Genomic Epidemiology of Methicillin-Resistant Staphylococcus aureus (MRSA) DURING Incarceration at a Large Inner-City Jail

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Table. Epidemiologic Predictors of MRSA Acquisition During Incarceration

<table>
<thead>
<tr>
<th>Epidemiologic Factor</th>
<th>MRSA Acquisition (n=12)</th>
<th>No MRSA Acquisition (n=131)</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposures prior to incarceration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of Benzodiazepine use</td>
<td>5 (42%)</td>
<td>27 (21%)</td>
<td>2.75</td>
<td>0.81, 9.35</td>
<td>0.11</td>
</tr>
<tr>
<td>Methamphetamine use</td>
<td>3 (25%)</td>
<td>23 (18%)</td>
<td>1.57</td>
<td>0.39, 6.23</td>
<td>0.53</td>
</tr>
<tr>
<td>Injection drug use in past year</td>
<td>2 (17%)</td>
<td>13 (10%)</td>
<td>1.82</td>
<td>0.36, 9.2</td>
<td>0.47</td>
</tr>
<tr>
<td>Homeless or unstable housing</td>
<td>7 (58%)</td>
<td>62 (47%)</td>
<td>1.67</td>
<td>0.51, 5.48</td>
<td>0.4</td>
</tr>
<tr>
<td>HIV infection</td>
<td>9 (75%)</td>
<td>91 (69%)</td>
<td>1.32</td>
<td>0.34, 5.13</td>
<td>0.69</td>
</tr>
<tr>
<td>Taking antiretrovirals*</td>
<td>5 (33%)</td>
<td>59 (46%)</td>
<td>0.26</td>
<td>0.06, 1.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Exposures during incarceration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participating in drug treatment classes</td>
<td>4 (33%)</td>
<td>22 (17%)</td>
<td>2.48</td>
<td>0.69, 8.95</td>
<td>0.17</td>
</tr>
<tr>
<td>Sharing of personal items*</td>
<td>7 (58%)</td>
<td>29 (22%)</td>
<td>4.92</td>
<td>1.45, 16.67</td>
<td>0.01</td>
</tr>
<tr>
<td>Any skin infections during incarceration</td>
<td>1 (8%)</td>
<td>4 (3%)</td>
<td>2.89</td>
<td>0.3, 28.11</td>
<td>0.36</td>
</tr>
<tr>
<td>Visit to infirmary</td>
<td>4 (33%)</td>
<td>20 (15%)</td>
<td>2.77</td>
<td>0.76, 10.09</td>
<td>0.12</td>
</tr>
<tr>
<td>Number of times showered in the past week, mean (SD)</td>
<td>4.8 (1.8)</td>
<td>6 (2.7)</td>
<td>0.81</td>
<td>0.62, 1.07</td>
<td>0.13</td>
</tr>
</tbody>
</table>

*143 reached the Day 30 study visit. There were 100 HIV-infected patients that reached Day 30 Study Visit; 9 HIV-infected patients acquired MRSA and 91 did not

†Personal items shared by individuals who acquired MRSA included towel, toothpaste, uniform, and deodorant

Results

- 800 males enrolled (19% colonized with MRSA at intake)
- 12 MRSA acquisitions detected at Day 30 (Table)
- USA300 clinical isolates (mostly skin infections) may originate from transmission within the jail or perhaps be due to more virulent strains (Figure 1)
- Sequenced clinical USA300 isolates were more likely to be genetically similar to each other in comparison to intake USA300 MRSA strains (p<0.001) (Figure 2)
- 7/12 (58%) acquisition isolates were within 40 SNVs from another isolate that was sequenced (5 were similar to intake isolates and 2 were similar to clinical isolates)
- Acquisition strains from those sharing personal items (versus not) tended to have closer genetic relatedness (19 SNVs versus 56 SNVs, p=0.22)

Methods

- Study Setting: Cook County Jail in Chicago, IL which is one of the largest single-site jails in the US
- Males were enrolled within 72 hours of jail intake
- Surveillance cultures of the anterior nares, throat, and inguinal area were collected at entrance to the jail to determine the prevalence of MRSA colonization
- Surveillance cultures were repeated at Day 30 for those who remained incarcerated to determine the rate of MRSA acquisition during incarceration
- A survey was administered and chart review performed to identify predictors of MRSA acquisition
- Whole genome sequencing was performed with integration of epidemiologic data

Conclusions

- There is a high burden of MRSA entering the jail (19% colonized at intake)
- Genomic analysis of acquisition, intake, and clinical isolates suggests spread of incoming strains and possible networks of spread of prevalent MRSA strains during incarceration
- Sharing of personal items during incarceration is associated with MRSA acquisition and could be a focus of an intervention
- Future study of epidemiologic and location data may inform targeting of infection control interventions within the jail

References


***See poster 1229 and oral presentation number 159 for additional abstracts from this project

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