaled)
- ❑ **Denominators:**
 - Days Present - number of days spent in specific unit or facility
 - Days present ≠ Patient days
 - Admissions - number of patients admitted to the facility

What is Clinical Document Architecture (CDA)?

- ❑ **Standard that specifies:**
 - Structure and semantics of a clinical document
 - For information exchange between systems
- ❑ **HL7 (Health Level 7) provides an Implementation Guide**
 - “How to...”
- ❑ **Used for importing Antimicrobial Use, Antimicrobial Resistance, and Healthcare Associated Infection data into NHSN**

AU Data from eMAR/BCMA to CDA

1. eMAR/BCMA captures drug administration
2. Vendor or 'homegrown' system extracts and aggregates data elements
 - a) eMAR/BCMA administration data
 - b) ADT (admission, discharge, transfer data)
3. "Package" AU data into CDA files using an XML format

```
<!-- 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="723"
              displayName="Amoxicillin"/>
      </participantRole>
    </participant>
  </observation>
</entryRelationship>
```

Flow of AU Data: From Bedside to NHSN



**eMAR/BCMA
& ADT**



**Vendor/Homegrown
System**

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



**Report in standard
format**



**NHSN
Servers**



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



**Pharmacists & Physicians
compare and target
education/interventions**

**New: Risk adjusted
comparisons for specific
locations, groupings of
antimicrobials**

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 the given location
 - 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 Orthopedic Ward
 - 1 CDA for Emergency Department
 - 1 CDA for FacWideIN (combination of all 4 inpatient locations above)
 - All CDA files are uploaded within 1 Zip file

NHSN Monthly Reporting Plans

- ❑ Add locations to monthly reporting plan prior to uploading data
- ❑ Same monthly reporting plan used for HAI reporting

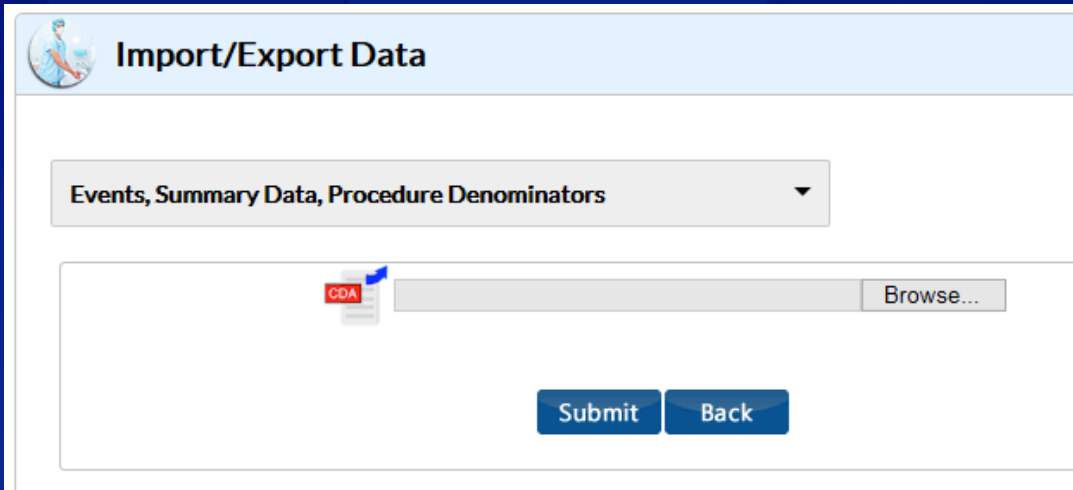
Antimicrobial Use and Resistance Module

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




Importing CDA Files into NHSN

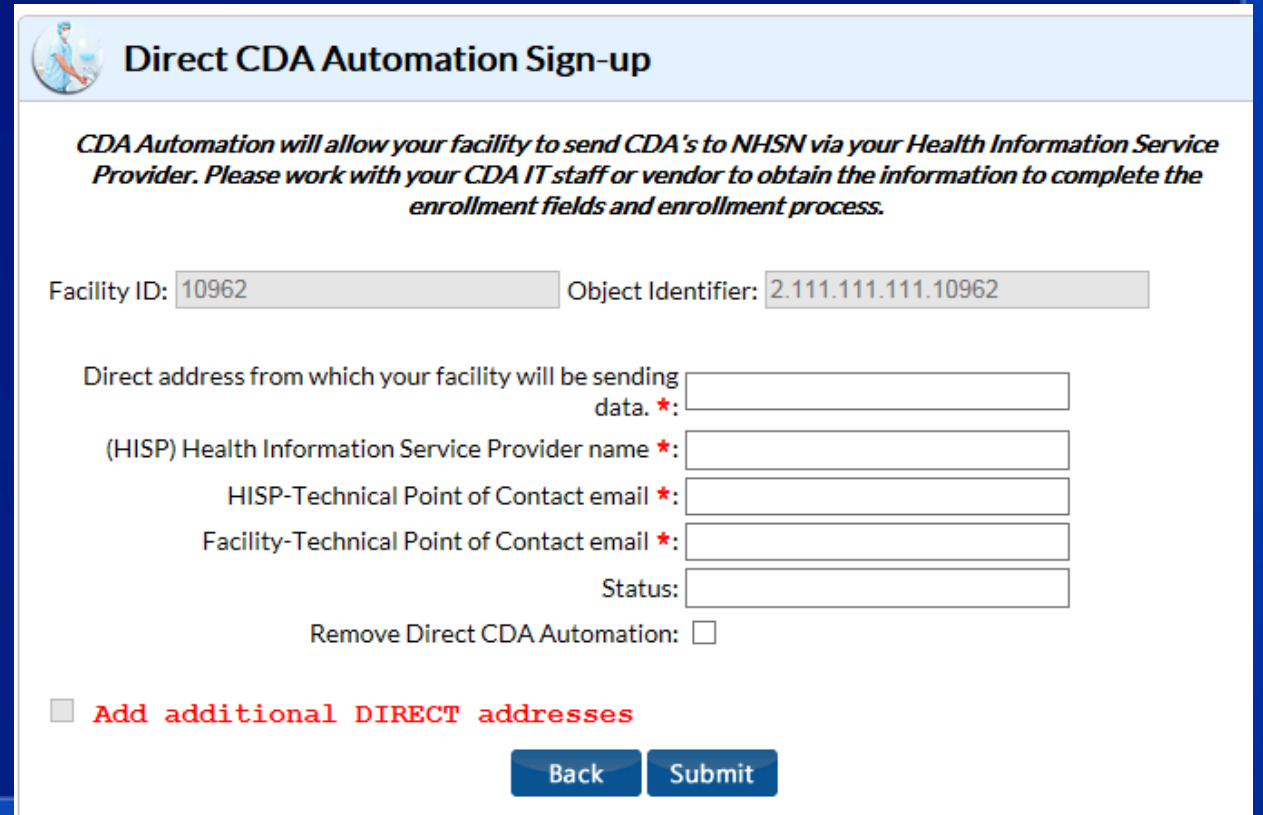
- ❑ Manual upload
- ❑ Automatic upload from vendor/IT solution using DIRECT CDA Automation



Import/Export Data

Events, Summary Data, Procedure Denominators

 Browse...



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: Object Identifier:

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

Antimicrobial Use Data

- SAAR Report - All SAARs
- SAAR Report - All SAARs by Location
- 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 - 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

AU Option – NHSN Analysis Reports

Basic analysis reports available

- Line lists
- Rate tables
- Pie charts
- Bar charts
- SAARs (Standardized Antimicrobial Administration Ratio)

Steps for Facility Participation in NHSN AU Option

- ❑ **Must have eMAR/BCMA**
- ❑ **Identify facility lead(s) for AU Option**
- ❑ **Gain support!**
- ❑ **Obtain/develop system for collecting/packaging eMAR/BCMA data into CDA**
 - Vendor or 'Homegrown' approach
- ❑ **Validation**
 - Pre- and post-submission to NHSN
- ❑ **Monthly submission**

AU Option Implementation Lessons Learned

❑ Nothing is one size fits all

- Time to connect eMAR/BCMA to vendor systems
- Different types of connections for different vendor/facility pairs
- Ability for eMAR/BCMA system to capture data

❑ Importance of validation

- Even more important since AU data are electronic submission only
- Completeness of eMAR/BCMA feeds
- Discrepancies in denominator data from different systems

❑ Importance of facility buy in & working together

- Support needed from various different departments of the facility

AU Option Implementation Lessons Learned (continued)

□ Ask around

- Knowledge gained from other facilities
- Collaboration with experienced NHSN users within the facility

□ Speak up!

- Express the need for participation to facility leadership
- Ask your vendor about product availability
- Don't settle for bad data

□ Patience

- New type of reporting into NHSN
- Takes time to work out the bugs

ANTIMICROBIAL RESISTANCE (AR) OPTION

Antimicrobial Resistance Data in NHSN

	AR Option	MDRO Module	Device & Procedure-Associated Modules
Events reported	AR Events from blood, CSF, urine, & lower respiratory specimens	Laboratory Identified (LabID) & Infection Surveillance Events	CLABSI, CAUTI, pedVAP, VAE, SSI Events
Type of susceptibility data	19 specific organisms; detailed lab test results & final interpretation	Positive specimens (i.e., MRSA, CDI, CRE) defined by NHSN criteria	Susceptibility results for specific antibiotics
Benefits	Wide-spread, 'whole-house' coverage; no manual entry	Simplified reporting; LabID MRSA & CDI national benchmarks	Infection control software; data can be manually entered; national AR data published (%resistance)
Drawbacks	Requires set-up by vendor/homegrown system	Small number of organisms followed	Only get susceptibility info for events that meet NHSN definitions

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 preventions efforts

- ❑ Voluntary reporting*

*Missouri SB 579 signed into law 6/2016.

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
 - 3rd party vendor or “Homegrown” solution

*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*

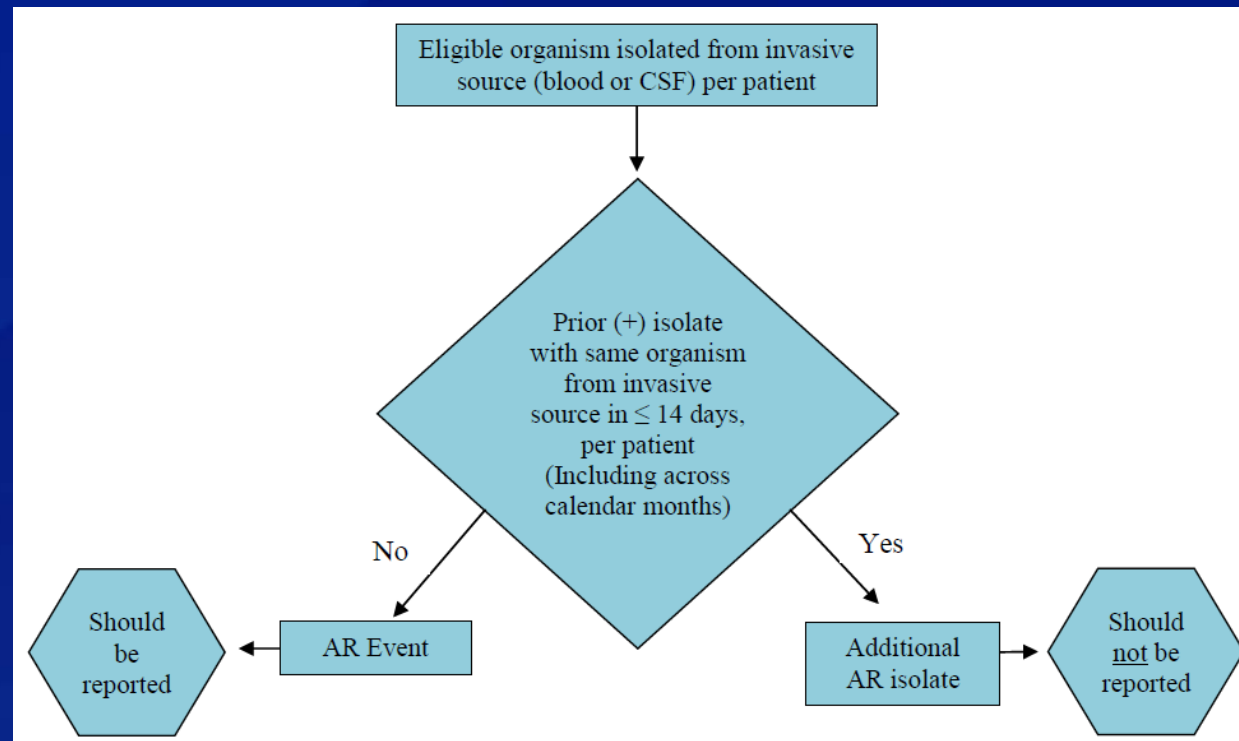
AR Option – Organism/Agent Combinations

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

- ❑ Selected antimicrobial agents are required to be reported 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>

AR Option Reporting Rules – Invasive Sources

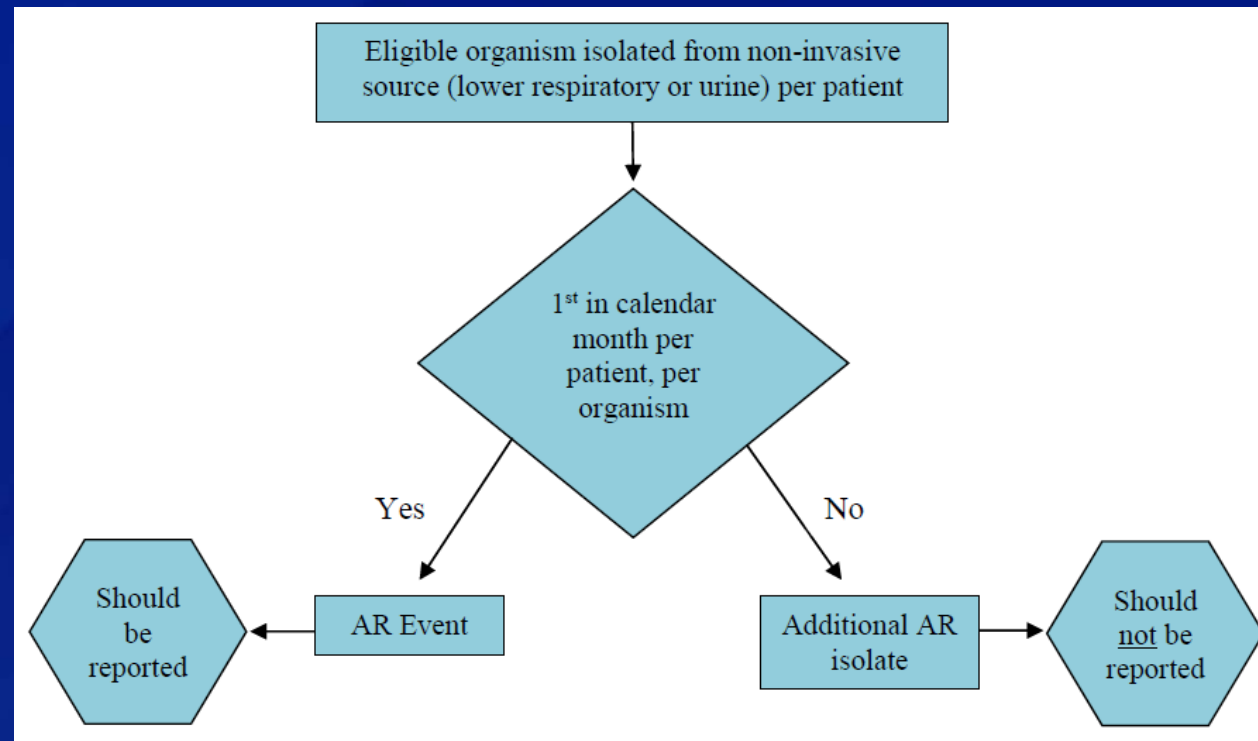
- Same organism from invasive specimen source (blood & CSF) reported once per patient per 14 day period



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

- 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>

Flow of AR Data: From Lab to NHSN



Laboratory
Information and
ADT Systems



EHRs, 3rd party vendor,
or homegrown system

- Organism-based reports
- Patient days and admissions



Report in standard
format



NHSN
Servers



Local AR data access via
NHSN web interface for
analysis, visualization
and data sharing



Hospital-wide antibiogram
and additional analytic
tools

Stewardship program can
use AR data for analysis
and action




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)
 - **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
- ❑ Same monthly reporting plan used for HAI reporting

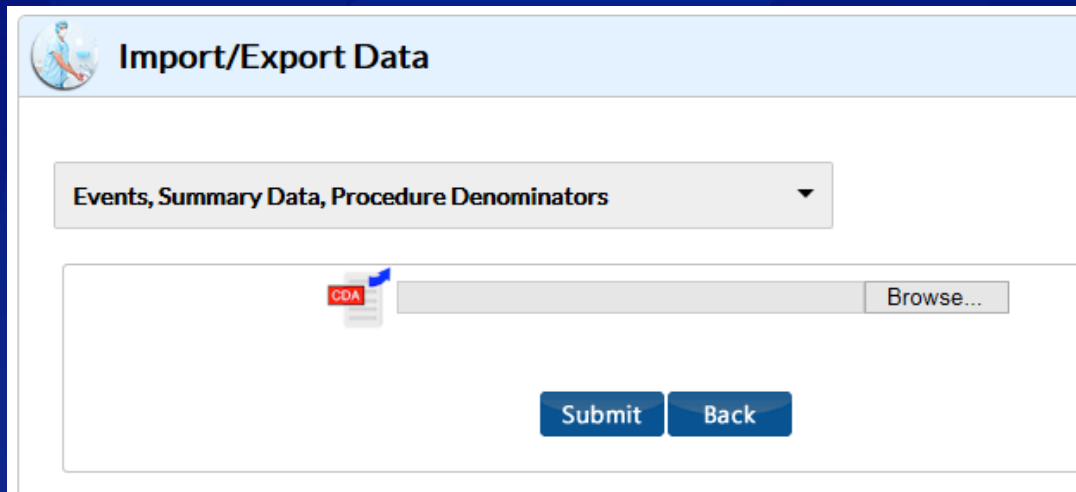
Antimicrobial Use and Resistance Module

	Locations	Antimicrobial Use	Antimicrobial Resistance
	FACWIDEIN - Facility-wide Inpatient (FacWIDEIn) ▼	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	ER - EMERGENCY DEPARTMENT - AU ▼	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	24HROBS - 24-HR OBS. ▼	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Importing CDA Files into NHSN

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

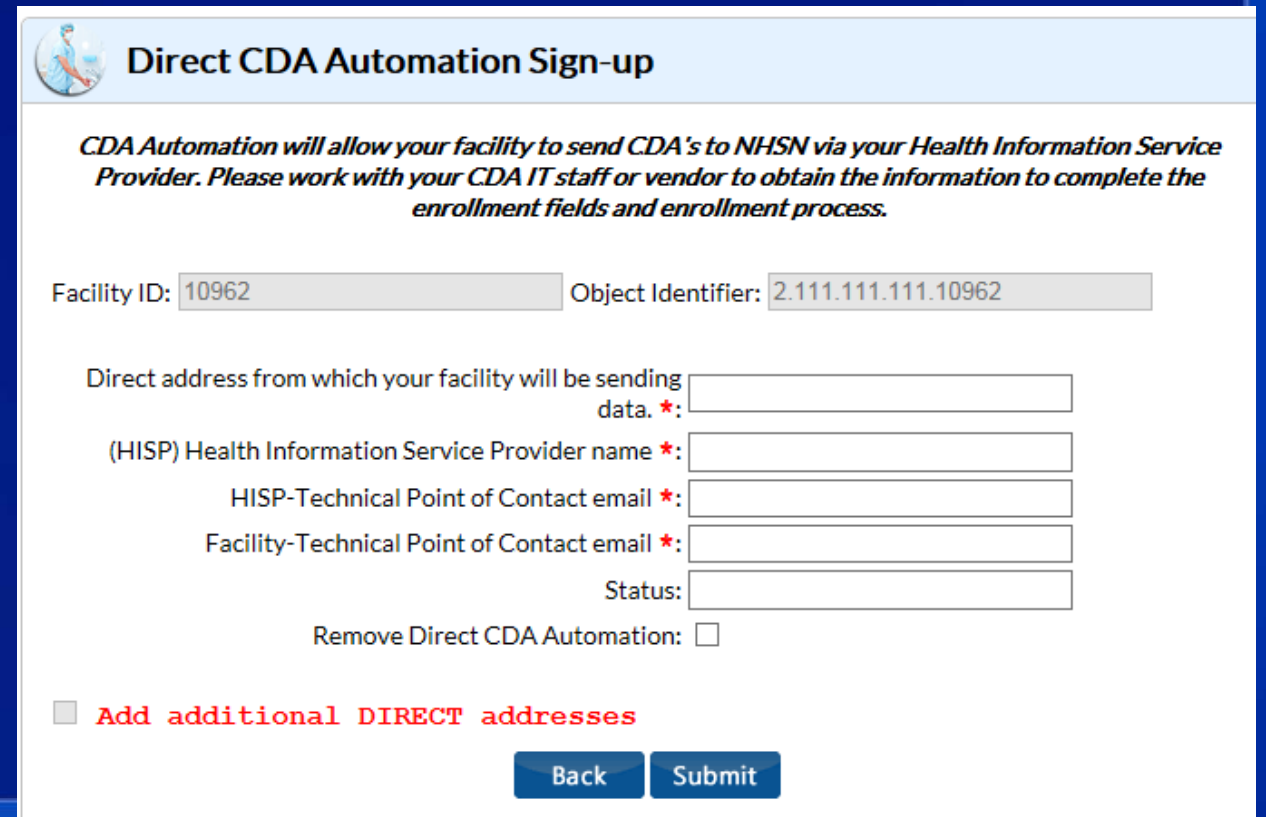


Import/Export Data

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. *: [Text Field]

(HISP) Health Information Service Provider name *: [Text Field]

HISP-Technical Point of Contact email *: [Text Field]

Facility-Technical Point of Contact email *: [Text Field]

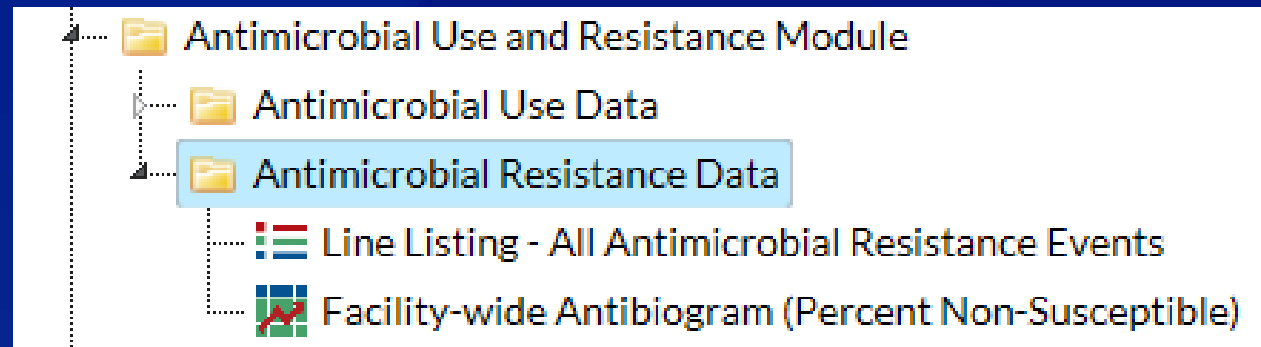
Status: [Text Field]

Remove Direct CDA Automation:

Add additional DIRECT addresses

Back Submit

AR Option – Output Options



□ Basic analysis output options available

- Line listing
- Facility-wide antibiogram

Steps for Facility Participation in AR Option

- ❑ **Must have electronic LIS** (or electronic access to data)
- ❑ **Identify facility lead(s) for AR Option**
- ❑ **Gain support!**
- ❑ **Obtain/develop system for collecting/packaging LIS data into CDA**
 - Vendor or 'Homegrown' approach
- ❑ **Validation**
- ❑ **Monthly submission**

AR Option Implementation Lessons Learned

- ❑ **Nothing is one size fits all**
 - Labs have different testing practices
- ❑ **Access to data**
 - Vendors pulling susceptibility data from EHR
 - Suppression of results
- ❑ **Importance of facility buy in & working together**
 - Support needed from various different departments of the facility
- ❑ **Speak up!**
 - Ask your vendor about product availability
 - Express the need for participation to facility leadership
 - Don't settle for bad data

ADDITIONAL RESOURCES

NHSN AUR Module Resources

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

National Healthcare Safety Network (NHSN)

NHSN	
NHSN Login	
About NHSN	+
Enroll Here	+
Materials for Enrolled Facilities	-
Ambulatory Surgery Centers	+
Acute Care Hospitals/Facilities	-
Surveillance for Antimicrobial Use and Antimicrobial Resistance Options	
Surveillance for UTI (CAUTI)	
Surveillance for C. difficile, MRSA, and other Drug-resistant Infections	
Surveillance for BSI (CLABSI)	
Surveillance for CLIP	
Surveillance for SSI Events	
Surveillance for VAE	
Surveillance for PNEU (pedVAP)	
Surveillance for Healthcare Personnel Exposure	
Surveillance for Healthcare	

[CDC](#) > [NHSN](#) > [Materials for Enrolled Facilities](#) > [Acute Care Hospitals/Facilities](#)


Surveillance for Antimicrobial Use and Antimicrobial Resistance Options



Resources for NHSN Users Already Enrolled

- > **Training** ←
- > **Protocols** ←
- > Frequently Asked Questions
- > 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>

- ❑ **CDA Submission Support Portal:**

- <https://www.cdc.gov/nhsn/cdaportal/index.html>

- ❑ **NHSN Helpdesk (protocol & submission questions):**

- NHSN@cdc.gov

- ❑ **NHSN CDA Helpdesk (technical questions):**

- NHSNCDA@cdc.gov

Questions?

NHSN@cdc.gov

Thank you!

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: 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.

Division of Healthcare Quality Promotion

National Center for Emerging and Zoonotic Infectious Diseases

