Lessons learned from validation of electronically-submitted National Healthcare Safety Network (NHSN) Antimicrobial Use (AU) Option data

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NHSN AU Option Background

- Antimicrobial resistance (AR) continues to increase in United States hospitals[1]

- Reliable reports about AU and AR can improve antimicrobial stewardship.[2-4]

- CDC launched NHSN AU Option in 2011 to provide a mechanism for hospitals to report and analyze antimicrobial use

- Hospital participation in the AU Option increased exponentially over the last two years – 1,293 hospitals reported at least one month of AU data as of May 1, 2019

Requirements for AU Data Submission

Participating hospitals must have:

- Electronic Medication Administration Record (eMAR) or Bar Coding Medication Administration (BCMA) system

- Admission Discharge Transfer (ADT) System

- Ability to collect and aggregate data using Clinical Document Architecture (CDA)

```xml
</participant>
<!-- Number of Patient-present Days -->
<entryRelationship typeCode="COMP">
  <observation classCode="OBS" moodCode="EVN">
    <templateId root="2.16.840.1.113883.10.20.5.6.69"/>
    <code codeSystem="2.16.840.1.113883.6.277"
          codeSystemName="cdcNHSN"
          code="2525-4"
          displayName="Number of Patient-present Days"/>
  <statusCode code="completed"/>
  <value xsi:type="PQ" unit="d" value="700"/>
  </observation>
</entryRelationship>
<!-- the Drug, aggregate data, no specified route of administration -->
<entryRelationship typeCode="COMP">
  <observation classCode="OBS" moodCode="EVN">
    <templateId root="2.16.840.1.113883.10.20.5.6.69"/>
    <code codeSystem="2.16.840.1.113883.6.277"
          codeSystemName="cdcNHSN"
          code="2524-7"
          displayName="Number of Therapy Days"/>
  <statusCode code="completed"/>
  <value xsi:type="PQ" unit="d" value="3"/>
  <participant typeCode="CSM">          <!-- antimicrobial Drug -->
    <participantRole classCode="MANU">
      <code codeSystem="2.16.840.1.113883.6.88"
            codeSystemName="RxNorm"
            code="620"
            displayName="Amantadine"/>
    </participantRole>
  </participant>
  </observation>
</entryRelationship>
<!-- stratified data: Drug + route -->
```

AU Option Data Elements – Numerator

- Captured automatically by hospital's eMAR/BCMA system
- **Antimicrobial days (days of therapy):** Sum of days for which <u>any</u> amount of specific agent was administered to a patient
  - Can report 91 antimicrobials, including antibacterial, antifungal, and anti-influenza agents
  - Antimicrobials sub-stratified by route of administration:
    - Intravenous (IV)
    - Intramuscular (IM)
    - Digestive (oral → rectal)
    - Respiratory (inhaled)

AU Option Data Elements – Denominator

- Calculated using data captured automatically by hospital's ADT system
- **Days present:** Number of days in which a patient spent <u>any</u> time in specific unit or facility
  - One patient can contribute more than one day present per day
  - Not the same as patient days denominator used elsewhere in NHSN
  - Days present should almost always be > than patient days

Electronic Data Submission

Advantages:

- Avoids manual data entry
- Potential for high quality, standardized data
- Potential for data reuse

Limitations:

- More difficult to implement
- Sometimes involves multiple data systems or vendors
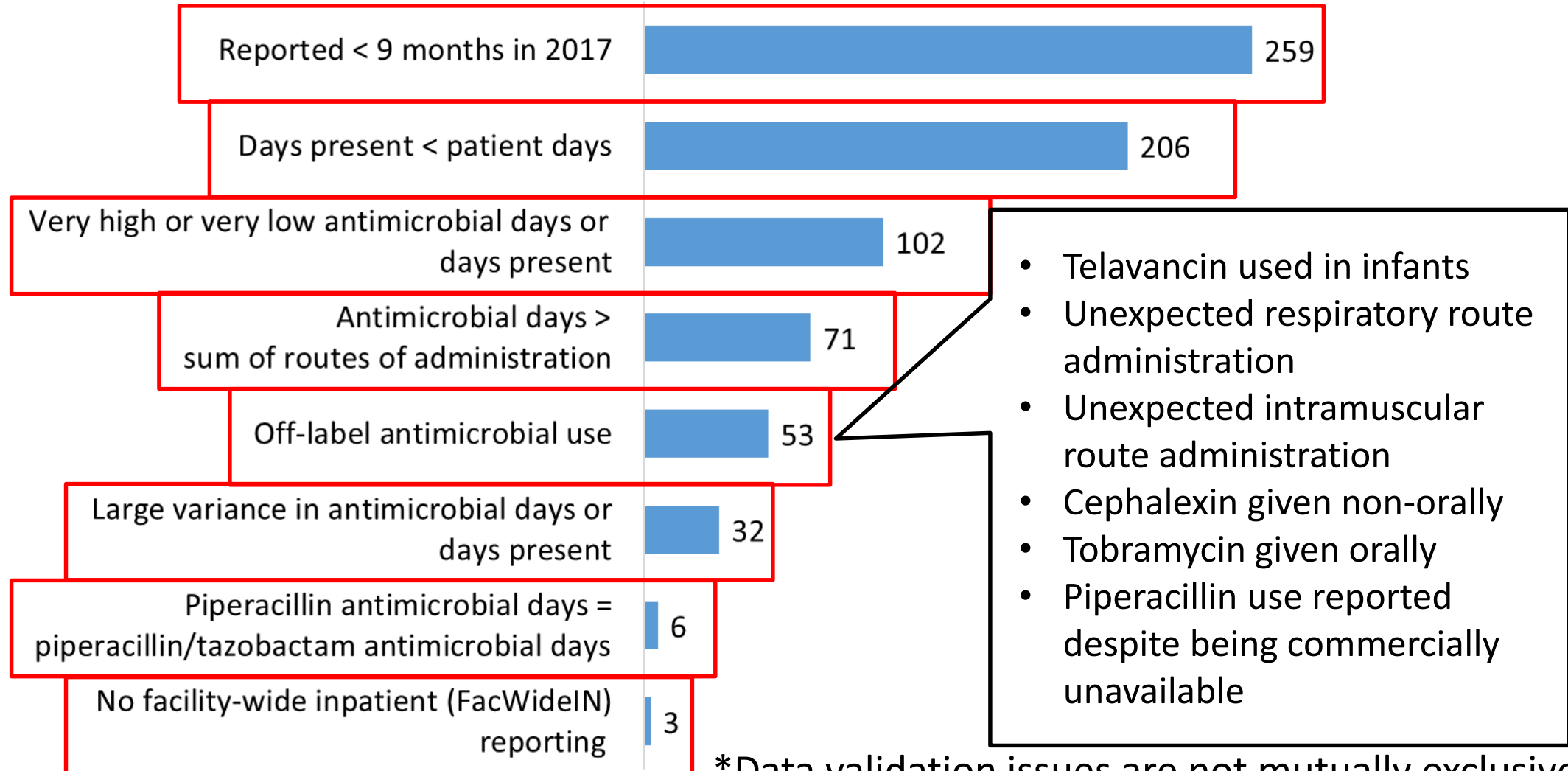- Data validation can be complex

AU Data Validation

- Validated AU data submitted between January 1, 2016 and March 31, 2018
- 744 hospitals submitted at least one month of AU data as of March 1, 2018
- NHSN AUR Team contacted 474 hospitals with potential data quality issues in antimicrobial days (i.e., numerator data) and days present (i.e., denominator data)

Goals:
- Ensure quality and accuracy of data used for 2017 Standardized Antimicrobial Administration Ratio (SAAR) rebaseline
- Identify most common data issues so partners without advanced statistical knowledge or subject matter expertise can act on them

Number of Hospitals with Each Data Validation Issue*

Data Validation Issue	Number of Hospitals
Reported < 9 months in 2017	259
Days present < patient days	206
Very high or very low antimicrobial days or days present	102
Antimicrobial days > sum of routes of administration	71
Off-label antimicrobial use	53
Large variance in antimicrobial days or days present	32
Piperacillin antimicrobial days = piperacillin/tazobactam antimicrobial days	6
No facility-wide inpatient (FacWideIN) reporting	3

- Telavancin used in infants
- Unexpected respiratory route administration
- Unexpected intramuscular route administration
- Cephalexin given non-orally
- Tobramycin given orally
- Piperacillin use reported despite being commercially unavailable

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*Data validation issues are not mutually exclusive

Actionable Insights

NHSN AU Team:

- Confirmed/corrected data included in referent population for SAAR models – data with outstanding issues excluded

- Target future AU data validation (e.g., neonatal location validation)

- Add new data quality reports for NHSN version 9.4 release in Dec. 2019

- Collaborate with public health partners for validation initiatives

Local, state, and territorial public health partners:

- Define and develop role in AU surveillance and antimicrobial stewardship

- Incorporate data validation that focuses on common errors

- Review NHSN data validation protocols (https://www.cdc.gov/nhsn/acute-care-hospital/aur/index.html)

- Encourage hospitals to validate AU data regularly

Thank you!
For any questions contact the
NHSN Helpdesk at nhsn@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348   www.cdc.gov

Sources

1. Weiner LM, Webb AK, Limbago B, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011-2014. Infect Control Hosp Epidemiol 2016;37:1288-1301.

2. Davey P, Marwick CA, Scott CL, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst Rev 2017:2;CD003543.

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 broadspectrum antibiotics at an academic medical center. Arch Inter Med 2001;161:1897-902.