# 3.1.3 - National Healthcare Safety Network (NHSN) Antimicrobial Use Measure

**Summary of Changes from DY13 Year End Reporting Manual**

* Antimicrobial Use (AU) Option, Settings, added “psychiatric units”.
* Denominator Exclusion added “Antibiotics ordered for patients admitted with primary diagnosis of Cystic Fibrosis.”
* Added ICD-10 Codes Identifying Patients for Cystic Fibrosis

**Summary of Changes from DY13 Mid-Year Reporting Manual**

* Modifications from Native Specification, aligned last sentence with last sentence of Purpose “…anti-MRSA drugs, carbapenems, and anti-pseudomonal -lactams.”
* Purpose, added “carbapenems,” to list of drugs in the last sentence.
* Denominator Exclusions, corrected typo of “nominator” to “numerator”
* Other Notes as Applicable, added “A lower rate indicates better quality”.

**Modification from Native Specification**

Specification Source: [CDC Antimicrobial Use Module](http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf); PRIME Innovative Measure Steward (University of California at Davis, University of California Irvine, University of California Los Angeles and University of California San Diego)

Metric Steward: Centers for Disease Control and Prevention (CDC), (University of California at Davis, University of California Irvine, University of California Los Angeles and University of California San Diego)

* This metric is a variation from the CDC specification. The PRIME metric specification limits the use of anti-MRSA drugs, carbapenems, and anti-pseudomonal -lactams.

**Value Sets for this measure:**

* No external value sets required for this metric; all required codes are listed within the metric specification.

### Purpose:

The goal of this National Healthcare Safety Network (NHSN) AU Module is to provide a mechanism for facilities to report and analyze antimicrobial use as part of local or regional efforts to reduce antimicrobial resistant infections through antimicrobial stewardship efforts.6 It is based off of the National Healthcare Safety Network (NHSN) Antibiotic Use and Resistance Module but is modified to allow facilities that currently are unable to report all antibiotic use to NHSN to allow for antibiotic use analysis within a PRIME entity. For the purpose of PRIME, the intent is to limit the use of anti-MRSA drugs, carbapenems and anti-pseudomonal -lactams.

### Antimicrobial Use (AU) Option

**Introduction:** Rates of resistance to antimicrobial agents continue to increase at hospitals in the United States.1 The two main reasons for this increase are patient-to-patient transmission of resistant organisms and selection of resistant organisms because of antimicrobial exposure.2 Previous studies have shown that feedback of reliable reports of rates of antimicrobial use and resistance to clinicians can improve the appropriateness of antimicrobial usage.3-5

**Objectives**: The primary objective of the Antimicrobial Use option is to evaluate trends of specific antimicrobial usage over time at the facility levels.

**Methodology:** The primary antimicrobial usage metric reported to this module is antimicrobial days per days present. An antimicrobial day, also known as day of therapy (DOT), is defined by any amount of a specific antimicrobial agent administered in a calendar day to a particular patient as documented in the electronic medication administration record (eMAR) and/or bar coding medication record (BCMA).

**Settings:** NHSN-defined inpatient locations to include medical wards and surgical wards, and medical critical care units, surgical critical care units, step-down units,obstetrics units and psychiatric units. Exclude oncology, BMT units and services and pediatric units.

**Numerator Data (Antimicrobial Days):** Antimicrobial Days (Days of Therapy(DOT)): Defined as the aggregate sum of days for which any amount of a specific antimicrobial agent was administered to individual patients as documented in the eMAR and/or BCMA.8-11 [Appendix B](#_bookmark9) provides the full list of antimicrobial agents included in this metric.

One DOT is defined as a day when a patient receives any amount of a specific antibiotic. For example, if a patient receives a single dose of Unasyn on a particular day, that counts as one DOT. If the same patient then receives another dose of Unasyn on the same day, it still counts as only one DOT since it is the same antibiotic. If the patient, however, receives a different antibiotic on the same day, then that counts as a separate DOT.

* Example 1: On day 1, patient receives 3 doses of Unasyn and 2 doses of Vancomycin, then the DOT is 2. Remember that DOT is counted only if the antibiotic is administered to the patient on that day.
* Example 2: On day 1, the patient receives a dose of Vancomycin. On day 2, no Vancomycin is given because of decreased creatinine clearance. On day 3, a dose of Vancomycin is given. The total DOT for the patient is 2 even though patient has effectively been on vancomycin (by levels) for 3 days.

**Denominator Data (Days Present):** The numerator will be analyzed against the denominators of days present for facility-wide inpatient only. The denominator is further defined below.

Days present is the number of days that the patient is admitted for. Most hospitals calculate this by taking a census once per day (usually at midnight).

* Example 1: the hospital takes a census at midnight and finds that 300 patients are in the hospital. The days present is 300. Another census is then taken 24 hours later and finds that 280 are in the hospital. Using the midnight census calculation approach, the Days Present for the 2 days is 580.

This method will miss those patients who are admitted and discharged between the time of the census, i.e., patients who are admitted after midnight but discharged before the next following midnight will be counted as 0 days present. In order to capture these patients, for Metric 3.1.3 denominator, all discharges who were admitted after midnight on the same day as the discharge date should also be counted for Days Present calculation. PRIME Entities should include patients who were admitted after midnight on the day of discharge.

* Example 2: A patient is admitted at 1:00 AM then discharged the same day at 1 PM. Using the midnight census calculation approach, that patient would have been missed since both the admission and discharge occurred between consecutive midnight censuses. This patient will be counted a “1” Days Present in the 3.1.3 denominator.

Days present: Defined as time period during which a given patient is at risk for exposure in a given patient location.

For facility-wide inpatient analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month at the facility-wide inpatient location. The aggregate measure is calculated by summing up all of the days present for facility-wide inpatient for a given month.

Denominator Exclusions

* Any patients that are found to be in oncology and BMT wards at the time of the daily census (usually midnight) are then excluded from the denominator (days present). Any antibiotics ordered for a patient on these wards are excluded from the numerator (DOT).
* Antibiotics ordered for patients admitted with primary diagnosis of Cystic Fibrosis.
* ICD-10 Codes Identifying Patients for Cystic FibrosisE84 Cystic fibrosis
	+ E84.0 Cystic fibrosis with pulmonary manifestations
	+ E84.1 Cystic fibrosis with intestinal manifestations
		- E84.11 Meconium ileus in cystic fibrosis
		- E84.19 Cystic fibrosis with other intestinal manifestations
	+ E84.8 Cystic fibrosis with other manifestations
	+ E84.9 Cystic fibrosis, unspecified

### Table. Location-specific and Facility-wide Inpatient Metrics

|  |  |  |
| --- | --- | --- |
| **Metric Collected** | **Metric Definition** | **Comments** |
| **Facility-wide Inpatient Analyses** |
| Antimicrobial Days/Days present | Drug-specific antimicrobial days for a facility /Days present per facility-wide inpatient  | One patient can contribute only one day present per calendar day for a facility. Thus, one denominator is obtained for an entire facility. The day present measure for facility-wide inpatient may be lower when compared to sum total from location-specific comparison. |

**Data Analyses**:

Antimicrobial use data are expressed as incidence density rates of antimicrobial days per days present stratified by patient care location and facility-wide inpatient. Antimicrobials will be grouped during analysis by spectrum of activity.

### Other Notes as Applicable

A lower rate indicates better quality.

### References

1. Hidron AI, Edwards JR, Patel J, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006- 2007. Infect Control Hosp Epidemiol 2008;29:996-1011.
2. Schwartz MN. Use of antimicrobial agents and drug resistance. N Eng J Med 1997;337:491-2.
3. Ansari F, Gray K, Nathwani D, et al. Outcomes of an intervention to improve hospital antibiotic prescribing; interrupted time series with segmented regression analysis. J Antimicrob Chemother 2003;52:842-8.
4. Solomon DH, Van Houten L, Glynn RJ. Academic detailing to improve use of broad- spectrum antibiotics at an academic medical center. Arch Inter Med 2001;161:1897-902.
5. Fraser GL, Stogsdill P, Dickens JD Jr, et al. Antibiotic optimizations: an evaluation of patient safety and economic outcomes. Arch Inter Med 1997;157-1689-94.
6. Dellit TH, Owens RC, McGowan JE, et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship. Clin Infect Dis 2007;44:159-77.
7. National Healthcare Safety Network (NHSN) Patient Safety Component: Clinical Document Architecture. <http://www.cdc.gov/nhsn/CDA/index.html>
8. Schwartz DN, Evans RS, Camins B, et al. Deriving measures of intensive care unit antimicrobial use from computerized pharmacy data: methods, validation, and overcoming barriers. Infect Control Hosp Epidemiol 2011;32:472-80.
9. Polk RE, Fox C, Mahoney A, Letcavage J, MacDougall C. Measurement of adult Antibacterial Drug Use in 130 US Hospitals: Comparison of Defined Daily Dose and Days of Therapy. Clin Infect Dis 2007;44:664-70.
10. Kuster SP, Ledergerber B, Hintermann A, et al. Quantitative antibiotic use in hospitals: comparison of measurements, literature review, and recommendations for standards of reporting. Infection 2008; 6:549-59.
11. Berrington A. Antimicrobial prescribing in hospitals: be careful what you measure. J Antimicrob Chemother 2010:65:163-168.

### Appendix A. Table of Instructions: Antimicrobial Use

|  |  |
| --- | --- |
| **Data Field** | **Instructions for CDA of Antimicrobial Use Data** |
| Month | Required. Record the 2-digit month during which the data were collected for this location. |
| Year | Required. Record the 4-digit year during which the data were collected for this location. |
| Numerator:Antimicrobial days per month per location | Required.Antimicrobial days are defined as the aggregate sum of the days of exposure for which a specific antimicrobial was administered. These are required to be extracted from electronic medication administration record (eMAR) and/or bar coding medication record (BCMA). Antimicrobials days will be collected for select antimicrobial agents (refer to [Appendix B](#_bookmark9)). |
| Denominator: Days present | Required.Days present is defined as risk for antimicrobial exposure per time unit of analysis stratified by location. For facility-wide inpatient analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month at the facility-wide inpatient location. |

### Appendix B. List of Antimicrobials

The source of the below listed NHSN drug codes and the drug values used for the development of the CDA files can be found here: <http://www.cdc.gov/nhsn/xls/aur/aur-eligible-antimicrobial-agents.xlsx> *(Note: this link includes all of the drugs from the original NHSN AUR measure, only a subset of which are used in this PRIME Variation on the AUR Metric)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Antimicrobial Agent** | **Valuea** | **NHSN Drug Code** | **Antimicrobial Classb** | **Antimicrobial Subclassb** |
| AZTREONAM | 1272 | AZT | Monobactams |  |
| CEFEPIME | 20481 | CEFEP | Cephalosporins | Cephalosporin 4th generation |
| CEFTAROLINE | 1040005 | CEFTAR | Cephalosporins | Cephalosporins with anti-MRSA activity |
| CEFTAZIDIME | 2191 | CEFTAZ | Cephalosporins | Cephalosporin 3rd generation |
| CEFTAZIDIME/ AVIBACTAM | 1820-0 | CEFTAVI | Β-lactam/ Β-lactamase inhibitor combination |  |
| CEFTOLOZANE/ TAZOBACTAM | 1818-4 | CEFTOTAZ | Β-lactam/ Β-lactamase inhibitor combination |  |
| DALBAVANCIN | 1815-0 | DALBA | Glycopeptides | Lipoglycopeptide |
| DAPTOMYCIN | 22299 | DAPTO | Antibacterial | Lipopeptides |
| DORIPENEM | 119771 | DORI | Antibacterial | Carbapenems |
| ERTAPENEM | 325642 | ERTA | Antibacterial | Carbapenems |
| IMIPENEM/ CILASTATIN | 34482 | IMIPWC | Antibacterial | Carbapenems |
| LINEZOLID | 190376 | LNZ | Antibacterial | Oxazolidinones |
| MEROPENEM | 29561 | MERO | Carbapenems |  |
| ORITAVANCIN | 1817-6 | ORITAV | Glycopeptides | Lipoglycopeptide |
| PIPERACILLIN/ TAZOBACTAM | 74169 | PIPERWT | Β-lactam/ Β-lactamase inhibitor combination |  |
| QUINUPRISTIN/ DALFOPRISTIN | 135098 | QUINWD | Streptogramins |  |
| TEDIZOLID | 1816-8 | TEDIZ | Oxazolidinones |  |
| TELAVANCIN | 473837 | TELAV | Glycopeptides | Lipoglycopeptides |
| TICARCILLIN/ CLAVULANATE | 113931 | TICARWC | Β-lactam/ Β-lactamase inhibitor combination |  |
| VANCOMYCIN | 11124 | VANC | Glycopeptides | Glycopeptide |

aRxNorm or NHSN Code

b Adapted from CLSI January 201

# 3.1.4 - Prophylactic antibiotics discontinued at time of surgical closure

**Summary of Changes from DY13 Year End Reporting Manual**

* Exclusions renamed as Denominator Exclusions
* Denominator Exclusion added, Joint Arthroplasty.

**Summary of Changes from DY13 Mid-Year Reporting Manual**

* Added “A lower rate indicates better quality” under “Other Notes as applicable”.
* Denominator description, added at the end “, with no evidence of infection at the start of the surgical case. Each visit to the OR should be counted as a single case regardless of the number of procedures that occur during that OR visit.”
* Exclusions, changed
	+ From: “Antibiotics not used for peri-operative prophylaxis (e.g. for treatment)”
	+ To: “None”
* Other notes as applicable, added “5. cases in which antibiotics are used for treatment purposes”

**Modification from Native Specification**

Specification Source: PRIME Innovative Measure Steward (University of California at Davis, University of California Irvine, University of California Los Angeles and University of California San Diego)

Metric Steward: University of California at Davis, University of California Irvine, University of California Los Angeles and University of California San Diego

* Name and numerator changed from “antibiotics not administered” to “antibiotics administered”

**Value Sets for this measure:**

* No external value sets required for this metric; all required codes are listed within the metric specification.

***Measure Description***

Surgical patients whose peri-operative prophylactic antibiotics were administered after surgical closure.

***Measure Numerator***

Number of surgical cases in the denominator in which peri-operative prophylactic antibiotics were administered after surgical closure

**Numerator Code/s (CPT, ICD10, other)**

* Surgery Date
* Surgery End Time (see [Appendix](#Appendix) for The Joint Commission Specifications)
* Antibiotic Administration Date
* Antibiotic Administration Time

***Measure Denominator***

Number of clean and clean-contaminated surgical cases that are required by CDPH for NHSN SSI reporting, in individuals aged 18 years or older at the beginning of the measurement period, with no evidence of infection at the start of the surgical case. Each visit to the OR should be counted as a single case regardless of the number of procedures that occur during that OR visit.

***Denominator Exclusion/s***

Joint Arthroplasty (see Table)***Denominator Code/s (CPT, ICD10, other)***

* Admission Date
* Anesthesia Start Date
* Antibiotic Administration Route
* Antibiotic Name
* Antibiotic Received
* Birthdate
* Clinical Trial
* Discharge Date
* ICD-10-CM Principal Diagnosis Code
* ICD-10-CM Principal Procedure Code
* Infection Prior to Anesthesia
* Oral Antibiotics
* Other Surgeries
* Perioperative Death
* Reasons to Extend Antibiotics
* Surgical Incision Date
* Surgical Incision Time

TABLE: Table 1: Hip and Knee Arthroplasty Codes (<https://www.aaos.org/news/aaosnow/feb13/managing7_t1.pdf>)

|  |  |
| --- | --- |
| **CPT Code**  | **Description** |
| **Hip** |  |
| 27090  | Removal of hip prosthesis; (separate procedure) |
| 27091 | Removal of hip prosthesis; complicated, including total hip prosthesis, methylmethacrylate with or without insertion of spacer |
| 27125 | Hemiarthroplasty, hip, partial (eg, femoral stem prosthesis, bipolar arthroplasty) |
| 27130 | Arthroplasty, acetabular and proximal femoral prosthetic replacement (total hip arthroplasty), with or without autograft or allograft |
| 27132 | Conversion of previous hip surgery to total hip arthroplasty, with or without autograft or allograft |
| 27134 | Revision of total hip arthroplasty; both components, with or without autograft or allograft |
| 27236 | Open treatment of femoral fracture, proximal end, neck, internal fixation or prosthetic replacement |
| 27137  | Revision of total hip arthroplasty; acetabular component only, with or without autograft or allograft |
| 27138 | Revision of total hip arthroplasty; femoral component only, with or without allograft |
| **Knee** |  |
| 27438 | Arthroplasty, patella; with prosthesis |
| 27446 | Arthroplasty, knee, condyle and plateau; medial OR lateral compartment |
| 27447 | Arthroplasty, knee, condyle and plateau; medial AND lateral compartments with or without patella resurfacing (total knee arthroplasty) |
| 27486 | Revision of total knee arthroplasty, with or without allograft; 1 component |
| 27487 | Revision of total knee arthroplasty, with or without allograft; femoral and entire tibial component |
| 27488 | Removal of prosthesis, including total knee prosthesis, methylmethacrylate with or without insertion of spacer, knee |

***Definitions***

**Clean and Clean Contaminated Surgeries**

All Clean and Clean Contaminated Cases required by CDPH for NHSN SSI reporting.

***Other Notes as applicable***

A lower rate indicates better quality.

Of note, as per the denominator criteria, the following cases are not exclusions, but are mentioned here as not being measured by this metric for sake of clarity:

1. contaminated cases
2. dirty or infected cases
3. surgeries with concomitant contaminated cases
4. surgeries with concomitant dirty or infected cases
5. cases in which antibiotics are used for treatment purposes

Link to [NQF 0529](http://www.qualityforum.org/QPS/0529)

***Rationale***

In 2014, the Centers for Disease Control and Prevention put forth the [following category 1A recommendation](https://www.federalregister.gov/articles/2014/01/29/2014-01674/draft-guideline-centers-for-disease-control-and-prevention-draft-guideline-for-the-prevention-of)[[1]](#footnote-2): “In clean and clean‐contaminated procedures, do not administer additional prophylactic antimicrobial agent doses after the surgical incision is closed in the operating room, even in the presence of a drain.” This has been followed by the release of the CDC’s 2017 Guideline for the Prevention of Surgical Site Infection, 2017 which provides details for the 2014 recommendation.[[2]](#footnote-3) World Health Organization 2016 recommendation: “The panel recommends against the prolongation of SAP administration after completion of the operation for the purpose of preventing SSI. (Strong recommendation/moderate quality of evidence)”[[3]](#footnote-4)

***Appendix***

**From**: Specifications Manual for Joint Commission National Quality Core Measures (2010A1)

**Data Element Name**: *Surgery End Time*

**Definition**: The surgical end time of the principal procedure.

**Suggested Data Collection Question**: What was the surgical end time of the principal procedure?

**Format**:

* **Length**: 5 - HH:MM (with or without colon) or UTD
* **Type**: Time
* **Occurs**: 1

**Allowable Values**:

* HH = Hour (00-23)
* MM = Minutes (00-59)
* UTD = Unable to Determine

Time must be recorded in military time format.

With the exception of Midnight and Noon:

* If the time is in the a.m., conversion is not required
* If the time is in the p.m., add 12 to the clock time hour

Examples:

Midnight = 00:00 Noon = 12:00

5:31 am = 05:31 5:31 pm = 17:31

11:59 am = 11:59 11:59 pm = 23:59

**Note**:

00:00 = midnight. If your electronic system documents time as 00:00 11-24-2007, review supporting documentation to determine if the Surgery End Date should remain 11-24-2007 or if it should be converted to 11-25-2007. When converting 24:00 to 00:00 do not forget to change the Surgery End Date.

Example:

Midnight or 24:00 on 11-24-2007 = 00:00 on 11-25-2007

**Notes for Abstraction:**

* For times that include “seconds,” remove the seconds and record the time as is.

Example:

15:00:35 would be recorded as 15:00

* If the principal procedure end time is unable to be determined from medical record documentation, enter UTD.
* The medical record must be abstracted as documented (taken at “face value”). When the time documented is obviously in error (not a valid time/format or outside of the parameters of care for this data element [*Surgery End Date/Surgery End Time* cannot be before *Surgery Start Date/Surgical Incision Time*]) and no other documentation is found that provides this information, the abstractor should select “UTD.”

Examples:

* Documentation indicates the *Surgery End Time* was 3300. No other documentation in the medical record provides a valid time. Since the *Surgery End Time* is outside of the range listed in the Allowable Values for “Hour,” it is not a valid time and the abstractor should select “UTD.”
* Documentation indicates the *Surgery End Date* was 3-11-2008, *Surgery End Time* was 1100, *Surgery Start Date* was 3-11-2008 and *Surgical Incision Time* was 2100. Documentation in the medical record support the *Surgery Start Date* and the *Surgical Incision Time* as being accurate. No other documentation in the medical record provides an accurate *Surgery End Time*. Since *Surgery End Date*/*Surgery End Time* are before the *Surgery Start Date/Surgical Incision Time*, it is outside of the parameter of care for this data element and the abstractor should select “UTD.”

**Note:**

Transmission of a case with an invalid time as described above will be rejected from the QIO Clinical Warehouse and the Joint Commission’s Data Warehouse. Use of “UTD” for *Surgery End Time* allows the case to be accepted into the warehouse.

* If multiple procedures occur during the same surgical episode, the *Surgical Incision Time* captured will be the incision that occurs first and the *Surgery End Time* will be the end time that occurs last.
* If a patient leaves the operating room with an open incision (for closure at a later date/time), use the *Surgery End Time* of the initial procedure. Do NOT use the date/time the patient returns to the OR for closure.

Follow the priority order within the Inclusion List of this data element’s Guidelines for Abstraction:

1. First, review all sources for any of the first priority synonyms for *Surgery End Time*. If multiple times are found, select the earliest time among the first priority synonyms.
2. Next, if none of the first priority synonyms are documented, go to the second priority list of synonyms for *Surgery End Time*. If multiple times are found, select the earliest time among the second priority list of synonyms.
3. Finally, if none of the first and second priority synonyms are documented, go to the third priority list of synonyms for *Surgery End Time*. If multiple times are found, select the earliest time among the third priority list of synonyms.

**Note:**

Priority order applies to items in inclusion table, not to source document. Also, please note the synonyms in the lists are alphabetized, not prioritized.

**Suggested Data Sources:**

* Anesthesia record
* Circulation record
* Operative report

**Additional Notes:**

**Guidelines for Abstraction:**

**Inclusion**

**Follow the priority order below.**

**If multiple times are found, use earliest time among the highest priority.**

**First priority**:

* Close time
* EOS/end of surgery
* End time
* Procedure end time
* Procedure stop time
* Stop time
* Time incision closed

**Second priority**:

* Discharge to PACU/recovery room
* Operating room end, finish, or stop time
* Room out time
* Time patient taken from surgery
* To PACU/recovery room

**Third priority:**

* Anesthesia end time
* Anesthesia stop time
* Arrival in the PACU/recovery room

**Exclusions**

None

1. Draft Guideline-Centers for Disease Control and Prevention Draft Guideline for the Prevention of Surgical Site Infections, A Notice by the Centers for Disease Control and Prevention on 01/29/2014, <https://www.federalregister.gov/articles/2014/01/29/2014-01674/draft-guideline-centers-for-disease-control-and-prevention-draft-guideline-for-the-prevention-of>, Accessed 3/9/2016 [↑](#footnote-ref-2)
2. Sandra I. Berríos-Torres, MD1; Craig A. Umscheid, MD, MSCE2; Dale W. Bratzler, DO, MPH; et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. **Published Online:** May 3, 2017. doi:[*10.1001/jamasurg.2017.0904*](http://jamanetwork.com/article.aspx?doi=10.1001/jamasurg.2017.0904) [↑](#footnote-ref-3)
3. World Health Organization 2016 Global Guidelines For The Prevention Of Surgical Site Infection Recommendation pp 163-170, POSTOPERATIVE MEASURES 4.24 Surgical antibiotic prophylaxis prolongation. <http://www.who.int/gpsc/global-guidelines-web.pdf>, Accessed May 16, 2017 [↑](#footnote-ref-4)