MEASURING ANTIBIOTIC USE IN LTCFS

ELIZABETH DODDS ASHLEY, PHARMD, MHS
LIAISON CLINICAL PHARMACIST

dason.medicine.duke.edu
The Core Elements of Antibiotic Stewardship for Nursing Homes

APPENDIX B
Sources for Antibiotic Data in Nursing Homes

Purchasing data
- Can be difficult for dispensing from a central pharmacy location to many facilities

Dispensing data
- Can be difficult with a lot of floor stock

Electronic MAR

Paper and pencil 😊
- Point prevalence survey
Are Additional Metrics Available?

Courses/starts per 1,000 resident days

- Advantages: easier to measure
- Disadvantages: does not tell the whole picture - what about durations and overall exposure
  - Remember - a single course of chronic UTI prophylaxis is only started once!!!

Are Additional Metrics Available?

Number (or percentage) of patients receiving antimicrobials

Advantages:
This number can help target education.

Disadvantages:
This can still underestimate key prescribing practices.

Table 2. Comparison of antibiotic use and cost indicators by physician, February 1999-September 2001*

<table>
<thead>
<tr>
<th>Physician code</th>
<th>Incidence</th>
<th>AUR</th>
<th>Cost/RCD</th>
<th>Cost/Ab-day</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.7 ± 1.3</td>
<td>3.7 ± 1.6</td>
<td>$0.18 ± 0.11</td>
<td>$5.49 ± 2.50</td>
</tr>
<tr>
<td>B</td>
<td>4.9 ± 1.4</td>
<td>4.7 ± 1.3</td>
<td>$0.25 ± 0.12</td>
<td>$5.35 ± 1.83</td>
</tr>
<tr>
<td>C</td>
<td>4.6 ± 2.7</td>
<td>4.2 ± 2.2</td>
<td>$0.30 ± 0.20</td>
<td>$7.43 ± 4.52</td>
</tr>
<tr>
<td>D</td>
<td>6.5 ± 2.4</td>
<td>6.5 ± 2.5</td>
<td>$0.39 ± 0.19</td>
<td>$5.87 ± 1.72</td>
</tr>
<tr>
<td>E</td>
<td>5.5 ± 1.4</td>
<td>4.7 ± 1.3</td>
<td>$0.25 ± 0.12</td>
<td>$5.31 ± 1.74</td>
</tr>
<tr>
<td>F1</td>
<td>4.1 ± 2.1</td>
<td>3.3 ± 1.9</td>
<td>$0.19 ± 0.12</td>
<td>$6.01 ± 3.37</td>
</tr>
<tr>
<td>F2</td>
<td>6.1 ± 1.9</td>
<td>5.5 ± 2.1</td>
<td>$0.27 ± 0.17</td>
<td>$5.00 ± 1.93</td>
</tr>
</tbody>
</table>

*RCD, Resident care-days; Ab, antibiotic; AUR, antimicrobial utilization ratio; Cost/RCD = Total cost for antibiotics per month/total resident care-days per month; cost per A Day = Total cost for antibiotics per month/total antibiotic-days per month; Incidence = Number of antibiotic courses started per 1000 resident care-days per month; AUR = Number of antibiotic days per month/number of resident care-days per month multiplied by 100 (%).

Values are mean ± standard deviation per month for 32-month study period.

Myelotte JM and Neff M. AJIC 2003;18-25.
Measuring Antibiotic Use: Defined Daily Dose

- Standardized definition of daily antibiotic dose
- Created by the World Health Organization
- Correction factor: Total Units (i.e. mg) Drug / DDD Correction Factor

Pros:
- Attempts to convert raw purchasing data into utilization data
- Allows comparisons with other institutions
- Easy to calculate

Cons:
- Not everyone agrees with the DDD correction factors
- Many use institution-specific correction factors (prescribed daily dose)
- Not patient level information
Measure Antibiotic Use: Antibiotic Days and Days of Therapy

Number of antibiotic days AND Days of Therapy
- Note: this is not the same as Days of Therapy

DOT:
- Piperacillin/tazobactam = 2
- Vancomycin = 4
- Antibiotic days:
  - Overall = 4

Polk et al. CID 2011;53(11):1100–10
Available Denominators for Measuring Antibiotic Use

Admissions:
- CDC Definition: The aggregate number of patients admitted to the facility starting on the first day of each month through the end of the calendar month.

Patient Days:
- CDC Definition: A daily count of the number of patients in the patient care location during a time period. To calculate patient days, for each day of the month, at the same time each day, record the number of patients.

Days Present:
- CDC Definition: Number of patients present in a given location for any portion of any day.
### Data Example

<table>
<thead>
<tr>
<th>DRUG NAME</th>
<th>SIG Description</th>
<th>Instructions</th>
<th>Date Written</th>
<th>QTY Auth</th>
<th>QTY Disp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOXYCYCLINE 100 MG CAPSULE</strong></td>
<td>TAKE ONE CAPSULE PO TWICE</td>
<td>DAILY X 7 DAYS (BRONCHITIS/COPD)</td>
<td>27-Jan-16</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td><strong>CIPROFLOXACIN 500MG TABS(*)</strong></td>
<td>ONE TABLET PO TWICE</td>
<td>DAILY. (OSTEOMYELITIS) (DC 2/8/16)</td>
<td>4-Jan-16</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td><strong>VANCOMYCIN 1 GM ADD-VAN VIA INFUSE 1GM I.V. EVERY 12 HOURS OVER 60-90 MINUTES (<em>Activate before use</em>)</strong></td>
<td>INFUSE 1GM I.V. EVERY 12</td>
<td>HOURS OVER 60-90 MINUTES (<em>Activate before use</em>)</td>
<td>12-Jan-16</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td><strong>VANCOMYCIN 1 GM ADD-VAN VIA SULFAMETHOXAZOLE/TMP DS TAB</strong></td>
<td>INFUSE 1GM I.V. EVERY 12</td>
<td>HOURS OVER 60-90 MINUTES (<em>Activate before use</em>)</td>
<td>25-Jan-16</td>
<td>28</td>
<td>8</td>
</tr>
<tr>
<td><strong>SULFAMETHOXAZOLE/TMP DS TAB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CEFPODOXIME 200 MG TABLET</strong></td>
<td>TAKE 1 TABLET BY MOUTH</td>
<td>TWICE DAILY X 14 DAYS. (PYELONEPHRITIS)</td>
<td>11-Jan-16</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td><strong>CEFPODOXIME 200 MG TABLET</strong></td>
<td>TAKE ONE TABLET PO EVERY</td>
<td>12 HOURS FOR 10 DAYS (PYELONEPHRITIS)</td>
<td>12-Jan-16</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Calculations:
- Doxycycline: 7 DOT
- Ciprofloxacin: $55/2 = 27.5 - 28$ DOT
- Vancomycin: $8/2 = 4$ DOT
Antibiotic Use by Nursing Home

Based on Aggregate Purchasing Data

<table>
<thead>
<tr>
<th>Year</th>
<th>DDD/10,000 resident days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>403.20</td>
</tr>
<tr>
<td>2</td>
<td>417.47</td>
</tr>
<tr>
<td>3</td>
<td>266.28</td>
</tr>
<tr>
<td>4</td>
<td>647.02</td>
</tr>
<tr>
<td>5</td>
<td>719.53</td>
</tr>
</tbody>
</table>
DDD vs. DOT (/1,000 Patient Days)- Experience at a Single Nursing Home
Days of Therapy/1,000 Patient Days

Based on Dispensing Data
Understanding Why Antibiotics are Used

Benoit SR et al.  JAGS 2008;56:2039-44.
There is no substitute for chart review (in some cases)…

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 snapshot 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. 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).

CDC. Core Elements of Antibiotic Stewardship in Nursing Homes- Appendix B 2015.
Most Common Indication for Antibiotic Use In Nursing Homes

- UTI: 252
- Cellulitis: 157
- Pneumonia: 91
- Bone/joint infection: 49
- Thrush: 40
- C. diff: 30
- Wound infection: 26
- Intra-abdominal: 13

Based on Dispensing Data
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.

CDC. Core Elements of Antibiotic Stewardship in Nursing Homes- Appendix B 2015.
SO WE HAVE DATA- WHAT DO WE DO NEXT?
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.4

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.5 Antibiotics are among the most frequently prescribed medications in LTCFs and have a high rate of adverse drug events.5,7

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.6,9 However, in acute care settings, antibiotic stewardship has been shown to reduce hospital pharmacy costs in addition to improving antibiotic use.10 This metric can be useful in justifying support of staff time and external consultant support for ASP activities.
Do we know our target?

Less is better:

Making the Data Actionable

Data alone will not answer all the questions, but is allows more refined reviews

- Who?- Who is writing for the antibiotics?
- What?- What is the most frequently used antibiotic?
- Where?- Are there units that tend to use the most antibiotics?
- When?- Are there times when antibiotics are most likely to be prescribed?
- Why? - What is the most common reason antibiotics are used?

From there

- Conversations become more productive
- Guidelines for use can be created with provider input
- Remember- always ask why- the reasons behind the use might not be what you had guessed!