The Core Elements of
Antibiotic Stewardship for Nursing Homes
APPENDIX B: Tracking and Reporting Antimicrobial Use—Beginner

CDC

Contents

I. Introduction

Antibiotics are among the most frequently prescribed medications in nursing homes, with up to 70% of nursing home residents receiving one or more courses of antibiotics when followed over a year.[1] Studies have shown that 40–75% of antibiotics prescribed in nursing homes may be unnecessary or inappropriate.[2,3]

The Core Elements of Antibiotic Stewardship for Nursing Homes provide a framework for antibiotic stewardship implementation. The Tracking and Reporting Core Elements emphasize monitoring and providing feedback on antimicrobial prescribing practices at your facility. Tracking and reporting antimicrobial use will allow long-term care (LTC) facilities to identify opportunities to improve antimicrobial prescribing, optimize resident safety, evaluate the impact of stewardship activities, and meet the stewardship core elements.[4]

The purpose of this document is to introduce **data sources, data elements** and **antimicrobial use measures** for LTC staff interested in learning more about antimicrobial use tracking and reporting.

The Centers for Medicare & Medicaid Services (CMS) require LTC facilities to have an antibiotic stewardship program that includes a system to monitor antimicrobial use.[5] Every LTC facility should implement an antibiotic stewardship policy that meets or exceeds CMS requirements.[6]

Document, Document, Document!

Ensure complete documentation of **every antimicrobial order** at the time of:

1. Prescribing

Assessment and documentation of a resident's clinical status, physical exam findings, laboratory testing results, and **prescribing elements** ensures accurate communication about prescribing rationale.

Prescribing elements include the dose, route, duration (i.e., start date, end date, and planned days of therapy), and indication (i.e., rationale and treatment site) for every antimicrobial course.

2. Post-prescription review

Once an antimicrobial is prescribed, ongoing assessment and documentation of the resident's clinical status and laboratory test results ensure the resident is receiving the best treatment for their infection.

Accurate documentation allows clinicians the opportunity to reassess the

- clinical response
- ongoing need for treatment
- choice of antimicrobial
- treatment duration

An antimicrobial review is critical whether an agent was started at the LTC facility or a transferring facility.

II. Antimicrobial Use Data Sources

Antimicrobial use data can be obtained from a variety of data sources:

- **Electronic health record (EHR) systems:** LTC facilities that have an EHR system that includes a Medication Administration Record (MAR) or electronic prescribing can report antimicrobial use data. Antimicrobial use reports can be generated by the facility if local information technology expertise exists, or by working with the EHR vendor.

- **Long-term care pharmacy dispensing data:** LTC facilities 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 antimicrobial use reports based on pharmacy transactions, the electronic exchange of prescribing information between the facility and pharmacy.

- **Manual chart review:** LTC facility staff can prepare antimicrobial 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 facilities.

III. Antimicrobial Use Data Elements

Information that should be collected to generate an accurate antimicrobial use report can include:

- **Resident data elements**
  - Resident name/ID
  - Resident demographic characteristics (e.g., age, sex)
  - Date of admission to the facility
- **Antimicrobial data elements**
  - Antimicrobial agent name
  - Route of administration (e.g., oral, intravenous, intramuscular)
  - Order start and end dates (or administration date(s)—if applicable)
  - Total days of therapy (DOT), days dispensed, or course duration
  - Prescribing indication (if available)
  - Prescriber name
- **Facility census data elements**
  - Total number of resident-days per month
  - Total number of unique residents at the facility per month

IV. Antimicrobial Use Measures

Antimicrobial use can be summarized and described using different **antimicrobial use measures.** Antimicrobial use measures like antimicrobial courses and days of therapy are calculated and tracked on an ongoing basis. Antimicrobial use rates can be reported by specific periods of time (e.g., monthly, quarterly, yearly).

a) Percent of residents receiving antimicrobials at the facility

$$\text{Percent of residents receiving an antimicrobial} = \frac{\textit{Total number of residents on an antimicrobial}}{\textit{Total number of unique residents}} \times 100$$

b) Number and rate of antimicrobial courses ordered or administered at the facility

An antimicrobial course is defined by a start date, end date and total duration.

For example, if a resident received amoxicillin that started on November 1st and ended on November 7th, they received **one amoxicillin course** with a **7-day duration.**

$$\text{Rate of antimicrobial courses } = \frac{\textit{Number of antimicrobial courses}}{\textit{Total number of resident-days}} \times 1{,}000$$

Antimicrobial courses can be stratified by:

- **Site of initiation,** where the antimicrobial course was started, whether at the facility or a referring hospital.

- **Type of stay,** long-stay (residents who reside long-term in the facility >100 days) and short-stay (residents who are admitted for a limited time for specific care needs, typically following a hospitalization ≤ 100 days).

- **Indication,** reason for treatment (e.g., urinary tract infection).

- **Prescriber,** to compare prescribing patterns among different providers practicing in the facility. Prescriber-specific rates must account for differences in the total number of residents cared for by each provider.

c) Number and rate of antimicrobial days of therapy (DOT)

Antimicrobial DOT: each day that a resident receives a specific antimicrobial.

For example, if a resident is prescribed a 7-day course of amoxicillin, that course equals 7 antimicrobial days. However, if a resident is prescribed a 7-day course of ceftriaxone plus a 5-day course of azithromycin, then the treatment equals 12 antimicrobial days.

Total DOT is the sum of all antimicrobial DOTs for all residents in the facility during a given time.

$$\text{Rate of antimicrobial DOT } = \frac{\textit{Total monthly DOT}}{\textit{Total monthly resident-days}} \times 1{,}000$$

Different measures can highlight opportunities where antimicrobial prescribing can be improved.

- Tracking and reporting **antimicrobial courses** can help LTC staff assess the impact of antibiotic stewardship interventions designed to educate and guide clinicians on situations when antimicrobials are not appropriate (e.g., avoiding prescribing for asymptomatic bacteriuria).

- Interventions designed to shorten the duration of antimicrobial courses or discontinue antimicrobials based on post-prescription review (i.e., "antibiotic time-out") may not necessarily change number and rate of antimicrobial courses but would decrease **course duration** or **DOT.**

V. Infection and Antimicrobial Use Tracking Log

Infection and antimicrobial use tracking log is a tool that lists all residents with an infection receiving an antimicrobial and can be generated for different time periods (e.g., weekly, monthly). These logs allow facility staff to routinely assess all residents receiving an antimicrobial and facilitate the process of post-prescription review.

Examples of data elements that can be included in an **infection and antimicrobial use tracking log:**

Resident Name	Resident Admission Date	Clinical Onset Date	Clinical Site of Infection	Clinical Diagnosis	Treatment Antimicrobial	Treatment Start Date	Treatment Stop Date	Treatment Course Duration
T.B.	8/5/2023	10/1	Respiratory	Sinusitis	Amoxicillin-clavulanate	10/3	10/7	5
M.K.	7/23/2024	10/15	Skin and Soft Tissue	Cellulitis	Cephalexin	10/17	10/21	5
L.V.	10/1/2024	10/18	Genitourinary	Urinary tract infection	Sulfamethoxazole-trimethoprim	10/18	10/20	3

Examples of infection and antimicrobial use tracking logs:

- Infection Tracking Logs | Center for Long-Term Care Quality and Innovation | Brown University
- Agency for Healthcare Research and Quality | Long-Term Care Toolkit | Tracking and Measuring Antibiotic Use
- Rochester Nursing Home Collaborative | Tracking Antibiotic Use
- Colorado Department of Public Health & Environment (CDPHE) Antimicrobial Stewardship in Long-Term Care Facilities
- Minnesota Department of Health Antimicrobial Stewardship Program Resources for Long-term Care Facilities

VI. Antimicrobial Use Report

Antimicrobial use reports contain summarized antimicrobial use measures to describe prescribing volume and rates at the facility for specific time intervals. The following are examples of tables and graphs that can be included in a facility's **antimicrobial use report.**

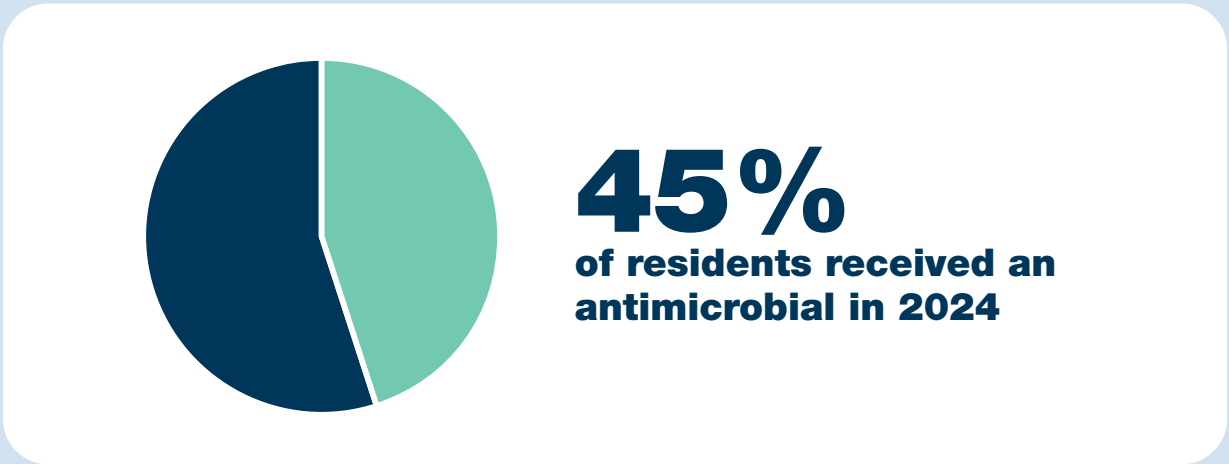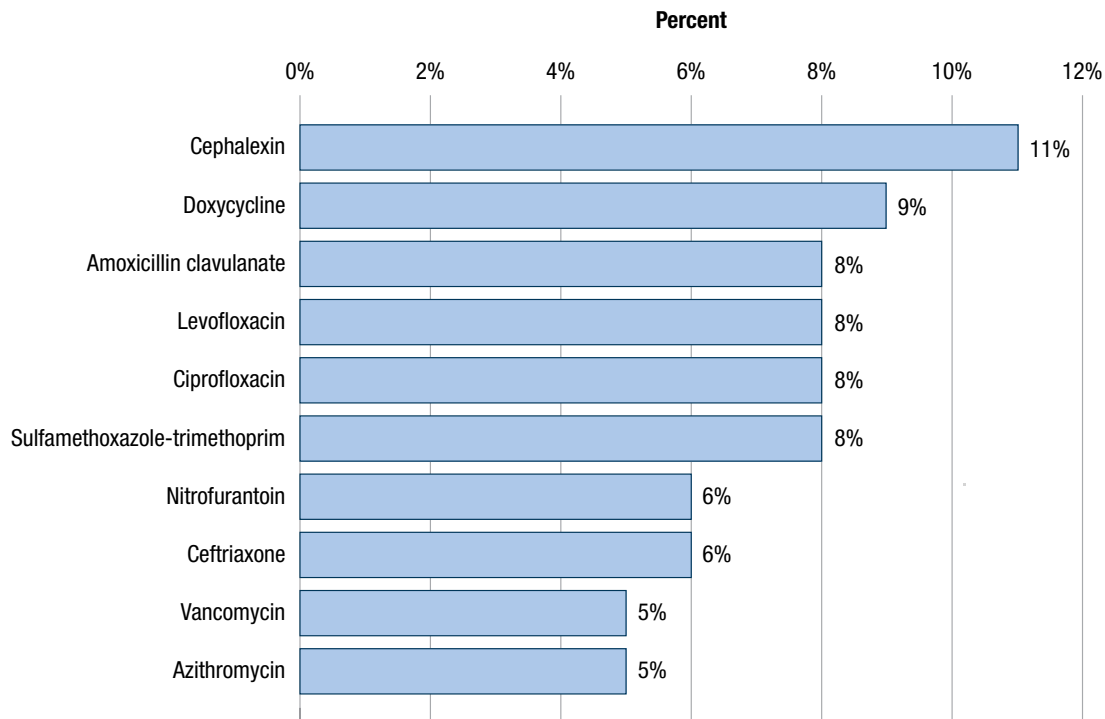## Figure 1. Percent of residents receiving antimicrobials, 2024

45%
of residents received an antimicrobial in 2024

Table 1. Annual animicrobial use, 2024

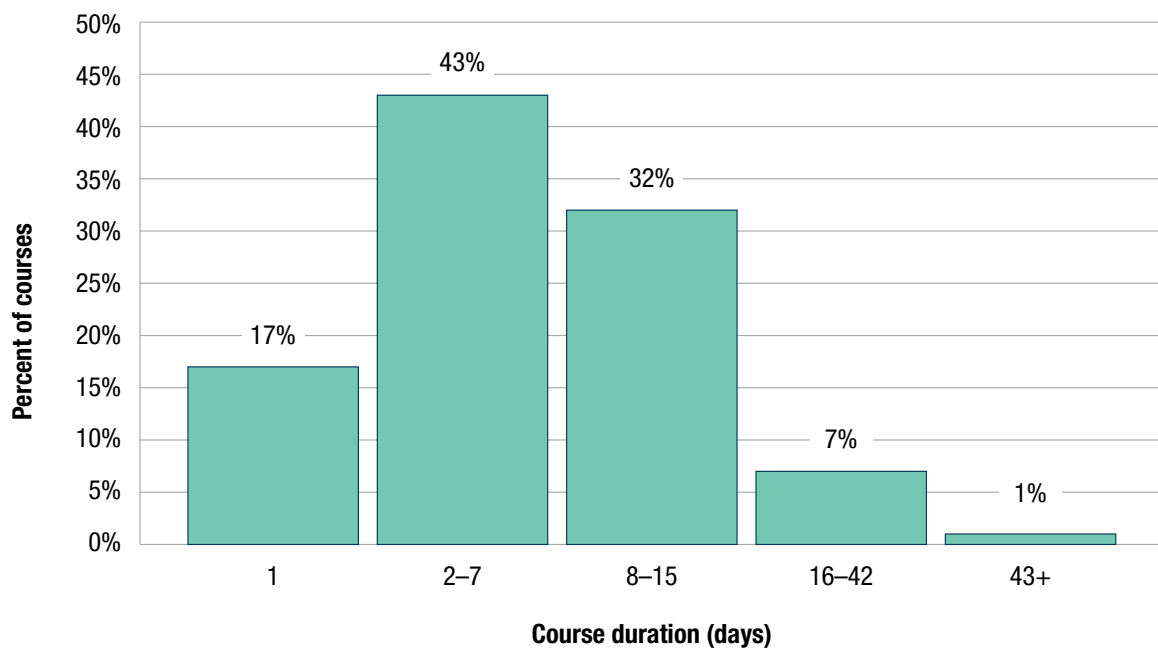| Agents	Antimicrobial Courses, N (%)	Prescribing Rate, courses per 1,000 resident days	Average Duration (days)
Cephalexin	31 (11)	0.89	7 (5–10)
Doxycycline	27 (9)	0.78	7 (7–10)
Amoxicillin-clavulanate	25 (8)	0.72	7 (5–10)
Levofloxacin	24 (8)	0.69	7 (5–8)
Ciprofloxacin	24 (8)	0.68	7 (5–9)
Sulfamethoxazole-trimethoprim	23 (8)	0.65	7 (5–10)
Nitrofurantoin	18 (6)	0.52	7 (5–10)
Ceftriaxone	17 (6)	0.49	5 (2–7)
Vancomycin	15 (5)	0.43	10 (6–15)
Azithromycin	15 (5)	0.43	5 (4–5)
Total courses	**297**	**8.5**	**7 (5–10)**

Note: These data are for illustrative purposes only and do not represent expected antimicrobial prescribing patterns in your facility.

## Figure 2. Percent of antimicrobial courses by antimicrobial agent, 2024

Percent

Antimicrobial agent	Percent
Cephalexin	11%
Doxycycline	9%
Amoxicillin clavulanate	8%
Levofloxacin	8%
Ciprofloxacin	8%
Sulfamethoxazole-trimethoprim	8%
Nitrofurantoin	6%
Ceftriaxone	6%
Vancomycin	5%
Azithromycin	5%

Figure 3. Antimicrobial course duration distributions, 2024

Course duration (days)	Percent of courses
1	17%
2–7	43%
8–15	32%
16–42	7%
43+	1%

Note: These data are for illustrative purposes only and do not represent expected antimicrobial prescribing patterns in your facility.

Figure 4. Total antimicrobial days of therapy by quarter, 2023–2024
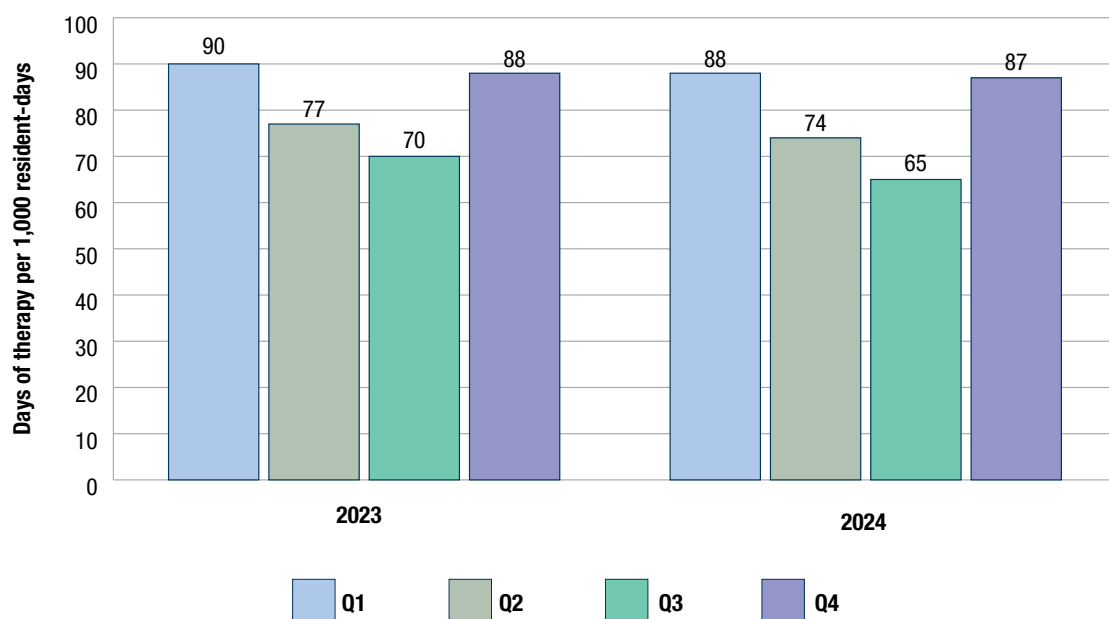
Note: These data are for illustrative purposes only and do not represent expected antimicrobial prescribing patterns in your facility.

VII. References

1. Nicolle LE, Bentley D, Garibaldi R, et al. Antimicrobial use in long-term care facilities. *Infect Control Hosp Epidemiol.* 2000; 21:537–45.

2. Lim CJ, Kong DCM, Stuart RL. Reducing inappropriate antibiotic prescribing in the residential care setting: current perspectives. *Clin Interven Aging.* 2014; 9: 165-177.

3. Eure T, LaPlace LL, Melchreit R, et al. Measuring Antibiotic Appropriateness for Urinary Tract Infections in Nursing Home Residents. *Infect Control Hosp Epidemiol.* 2017;38(8):998-1001. doi:10.1017/ice.2017.96

4. Centers for Disease Control and Prevention. Core Elements of Antibiotic Stewardship for Nursing Homes. https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

5. Centers for Medicare and Medicaid Services. Medicare and Medicaid Programs; Reform of Requirements for Long-Term Care Facilities. https://www.federalregister.gov/documents/2016/10/04/2016-23503/medicare-and-medicaid-programs-reform-of-requirements-for-long-term-care-facilities

6. Jump RLP, Gaur S, Katz MJ, et al. Template for an Antibiotic Stewardship Policy for Post-Acute and Long-Term Care Settings. *J Am Med Dir Assoc.* 2017;18(11):913-920.