Utility of Clinical Scoring Models in Predicting Community Acquired Urinary Tract Infections with Extended-Spectrum \(\beta\)-lactamase-Producing Enterococci

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Abstract

Background: The use of clinical scoring models in predicting infections with extended-spectrum \(\beta\)-lactamase (ESBL)-producing Enterococci can help select an adequate empiric treatment.

Methods: Retrospective case-control study of all patients with UTI, from January 2014 until December 2016. Cases were ESBL-producing isolates and controls were non-ESBL. Demographic information and variables were collected using the Patient Safety Data System.

Results: 171 cases and 294 controls were included. Table 1 shows the statistically significant variables associated with ESBL. Tumbarello’s model performs better in UTI and 100% for complicated UTI, while Duke’s model predicts most cases of cystitis and pyelonephritis and all cases of complicated UTI.

Table 1. Statistically significant results associated with ESBL infection in both models.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>(p) Value</th>
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<tbody>
<tr>
<td>Tumbarello</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Duke</td>
<td>0.001</td>
<td>0.001</td>
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</table>

Conclusion: Both clinical scoring models have high specificity and negative predictive value identifying best non-ESBL infections.

Discussion

Both clinical scoring models provided high diagnostic value and specificity with no difference in performance between each other using McNemar’s adjusted test. In the analysis per type of UTI, Tumbarello’s model tends to overestimate ESBL infections, with no statistical significance.

Results

- Sensitivities and specificities were performed at various cutoffs and area under the receiver operating curve (ROC AUC)
- Operating Characteristic curve analysis, sensitivity, specificity, positive and negative predictive values
- A total of 171 cases and 294 controls were included. Table 1 displays the statistically significant variables associated with ESBL. Table 2 classifies by type of UTI, shows the percentage of adequate initial treatment and the number of cases predicted by each model.

Table 2. Use of carbapenem or nitrofurantoin as empiric treatment and ESBL infection, predicted by each type of UTI.

- Carbapenem use in 31% of pyelonephritis and 41% of complicated UTI.
- The use of a clinical scoring model (Duke model) to predict ESBL infection could spare carbapenem use in 30% of pyelonephritis and 41% of complicated UTI.

Conclusions

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- Clinical scoring models have high specificity and negative predictive value identifying best non-ESBL infections.
- The use of clinical scoring models (Duke model) can help spare carbapenem for community-acquired pyelonephritis and complicated UTI.

References