



The Core Elements of **Antibiotic Stewardship for Nursing Homes**

APPENDIX C: Data Sources, Elements, and Measures for Tracking Antibiotic Use in Nursing Homes





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The Core Elements of Antibiotic Stewardship for Nursing Homes highlight how tracking and reporting antibiotic use will allow nursing homes to identify opportunities to improve antibiotic prescribing, evaluate the impact of new stewardship activities, and meet the core elements of antibiotic stewardship.

This document will review **data sources** that nursing homes can use to track antibiotic prescribing practices. Data on antibiotic use can be obtained from electronic health records (EHRs), long-term care (LTC) pharmacy vendors, or through a manual chart review. Antibiotic use **data elements** are defined. “Essential” data elements that are required to quantify, or determine how much antibiotics are used, are listed. Quantifying the volume of antibiotic use will show signals that could require further evaluation to determine the appropriateness of antibiotic use. These “essential” data elements should be available to most nursing homes, and can be requested from the EHR or LTC pharmacy vendor to prepare an antibiotic use report. Additional “important” data elements are then reviewed. These data elements can be collected at the facility level and will help determine the appropriateness of antibiotic use, and identify additional opportunities for improvement. **Antibiotic use measures** are discussed, specifically how antibiotic days of therapy (DOT) can be calculated. A few examples are reviewed.

General Definitions

Data element. Specific information associated with the antibiotic prescription (e.g. the name of the antibiotic, date of administration).

Antibiotic order. Antibiotic prescription information, entered in the electronic or paper chart, for the antibiotic to be administered.

Pharmacy transaction. Electronic exchange of prescribing information between the nursing home and the LTC pharmacy.

Antibiotic course. Days of antibiotic therapy for the treatment of a specific infection.

Days of therapy (DOT). The total number of days a specific antibiotic is administered.

Days dispensed. The number of days of antibiotics dispensed by the LTC pharmacy.

Data Sources for Tracking Antibiotic Use

Electronic health record (EHR) systems. Nursing homes that have an EHR system that includes a Medication Administration Record (MAR) or e-prescribing can report accurate antibiotic use data. Antibiotic use reports can be generated by the facility if local information technology expertise exists, or by working with the EHR vendor. Uptake of EHR use in nursing homes and the interface and capability of different EHRs may vary by nursing home.

Long-term care (LTC) pharmacies. Nursing homes contract with LTC pharmacies to dispense and deliver medications. Most pharmacies provide services such as drug regimen reviews or medication management performed by a consultant pharmacist. LTC pharmacies can generate reports of the number of days of antibiotics dispensed. Due to multiple pharmacy transactions for the same antibiotic course, identifying an accurate antibiotic start date may not always be possible. Also the indication for treatment may not be available.

Manual chart review. Nursing homes can prepare antibiotic use reports based on a manual chart review. This method is time consuming and may be difficult to sustain, but may be the only available data source in some nursing homes.

Essential Data Elements

Essential antibiotic use data elements should be available to most nursing homes from their EHR or LTC pharmacy vendors. Below are essential data elements that can be used to quantify and track antibiotic use over time and identify opportunities for improvement.

Resident name. Tracking the number and identity of residents on antibiotics.

Prescription or administration date. Tracking the date the antibiotic was ordered or administered will allow comparing antibiotic use over time.

Antibiotic name and class. Tracking specific antibiotics and antibiotic classes (e.g. cephalosporins, fluoroquinolones) will help evaluate prescribing practices.

Days of therapy (DOT) or days dispensed. Tracking antibiotic use by DOT provides a measure to quantify and compare antibiotic use over time. The number of days the antibiotic was administered from the MAR in EHR data can be used to calculate DOT. Days dispensed from LTC pharmacy data can be used as a proxy for DOT when DOT is not available.

Route. Tracking antibiotic use by administration method (e.g. oral, intravenous).

Resident-days. Total resident-days for all residents in the facility, collected by the nursing home (e.g. census data), to calculate the rate of antibiotic use.

Important Data Elements

Other important data elements can be useful for tracking antibiotic use at the facility level. These data elements help identify the reasons for inappropriate antibiotic prescribing, and should be explored based on availability and nursing home needs.

Indication. Tracking antibiotic use by the reason for treatment (e.g. urinary tract infection or respiratory infection).

Duration of the antibiotic course. Calculating the number of days of an antibiotic course from the start to the end date for a specific infection.

Nursing home unit. Tracking antibiotic use by location within the nursing home.

Admission date. Identifying the date of prescription in relation to the date of nursing home admission can help define which prescriptions were started in the nursing home, emergency department or acute care hospital, and determine the resident's type of stay.

Prescriber. Tracking antibiotic use by individual providers will help generate provider-specific reports of antibiotic prescribing practices.

Antibiotic Use Measures for Tracking Antibiotic Use

Antibiotic starts and **days of therapy (DOT)** are the most commonly used antibiotic use measures, and discussed in [Appendix B: Measures of Antibiotic Prescribing, Use and Outcomes](#).

Antibiotic starts are based on prescriptions written in the nursing home. However, antibiotic prescribing is complex in nursing homes. One antibiotic course may be associated with multiple antibiotic orders or pharmacy transactions. Tracking the number of antibiotic orders or pharmacy transactions may over-count antibiotic starts in nursing homes. To prevent overestimation, antibiotic DOT may provide a more accurate estimate of antibiotic use that can be tracked over time.

The reported monthly DOT (or days dispensed) and number of total resident-days are used to calculate the monthly **rate of antibiotic DOT**. Antibiotic use can also be tracked quarterly or yearly.

Rate of antibiotic DOT (per 1,000 resident-days):
 (Total monthly DOT/total monthly resident-days) x 1,000

Table 1 and Table 2 provide examples of how to calculate the monthly rate of antibiotic DOT.

Table 1: Antibiotics Administered Monthly

Name	Date of Antibiotic Order or Transaction	Antibiotic Name	Calendar Days Antibiotic was Administered or Dispensed
Resident A	January 7	Nitrofurantoin	3
Resident B	January 7	Cephalexin	3
Resident A	January 10	Nitrofurantoin	2
Resident C	January 18	Ceftriaxone	7
Resident D	February 5	Vancomycin	10
Resident B	February 24	Ciprofloxacin	5
Resident B	February 24	Metronidazole	5

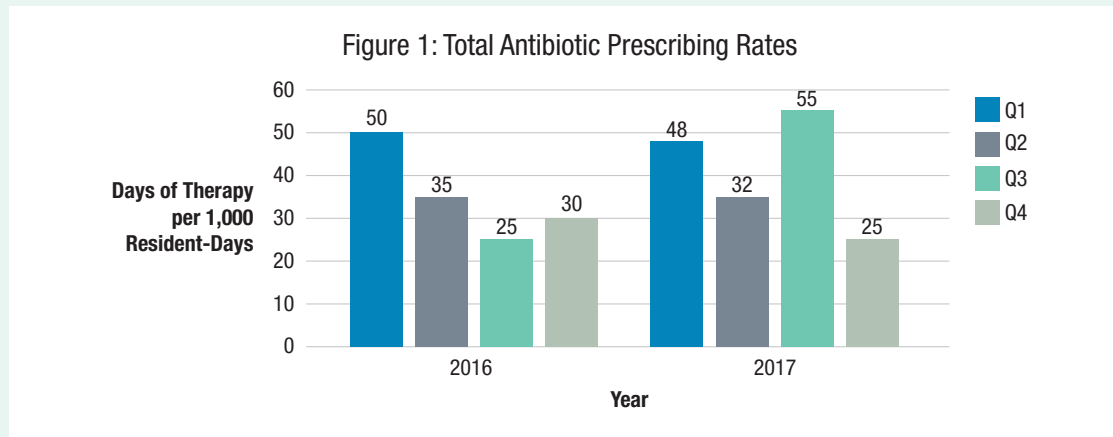
Table 2: Calculation of Monthly Days of Therapy/1,000 Resident-Days

Month	Antibiotic DOT	Monthly Resident-Days	Rate of DOT/1,000 Resident-Days
January	(3+3+2+7)=15	200	(15/200)x1,000=75
February	(10+5+5)=20	250	(20/250) x1,000=80

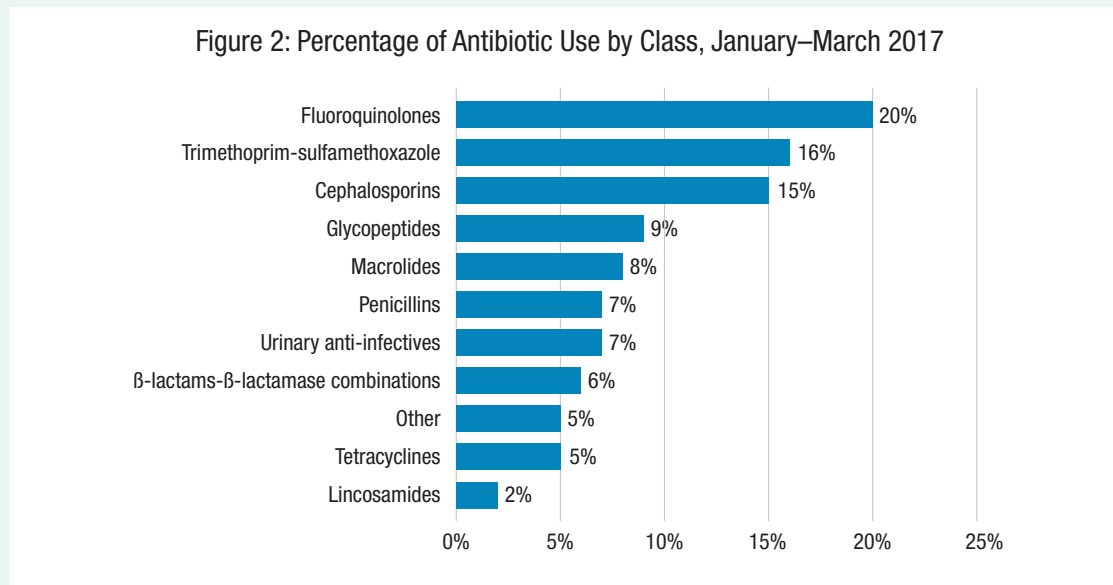
Tracking Antibiotic Use

Figure 1 and Figure 2 provide examples of how antibiotic quantity and types can be tracked to identify opportunities for improvement, and to determine where further evaluation might be needed to determine the appropriateness of antibiotic therapy.

The nursing home in **Figure 1** may want to examine their antibiotic use in the 3rd quarter (Q3) of 2017 (55 DOT/1,000 resident-days) to determine the reason for increased antibiotic prescribing rates compared to Q3 2016 (25 DOT/1,000 resident-days).



The nursing home in **Figure 2** may choose to review the indications for fluoroquinolone use, as the most commonly used antibiotic class, to determine whether prescribing was appropriate.



Total antibiotic use can be further stratified by indication, unit, date of prescription in relation to the date of admission, and provider. This will allow the nursing home to identify the reasons for inappropriate prescribing, design effective stewardship actions, define the resident population where interventions can be most effective, and provide individualized feedback on antibiotic prescribing practices to clinical providers.