Dividing Infectious Diseases

Using the antibiotic intensity score to evaluate antibiotic use in hospitalized patients with community-acquired pneumonia (CAP) with known versus unknown etiology

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ABSTRACT

Introduction: In CAP patients with an identified pathogen, broad-spectrum antibiotic therapy should narrow to a pathogen-directed therapy. This leads to less antibiotic exposure when compared to patients with CAP of unknown etiology. Less exposure may decrease the risk of toxicity and collateral damage. The antibiotic intensity score combines the number of days of each antibiotic with the antibiotic spectrum to calculate a score that defuses antibiotic exposure.

The objective of this study was to use the antibiotic intensity score to define patients with CAP of known etiology are exposed to fewer antibiotics compared to patients with unknown etiology.

Methods: This was a secondary data analysis of the Community-Acquired Pneumonia Organization (CAPO) International Cohort Study database. The intensity score was calculated as the sum of the number of days of each antibiotic multiplied by the antibiotic spectrum. The spectrum was translated into numeric values from 1 to 9 with increasing spectrum.

Results: A total of 772 patients were included in the study, 401 with an unknown etiology and 371 with a known etiology. The median antibiotic intensity score (IQR) was 60 (54) for those with a known etiology, and 55 (48) for those with an unknown etiology (P<0.33).

Study definition

Diagnosis of CAP required the presence of criteria A, B, and C:

1. New pulmonary infiltrate on imaging (CT scan or chest x-ray) at the time of admission to the hospital.
2. Signs and Symptoms of CAP (at least one of the following):
   - New or increased cough (per the patient)
   - Fever >37.8°C (100.0°F) or hypothermia <35.6°C (96.0°F).
3. Changes in WBC (leukocytosis ≥11,000 cells/mm³, left shift >10% band forms/microliter, or leukopenia ≤4,000 cells/mm³).

Working diagnosis of CAP at the time of hospital admission with antimicrobial therapy given within 24 hours of admission.

Antibiotic intensity score

The antibiotic intensity score was calculated as the sum of the number of days of each antibiotic multiplied by the antibiotic spectrum. The spectrum was translated into numeric values from 1 to 9 with increasing spectrum, 1 having the narrowest and 9 having the broadest spectrum (Table 3).

Study groups

Patients were classified in two groups:

1. Known etiology: If a pathogen was identified in any microbiological test performed upon admission to the hospital.
2. Unknown etiology: If no pathogen was identified in any microbiological test.

Table 3: Antibiotic intensity score: antibiotic spectrum value

<table>
<thead>
<tr>
<th>Low score (1-3)</th>
<th>Intermediate score (4-6)</th>
<th>High score (7-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1 point: Penicillin</td>
<td>• 4 points: Gentamicin</td>
<td>• 7 points: Cefoxitin</td>
</tr>
<tr>
<td>• 2 points: Aminoglycosides</td>
<td>• 5 points: Ciprofloxacin</td>
<td>• 9 points: Meropenem</td>
</tr>
<tr>
<td>• 3 points: Third-generation cephalosporins</td>
<td>• 6 points: Levofloxacin</td>
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</tr>
</tbody>
</table>

RESULTS

- A total of 772 patients were included in the study, 401 with an unknown etiology and 371 with a known etiology.
- The antibiotic score for both study groups is shown in Figure 1. The median antibiotic intensity score was 60 (54) for those with a known etiology, and 55 (48) for those with an unknown etiology (P=0.33).

CONCLUSIONS

- This study indicates that there is not a significant difference in antibiotic exposure for patients with CAP when a pathogen is identified or not.
- Our data suggests that current clinical practice is to manage patients with broad-spectrum antibiotics without performing pathogen-directed therapy once an etiology of CAP has been identified. The relevance of this data identifies an important point in our evidence-based practice medicine, regarding the management of pneumonia, which increases the need to implement programs at the national level that will improve the collateral damage and poor outcomes in our patient population.

REFERENCES


2. Quantifying Antibiotic Collateral Damage: The Antibiotic Intensity Score Daniel R. Curran MD, Timothy Wiemken MPH, CIC, Robert R. Kelley PhD M.S.S., Khan, PhD Paula Peyrani MD, Julio Ramirez MD, Division of Infectious Diseases, University of Louisville, Louisville, KY