Updates on NHSN Monitoring of Antimicrobial Use and Resistance

HICPAC
March, 2013
Updates on NHSN Monitoring of Antimicrobial Use and Resistance

- Enhancing use of existing data on (HAI) antimicrobial resistance reported to NHSN
  - Device-associated infection reporting (CLABSI, CAUTI, VAE)
  - Procedure-associated infection reporting (SSI)
- Implementation of Antimicrobial Use and Resistance Module
- Assessments of antimicrobial use through the 2011 EIP Antimicrobial Use and HAI Point Prevalence Survey (PPS)
Enhancing use of Existing Data on Antimicrobial Resistance Reported to NHSN

1. Alert Initiative
   - Near term initiative (January 2014)
   - Focus on data quality, build confidence in rare phenotypes
   - Potential to improve attention to “detect and prevent” awareness

2. Summary Resistance Measures (e.g., %R)
   - Near term initiative (Early 2014)
   - Focus on enhancing use of existing (HAI) data for group users, facility users
   - Potential for regional, state-specific reporting
1. Alert Initiative-Automated Response to Unusual Phenotypes: Three Types of Reports/Alerts

- **Immediate pop-up window (focuses on action)**
  - Trigger when saving data (event reported)
  - Proposing 3 distinct messages (VRSA, CRE, general MDRO)
  - Short message focused on immediate checking data entry, verify with lab, save isolate, transmission prevention, report to public health if applicable; no links.
  - Click to dismiss; user ideally will correct data entry errors real time
1. Alert Initiative-Automated Response to Unusual Phenotypes: Three Types of Reports/Alerts

- **Monthly alert message (focused on data quality)**
  - Monthly quality report for all users to verify validity of data entered
  - Line list of events with unusual phenotypes
    - Clickable event to go directly to event for further evaluation
    - Requires verification by user that correct data entry
    - Additional messaging about infection control, links to guidance
  - Response required for only first 3 per year (3 different patients) for some phenotypes

- **Group user (or facility) alert report generation**
  - At any user generates report of unusual phenotypes
  - Line list of each event, by phenotype,
    - Status of validation (pending validation vs. validated)
    - Potential use for inter-facility communication, reporting
# Alert Initiative-Automated Response to Unusual Phenotypes:
Eligible Phenotypes and Alert Frequency

<table>
<thead>
<tr>
<th>Organism or Organism Group</th>
<th>Resistance Phenotype Detected</th>
<th>Justification</th>
<th>Message Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enterobacteriaceae (i.e., E.coli, Enterobacter spp. Klebsiella pneum/oxytoca)</strong></td>
<td>Carbapenem- I or R</td>
<td>Uncommon</td>
<td>First 3</td>
</tr>
<tr>
<td></td>
<td>Highly drug resistant (HDR)</td>
<td>Rare</td>
<td>All</td>
</tr>
<tr>
<td><strong>Escherichia coli, Klebsiella pneum/oxytoca</strong></td>
<td>Extended-spectrum cephalosporin - I or R</td>
<td>IP concern</td>
<td>First 3</td>
</tr>
<tr>
<td><strong>Acinetobacter baumannii</strong></td>
<td>Colistin/polymixin - R</td>
<td>Uncommon</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Carbapenem - I or R</td>
<td>IP concern</td>
<td>First 3</td>
</tr>
<tr>
<td></td>
<td>HDR</td>
<td>Rare</td>
<td>All</td>
</tr>
<tr>
<td><strong>Pseudomonas aeruginosa</strong></td>
<td>Colistin/polymyxin - I or R</td>
<td>Uncommon</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Carbapenem - I or R</td>
<td>IP concern</td>
<td>First 3</td>
</tr>
<tr>
<td></td>
<td>HDR</td>
<td>Rare</td>
<td>All</td>
</tr>
<tr>
<td><strong>Enterococcus faecalis, faecium, spp.</strong></td>
<td>Daptomycin – NS AND Linezolid -R</td>
<td>Uncommon</td>
<td></td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>Vancomycin – R</td>
<td>Rare</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Daptomycin – NS AND Linezolid – R</td>
<td>Rare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vancomycin- I</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Staphylococcus, coagulase-negative</strong></td>
<td>Vancomycin – R</td>
<td>Uncommon</td>
<td></td>
</tr>
</tbody>
</table>

- HDR = testing I or R to at least one drug in each of 5 classes (Enterobacteriaceae, Pseudomonas) or in each of 6 classes (Acinetobacter spp.); classes include extended-spectrum cephalosporin, fluoroquinolones, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam, ampicillin sulbactam (Acinetobacter only)
Enhancing use of Existing Data on Antimicrobial Resistance Reported to NHSN

1. Alert Initiative
   - Near term initiative (January 2014)
   - Focus on data quality, build confidence in rare phenotypes
   - Potential to improve attention to “detect and prevent” awareness

2. Summary Resistance Measures (e.g., %R)
   - Short term initiative (fall 2014)
   - Focus on enhancing use of existing data for group users, facility users
   - Potential for regional, state-specific reporting
2. Summary Resistance Measures (existing HAI data)

- Line list of patients with key AR phenotypes
  - For use by group users and facilities
  - Supplement the Alert Initiative (unusual phenotypes) to include more traditional resistance concerns; e.g.,
    - MRSA
    - VRE

- Summary % Resistance - crude
  - Output for group-users or facility users
  - Initial considerations – HAI type specific (i.e., SSI, CLABSI, CAUTI) % Resistance
    - Crude (% R) proportion for key phenotypes (similar to NHSN AR report)
    - Gathering requirements now, implement no earlier than early 2014
  - Exploring second “infection” based measure (e.g., CRE HAI/1000 pt-day)
  - Primary users likely State Department of Health, collaborative partner organizations, academic partners with data rights
2. Summery Resistance Measures (existing HAI data)

- **Adjusted Summary % Resistance**
  - Exploratory work started, presented to CSTH HAI subcommittee
    - Adjusted ICU CLABSI % Resistance for MRSA, CRE (IDWeek, 2012)
      - Age single most significant predictor of %R, not location (ICU, other)
      - Age adjustment rarely moved state’s value/rank
    - Analysis limited
      - Excluded states with few isolates (e.g., <30 S. aureus), ICU only

- **Potential to publish summary measures by state**
  - Outstanding issues include sufficient rational for adjustment?
  - Consider crude or adjusted into regular NHSN AR report 2011-2012
Updates on NHSN Monitoring of Antimicrobial Use and Resistance

- Enhancing use of existing data on antimicrobial resistance reported to NHSN
  - Device-associated infection reporting (CLABSI, CAUTI, VAE)
  - Procedure-associated infection reporting (SSI)

- Implementation of Antimicrobial Use and Resistance Module

- Assessments of antimicrobial use through the 2011 EIP Antimicrobial Use and HAI Point Prevalence Survey (PPS)
Implementation of Antimicrobial Use and Resistance Module: Resistance Option

- **Goals**
  - Provide a mechanism for facilities to report and analyze antimicrobial resistance data from clinical specimens
    - Standard antibiograms, aid in clinical decisions
    - Identify emerging resistance early; prevent transmission early
  - Provide regional and national assessment of antimicrobial resistant pathogens of public health importance
    - Broader coverage than relying on HAI data only
    - Simplified measures of infection burden for AR pathogens

- **Operational overview**
  - Rely on electronically captured data only (no manual data entry)
  - Submit files monthly (CDA), similar to requirement for AU option
  - Protocol revisions now, implementation guidance being drafted
  - Likely time to receive data Fall 2014
Implementation of Antimicrobial Use and Resistance Module: Resistance Option

• Eligible Facilities
  • Acute-care (inc LTAC, INPT rehabilitation)
  • Inclusive of ED/observation (unlike CMS reporting requirements for MRSA BSI through MDRO Module)
• Isolate-level reporting (regardless of “R” status)
  • By month, facility wide
  • Standard filtering of test results prior to creating file
    • First eligible pathogen isolated from blood culture per patient (requiring 14 days since last positive)
    • First eligible pathogen isolated from non-blood culture source, per patient, per month
  • Eligible culture sources: blood, urine, lower respiratory, CSF
  • Eligible pathogens; common (HAI), S. pneumoniae, Group B Streptococcus, Candida spp.
  • De-duplication when same isolate tested on same day
  • Numerator data set include key susceptibility test results, key patient and hospital information
• Denominator: admissions, patient-days, blood cultures
# NHSN Resistance Option Proposed Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Simplified Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Non-susceptible</td>
<td>Resistant + Intermediate Tested</td>
</tr>
<tr>
<td>Bloodstream infection % non-susceptible</td>
<td>Resistant from BC + Intermediate from BC BC Tested</td>
</tr>
<tr>
<td>Hospital-onset resistance rate</td>
<td>Hospital-onset(^1) isolates / 1000 Patient days</td>
</tr>
<tr>
<td>Resistant bloodstream infection rate</td>
<td>Resistant from BC + Intermediate from BC 100 Admissions</td>
</tr>
</tbody>
</table>

1. Hospital onset = isolate collected $\geq$ 3 days from admission, include resistant +/- intermediate as appropriate
2. Only one isolate / patient
NHSN Surveillance of Antimicrobial Use in Healthcare Settings

Status update

March 2013
Use of NHSN in Antimicrobial Stewardship: NHSN Antimicrobial Use Option

• Purpose
  – Assist hospitals in collecting data on antimicrobial use
  – Feedback rates to encourage appropriate prescribing

• Operations and analysis
  – For each location and hospital wide
  – Accepts only electronically captured administration records (eMAR/Barcode)
  – Risk adjusts usage patterns based on location types
    (similar to experience with HAI comparisons)

• NHSN ELC-eMAR initiative
  – Funded 4 health departments to implement (2012)
# Timeline for NHSN ELC-eMAR Initiative*

<table>
<thead>
<tr>
<th>Calendar Quarter</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd</td>
<td>NHSN enabled to receive AU data via CDA</td>
<td>ELC eMAR funding awards</td>
<td>No. reporting data: 7</td>
</tr>
<tr>
<td>3rd</td>
<td></td>
<td></td>
<td>No. facilities reporting data: 7</td>
</tr>
<tr>
<td>4th</td>
<td></td>
<td></td>
<td>No. facilities reporting data: 20</td>
</tr>
<tr>
<td>1st</td>
<td></td>
<td></td>
<td>No. facilities reporting data: 40</td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td>No. facilities reporting data: 70</td>
</tr>
<tr>
<td>3rd</td>
<td>Vendor Development</td>
<td>Validation Activities*</td>
<td>Facility Submission</td>
</tr>
</tbody>
</table>

*Validation protocol required in NHSN ELC-eMAR project., but promote use for all reporters
Example Use of Data for a Hospital (AU Analysis Output Options): Line List Rate Tables, by Location

<table>
<thead>
<tr>
<th>Summary Yr/Mon</th>
<th>Antimicrobial Category</th>
<th>Antimicrobial Class</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1000 Days Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>-- All --</td>
<td>90165</td>
<td>10000</td>
<td>9,016.500</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Aminoglycosides</td>
<td>438</td>
<td>10000</td>
<td>43.800</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Carbapenems</td>
<td>12</td>
<td>10000</td>
<td>1.200</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Cephalosporins</td>
<td>57</td>
<td>10000</td>
<td>5.700</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Fluoroquinolones</td>
<td>12</td>
<td>10000</td>
<td>1.200</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Folate pathway inhibitors</td>
<td>6</td>
<td>10000</td>
<td>0.600</td>
</tr>
</tbody>
</table>

*Data is for example only*
Antimicrobial Class-Specific Usage Rates and Standardized Utilization Ratios (SURs)

<table>
<thead>
<tr>
<th>Location</th>
<th>ABX Days</th>
<th>Observed</th>
<th>Predicted</th>
<th>SUR</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICU</td>
<td>4000</td>
<td>1000</td>
<td>4.0</td>
<td></td>
<td>Excessive</td>
</tr>
<tr>
<td>SICU</td>
<td>2000</td>
<td>2000</td>
<td>1.0</td>
<td></td>
<td>Consistent</td>
</tr>
<tr>
<td>Medical Ward</td>
<td>3000</td>
<td>4000</td>
<td>0.75</td>
<td></td>
<td>Lower Use</td>
</tr>
<tr>
<td>Surgical Ward</td>
<td>1000</td>
<td>3000</td>
<td>0.33</td>
<td></td>
<td>Much Lower</td>
</tr>
<tr>
<td>Hospital</td>
<td>170,250</td>
<td>171,000</td>
<td>0.99</td>
<td></td>
<td>Consistent</td>
</tr>
</tbody>
</table>

*Example Data Only:* SUR is a ratio of actual usage patterns compared to expected patterns given the patient population defined by the location (e.g., MICU, SICU, etc.)
## ELC-NHSN eMAR Initiative: Potential Scalability

<table>
<thead>
<tr>
<th>Participating Vendors</th>
<th>Number of Healthcare Systems*</th>
<th>Number of Facilities*</th>
<th>Vendor System Scalability*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asolva</td>
<td>1</td>
<td>9</td>
<td>Small</td>
</tr>
<tr>
<td>ICNet Systems</td>
<td>2</td>
<td>2</td>
<td>Medium</td>
</tr>
<tr>
<td>Theradoc</td>
<td>9</td>
<td>38</td>
<td>Large</td>
</tr>
<tr>
<td>Vigilanz</td>
<td>1</td>
<td>1</td>
<td>Medium</td>
</tr>
<tr>
<td>Homegrown</td>
<td>3</td>
<td>8</td>
<td>Small</td>
</tr>
<tr>
<td>Epic</td>
<td>-</td>
<td>-</td>
<td>Large (developing for release in 2014)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>16</strong></td>
<td><strong>58</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Subject to change; Feb 2013
Estimates in Acute care Facilities Utilizing eMAR Systems, by Year

NHSN Antimicrobial Use Option Summary

- First version (2011) is available
- Currently 16 hospitals, expanding to 40 by July 2013
  - Expect 70 by January 2014 reporting
    - 58 through ELC funding of health departments
    - 12 through voluntary efforts (Asolva)
- Limited metrics (days of therapy, by location)
- Indirect Standardization to risk adjust usage patterns
  - Standardized usage ratio (proposed); focus is on benchmarking
- No ability
  - To calculate “typical dose”
  - To directly sum grams used in all hospitals (just days of therapy)
- Largest obstacle includes facility IT staff availability