Correspondence

Doubtful Model Utility in Predicting High Vancomycin Minimum Inhibitory Concentration Methicillin-Resistant Staphylococcus aureus Bloodstream Infection Episodes

To the Editor—High vancomycin minimum inhibitory concentration (MIC) methicillin-resistant Staphylococcus aureus (MRSA) bloodstream infections (BSI) have increasingly been associated with increased treatment failure and mortality [1, 2]. Recent MRSA treatment guidelines support the need for alternative antibiotic therapy in clinically failing patients, especially if the vancomycin MIC is 2 μg/mL or greater [3]. The current evidence suggests that vancomycin Etest is the method of choice for determining susceptibility [4]. However, because it is a non-automated method, multiple laboratory issues arise. The ability to predict high vancomycin MIC episodes would circumvent some of these concerns. Therefore, we read with interest the prediction model proposed by Lubin and colleagues [5].

Unfortunately, when applied to 401 consecutive MRSA BSI episodes occurring at our hospital between 1997 and 2008 the performance of the model was inadequate (C statistic of 0.56; Table 1). This was despite using the same definitions including chronic liver disease. The overall prevalence of high Etest vancomycin MIC (≥2 μg/mL) episodes was 14% (55/401), lower than the 20% detected by Lubin, et al. Thus the expected negative predictive value as suggested by the authors should have increased rather decreased (by 4%) for a cutoff of ≥4.

A possible explanation, as noted by the authors, is the influence of the various circulating MRSA clones, especially community-acquired strains that have lower MICs [6]. All isolates were typed based on pulsed field gel electrophoresis (PFGE) patterns against fully characterized controls. The majority (78%) of isolates resembled ST239 with the remaining isolates similar to the common circulating community clones in Australia [7]. These included ST22 (10%), ST1 (4%), ST93 (2%), and ST30-like (2%); 12 (3%) isolates were unable to be classified by PFGE. Excluding the community clones did not improve the performance of the model (data not shown).

Variables used to construct the model were based on independent factors that predicted high MIC episodes in the multivariate analysis. These include age >50 years; vancomycin >48hrs in the previous week; history of MRSA bacteremia; chronic liver disease; and having a nontunneled central line. Unlike the results of Lubin et al, no significant differences in the clinical or patient demographic features were detected between episodes with high or low vancomycin Etest MIC on univariate analysis (data not shown) in our data set. An alternate explanation for the poor performance of the model in our institution is the different patient populations. In addition, it is likely that high MIC isolates reflect selection pressure, which would vary greatly between hospitals [8].

It is possible that the predictive model still has adequate utility in other settings. However, we would warn against adopting this model without prior local verification and validation. In addition, as noted, the proportion of circulating MRSA clones is in constant flux; thus regular verification would be required to ensure ongoing utility. For our institution, unfortunately, this predictive model is unlikely to be of benefit. In any case, the “gold standard” remains MIC testing. This would be supported by the recent Infectious Diseases Society

Table 1. Performance of the Predictive Rule by Score Cutoffs as Applied to 401 Consecutive Methicillin-Resistant Staphylococcus aureus Bloodstream Infection Episodes

<table>
<thead>
<tr>
<th>Score</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
<th>Percent of entire cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥8</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>86</td>
<td>0</td>
</tr>
<tr>
<td>≥7</td>
<td>2</td>
<td>99</td>
<td>25</td>
<td>86</td>
<td>1</td>
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<td>5</td>
<td>97</td>
<td>25</td>
<td>87</td>
<td>3</td>
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<tr>
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<td>24</td>
<td>88</td>
<td>24</td>
<td>88</td>
<td>13</td>
</tr>
<tr>
<td>≥4</td>
<td>29</td>
<td>77</td>
<td>17</td>
<td>87</td>
<td>24</td>
</tr>
<tr>
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<td>78</td>
<td>24</td>
<td>14</td>
<td>87</td>
<td>76</td>
</tr>
<tr>
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<td>21</td>
<td>15</td>
<td>91</td>
<td>80</td>
</tr>
<tr>
<td>≥1</td>
<td>95</td>
<td>16</td>
<td>15</td>
<td>95</td>
<td>100</td>
</tr>
</tbody>
</table>

The score is based on the presence of 5 variables: age >50 years (3 points); vancomycin >48 hours in the previous week (2 points); history of MRSA bacteremia (2 points); chronic liver disease (2 points); and presence of a nontunneled central venous catheter (1 point) [5].
of America MRSA treatment guidelines, which recommend nonautomated MIC testing based on clinical response [3].

Note

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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