

AU Option Implementation Data Validation

The National Healthcare Safety Network (NHSN) Antimicrobial Use (AU) Option, managed by the Centers for Disease Control and Prevention (CDC), is a surveillance module. It receives data extracted from hospital electronic medication administration record (eMAR) or bar-coding medication administration (BCMA) systems, compiled according to the protocol for the [NHSN Antimicrobial Use and Resistance \(AUR\) Module](#). To ensure the data submitted to NHSN accurately reflect antimicrobial use (AU) in the reporting hospitals, the NHSN AUR Team developed this document to assist hospitals in verifying that the data generated by the surveillance software meets the requirements of the NHSN AU Option. This document helps identify potential sources of errors and explores possible solutions. We recommend reviewing the questions and steps outlined in this validation document during the initial implementation for reporting to the NHSN AU Option and whenever your hospital has a change in their commercial software vendor. We expect facilities to use this document internally and do not require them to share the results with NHSN.

To ensure accurate and reliable reporting of AU data, software vendors must complete a separate validation process using the [AU Synthetic Data Set \(SDS\)](#). While this process detects some validation issues, it does not cover all potential errors—making it critical for facilities to review AU data during implementation. For example, AU SDS will not be able to identify terminology mapping issues which could lead to drug mismatch between the data submitted to the AU Option and your eMAR/BCMA system. Facilities are encouraged to complete Section A as an initial step. If facilities identify data quality issues in Section A, we recommend completing Sections B and C to identify the source of the issues. Please refer to the [NHSN AUR Module Protocol](#) for a review of applicable definitions. Facilities that completed implementation validation and actively report AU Option data to NHSN (the “maintenance” phase of AU reporting) or those with extremely high or low Standardized Antimicrobial Administration Ratio (SAAR) values should use the separate, more focused [Annual AU Option Data Validation Protocol](#). Facilities interested in validating Antimicrobial Resistance (AR) Option data can refer to the [AR Option Data Validation Protocol](#).

Validation Checklist

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Section A. Spot Check Data Submitted to NHSN

Prior to beginning this section, you should upload at least one month’s worth of AU data into NHSN for all patient care locations if you have not already done so. After uploading the data, generate new data sets in NHSN by following the [guidance for data set generation](#). Please review “[How to Modify a Report](#)” for a general explanation of modifying reports within NHSN.

Note: If you identify any data anomalies and need to update the record, be sure to delete the existing AU Summary record and upload the corrected file.

1. Use the AU Option Data Quality Line List within NHSN

Methodology: The AU Option Data Quality Line List provides facilities with a quick way to assess six potential data quality issues.

- 1) Zero or missing antimicrobial days
- 2) Antimicrobial days reported when patients were not present
- 3) Antimicrobial days greater than or equal to days present
- 4) Sum of the routes of administration less than total antimicrobial days
- 5) Antimicrobial days for facility-wide inpatient (FacWideIN) greater than the sum of antimicrobial days for all inpatient locations
- 6) Days present for FacWideIN greater than the sum of days present for all inpatient locations

Run the [Data Quality Line List](#) within the NHSN application to check if any of the six potential data quality issues are present in your data. Within the [document](#), you’ll also find guidance for interpreting your output and next steps for how to address the data quality issues.

Note: If NHSN does not identify one of the six potential data quality issues in your facility’s AU data, NHSN will generate one of the following messages (depending on whether the report was modified):

National Healthcare Safety Network
Line Listing for Antimicrobial Use Data to Review
As of: February 13, 2024 at 2:25 PM
Date Range: AU_DATAQUALITY summaryYM 2021M01 to 2023M08

No Records Met Your Criteria.

Please check your time period and/or filter criteria.

National Healthcare Safety Network
Line Listing for Antimicrobial Use Data to Review
As of: February 12, 2024 at 3:05 PM

No Records in Analysis Dataset: AU_DataQuality

Please check the date that Analysis Datasets were last generated and generate new ones if necessary.

2. Ensure complete and accurate mapping for routes of administration

Methodology: This section asks you to review the mapping for drugs with multiple or unusual routes of administration. It’s important to ensure administrations are being captured via the correct routes as some AU SAAR calculations use route-specific antimicrobial days. Generate a line list within NHSN using the “[Line Listing – All Submitted AU data by Location](#)” report. Use the line list to review the following scenarios in the table below. We recommend confirming at least one drug in each grouping.

Route of Administration	Example Items for Verification (if applicable for your Facility)
Intravenous (IV)	Continuous or extended infusions (for example, piperacillin/tazobactam, cefiderocol, ceftazidime/avibactam, meropenem/vaborbactam)
Intramuscular (IM)	Ceftriaxone IM usage in the Emergency Department (ED) (often used for treatment of <i>N. gonorrhea</i> in ED setting)
Digestive	Vancomycin digestive includes oral and rectal administrations of vancomycin. Nasogastric administration of antimicrobials such as ciprofloxacin or levofloxacin is included under the digestive route of administration.
Respiratory	Intrapleural doxycycline, minocycline, and tetracycline should not be included as respiratory route and excluded from AU reporting. Amikacin, gentamicin, or tobramycin respiratory usage in ICUs or units with patients who have cystic fibrosis or atypical mycobacterial infections Aztreonam, colistin*, and/or polymyxin B respiratory administrations *Note: While the vendor software will report colistin and colistimethate separately in the CDA file, NHSN will roll up colistin and it will appear with colistimethate in the NHSN AU Option Line Lists.

3. Evaluate location-specific patterns of antimicrobial use

Methodology: This section asks you to review location-specific patterns as a high-level review of reported data. These questions can quickly help pinpoint if there's a location-specific issue that needs to be addressed. Use the "[Line Listing – All Submitted AU data by Location](#)" report to answer the following questions. While we expect to see these patterns in most cases, variations can occur. If these patterns are not observed for these locations or if inconsistencies are discovered, work with your vendor to resolve the issues.

Confirm usage patterns reflect unit specific hospital treatment guidelines. Here are some examples:

- Review Labor and Delivery usage. Narrow spectrum beta-lactams, such as ampicillin and penicillin G, are usually used more often in Labor and Delivery than in other adult locations.
- Review neonatal intensive care unit (NICU) usage. Ampicillin and gentamicin are usually used more often than other antibacterials used in the NICU.
- Review critical care location usage. Broad spectrum antibacterial agents are usually used more often in critical care locations than in non-specialty medical wards.
- Review Operating Room usage (if applicable). Cefazolin and vancomycin are usually the most commonly used antimicrobials in the Operating Room.
- Review cancer and/or transplant locations usage. Antifungals, including azoles, echinocandins, and amphotericin B products are used more often in cancer and transplant locations than in other non-oncology locations.

4. Evaluate drug-specific patterns

Methodology: This section asks you to review drug-specific patterns as a high-level review of reported data. These questions can quickly help pinpoint if there's a drug-specific issue that needs to be

addressed. Use the “[Line Listing – All Submitted AU data by Location](#)” report to answer the following questions. If these expected patterns are not found, review the AU data for the given drug to confirm the accuracy of what’s being reported.

- a. The vendor system is capturing non-formulary and rarely used agents.
 - If any antimicrobial agents (for example oral cephalosporins), are rarely used but available for use in your facility and can be accurately captured, ensure their antimicrobial days are reported as 0 (if no use) instead of N/A in the data reported to the AU Option. Drugs reported as N/A will show as “.” in the NHSN AU Option Line List.
- b. Anti-influenza agents (for example, baloxavir marboxil, oseltamivir, peramivir, zanamivir) are primarily used during flu season with potential peaks in usage in January and February.
- c. The vendor system is correctly capturing single and combination drugs such as amoxicillin and amoxicillin/clavulanate, ampicillin and ampicillin/sulbactam, ceftazidime and ceftazidime/avibactam, and meropenem and meropenem/vaborbactam. For example, the vendor system is not mapping and aggregating ceftazidime/avibactam to ceftazidime or double-counting administrations as both ceftazidime/avibactam and ceftazidime.
- d. The vendor system is correctly capturing different formulations of amphotericin B (i.e., amphotericin B, amphotericin lipid complex, and amphotericin B liposomal). For example, the vendor system is not double-counting administrations as both amphotericin lipid complex and amphotericin B liposomal.
- e. The vendor system is correctly capturing different formulations of colistin (i.e., colistin and colistimethate). For example, the vendor system is not double-counting administrations as both colistin and colistimethate.

Note: The NHSN application combines colistin and colistimethate use and reports them together as colistimethate. To check that your vendor system is capturing colistin and colistimethate administrations correctly, you will need to compare the colistin and colistimethate administrations in your Electronic Health Record (EHR) or vendor system to the colistimethate counts in the NHSN application.

- f. If your facility submitted AU data for more than one month, confirm general usage patterns for a specific location are similar across months, unless there is a reason for a substantial change in usage (for example, formulary changes or drug shortages).

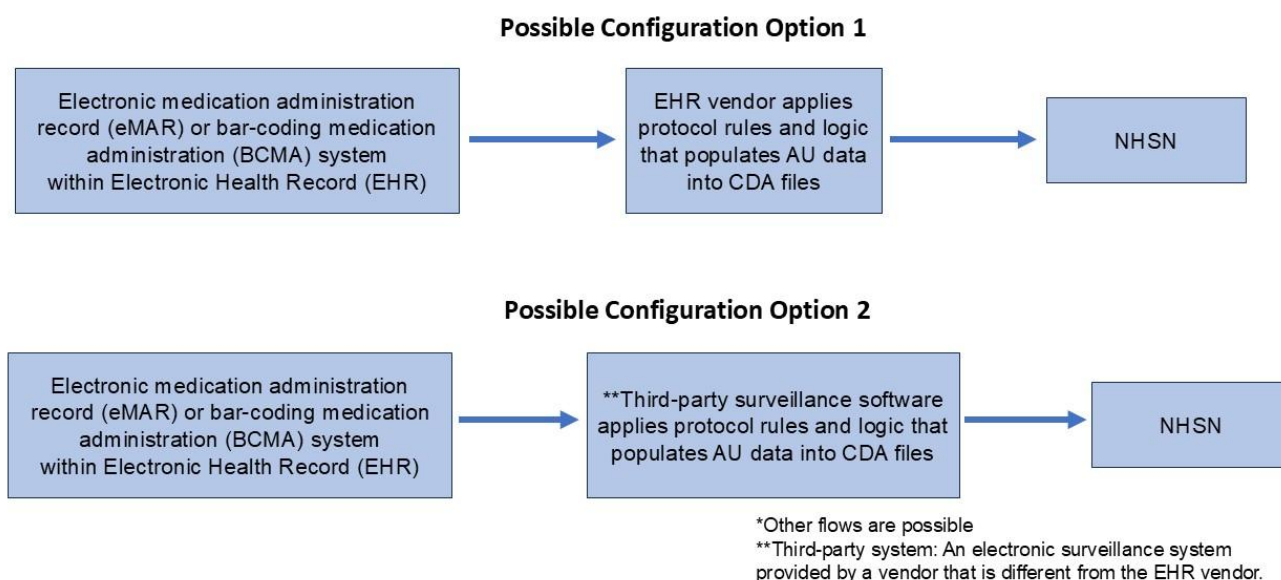
End of Section A: Spot Check Data Submitted to NHSN

If data quality issues were identified in Section A, we recommend completing Sections B and C below to determine the source of the issue(s).

Section B. Review Mappings

The NHSN AU Option uses data on antimicrobial administrations captured by the eMAR or BCMA system within the facility's EHR. Additionally, some facilities feed the data from the EHR into a third-party surveillance software. Review the illustration below showing Possible Configuration Options 1 and 2 to determine how your AU data get from the eMAR/BCMA system to NHSN.

Example Antimicrobial Use Data Flows*



During the implementation of reporting your AU data, it is essential to ensure that data feeds, including eMAR and BCMA, are properly integrated with your third-party system. Further, specific variables like locations/units and antimicrobials need to be mapped to standardized value sets. The questions in this section will guide you in checking these mappings.

For subsections 1 and 2 below, you'll compare the output from your AU surveillance vendor with the data input from your eMAR/BCMA and shown in your EHR as illustrated in Possible Configuration Option 2 in the figure above. Alternatively, if you don't use a third-party software, you'll be reviewing the EHR data for accuracy as shown in Possible Configuration Option 1 in the figure above.

To have a reference for crosschecking between your facility's original source of data and your AU reporting, the validator should generate a line list of agents administered per day, per patient, per patient care location. Data fields associated with the agents administered should include patient identifier, antimicrobial agent, route and date of administration, and location of patient for all inpatient locations, emergency departments (EDs), and 24-hour observation locations as applicable. We recommend generating this line list for 1 month (or 7 days for large facilities) from the output of the system being used to submit AU Option data to NHSN (eMAR/BCMA for Possible Configuration Option 1; one list from eMAR/BCMA and one list from the third-party software for Possible Configuration Option 2).

For subsection 3 below, you will verify the locations in your NHSN facility match the locations used in the vendor system you plan to use to submit AU data to NHSN.

1. Review mappings for patient care locations and antimicrobial agents

Methodology:

Possible Configuration Option 1: If you will be using your EHR to submit AU Option data to NHSN, we recommend reviewing patients with the scenarios below directly in your EHR to ensure the EHR is accurately capturing these data.

Possible Configuration Option 2: Compare the line list generated from the third-party software that will be used to submit AU data to NHSN to the hospital-based eMAR report or use manual confirmation of eMAR/BCMA to review the following patient-level scenarios.

We recommend reviewing five patients per scenario. Your vendor may have additional tools available to facilitate this section. We recommend contacting your vendor representative prior to starting this section.

- a. Some facilities house observation patients in an inpatient location rather than a designated outpatient unit for 24-hour observation. If these observation patients' administrations are not correctly attributed to the inpatient location where they were physically housed at the time of administration, this should be corrected in your vendor system. Ensure your vendor software includes these patients in the antimicrobial days (numerator) and days present (denominator) for the location in which they are physically located, regardless of patient status (for example, inpatient, outpatient, observation).
- b. Some facilities may use a different vendor system for their outpatient locations (specifically, outpatient ED, pediatric ED, and 24-hour observation area) compared to their inpatient locations. Regardless of whether you use the same or different system for your outpatient units, review patients admitted to an inpatient location through the ED and/or 24-hour observation location. If the vendor system is misattributing antimicrobials administered in the ED and/or 24-hour observation location to the inpatient location, or antimicrobials administered in the inpatient location to the ED and/or 24-hour observation area, work with your vendor to resolve the misattribution. Check that the vendor system attributes antimicrobials to the location where they were administered.
- c. If you've found that antimicrobials administered to patients transferred to and from NHSN procedural locations (for example, Operating Room, Interventional Radiology, Cardiac Catheterization Room/Suite, Cesarean Section Room/Suite, Post-anesthesia Care Unit/Recovery Room) are not correctly reflected in the location where they received the antimicrobial, take steps to ensure the antimicrobial is assigned to the correct location. For example, confirm an antimicrobial given in the Operating Room is attributed to the Operating Room while an antimicrobial given in the location the patient was housed prior to the Operating Room is attributed to that location.

Note: NHSN does not have location mappings for designated preoperative, intraoperative, or perioperative locations because they are not eligible for NHSN healthcare-associated infection (HAI) reporting. For the AU Option, we recommend reporting eligible antimicrobial administrations given in a designated preoperative location under the NHSN procedural location where the patient will have their operation/procedure.

- d. If antimicrobials given to a newborn housed in the room with their mothers are attributed to the mother's NHSN Labor & Delivery Ward, Postpartum Ward, and/or Labor/Delivery/Recovery/Postpartum Suite (LDRP) location, the location mapping should be updated. NHSN recommends capturing babies housed in the room with their mothers in a separate "virtual" nursery/NICU location within NHSN for the most accurate risk adjustment. If this is not possible, make note of where antimicrobial administrations are captured for newborns housed in the room with their mothers for your own internal analysis purposes.

2. Confirm appropriate use of N/A versus zero

Note: According to the AUR Module Protocol, "Not applicable (N/A)" is used when an antimicrobial can't be electronically captured from the eMAR/BCMA while "0" is used when no patients were administered the drug and/or route(s) during the given month. Facilities should only use "N/A" for non-formulary agents when those agents, if administered, cannot be accurately electronically captured by the eMAR/BCMA system. NHSN expects facilities to consistently report "N/A" across all locations and FacWideIN and across months.

- a. List any antimicrobial agents and/or routes of administration that would require "N/A." Describe any inconsistencies you identified and how you addressed the issues (for example, Nirsevimab or Nirmatrelvir). For instance, if any antimicrobial agents can be electronically captured but are not typically administered via that route, it should be reported as zero antimicrobial days for that route of administration instead of N/A. Additionally, if the total number of antimicrobial days is a numerical value, then none of the individual routes should be marked as N/A.

3. Review locations mapped in NHSN

Methodology: Correct location mapping is very important when submitting AU data to NHSN as it allows for appropriate risk adjustment within the AU SAARs. With the NHSN Facility Administrator (or representative from your Infection Control and Prevention team), review the NHSN Locations used for reporting to NHSN. Review the locations in the NHSN Location Manager or export the list of locations used within your NHSN facility by navigating to Facility > Locations > Export Location List within NHSN.

Note: Facilities should use the same NHSN Locations for ALL NHSN reporting, including HAI and AU. Facilities should not map a different set of locations for AUR reporting (for example, "1 North" and "1 North AUR"). Facilities are encouraged to report AU data from all inpatient locations, which means facilities may report AU data for more locations than are used for HAI reporting (for example, Operating Rooms or specialty ward locations like labor and delivery).

- a. All physical inpatient locations, as well as outpatient EDs and 24-hour observation units, are mapped in the NHSN facility to the appropriate CDC Location Description outlined in the [NHSN Locations Chapter](#).

With approval from the NHSN Facility Administrator and Infection Control and Prevention team, update any locations that have changed patient mix since the last review (for example, changed from medical ward to medical/surgical ward).

- b. All NHSN locations, especially the "Your Code" and CDC Location Description, match the locations in your vendor software.

- c. **With approval from your NHSN Facility Administrator**, users with administrative rights can inactivate all locations no longer housing patients from both the NHSN Location Manager and the vendor software.

A guide to inactivating NHSN locations can be found here: [Inactivate a CDC Location](#). Update your vendor system accordingly.

- d. Of the locations mapped in your NHSN facility, confirm that your vendor system can **accurately electronically** capture both the numerator (antimicrobial days) and denominator (days present). The vendor system should EXCLUDE any locations from the NHSN AU data submission where it cannot accurately capture the antimicrobial days and/or the days present for a specific location and/or FacWideIN. For example, if the vendor system cannot accurately capture the antimicrobial administrations in the Operating Room, then the system should exclude the Operating Room from all AU Option submissions.
- e. Confirm that all NHSN-mapped locations correspond one-to-one with locations in your vendor system. Locations included in your vendor system should be mapped within NHSN. We highly recommend, if feasible, reporting all patient care locations under HAI surveillance (e.g. CLABSI and CAUTI) and procedural locations to the AU Option.

End Section B: Review Mappings

Section C. Validation of Data Aggregations and Calculations

1. Review aggregations

Although [AU SDS validation](#) checks would identify most of the aggregation issues outlined below, we still recommend facilities complete the steps below, as AU SDS validation does not account for every possible route or antimicrobial combination encountered in practice. To complete the questions below, check with your vendor to determine whether there is a mechanism in the vendor system to see aggregated data prior to NHSN upload. If this does not exist in the vendor software, upload 1 month of AU data into NHSN, [generate data sets](#), and create a line list by using the [“Line Listing – All Submitted AU Data by Location”](#) report.

Aggregating the routes of administration and total antimicrobial days

This section confirms that the software is correctly counting drugs that can be administered via more than one route. It is important to ensure both the total antimicrobial days and the antimicrobial days by route of administration are counted correctly to ensure appropriate aggregation. First, you will review the data at the patient-level then move to the individual location and FacWideIN levels.

Patient-level methodology: Choose three commonly used drugs that can be administered via more than one route to confirm both the individual routes and the total antimicrobial day counts are correct. Review five patients per drug.

Remember, a patient can only attribute one antimicrobial day per specific drug, route, and location, regardless of how many doses of the drug they receive during the calendar day.

Example: A patient administered ciprofloxacin intravenously and orally on the same day would be attributed “one ciprofloxacin day (Total).” When broken down by route, this would be recorded as “one ciprofloxacin day (IV)” and “one ciprofloxacin day (Digestive).” In cases like this, the sum of antimicrobial days per route should exceed the total count of antimicrobial days for the drug. See Appendix C in the [AUR Module Protocol](#) for more examples of antimicrobial day calculations.

Consider using the table below, or something similar in the program of your choice, to compare your aggregations.

- **Step 1:** Consult with your vendor to determine if there is a mechanism to view patient-level data before it is aggregated for NHSN upload. If not, contact your institution’s IT or other representative to obtain a line list from your eMAR or BCMA of your data prior to vendor aggregation.
- **Step 2:** For each drug, manually review the records for five patients and calculate the total antimicrobial days for each route of administration.
- **Step 3:** Compare the manually aggregated patient-level data with your line listing generated in NHSN to identify any inconsistencies.

		Manual Aggregation of Antimicrobial Days				
Drug 1	Patient	Total	IV	IM	Digest	Resp
	1					
	2					
	3					
	4					
	5					
TOTAL						

- a. For patients receiving the same antimicrobial by two different routes of administration in the same calendar day (for example, patient switched from IV to oral antimicrobial formulation), confirm that the administrations were counted appropriately: one total antimicrobial day and one antimicrobial day for each of the specified routes.
- b. On the days of admission, transfer or discharge, confirm antimicrobial days (if administered an antimicrobial agent) were attributed to that patient care location even though the patient was only there for a partial day.

Individual Location-level methodology: Choose three patient care locations during the specified time period. Continue using the commonly used drugs that can be administered via more than one route to confirm the aggregations for both the individual routes and the total antimicrobial days.

Consider using the table below, or something similar in the program of your choice, to compare your aggregations.

Month, Year:

Location:

Drug	Manual Aggregation of Antimicrobial Days					Vendor Software Aggregation of Antimicrobial Days*				
	Total	IV	IM	Digest	Resp	Total	IV	IM	Digest	Resp

*The vendor software aggregation of antimicrobial days will be the same as the data submitted to NHSN.

Manually validate that the vendor software is correctly aggregating the numerator for the total antimicrobial days and sub-stratification based on routes of administration. Confirm that the total antimicrobial days are less than or equal to the sum of the routes of administration.

Note: For drugs administered more than once daily, the total may be equal to the sum of the routes if there was a low patient census for the specified location and month.

FacWideIN methodology: This section confirms that the software is correctly aggregating the antimicrobial days reported for the FacWideIN record. The vendor system's FacWideIN logic should include all applicable inpatient locations, including procedural areas such as Operating Rooms and Interventional Radiology, if applicable. It's important to ensure the FacWideIN antimicrobial days are correct to confidently interpret antimicrobial usage rates across the facility. Additionally, this section may help identify locations that are missing from either the FacWideIN calculation or individual submission. Choose three commonly used drugs, administered more than once per day, to confirm appropriate aggregation of FacWideIN antimicrobial days (see table below).

Example: The location-specific antimicrobial days for piperacillin/tazobactam may add up to be higher than the FacWideIN antimicrobial days for piperacillin/tazobactam because piperacillin/tazobactam can be administered more than once daily. Therefore, if a patient received piperacillin/tazobactam once in the medical ward in the morning then was transferred and received the remaining doses in the medical intensive care unit (ICU), that patient would contribute one antimicrobial day for piperacillin/tazobactam to both the medical ward and the medical ICU but could still only contribute one total antimicrobial day to the FacWideIN count for piperacillin/tazobactam.

Consider using the table below, or something similar in the program of your choice, to compare your aggregations. List the drug-specific values of antimicrobial days for FacWideIN and the drug-specific values of antimicrobial days for the aggregate of all inpatient locations in the table and then review.

The difference in antimicrobial days between the sum across all inpatient locations and FacWideIN depends on how frequent patients with antimicrobial use are transferred among inpatient locations in your facility. You may select three commonly used antimicrobials and calculate the percentage of difference using the formula below:

Percent difference:
$$\frac{\text{Sum of antimicrobial days across all inpatient locations} - \text{FacWideIN antimicrobial days}}{\text{FacWideIN antimicrobial days}} \times 100\%$$

This value should always be equal or greater than zero. In most cases (>90% of all facilities), this percentage of difference for vancomycin, piperacillin/tazobactam, and ceftriaxone fell within 4.5%, 6.2%, and 2.2%, respectively.

Drug Name	Month/Year	Total Antimicrobial Days for FacWideIN	Total Antimicrobial Days for aggregate of all individual inpatient locations	Percent Difference between FacWideIN and sum of all inpatient locations
Vancomycin				
Piperacillin/tazobactam				
Ceftriaxone				

Normally, the counts of antimicrobial days for FacWideIN should be **less than or equal to** the sum of antimicrobial days across all inpatient locations.

If your data follow this pattern, move to the section for Aggregating days present below.

If you see the counts for FacWideIN are **higher** than the sum of all inpatient locations in the data you populated above, possible errors are listed below to aid in your investigation:

- Vendor system is **incorrectly** including outpatient locations (for example, ED or 24-hour observation unit) in the FacWideIN calculations.
- Missing a reportable inpatient location when doing the location-specific aggregations.
- For locations the vendor system is not reporting individually due to lack of accurate data capture, vendor system is **incorrectly** including them in the FacWideIN calculations.

Aggregating days present

This section confirms that the software is correctly counting patients in the denominator for days present. It's important to ensure days present are counted correctly as it is the denominator used in rate reports and is also used in risk adjustment for your facility's SAAR calculations. First, you'll review the days present data at the individual location-level then move to the FacWideIN level.

Note: NHSN defines days present as the aggregate number of patients housed in a patient care location (or all inpatient units for FacWideIN counts) at any time throughout a calendar day during a

month. Days present is **not** the same as patient days, which NHSN defines as the aggregate number of patients housed in a patient care location during the census count taken once daily. See the [AUR Module Protocol](#) for more details.

- a. On the days of admission, transfer or discharge, confirm days present were attributed to that patient care location even though the patient was only there for a partial day.

Location-level methodology: Choose three patient care locations. Confirm appropriate aggregation of days present for each location. List the manual aggregation of days present for each location and the aggregation produced by the vendor software. The values in the two columns should be the same.

Consider using the table below, or something similar in the program of your choice, to compare your aggregations.

Month, Year:

Location	Manual Aggregation of Days Present	Vendor Software Aggregation of Days Present

- b. Manually validate that the vendor software is correctly aggregating the days present within the given patient care locations.

FacWideIN methodology: This section confirms that the software is correctly aggregating the days present reported for the FacWideIN record. The vendor system's FacWideIN logic should include all applicable inpatient locations, including procedural areas such as Operating Rooms and Interventional Radiology, if applicable. It's important to ensure the days present for FacWideIN are correct to confidently interpret antimicrobial usage rates across the facility. Additionally, this question may help identify locations that are missing from either the FacWideIN calculation or individual submission. To confirm the appropriate aggregation of days present for FacWideIN, please list the value of days present for FacWideIN shown within the vendor software and the value of days present for the aggregate of all inpatient locations in the table below. You will likely need to manually sum the days present for each individual inpatient location to get the total aggregate of days present.

Month/Year	Vendor Software Total Days Present for FacWideIN	Total Days Present for aggregate of all individual inpatient locations within the Vendor Software

Due to admissions, discharges, and transfers, the days present count for FacWideIN should always be **less** than the sum of the days present count for all inpatient locations.

If you see days present for FacWideIN is **higher** than the sum of days present of all inpatient locations in the data you populated above, possible errors are listed below to aid in your investigation:

1. Vendor system is **incorrectly** including outpatient locations (for example, ED or 24-hour observation unit) in the FacWideIN calculations.
2. Missing one or more reportable inpatient locations when doing the location-specific aggregations.
3. For units the vendor system is not reporting individually due to lack of accurate data capture, vendor system is incorrectly **including** them in the FacWideIN calculations.

2. Compare AU, AR, and HAI denominators

Note: The NHSN Team expects some variability due to the different definitions and data sources used for the various reporting modules of NHSN.

Methodology: It's important to ensure the AU denominators of days present are correct due to their inclusion in the SAAR calculations. The HAI denominator of patient days is often considered the gold standard for denominator data reported to NHSN. If the same patient care locations are covered under both AU Option and HAI reporting, comparing the AU days present to the HAI patient days provides a helpful starting place for determining if there are issues with the AU denominator of days present. This comparison should only be performed when AU Option and HAI locations are matched one-to-one. The AU Module may include additional procedural locations, which is acceptable. Please see Section B to review the patient locations mapped in NHSN. If an appropriate comparison can be made, list the AU days present from either the vendor software, or if you've already uploaded AU data, from NHSN, in the table below. Next, include the HAI patient days from the monthly summary data for the Device Associated Module reported in NHSN for a selection of locations in the table below. Then, calculate the percent difference using the formula provided below. We recommend checking at least two ICU locations, two ward locations, and one NICU location (if applicable). You can find the HAI patient days in the Device-Associated summary records in NHSN used for HAI reporting.

Note: For facilities participating in HAI reporting for Centers for Medicare and Medicaid Services (CMS), all adult, pediatric, and NICU locations along with adult and pediatric medical, surgical, and medical/surgical ward locations should report monthly summary HAI patient days for each location. You may need to ask your Infection Preventionist (IP) for help finding these numbers within NHSN.

If the same locations are covered under both AU and HAI reporting, AU days present should always be equal or higher than HAI patient days. The difference depends on how frequently patients are transferred among inpatient locations in your facility. You may calculate the percentage of difference between AU days present and HAI patient days using the below formula. Based on internal NHSN analyses, for most facilities (90%), this difference in AU days present falls within 42% of HAI patient days across all inpatient locations (FacWideIN). You can find the detailed breakdown of percent difference by location type in the table shown below.

Percent Difference: $\frac{(AU\ Days\ Present - HAI\ Patient\ Days)}{AU\ Days\ Present} \times 100$

NHSN-Calculated Percent Difference using nationally reported AU and HAI data for 2024

Location Type	90 th Percentile of Percent Differences	Interpretation
FacWideIN	42%	Most facilities (90%) had a difference of <42%.
Adult ICUs	35%	Most facilities (90%) had a difference of <35%.
Adult Wards	37%	Most facilities (90%) had a difference of <37%.
Pediatric ICUs	39%	Most facilities (90%) had a difference of <39%.
Pediatric Wards	49%	Most facilities (90%) had a difference of <49%.
Neonatal ICUs	18%	Most facilities (90%) had a difference of <18%.
Neonatal Step-Down Unit	44%	Most facilities (90%) had a difference of <44%.
Well Baby Nursery (Level I)	46%	Most facilities (90%) had a difference of <46%.
Labor, Delivery, Postpartum Units	72%	Most facilities (90%) had a difference of <72%.
Outpatient Locations (ED, Pediatric ED, 24-Hour Observation Locations)	70%	Most facilities (90%) had a difference of <70%.

AU days present and HAI Device Associated patient days for a selection of locations

Compare the AU days present and HAI patient days and percent difference for each location listed below.

Month/Year	Location Name	Location Type	Total AU Days Present	Total HAI Device Associated Patient Days	Percent Difference

- If the percent difference is **considerably higher than the 90th percentile** for a certain location type displayed in the Percent Difference Table above, consider discussing the denominator counts with your vendor. Check for double counting (for AU reporting, the vendor system should count a patient only once per location per day).
- If AU days present are **equal** to or **lower** than the HAI patient days, check with your vendor as this should never happen. Make sure the vendor system includes all patients in the location counts regardless of patient status (for example, inpatient, outpatient, observation).

FacWideIN days present, patient days, and admissions

Methodology: The HAI patient days and admissions denominators for FacWideIN from the Multidrug Resistant Organism (MDRO)/*Clostridioides difficile* Infection (CDI) Module are often considered the gold standard for facility-wide denominator data reported to NHSN. Comparing the AU days present and admissions to the MDRO/CDI patient days and admissions for FacWideIN provides a helpful starting place for determining if there are issues with the AU days present and admissions denominators. It's important to ensure the AU days present and admissions denominators for FacWideIN are correct due to their inclusion in AU rates for FacWideIN.

In the first table, please list the AU days present either from the vendor software or, if you've already uploaded AU data from NHSN, in the table below. Next, list the MDRO/CDI patient days reported in NHSN for FacWideIN in the table below. Then, calculate the percent difference.

In the second table, please list the AU admissions either from the vendor software or, if you've already uploaded AU data from NHSN, in the table below. Next, include the MDRO/CDI admissions reported in NHSN for FacWideIN in the table below. Additionally, if your facility has AR Option data, add the AR Option admissions from either the vendor software or NHSN to the table for a third layer of comparison. The AR Option admissions will come from the [AR Option Denominator Line List](#).

You can find the MDRO/CDI total patient days and admissions for FacWideIN in the MDRO/CDI summary records used for laboratory-identified (LabID) reporting in NHSN. You may need to ask your IP for help finding these numbers. We recommend checking at least four months.

Based on internal NHSN analyses, for most facilities (90%), the AU days present for FacWideIN are <42% higher than the MDRO/CDI patient days for FacWideIN in the same month.

Month/Year	Total AU Days Present for FacWideIN	Total Facility Patient Days for MDRO/CDI FacWideIN	Percent Difference

Compare Locations: Compare the locations included in your MDRO/CDI and AU denominators for FacWideIN. We expect to see the same locations with AU having additional procedural locations. For AU reporting, we recommend the vendor system include all locations in the FacWideIN record where the system can accurately electronically capture both the numerator and denominator.

Compare Days Present vs Patient Days: If the same locations are included for MDRO/CDI and AU Option reporting, compare the AU days present for FacWideIN and the MDRO/CDI patient-days from FacWideIN. If the percent difference is **considerably higher than the 90th percentile** for FacWideIN, verify that the vendor system includes only locations in the FacWideIN record where it can accurately electronically capture both the numerator and denominator for AU reporting.

Compare Admissions: Compare the admission counts between the AU Option and the MDRO/CDI Module. The table below can help with this comparison.

Note: Unlike the MDRO/CDI admission definition, AU admission also includes same-day discharges. Due to the slightly different definitions and data sources used to collect these counts, the NHSN Team expects equal or higher admission counts for AU when comparing to

the MDRO/CDI Module. Specifically, if your facility performs same-day surgical procedures in an inpatient location, those admissions would be counted towards an AU admission and not a MDRO/CDI admission.

Month/Year	Total AU Admissions for FacWideIN	Total HAI MDRO/CDI Admissions for FacWideIN	Total AR Admissions for FacWideIN

- a. Confirm the admissions reported within the AU and AR Options are roughly the same.

Note: These definitions are the same, but counts could vary if specific inpatient locations were included in one reporting option but not the other.

Outpatient days present and encounters

Methodology: Comparing the AU days present from outpatient locations to the outpatient encounters from the MDRO/CDI Module provides a helpful starting place for determining if there are issues with the denominator for AU encounters in outpatient settings. It's important to ensure the denominators for AU days present in outpatient locations are correct due to their inclusion in AU rates for outpatient locations. Please list the days present and encounters reported for the ED, pediatric ED, and 24-hour observation locations in the table below, as applicable. Enter either the AU days present in the vendor system or the values reported to NHSN. You can find the MDRO/CDI encounters in the MDRO/CDI Module summary records in NHSN used for LabID reporting. You may need to ask your IP for help finding these numbers within NHSN.

Based on internal NHSN analyses, for most facilities (90%), the ED and 24-hour observation AU days present are <70% higher than the MDRO/CDI encounters for the same month/location.

Location	Month/Year	Total AU Days Present	Total MDRO/CDI Encounters	Percent Difference
Emergency Department				
Pediatric Emergency Department				
24-hour Observation				

- a. Confirm the ED and 24-hour observation AU days present are greater than the MDRO/CDI encounters for the same outpatient locations and time period.

End Section C: Validation of Data Aggregations and Calculations

Appendix: Links to Referenced Documents

Complete web addresses for references hyperlinked in this document in the order of appearance:

- [AUR Module Protocol](#)
- [AU Synthetic Data Set Validation](#)
- [Annual AU Option Validation Protocol](#)
- [AR Option Data Validation Protocol](#)
- [Generating Data Sets Guidance](#)
- [How to Modify a Report](#)
- [AU Data Quality Line List](#)
- [AU Option Line List](#)
- [NHSN Locations Chapter](#)
- [Inactivate a CDC Location](#)
- [AR Option Denominator Line List](#)