



The Core Elements of

# Antibiotic Stewardship for Nursing Homes

APPENDIX B: Measures of Antibiotic Prescribing, Use and Outcomes



National Center for Emerging and Zoonotic Infectious Diseases  
Division of Healthcare Quality Promotion





## Appendix B: Measures of antibiotic prescribing, use and outcomes

This document contains more detailed explanations of antibiotic use process and outcome measures which can be tracked by nursing homes to monitor the impact of their antibiotic stewardship activities.

### Process measures for tracking antibiotic stewardship activities

**Completeness of clinical assessment documentation at the time of the antibiotic prescription.** Incomplete assessment and documentation of a resident's clinical status, physical exam or laboratory findings at the time a resident is evaluated for infection can lead to uncertainty about the rationale and/or appropriateness of an antibiotic. If a facility has developed algorithms or protocols for evaluating a resident suspected of having an infection, then perform audits of the quality of the assessment to ensure that algorithm was followed.

### **Completeness of antibiotic prescribing**

**documentation.** Ongoing audits of antibiotic prescriptions for completeness of documentation, regardless of whether the antibiotic was initiated in the nursing home or at a transferring facility, should verify that the antibiotic prescribing elements have been addressed and recorded. These elements include: dose, (including route), duration (i.e., start date, end date and planned days of therapy), and indication (i.e., rationale and treatment site) for every course of antibiotics.

### **Antibiotic selection is consistent with recommended agents for specific indications.**

If a facility has developed and implemented facility-specific treatment guidelines for one or more infections, then an intermittent review of antibiotic selection is warranted to ensure practices are consistent with facility policies.

## Measures of antibiotic use

**Point prevalence of antibiotic use.** Point prevalence surveys of antibiotic use track the proportion of residents receiving antibiotics during a given time period (i.e., a single-day, a week, or a month). Because the data collection is time-limited, point prevalence surveys are an easier way to capture antibiotic use data. In addition to providing a snap-shot of the burden of antibiotic use in a facility, point-prevalence surveys can capture specific information about the residents receiving antibiotics and indications for antibiotic therapy.<sup>1</sup> Unlike other antibiotic use measures which focus only on the prescriptions initiated in the nursing home, prevalence surveys could also include data on residents admitted to the facility already receiving an antibiotic to track the total burden of individuals at risk for complications from antibiotic use (e.g., *C. difficile* infection).

- Percent of residents receiving antibiotics: (Number of residents on antibiotic/total residents in the facility) X 100
  - Prevalence data can be stratified by specific resident characteristics, for example percent of residents receiving antibiotics among short-stay versus long-stay residents
- Percent of new admissions receiving antibiotics: (Number of residents admitted to nursing home receiving antibiotics/total number of new admissions) X 100

Because prevalence surveys are often conducted for a brief window of time, this data may not portray the magnitude of antibiotic use over time. While a single-day prevalence survey may show 5% to 13% of residents are receiving an antibiotic, studies which follow a group of residents over long periods of time (e.g., 12 months) show that as many as 50% to 75% of residents receive one or more courses of antibiotics.<sup>2</sup>

**Antibiotic starts.** Most nursing home infection prevention and control programs already track new antibiotic starts occurring in the facility as part of their infection surveillance activity. Generally, rates of antibiotic starts are based on the prescriptions written after the resident has been admitted to the facility. Data on antibiotic starts can be calculated and reported in the following ways:

- Rate of new antibiotic starts initiated in nursing home (per 1,000 resident-days): (Number of new antibiotic prescriptions/total number of resident-days) X 1,000
  - Rate of antibiotic starts can be calculated by indication, for example: (Number of new antibiotic starts for urinary tract infection/total number of resident-days) X 1,000
- Rates of antibiotic starts could also be calculated for individual prescribers in the nursing home to compare

prescribing patterns among different providers practicing in the facility. However, prescriber-specific rates must take into account differences in the total number of residents cared for by each provider.

Tracking and reporting antibiotic start data could assess the impact of antibiotic stewardship initiatives designed to educate and guide providers on situations when antibiotics are not appropriate. However, interventions focused on shortening the number of days of therapy may not demonstrate significant changes in antibiotic starts.

**Antibiotic days of therapy (DOT).** Tracking antibiotic DOTs requires more effort than tracking antibiotic starts, but may provide a better measure to monitor changes in antibiotic use over time. The ratio of antibiotic DOT to total resident-days has been referred to as the antibiotic utilization ratio (AUR).<sup>3</sup> Below are the steps for calculating monthly rates of antibiotic DOT and AUR.

- An antibiotic day: each day that a resident receives a single antibiotic
  - For example, if a resident is prescribed a 7-day course of amoxicillin, that course equals 7 antibiotic days. However, if a resident is prescribed a 7-day course of ceftriaxone plus azithromycin, then that course equals 14 antibiotic days.
- Antibiotic DOT: the sum of all antibiotic days for all residents in the facility during a given time frame (e.g., 1 month or 1 quarter)
  - Rate of antibiotic DOT (per 1,000 resident-days):  
(Total monthly DOT/total monthly resident-days) X 1,000
  - Antibiotic utilization ratio: Total monthly DOT/total monthly resident-days

# Antibiotic outcome measures

## **Track *C. difficile* and antibiotic resistance.**

The National Healthcare Safety Network (NHSN) is a CDC-operated web-based system for tracking and reporting targeted infections and antibiotic-resistant organisms from healthcare facilities. In 2012, NHSN launched a reporting component specifically designed for use by nursing homes and other long-term care facilities. The Laboratory-identified event module in NHSN (<http://www.cdc.gov/nhsn/ltc/cdiff-mrsa/index.html>) allows facilities to track rates of *C. difficile* and selected multidrug-resistant organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA) and antibiotic resistant gram-negative bacteria like *E.coli* using laboratory based surveillance as a proxy for infections.<sup>4</sup>

## **Track adverse drug events related to antibiotic use.**

Adverse events due to use of medications in skilled nursing homes accounted for nearly 40% of harms identified in a recent report.<sup>5</sup> Antibiotics are among the most frequently prescribed medications in LTCFs and have a high rate of adverse drug events.<sup>6,7</sup>

## **Track costs related to antibiotic use.**

Very few, if any, studies on antibiotic use in nursing homes have calculated the financial costs of antibiotic use.<sup>8,9</sup> However, in acute care settings, antibiotic stewardship has been shown to reduce hospital pharmacy costs in addition to improving antibiotic use.<sup>10</sup> This metric can be useful in justifying support of staff time and external consultant support for ASP activities.

# References

1. Zarbarsky TF, Sethi AK, Donskey CJ. Sustained reduction in inappropriate treatment of asymptomatic bacteriuria in a long-term care facility through an educational intervention. *Am J Infect Contr.* 2008; 36: 476-480
2. Lim CJ, Kong DCM, Stuart RL. Reducing inappropriate antibiotic prescribing in the residential care setting: current perspectives. *Clin Interv Aging.* 2014; 9: 165-177
3. Mylotte JM. Antimicrobial prescribing in long-term care facilities: Prospective evaluation of potential antimicrobial use and cost indicators. *Am J Infect Control.* 1999; 27(1): 10-19.
4. Centers for Disease Control and Prevention. Laboratory-identified Event Module for Long-term care facilities. [http://www.cdc.gov/nhsn/PDFs/LTC/LTCF-LabID-Event-Protocol\\_FINAL\\_8-24-12.pdf](http://www.cdc.gov/nhsn/PDFs/LTC/LTCF-LabID-Event-Protocol_FINAL_8-24-12.pdf) Accessed 12/30/14
5. Office of the Inspector General. Adverse Events in Skilled Nursing Facilities: National Incidence Among Medicare Beneficiaries (OEI-06-11-00370), February 2014.
6. Nicolle LE, Bentley D, Garibaldi R, et al. Antimicrobial use in long-term care facilities. *Infect Control Hosp Epidemiol* 2000; 21:537-45.
7. Gurwitz JH, Field TS, Avorn J et al. Incidence and preventability of adverse drug events in nursing homes. *Am J Med.* 2000;109:87-94.
8. Mylotte JM. Antimicrobial prescribing in long-term care facilities: Prospective evaluation of potential antimicrobial use and cost indicators. *Am J Infect Control.* 1999; 27(1): 10-19.
9. Mylotte JM, Keagle J. Benchmarks for antibiotic use and cost in long-term care. *J Am Geriatr Soc* 2005; 53:1117-1122.
10. Beardsley JR, Williamson JC, Johnson JW, Luther VP, Wrenn RH, Ohl CC. Show me the money: long-term financial impact of an antimicrobial stewardship program. *Infect Control and Hosp Epidemiol.* 2012;33(4):398-400