AR Verification Plan

Version: 1
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Contents

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Acronyms and Abbreviations

- Admission Count – The total number of admissions for all facility inpatient locations combined for the month
- CDA – Clinical Document Architecture: An XML-based file format required for AU reports
- CSF – Cerebrospinal fluid
- Event – Test result
- FacWideIn – Facility Wide Inpatient: A single, all-encompassing location representing the entire inpatient setting of an AU report
- Isolate – A single isolated organism
- LIS – Laboratory information system
- Patient Days - the total number of patient days collected at the same time each day combined for the month

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Purpose and Scope

- This document helps validate and verify data before submission for NHSN AR reporting. It focuses on verifying the calculation algorithms used for counting patient days and antimicrobial resistance events
- The plan targets the primary points where most data errors occur and is not intended to be a comprehensive validation of all data
- Intended audience: Staff responsible for reporting of AR data to NHSN

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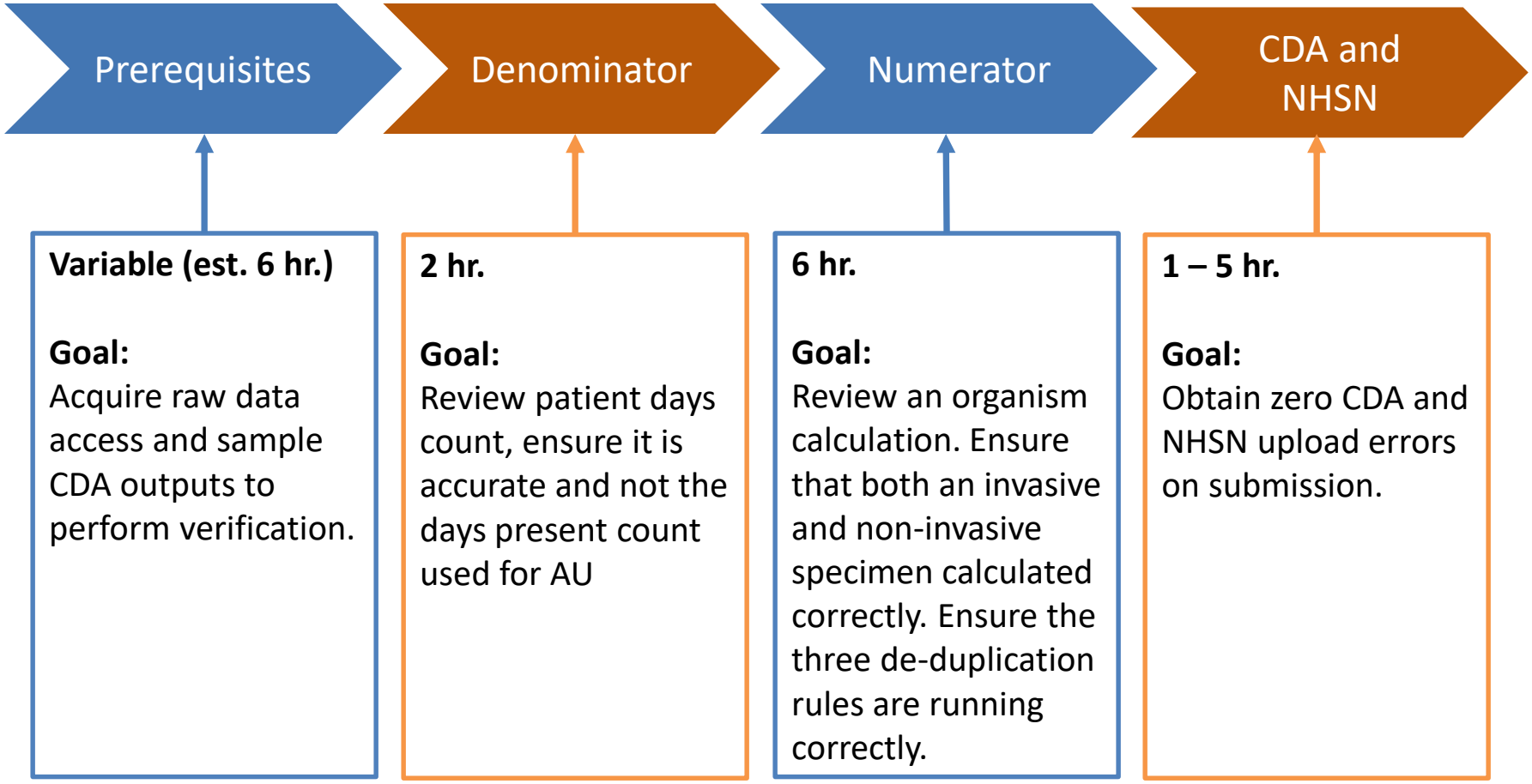
Timeline Estimate



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AR vs AU Reporting

- Denominator:
  - AU: Days Present count
  - AR: Patient Days count
- Numerator:
  - AU: Days of Therapy for 90 antimicrobials, for each location
  - AR: Isolate Reports for Organisms in any inpatient location and select outpatient locations
- Location Data:
  - AU: All collected, and reported by location
  - AR: Facility-wide for inpatient locations and select outpatient locations

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AR vs AU Reporting

- Different Source Systems:
  - AU requires data from ADT and eMAR systems
  - AR requires data from LIS and ADT systems
- Data Sensitivity:
  - AU reports are summary data, with no PHI
  - AR reports contain patient level data
- CDA Reports:
  - AU reporting requires 1 file per location
  - Each file contains numerator and denominator
  - AR reporting numerator requires 1 file per isolate
  - Denominator is a separate file, for entire facility

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Validation vs. Verification

The terms “validation” and “verification” are often used interchangeably. In this document, there are distinct meanings assigned to each word.

Validation:

Ensure the report format and structure is correct.

Verification:

Ensure the information found within the report is accurate.

Manual Verification Prerequisites

- Reviewer has AR event outputs from exported NHSN report
- Admission Discharge Transfer (ADT) Feed
  - Patient Information
  - Location of admission, transfer, or discharge
  - Time and date of A/D/T
- Laboratory Information System (LIS) Reports
  - Specimen Collection Date
  - Specimen Source
  - 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

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Denominator Verification - 1

1 CDA File per Month

Each AR report has 1 denominator file for the entire facility for the month

The Denominator must contain Patient Days count and Admission Count

The Patient Days and Admission Counts are calculated for Inpatient locations only
Outpatient locations are not included in the denominator data
(Instruction to review an NHSN CDA File)

Denominator File must be a valid CDA File

CDA File must validate against the NHSN formatting rules (how to validate?)

Denominator Verification - 2

Patient Days Count is Accurate

Patient Days are calculated for all inpatient locations based on a once daily census count

Admission Count is Accurate

Admission counts are calculated for Inpatient Locations only

(Instruction to review an NHSN CDA File)

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Verifying Denominator Data: Special Cases

- IG contains requirement for “Blood Cultures Performed”
  - Variable removed from the protocol but is still required in the CDA --use dummy data for import

Numerator Verification Checklist

AR Events/Isolate are identified correctly

Use the NHSN rules to identify eligible isolates (validation)

One CDA File for each Isolate

Each eligible AR Event/Isolate should be in its own CDA file
(Instruction to review an NHSN CDA File)

All Numerator files must be valid CDA files

CDA Files must validate against the NHSN format rules (steps)

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Numerator "Quick Checks"

- 1 AR Event for an organism on one day per patient
  - De-duplication rules should be used in case there are two AR Events on the same day
- No invasive specimens should be within 14 days of each other even across months per patient per organism
- At most 3 invasive AR Events per organism per patient in a given calendar month
- At most 1 non-invasive AR Event per organism in a given calendar month per patient

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Verifying Numerator Data

1. Collect All Isolates for 1 particular organism from the LIS
   - Suggest *Enterococcus faecalis*, as it has a manageable combination of antimicrobial agents to verify manually
2. Identify the source of the Isolate:
   1. Invasive Source
   2. Non-Invasive Source
3. If Invasive Source, follow the 14 day algorithm to identify AR Events
4. If Non-Invasive Source, follow the Monthly Algorithm to identify AR Events

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Verifying Numerator Data

5. Based on organism and source, confirm that all NHSN-required antimicrobials are present in the CDA file and results are present if they are available
6. Use De-Duplication rules to resolve isolate reports from the same day
7. Count number of isolates remaining. This is the number of eligible AR Events
8. Compare to AR Events reported by the software export.

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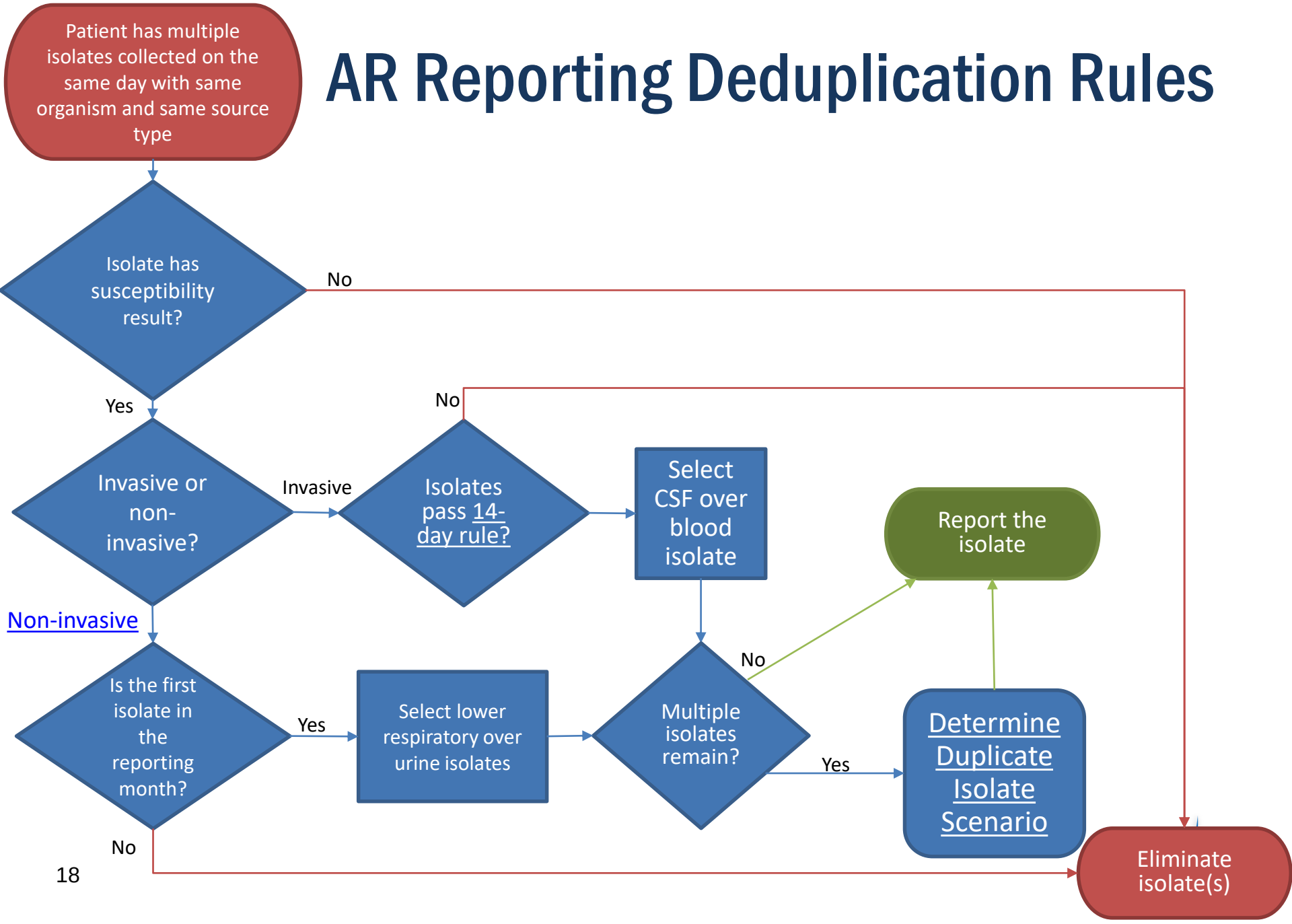
Verifying Numerator Data: Special Cases

- The LIS does not differentiate between Penicillin G and Penicillin V
  - List susceptibility results under Penicillin G and indicate that Penicillin V was not tested (N)
- For Staphylococcus aureus susceptibility testing, if the LIS tests Nafcillin instead of Oxacillin
  - Report Nafcillin susceptibility results as Oxacillin
- If the LIS produces meningitis and non-meningitis breakpoint results, rely on the specimen source to determine which susceptibility results to report
  - For CSF report the meningitis breakpoint susceptibility
  - For blood, urine, or lower respiratory report the non-meningitis breakpoint susceptibility

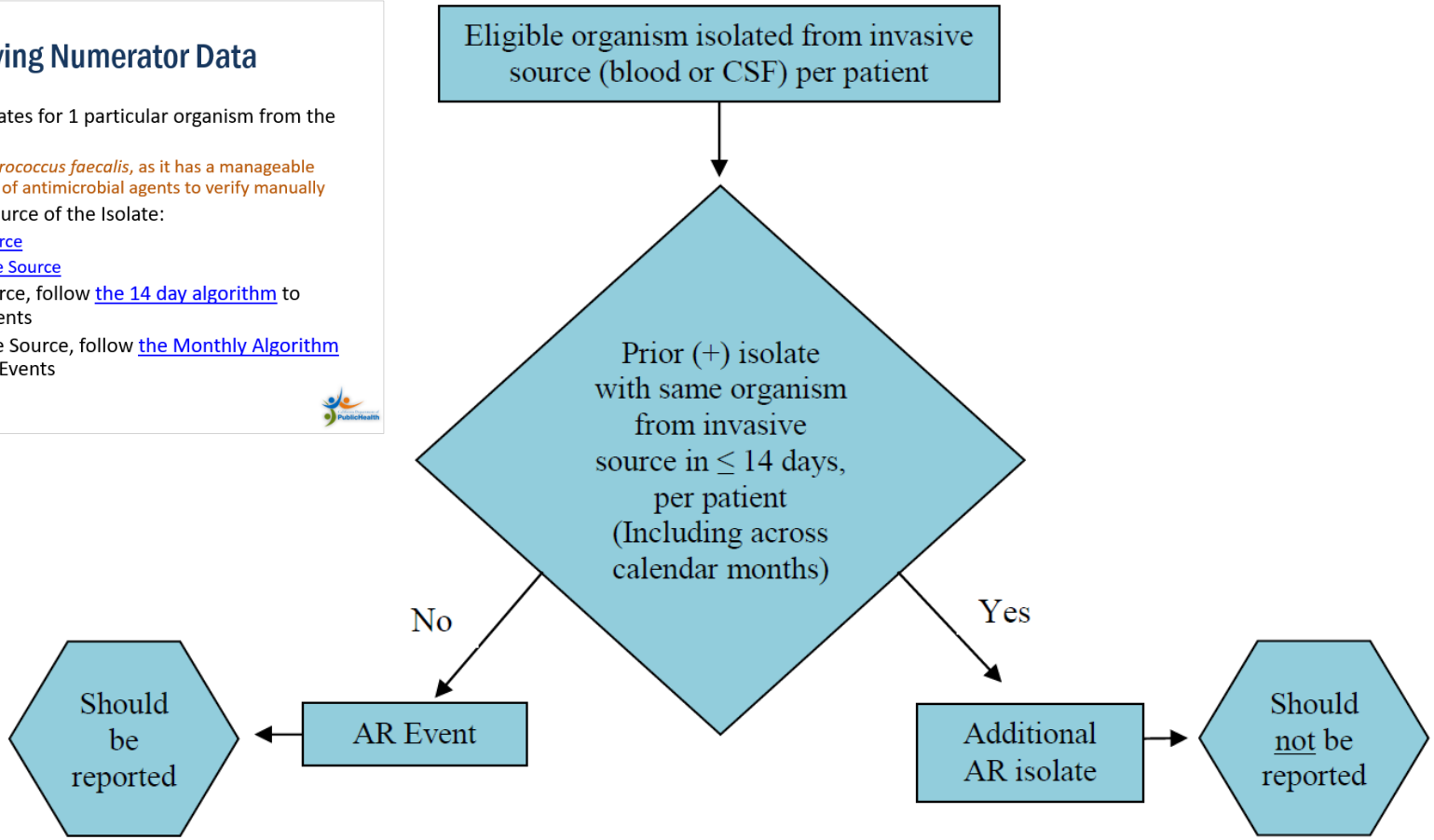
AR Reporting Deduplication Rules



Algorithm for Invasive Specimen

Verifying Numerator Data

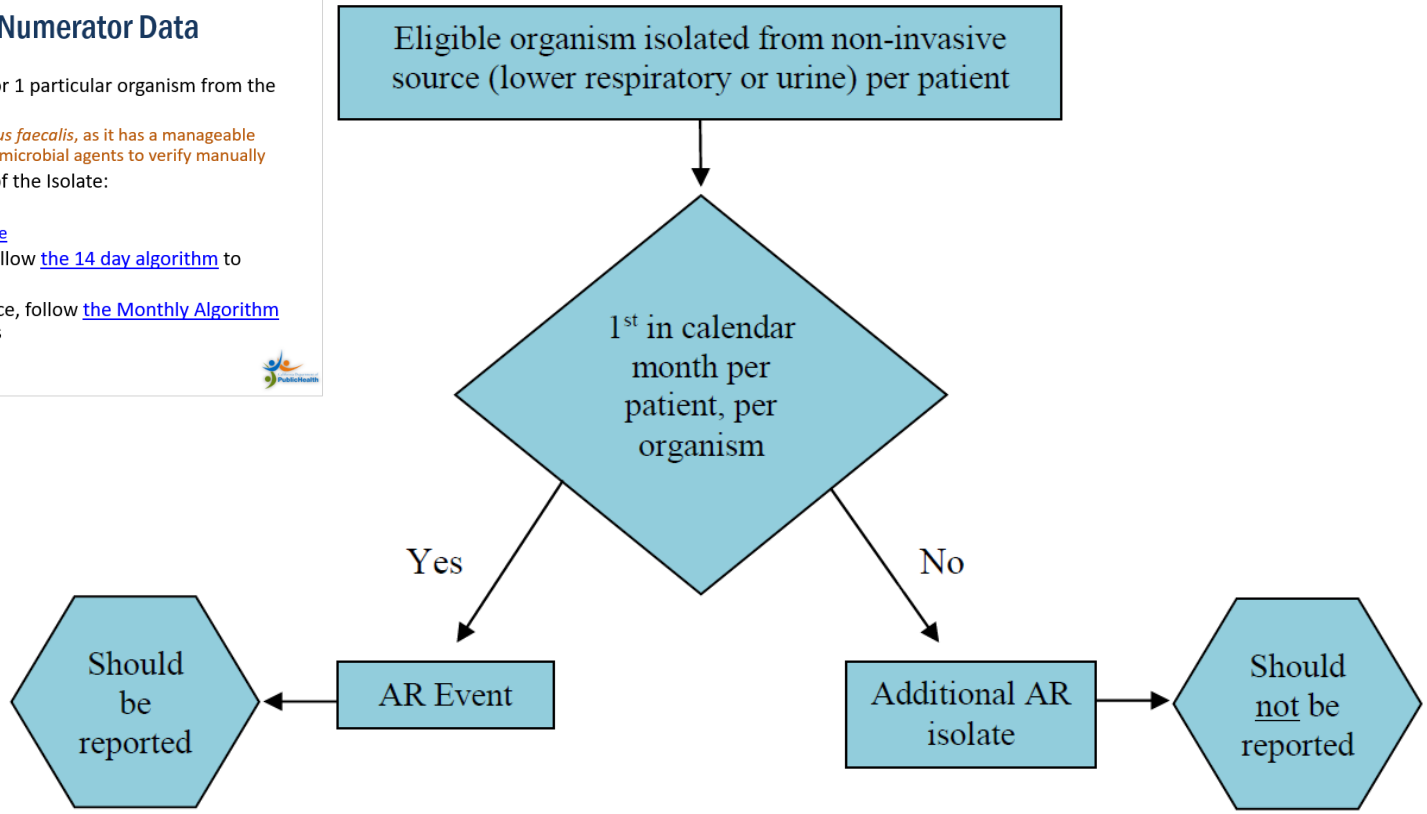
1. Collect All Isolates for 1 particular organism from the LIS
   - Suggest *Enterococcus faecalis*, as it has a manageable combination of antimicrobial agents to verify manually
2. Identify the source of the Isolate:
   1. Invasive Source
   2. Non-Invasive Source
3. If Invasive Source, follow the 14 day algorithm to identify AR Events
4. If Non-Invasive Source, follow the Monthly Algorithm to identify AR Events



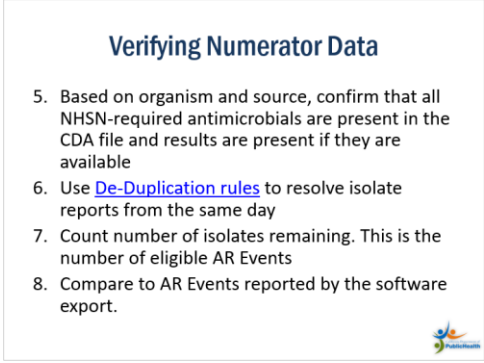
Non Invasive Specimen Algorithm

Verifying Numerator Data

1. Collect All Isolates for 1 particular organism from the LIS
   - Suggest *Enterococcus faecalis*, as it has a manageable combination of antimicrobial agents to verify manually
2. Identify the source of the Isolate:
   1. Invasive Source
   2. Non-Invasive Source
3. If Invasive Source, follow the 14 day algorithm to identify AR Events
4. If Non-Invasive Source, follow the Monthly Algorithm to identify AR Events



Duplicate Isolates



- Duplicate Isolates
  - Defined as same species or same genus when the identification to the species level is not provided from same patient on same day
  - Isolates must have the same source type (i.e., invasive or non-invasive)
- Handling multiple isolates of the same organism
  - Isolates may produce conflicting results
  - Facilities should only report one isolate to NHSN
  - NHSN has rules for removing duplicates

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Duplicate Isolate Removal Rules

- Basic de-duplication rules that apply to all:
  - For Invasive Specimens: select CSF isolates over blood isolates
  - For Non-Invasive Specimens: select lower respiratory isolates over urine isolates
  - Eliminate isolates on same day without susceptibility test results
  - Do not merge test results across multiple isolates
  - Do not summarize results across different isolates tested on same day

Duplicate Isolates: Scenarios

- There are three different scenarios that can create duplicates
  1. The same isolate was tested using the same test, with conflicting results
  2. The same isolate was tested using different tests, with conflicting results
  3. Two isolates collected on the same day return conflicting results from a panel of antimicrobial tests

Duplicate Isolate Removal Rules

- Same isolate, same specific test performed, produced conflicting results:
  - If available, report the final interpretation
  - Without a final interpretation, report the most resistant interpretation (i.e., NS > R > I > S-DD > S > NT)

- Example:
  - Two E-tests are performed for the same drug on the same isolate and one produces “Intermediate” and the other produces “Susceptible”, report “Intermediate” as the final interpretation for that specific drug susceptibility.

Duplicate Isolate Removal Rules

- Same isolate, different specific antimicrobial tests performed, produces conflicting results:
  - If available, report the final interpretation
  - If no final interpretation is provided, report the most resistant interpretation (i.e., NS > R > I > S-DD > S > NT).

- Example:
  - if drug susceptibility results produced MIC = Resistant and E-Test = Intermediate but no final interpretation was provided, report “Resistant” as the final interpretation for that specific drug susceptibility

Duplicate Isolate Removal Rules

- Two isolates from same day, conflicting results to panel of antimicrobials test:
  - Report isolate with the most resistant final interpretation.
  - If no final interpretation, report the isolate with the higher amount of drug resistance based on the number antimicrobials testing “NS” or “R”.
  - If all else fails, report first isolate entered into LIS

- Example: *Candida albicans,* isolated from two blood specimens, same patient, same calendar day, no final interpretation
  - First isolate tested “R” to 3 of 8 antimicrobials
  - Second isolate tested “R” to 4 of 8 antimicrobials
  - Report the second isolate showing higher resistance

Verification Walkthroughs

Verification Walkthroughs

- Setup:
  - Organism Isolate: *Stenotrophomonas maltophilia*
  - Isolates collected in an inpatient location
  - Patient: Rudolf Lingens
- Scenarios
  - 14 Day Rule – Invasive Sources
  - Deduplication scenario 3 - panel

Verification Walkthrough: 14 Day Rule

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffu			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum concentr			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Inte			**Final Interpretation**	**Susceptible**
2018-02-24	CSF	Chloramphenicol	E-test	Susceptible	vofloxacin	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Susceptible**
2018-03-16	Blood	Minocycline	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml Resistant
			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Resistant**

Apply 14 day rule when sources are invasive

Verification Walkthrough: 14 Day Rule

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobi l agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test		eftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diff			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Mini mur concentration (MIC			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
2018-02-24	CSF	Chloramphenicol	E-test	Less than 0.1 ug/ml Susceptible	Levofloxacin	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Susceptible**
2018-03-16	Blood	Minocycline	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml Resistant
			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Resistant**

Report to NHSN

This is the first blood culture collected for this patient

Verification Walkthrough: 14 Day Rule

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum inhibitory concenti	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Int			**Final Interpretation**	**Susceptible**
2018-02-24	CSF	Chloramphenicol	E-test		vofloxacin	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diff			Disk Diffusion (KB)	N/A
			Mini mur concenti			Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Susceptible**
2018-03-16	Blood	Minocycline	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml Resistant
			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Resistant**

Do not report to NHSN

It has been less than 14 days since the last positive culture (Feb/20)

Verification Walkthrough: 14 Day Rule

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum inhibitory concentration (MIC	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
2018-02-24	CSF	Chloramphenicol	E-test	Less than 0.1 ug/ml Susceptible	Levofloxacin	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Int			**Final Interpretation**	**Susceptible**
2018-03-16	Blood	Minocycline	E-test		tazidime	E-test	Greater than 5.0 ug/ml Resistant
			Disk Diff			Disk Diffusion (KB)	N/A
			Minimu concentration (MIC)	0.1 ug/ml Susceptible		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Resistant**

Report to NHSN

It has been more than 14 days since the last positive culture (Feb/24)

Verification Walkthrough: 14 Day Rule Data Reported

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum inhibitory concentration (MIC	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
~~2018-02-24~~	~~CSF~~	~~Chloramphenicol~~		~~than 0.1 ug/ml eptible~~			~~Less than 0.1 ug/ml Susceptible~~
						~~B~~	~~N/A~~
						~~ce y A C)~~	~~N/A~~
			~~**Final Interpretation**~~	~~**Susceptible**~~		~~**Final Interpretation**~~	~~**Susceptible**~~
2018-03-16	Blood	Minocycline	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml Resistant
			Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Resistant**

February Report

March Report

Verification Walkthrough: Deduplication

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum inhibitory concentration (MIC	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml= Non-susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Non-Susceptible**

Scenario:
Two isolates from same day, conflicting results to panel of antimicrobials

Verification Walkthrough: Deduplication

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim		) ug/ml	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
						Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
						Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml= Non-susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Non-Susceptible**

Collected on the same day

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Verification Walkthrough: Deduplication

Conflicting Results

Date	Source	Antimicrobial Agent			Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim		ug/ml	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
						Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minimum inhibitory concentration (MIC	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final Interpretation	**Resistant**		**Final Interpretation**	**Susceptible**
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml= Non-susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Non-Susceptible**

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Verification Walkthrough: Deduplication

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Greater than 5.0 ug/ml Resistant	Ceftazidime	E-test	Less than 0.1 ug/ml Susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	Exactly equal to 2.5 mm Intermediate
			Minim conce	N/A		Minimum inhibitory concentration (MIC)	Less than or equal to 0.1 ug/ml Susceptible
			Final			**Final Interpretation**	**Susceptible**
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test		Ceftazidime	E-test	Greater than 5.0 ug/ml= Non-susceptible
			Disk D			Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Non-Susceptible**

Report most resistant result

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Verification Walkthrough: Deduplication Data Reported

Date	Source	Antimicrobial Agent	Test	Results	Antimicrobial agent	Test	Results
~~2018-02-20~~	~~Blood~~	~~Sulfamethoxazole with Trimethoprim~~	~~E-test~~	~~Greater than 5.0 ug/ml Resistant~~	~~Ceftazidime~~	~~E-test~~	~~Less than 0.1 ug/ml Susceptible~~
			~~Disk Diffusion (KB)~~	~~N/A~~		~~Disk Diffusion (KB)~~	~~Exactly equal to 2.5 mm Intermediate~~
			~~Minimum inhibitory concentration (MIC~~	~~N/A~~		~~Minimum inhibitory concentration (MIC)~~	~~Less than or equal to 0.1 ug/ml Susceptible~~
			~~**Final Interpretation**~~	~~**Resistant**~~		~~**Final Interpretation**~~	~~**Susceptible**~~
2018-02-20	Blood	Sulfamethoxazole with Trimethoprim	E-test	Less than 0.1 ug/ml Susceptible	Ceftazidime	E-test	Greater than 5.0 ug/ml= Non-susceptible
			Disk Diffusion (KB)	N/A		Disk Diffusion (KB)	N/A
			Minimum inhibitory concentration (MIC)	N/A		Minimum inhibitory concentration (MIC)	N/A
			Final Interpretation	**Susceptible**		**Final Interpretation**	**Non-Susceptible**

Reviewing and Validating CDA Documents

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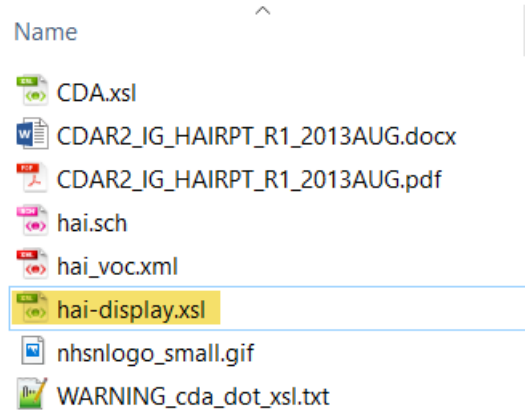
Reviewing an NHSN CDA Document

- Review NHSN CDA files in a browser using hai-display.xsl
- Associate .XSL File within the CDA document

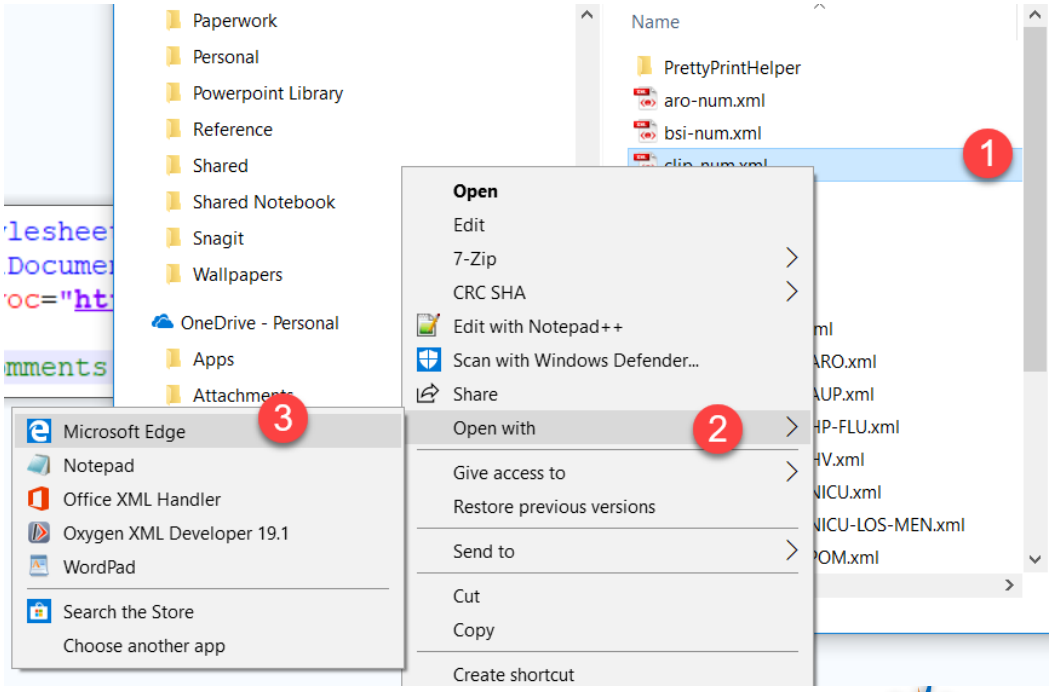



```
<?xml-stylesheet type="text/xsl" href="../../transform/hai-display.xsl"?>
<ClinicalDocument xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2001/XMLSchem
  xmlns:voc="http://www.lantanagroup.com/voc" xsi:schemaLocation="urn:hl7-org:v3 ..

  <!-- Comments precede their subject. -->
```

Reviewing an NHSN CDA Document

- Right-Click the XML file that is associated with the stylesheet
- Select “Open With” and select a web browser



Reviewing an NHSN CDA Document

Antimicrobial Resistance Option (ARO) report

Patient	Ned Nuclear		
Admission Date	January 15, 2009		
Date of birth	November 25, 1954	**Sex**	Male
Race	Information not available	**Ethnicity**	Not Hispanic or Latino
Contact info	address not available Telecom information not available	**Patient IDs**	123456 (2.16.840.1.113883.3.117.1.1.5.1.1.1)
Document Id	20202201 (2.16.840.1.113883.3.117.1.1.5.2.1.1.2)		
Document Created	August 7, 2008		
Author	anAuthorID (2.16.840.1.113883.3.117.1.1.5.1.1.2)		
Encounter Date	From January 15, 2009		
Encounter Location	2.16.840.1.113883.3.117.1.1.5.1.1		
Document maintained by	2.16.840.1.114222.4.3.2.11		
Legal authenticator	aLegalAuthenticatorID (2.16.840.1.113883.3.117.1.1.5.1.1.2) signed date/time: August 7, 2008		

Findings

Specimen type	Date Specimen Collected	In-facility location of patient when specimen was drawn
Blood specimen	January 21, 2009	9W Medical/Surgical critical care unit

Microbiology Studies: Pathogen Isolate

Staphylococcus aureus

Staph Aureus Specific Test	Result
Oxacillin Resistant Staphylococcus sp isolate [Presence] in Isolate by Latex agglutination	Negative
Bacterial methicillin resistance (mecA) gene [Presence] by Probe and target amplification method	Positive

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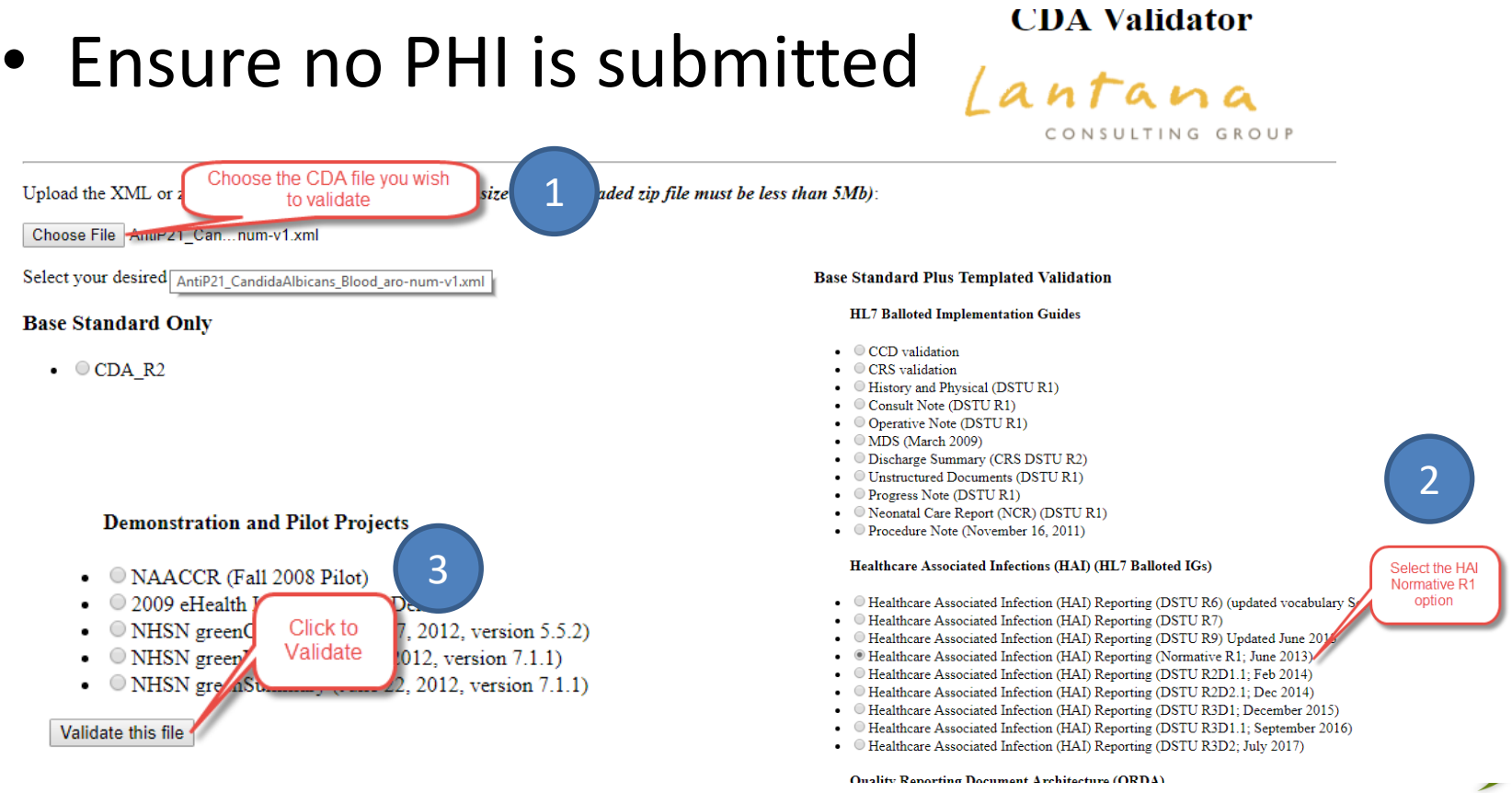
Validate CDA Files

- Use the Lantana Group online validator: http://lantanagroup.com/validator/
- Ensure no PHI is submitted



Uploading to NHSN: Common Errors

- Incorrect Facility OID – NHSN does not recognize Facility identifier
  - Ensure that the Facility OID is used for submitting CDA documents to NHSN. Facility OIDs are assigned by NHSN and are different from FacilityIDs
- Too many files/package too large
  - Max: 1000 CDAs in a single zip or file size <2 MB per zip

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Reference

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Additional Resources

- NHSN Video Explaining AUR Option
  - Explains data elements collected
  - Describes available analysis reports
  - Reviews requirements for participation in NHSN AUR
- Antimicrobial Resistance ToolKit
  - Contains all supporting information for AU implementation
- NHSN HAI CDA Implementation Guide
  - Contains technical guidance on the structure of an CDA-based AU report

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Denominator Data Elements

Facility Wide Denominator

- Facility ID
- Location
- Reporting Month and Year
- Patient Days
- Admission Count
- IG contains requirement for “Blood Cultures Performed”
  - Variable removed from the protocol but is still required in the CDA --use dummy data for import

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Numerator Data Elements

Facility Identifier

Unique NHSN Facility ID (i.e., Object Identifier [OID] in the CDA)

Patient Data

- Patient identifier
- Date of birth
- Gender
- Date admitted to facility (use the encounter date if the event occurred in outpatient location)

Specimen Data

- Specimen collection date
- Specimen source
- Location code (mapped to CDC location codes)
- Isolate identifier (unique isolate ID in the electronic laboratory report)
- Organism

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Numerator Data Elements

Antimicrobial Susceptibility Data

- Antimicrobial
- PBP2a-agglutination (only if Staphylococcus aureus)
- PCR mec-gene (only if Staphylococcus aureus)
- E-test sign
- E-test value and unit of measure
- Interpretation of E-test
- MIC sign
- MIC value and unit of measure
- Interpretation of MIC test
- Disk diffusion (KB) test sign
- Disk diffusion (KB) test value and unit of measure
- Interpretation of disk diffusion (KB) test
- **Final interpretation result**

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Numerator Data Element: Additional Note

- While many of these specific test results (specifically, E-test, MIC, Disk diffusion [KB]) are required to be included in the CDA report, facilities unable to electronically obtain these results may still participate assuming the final interpretation is accessible
  - Use ‘Unknown’ or ‘Not Tested’.
  - Facilities should not employ manual means of data collection.

Organism and Antimicrobial Agent Combinations

Organism	Specimen Type	Antimicrobial Agents
Acinetobacter (All *Acinetobacter* 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
Candida albicans *Candida auris* *Candida glabrata*	Blood, Urine, CSF Note: Lower respiratory will not be collected for Candida spp.	Anidulafungin Caspofungin Fluconazole Flucytosine Itraconazole Micafungin Posaconazole Voriconazole
	Additional Agents for Urine	None

Organism	Specimen Type	Antimicrobial Agents
Citrobacter freundii *Enterobacter* (All *Enterobacter* species noted in the IDM/Pathogen Codes tab listed in the ARO Pathogen column) *Escherichia coli* *Klebsiella oxytoca* *Klebsiella pneumoniae* *Morganella morganii* *Proteus mirabilis* *Serratia marcescens*	Blood, Urine, Lower Respiratory, CSF	Amikacin Amoxicillin-clavulanic acid Ampicillin Ampicillin-sulbactam Aztreonam Cefazolin Cefepime Cefotaxime Cefoxitin Ceftazidime Ceftriaxone Cefuroxime Chloramphenicol Ciprofloxacin Doripenem Ertapenem Gentamicin Imipenem with Cilastatin Levofloxacin Meropenem Piperacillin Piperacillin-tazobactam Tetracycline Ticarcillin-clavulanic acid Trimethoprim-sulfamethoxazole Tobramycin
	Additional Agents for Urine	Cephalothin Lomefloxacin Nitrofurantoin Norfloxacin Ofloxacin Sulfisoxazole Trimethoprim

Organism	Specimen Type	Antimicrobial Agents
Enterococcus faecalis *Enterococcus faecium* *Enterococcus* spp. (When not otherwise specified; excluding *E. faecalis*, *E. faecium*, and other identified species)	Blood, Urine, Lower Respiratory, CSF	Ampicillin Daptomycin Gentamicin Linezolid Penicillin[a] Quinupristin/dalfopristin Rifampin Streptomycin Vancomycin Note: For Gentamicin and Streptomycin only: Synergistic = Susceptible Non-synergistic = Resistant
	Additional Agents for Urine Note: Exclude Gentamicin and Streptomycin	Ciprofloxacin Levofloxacin Nitrofurantoin Norfloxacin Tetracycline
Pseudomonas aeruginosa	Blood, Urine, Lower Respiratory, CSF	Amikacin Aztreonam Cefepime Ceftazidime Ciprofloxacin Gentamicin Imipenem with Cilastatin Levofloxacin Meropenem Piperacillin Piperacillin-tazobactam Ticarcillin Tobramycin
	Additional Agents for Urine	Lomefloxacin Norfloxacin Ofloxacin

Organism	Specimen Type	Antimicrobial Agents
Staphylococcus aureus	Blood, Urine, Lower Respiratory, CSF	Azithromycin Cefoxitin Chloramphenicol Ciprofloxacin Clarithromycin Clindamycin Daptomycin Doxycycline Erythromycin Gentamicin Levofloxacin Linezolid Minocycline Moxifloxacin Ofloxacin Oxacillin or Nafcillin[b] Penicillin[a] Quinupristin-dalfoprisin Rifampin Telithromycin Tetracycline Trimethoprim-sulfamethoxazole Vancomycin
	Additional Agents for Urine	Lomefloxacin Nitrofurantoin Norfloxacin Sulfisoxazole Trimethoprim
Stenotrophomonas maltophilia	Blood, Urine, Lower Respiratory, CSF	Ceftazidime Chloramphenicol Levofloxacin Minocycline Ticarcillin-clavulanate Trimethoprim-sulfamethoxazole
	Additional Agents for Urine	None

Organism	Specimen Type	Antimicrobial Agents
Streptococcus pneumoniae	Blood, Urine, Lower Respiratory, CSF	Amoxicillin Amoxicillin-clavulanic acid Azithromycin Cefepime Cefotaxime (meningitis or non-meningitis breakpoint)[c] Ceftriaxone (meningitis or non-meningitis breakpoint)[c] Cefuroxime Chloramphenicol Clindamycin Ertapenem Erythromycin Gemifloxacin Imipenem with Cilastatin Levofloxacin Linezolid Meropenem Moxifloxacin Ofloxacin Penicillin[a] (meningitis or non-meningitis breakpoint)[c] Penicillin V[a] (oral breakpoint) Rifampin Telithromycin Tetracycline Trimethoprim-sulfamethoxazole Vancomycin
	Additional Agents for Urine	None
Group B *Streptococcus*	Blood, Urine, Lower Respiratory, CSF	Ampicillin Cefazolin Cefotaxime Cefoxitin Ciprofloxacin Clindamycin Daptomycin Erythromycin Levofloxacin Linezolid Penicillin[a] Tetracycline Vancomycin
	Additional Agents for Urine	None