Healthcare Antibiotic Resistance Prevalence—DC (HARP-DC)

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Nothing to Disclose
CRE: A Growing Concern

• Common
• Resistant
• Deadly
• Spreading
Working Together is Vital!

Source: http://www.cdc.gov/vitalsigns/stop-spread/
Working Together is Vital for Washington D.C.!

- Metropolitan city that is not part of any state
- 6\textsuperscript{th} largest metropolitan statistical area in the U.S. with over 6 million residents
- All healthcare facilities clustered within 61 square miles
- Also receive patients from MD, VA and international visitors
- Competition for market share among facilities that also share patients
You Can’t Manage What You Don’t Measure

• Colonization among asymptomatic patients common

• Identified and unidentified colonized patients serve as reservoir for transmission

• Burden of CRE can only be determined through surveillance cultures

• D.C. does not mandate CRE reporting

• Healthcare facilities do not routinely conduct CRE surveillance
Study Design and Methods
Study Design

• Study team:
  – D.C. Department of Health
  – D.C. Department of Forensic Science – Public Health Lab
  – District of Columbia Hospital Association
  – OpGen Laboratories

• 16 participating healthcare facilities:
  – 8 short-term acute care (STAC)
  – 7 long-term care (LTC)
    • 2 long-term acute care (LTAC)
    • 5 skilled nursing facilities (SNF)
  – 1 inpatient rehabilitation facility (IRF)
Study Design

• Surveillance conducted over a 1 to 3 day interval for each facility between January 11, 2016 and April 14, 2016

• CDC 2015 CRE surveillance definition

• Peri-anal swab samples collected by facility-based volunteers

• Independent external review

• Verbal consent obtained
Study Design

• Exclusion criteria:
  – Psych or ob-gyn patients, inability to consent, or clinically inappropriate

• Patient based variables collected:
  – Age, sex, and zip code

• Unit location variables grouped as:
  – Critical care, step-down units, wards, inpatient rehabilitation, and long-term care (with SNF and LTAC combined)
HARP-DC Results
# HARP-DC Results Overview

<table>
<thead>
<tr>
<th></th>
<th>Target Population</th>
<th>Short-term Acute Care</th>
<th>Inpatient Rehabilitation</th>
<th>Long-term Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>2217 patients</strong></td>
<td><strong>1581</strong></td>
<td><strong>543</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Eligible</strong></td>
<td><strong>1042 (65.9%)</strong></td>
<td><strong>377 (69.4%)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Agree</strong></td>
<td><em><em>732</em> (70.2%)</em>*</td>
<td><strong>Agree 252† (66.8%)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Refuse</strong></td>
<td><strong>310 (29.8%)</strong></td>
<td><strong>Refuse 125 (33.2%)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>n CRE</strong></td>
<td><strong>36 (5.0%)</strong></td>
<td><strong>n CRE 17 (7%)</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Refuse</strong></td>
<td><strong>33 (38.8%)</strong></td>
<td><strong>Refuse</strong></td>
</tr>
</tbody>
</table>

* = 6 tests not performed
† = 8 tests not performed
# Results by Facility and Facility Type

<table>
<thead>
<tr>
<th>Patient Care Type</th>
<th>CRE (%)</th>
<th>Range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient Rehabilitation</td>
<td>0.0</td>
<td>--</td>
</tr>
<tr>
<td>Long Term Care</td>
<td>7.0</td>
<td>0.0-29.4</td>
</tr>
<tr>
<td>Short Term Acute Care</td>
<td>5.0</td>
<td>0.0-7.7</td>
</tr>
<tr>
<td>-- Critical Care</td>
<td>6.7</td>
<td>0.0-11.6</td>
</tr>
<tr>
<td>-- Step down</td>
<td>1.6</td>
<td>0.0-3.7</td>
</tr>
<tr>
<td>-- Ward</td>
<td>5.0</td>
<td>0.0-9.5</td>
</tr>
<tr>
<td>Total</td>
<td>5.2</td>
<td>0.0-29.4</td>
</tr>
</tbody>
</table>
CRE Prevalence by Age Group

<table>
<thead>
<tr>
<th>Age</th>
<th>Prevalence (%) with CRE</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>1.8</td>
<td>55</td>
</tr>
<tr>
<td>20-39</td>
<td>8.0</td>
<td>88</td>
</tr>
<tr>
<td>40-59</td>
<td>5.6</td>
<td>285</td>
</tr>
<tr>
<td>60-79</td>
<td>5.9</td>
<td>442</td>
</tr>
<tr>
<td>over 79</td>
<td>2.2</td>
<td>137</td>
</tr>
</tbody>
</table>
CRE Prevalence by Sex

Prevalence (% Resistance)

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>p=0.01</td>
<td>3.6</td>
<td>7.1</td>
</tr>
</tbody>
</table>

p=0.01
## CRE Identification by Detection Method

<table>
<thead>
<tr>
<th>Organisms Identified by ID-AST</th>
<th>Carbapenemase Genes</th>
<th>No Carbapenemase Detected (culture only)</th>
<th>Total (% of total CRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\text{bla}_{\text{KPC}}$</td>
<td>$\text{bla}_{\text{NDM}}$</td>
<td>$\text{bla}_{\text{OXA 48}}$</td>
</tr>
<tr>
<td><strong>Klebsiella pneumoniae</strong></td>
<td>16</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Enterobacter cloacae</strong></td>
<td>6</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Escherichia coli</strong></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Serratia marcescens</strong></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Citrobacter sp.</strong></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indeterminant</strong></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No growth (gene only)</strong></td>
<td>19</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total (% of total CRE)</strong></td>
<td>44 (83.0)</td>
<td>1 (1.9)</td>
<td>1 (1.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* One sample without growth was positive for both KPC and OXA 48. The total column corrects for the double count.
Distribution of Organisms

- **S. marcescens** (n=1, 3%)
- **C. amalonaticus** (n=1, 3%)
- **C. koseri** (n=1, 3%)
- **K. pneumoniae** (n=19, 56%)
- **E. cloacae** (n=7, 20%)
- **E. coli** (n=4, 12%)
- **Indeterminate** (n=1, 3%)
HARP-DC Conclusions
Strengths

• One of few studies to assess regional prevalence that aligns with CDC’s recommended collaborative approach
  – 4 facility types sampled
• Used surveillance cultures rather than clinical cultures
  – All participating ward types sampled, rather than selecting expected high prevalence areas
• Samples obtained from a single peri-anal source rather than multiple source-types
• All testing performed with a single molecular/culture method to allow for standardization across sites
Limitations

• Limited risk factor analysis
• Results de-identified
• Verbal consent challenges
• Selection of peri-anal site
  – Patient acceptability
  – Difficulty for patients who were obese, bed-bound, or in chair
• Variability in acceptance rate across facilities
Conclusions

• CRE is endemic in DC facilities, with an average prevalence of 5.2% and wide variation across facilities
• Importance of surveillance validated by genotypic profile tending to identify possible CRE transmission within and between facilities
• Inpatient healthcare facilities in DC successfully initiated a collaborative approach for further assessment and control efforts
• HARP-DC provides a model for other regions to collaborate on MDRO prevalence measurement
Thank you!
Projected Impact of Coordinated Approach