Angiotensin converting enzyme inhibitors prescribing pattern for different indications: a population based study

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Introduction: Angiotensin converting enzyme inhibitors (ACE-inhibitors) are one of the most frequently prescribed groups of medications which are commonly used in the treatment of hypertension, heart failure, myocardial infarction and renal disease. A substantial number of patients discontinue therapy with ACE-inhibitors. 

Objectives: To investigate whether the pattern of ACE-inhibitors use differ between indications in terms of persistence rate, continuation, discontinuation and switching.

Methods: Design & setting: descriptive population-based cohort study in the Clinical Practice Research Datalink (CPRD) which contains the data of almost 12 million subjects in the UK collected by general practitioners. 

Study population: A cohort of patients older than 45 years who started ACE-inhibitor treatment between 2007 and 2014 were selected within the CPRD.

Follow up: Patients were followed until the end of the study period which was January 1st 2014, or the censor date which was the date a patient died or moved outside of the catchment area (loss of follow-up), whichever came first.

Indications: Indications for ACE-inhibitor treatment were retrieved from the medical records any time before or maximum one year after the first ACE-inhibitor prescription.

Medical records:
- a) Persistent group:
  - 1) Hypertension
  - 2) Heart failure
  - 3) Myocardial infarction (MI)
  - 4) Renal disease
  - 5) More than one above
  - 6) Non of the above
- b) Non-persistent group:
  - 1) Stop group
  - 2) Switch group to alternative medication
  - 3) Restart group

Data analyses: 5-year persistence rates and the time to discontinuation among the different indications were calculated and compared using the Kaplan-Meier method and the log-rank test.

Results: Study population: 276,977 ACE-inhibitor starters were included in this study (Table 1).

In total: 36.4% discontinued ACE therapy, 50% of them switch to an alternative medication and more than 60% of all switches were to ARBs (Table 3).

By indication: MI lowest 23.6% and renal failure highest 45.1% probability to discontinue. (Table 2)

Within discontinuers: hypertension highest 53.9% and renal failure lowest 36.0% probability to switch.

Restart: No considerable differences

Within switchers: MI highest 80.5% and hypertension lowest 58.7% probability to switch to ARBs.

Conclusion: Although ACE-inhibitors are usually initiated for life long treatment, a high percentage of ACE-inhibitor starters will stop or switch their therapy. The highest risk of discontinuation or switching in renal disease patients and heart failure patients.

Figure 1. Comparing the non-persistence rates of ACE-inhibitors use between different indications.

<table>
<thead>
<tr>
<th>Indication</th>
<th>5-year persistence rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI</td>
<td>68.9%</td>
</tr>
<tr>
<td>Heart failure</td>
<td>59.8%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>57.2%</td>
</tr>
<tr>
<td>None of the mentioned indication</td>
<td>54.8%</td>
</tr>
<tr>
<td>More than one indication</td>
<td>53.7%</td>
</tr>
<tr>
<td>Renal failure</td>
<td>44.1%</td>
</tr>
</tbody>
</table>

Table 1. General characteristics of included patients stratified for different indications (N=276,977 patients).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All</th>
<th>Hypertension</th>
<th>Myocardial infarction</th>
<th>Heart failure</th>
<th>Renal failure</th>
<th>More than one indication</th>
<th>None of the mentioned indications</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of death</td>
<td>24.8%</td>
<td>4.3%</td>
<td>8.2%</td>
<td>14.4%</td>
<td>16.6%</td>
<td>8.1%</td>
<td>7.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 2. Percentage of non-persistence ACE-inhibitor users stratified by indication

Table 3. Pattern of ACE-inhibitor use for the total population

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