A clinical prediction model did well in diagnosing pediatric group A \( \beta \)-hemolytic streptococcal pharyngitis


**Question**
In children with suspected group A \( \beta \)-hemolytic streptococcal (GABHS) pharyngitis, how well does a prediction model predict a positive throat culture?

**Design**
1-year validation of a previously derived prediction model.

**Setting**
Pediatric emergency department and 2 pediatric outpatient clinics in Wilmington, Delaware, USA.

**Patients**
587 children (mean age 6.8 y, 51% girls) who had signs and symptoms of acute pharyngitis. Exclusion criteria were antibiotic therapy within 5 days of enrollment.

**Description of Prediction Guide**
During the clinical evaluation, the examining physician recorded 4 variables from the tested model: cervical lymphadenopathy, tonsillar swelling (2-category severity scale: absent or mild and moderate or severe), coryza, and scarlatiniform rash (present or absent). 2 tonsillopharyngeal specimens were collected for each patient for serotyping (diagnostic standard) and a rapid streptococcal antigen detection test. Furthermore, the physician made a subjective probability estimate for a GABHS-positive throat culture result (11-point scale: 0 = most unlikely and 10 = extremely likely).

**Main Outcome Measures**
A performance score was calculated for the prediction model ranging from 0 to 5, with higher scores indicating more severe presentation of the clinical feature. Sensitivity, specificity, likelihood ratios, and post-test probability were calculated for cutoff points of the performance score.

**Main Results**
218 children (37%) had positive culture results for GABHS. The prediction model did better than the physicians' probability estimates and was comparable to the rapid antigen detection test (Table). The model did not differ in performance according to setting (emergency department vs outpatient clinic) or study period (in season [January to March] vs off season [April to December]).

**Conclusion**
In children with suspected group A \( \beta \)-hemolytic streptococcal pharyngitis, a clinical prediction model predicted a positive throat culture as well as a rapid antigen detection test and better than subjective estimation by physicians.

**Source of funding:** Nemours Research Programs.

For correspondence: Dr. M.W. Attia, Department of Pediatrics, Alfred I. duPont Hospital for Children, 1600 Rockland Road, Wilmington, DE 19803, USA. E-mail mattia@nemours.org.

**Validation at 1 year of a prediction model for diagnosing pediatric group A \( \beta \)-hemolytic streptococcal pharyngitis**

<table>
<thead>
<tr>
<th>Assessment tool</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (CI)</th>
<th>+LR</th>
<th>−LR</th>
<th>PP (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective score 6 to 10</td>
<td>75% (68 to 80)</td>
<td>56% (51 to 62)</td>
<td>1.7</td>
<td>0.5</td>
<td>0.52 (0.5 to 0.6)</td>
</tr>
<tr>
<td>Score ≥ 4</td>
<td>17% (13 to 27)</td>
<td>98% (94 to 99)</td>
<td>0.9</td>
<td>0.8</td>
<td>0.79 (0.6 to 0.9)</td>
</tr>
<tr>
<td>Score 1 to 3</td>
<td>81% (75 to 86)</td>
<td>7% (5 to 10)</td>
<td>0.9</td>
<td>2.5</td>
<td>0.36 (0.3 to 0.4)</td>
</tr>
<tr>
<td>Score 0</td>
<td>99% (96 to 100)</td>
<td>5% (3 to 7)</td>
<td>1.0</td>
<td>0.2</td>
<td>0.12 (0.02 to 0.3)</td>
</tr>
</tbody>
</table>

*Abbreviations and diagnostic terms defined in Glossary.

†Higher scores of the prediction model equal more severe presentation of the clinical feature.

**Commentary**
The study by Attia and colleagues shows that clinicians are not good at estimating the presence of GABHS pharyngitis in symptomatic children (only about 50% of those subjectively estimated as being "strep positive" had a positive GABHS throat culture result). The simple predictive model described here is much more accurate (post-test probability of 79%) and almost as good as a rapid antigen test (post-test probability of 85%). Such results should encourage us to use the model for deciding on management: It is easy to use, quick, and cheaper than the rapid antigen test. Furthermore, the physician made a subjective probability estimate for a GABHS-positive throat culture result (11-point scale: 0 = most unlikely and 10 = extremely likely).

But let us step back a moment. Why is accurate diagnosis of streptococcal sore throat and its differentiation from other causes of sore throat important? It enables us to treat "strep throat" with antibiotics to prevent acute rheumatic fever (ARF), acute glomerulonephritis, and suppurtive complications and to shorten the illness or decrease its severity. But in many areas, ARF is so rare that treating it might create as much risk from the antibiotics as there is from the disease. And the symptomatic benefits of antibiotics are modest (2) that alternative, nonantibiotic treatment (3) may be as good if not better.

Perhaps we should think carefully about what we intend to do once we diagnose GABHS before worrying too much about how to diagnose it. Only in clinical settings where ARF is common (e.g., developing countries) (4) or in patients with special concerns for symptomatic relief, should we concern ourselves with deciding the cause. After all, sore throats get better spontaneously.

**References**