Effective Antimicrobial Stewardship Strategies (ARIES): Cluster-randomized trial of a clinical decision support system to supplement antibiotic prospective review and feedback

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Introduction

Prospective review and feedback (PRF) of antibiotic prescriptions is a tenet of antimicrobial stewardship (ASP), but labour intensive. Clinical Decision Support Systems (CDSS) have the potential to automate some of this work. We hypothesised that prescriber engagement with the CDSS would reduce the requirement for PRF by the ASP team and improve prescribing behaviour without causing harm.

Methods

A parallel-group, 1:1 block-cluster randomized, cross-over study was conducted in 32 medical and surgical wards from Mar 2017 to Aug 2017. Participants in Arm A were allocated to voluntary use of CDSS by the clinician at first prescription of piperacillin-tazobactam or a carbapenem, while in Arm B, CDSS use was compulsory. PRF continued for both arms. The primary outcome was 30 day mortality. Cox-proportional hazards models were used to calculate the risk of various outcomes. All tests were done at a 5% significance level.

Results

Table 2a and 2b, Summary of recommendations in patients who received voluntary or compulsory CDSS.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Arm A: Voluntary CDSS (n=641) (%)</th>
<th>Arm B: Compulsory CDSS (n=616) (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received PRF rec’d</td>
<td>416 (64.9%)</td>
<td>442 (71.8%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Received CDSS rec’d</td>
<td>587 (91.6%)</td>
<td>625 (97.5%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Received both CDSS/PRF rec’d</td>
<td>420 (68.2%)</td>
<td>558 (89.9%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Excluded (n=2803)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1. Assessed for eligibility (n=4060)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Included in other trials (n=4)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Excluded as recruitment target reached for arm A (n=77)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. No CDSS entry due to system error in arm B (n=33)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Renal dose module only accessed in arm B (n=27)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Antibiotic not served (n=6)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Included in other trials (n=4)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Below 21 years old (n=1)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1a and 1b, Summary of characteristics of patients who received voluntary or compulsory CDSS.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Arm A: Voluntary CDSS (n=641) (%)</th>
<th>Arm B: Compulsory CDSS (n=616) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age years, median, IQR</td>
<td>74, 45-93</td>
<td>76, 48-93</td>
</tr>
<tr>
<td>Male</td>
<td>376 (58.7%)</td>
<td>333 (54.1%)</td>
</tr>
<tr>
<td>Medical discipline</td>
<td>538 (83.9%)</td>
<td>515 (83.6%)</td>
</tr>
<tr>
<td>Charlson’s, median, IQR</td>
<td>7, 2-13</td>
<td>7, 2-13</td>
</tr>
<tr>
<td>APACHE II, median, IQR</td>
<td>15, 6-28</td>
<td>16, 6-28</td>
</tr>
</tbody>
</table>

Conclusions

Compulsory use of a CDSS at antibiotic prescription did not reduce the requirement for PRF and appropriateness of prescribing was similar. However, it provided more recommendations and limited the duration of antibiotic courses, without compromising clinical outcomes.

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