Prescribing patterns for asthma by general practitioners in six European countries

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To assess the level of concordance with international consensus on asthma management, we compared primary care prescribing patterns for asthma in different European countries.

A prospective study of prescription items with an associated diagnostic label of asthma in patient consultations with a total of 235 general practitioners (GPs) from Belgium, England, Ireland, Italy, Northern Ireland, Portugal, Scotland and Spain was performed. A total of 101,544 consecutive consultations were recorded in autumns 1994 and 1995 of which 3595 (3.5%) were for patients with asthma and 3243 (3.2%) were for patients receiving a prescription for asthma.

Overall, asthma consultations varied from 1.8% in Italy to 5.8% in Ireland (mean 3.4%, SD 1.6). Prescribed inhaled medications for children varied from 72% of the total asthma prescriptions in Ireland and Portugal to 82% in Northern Ireland (mean 79%, SD 8.1) and for adults 55% in Italy to 85% in Spain (mean 70%, SD 10). Inhaled corticosteroid usage for adults varied from 14% in Italy to 31% in Northern Ireland (mean 24%, SD 6.4). For children, \( \beta_2 \)-agonist use varied from 24% in Italy to 67% in Spain (mean 45%, SD 13).

Despite publication of international guidelines for the management of asthma, inter-country prescribing practices vary considerably and could be improved. The frequency of use of asthma as a diagnostic label also varies markedly.

**Key words:** asthma; prescribing patterns; drug utilization; primary care; Europe.

**Introduction**

High levels of asthma morbidity and mortality have been shown in many countries (1–8). National prevalences of asthma symptoms in children have been found to vary widely from 1.6% in Indonesia to 36.8% in the U.K. (9). Under-treatment has been acknowledged as a problem in several European countries (10–16) and beyond (7,17–19). Despite under-diagnosis and under-treatment, the requirement for prescriptions in asthma care is massive—in the U.K. about 7% of all National Health Service (NHS) prescriptions are for asthma (20). The total annual cost of asthma in the U.K. in 1990 was estimated to be between 322 and 686 million pounds (21), 20–25% of the direct costs being due to hospitalization.

Following international consensus on asthma management (22), it is reasonable to hope that prescribing in the community should be in line with recognized guidelines to optimize asthma treatment. This study aimed to compare prescribing patterns for asthma in different western European countries by gathering prospectively details of diagnoses made and drug items prescribed in the practices of general practitioners (GPs) over two distinct time periods in the mid 1990s.

**Patients and methods**

This research emerged from a 3-year BIOMED-funded study to investigate the effect of a consensus-based European Formulary (EF) for general practice, together with an educational intervention promoting the rational prescribing of specific drug groups, namely antibiotics and non-steroidal anti-inflammatory drugs (NSAIDs) (23,24). The study used a multi-national, prospective randomized controlled methodology. After an international conference in 1987, a group of approximately 50 members from 17 European countries compiled a draft European Formulary to cover the majority of conditions presenting in general practice.

Ethical permission for this study was not required since patients’ medical care was not being adversely affected and the intervention only involved the doctors concerned.
STUDY SUBJECTS

The subjects were patients with asthma consulting with and receiving prescribed medication from GPs within six European countries, namely Belgium, Ireland, Italy, Portugal, Spain and the U.K. (consisting of three participating centres: England; Northern Ireland and Scotland). Of the eight centres, each had an active member on the EF development group who acted as a national co-ordinator under the central guidance of a research team in Newcastle, U.K.

STUDY DESIGN

The research was a prospective study of prescription items with an associated diagnostic label of asthma in patient consultations with GPs.

METHODS

Each co-ordinator recruited up to 40 volunteer GPs in their countries prior to being randomly allocated to either a study group, which received the EF and an associated educational programme focusing on antibiotic and NSAID prescribing or to a control group, receiving neither. Participating doctors were asked to record data for two periods, the first time period was in the autumn of 1994 and the second time period in the autumn of 1995. The GPs who were part of the study group received the educational intervention prior to the second time period.

Information was requested from consecutive face-to-face consultations, until a total of 200 resulting in a prescription had been reached. Variables included: patient age, patient gender, patient diagnosis(es), drug name, single entity or combination preparation and the category/origin of the script. The doctors were asked to record a diagnosis for every drug prescribed.

Completed data sets (translated where necessary) were sent to Newcastle for manual coding and data entry. The drug coding frame was based on the British Read Codes Classification system (25) and additional drug entities were added in appropriate therapeutic sections as coding progressed. The diagnosis coding frame consisted of the diagnoses covered by the Formulary and subsequent non-Formulary diagnoses. The latter were added after consultation with the ninth revision of the International Classification of Diseases (26). Asthma was covered by the EF but since the educational intervention did not focus on this area, all the asthma consultation data before and after the intervention were considered together. No time trends between the two periods were found in terms of concordance with the EF so the whole data set is considered together.

ANALYSIS

Outcome measures examined by country include: percentage of asthma diagnoses, inhaled medication use, patterns of inhaled corticosteroids, patterns of \( \beta_2 \)-agonist bronchodilators and other prescriptions for asthma. Data are presented for children (15 years and under) and separately for adults (16 years and over). Statistical analysis used the SPSS 7.0 statistical analysis package (27). Descriptive statistics are presented with comparisons between countries using analysis of variance.

Results

The data set as a whole comprised 101,544 consultations from 235 doctors, ranging from 10 doctors in Belgium to 40 doctors in Italy and Scotland. The mean number of doctors per country was 27. Overall, asthma was the sixth most common diagnosis, accounting for 3.5% of the total number of consultations in general practice. The frequency of asthma consultations (Table 1) in each country varied from 1.8% in Italy to 5.8% in Ireland (mean 3.4%, SD 1.6). Using the number of patient consultations as a proxy for the number of patients seen (it was clearly possible for a single patient to be seen on more than one occasion), the percentage of treated asthma patients on inhaled corticosteroids for all ages combined (Table 1) varied from 23% in Italy to 48% in Spain (mean 37%, SD 9.9). The proportion of total items prescribed in children 0–15 years which prescribed items for asthma represent (Table 2), varied from 3.2% in Portugal to 17% in Ireland and Northern Ireland (mean 10%, SD 5.5) and in adults 16 years and above this varied from 1.8% in Portugal to 5.3% in Ireland (mean 3.1%, SD 1.3).

CHILDREN

Prescribed inhaled medications varied from 72% of all prescribed items for asthma in Ireland and Portugal to 82% in Northern Ireland (mean 79%, SD 8.1) (Table 3). Inhaled corticosteroid usage varied from 12% in Portugal to 34% in Northern Ireland (mean 22%, SD 8.0). Use of individual corticosteroids also varied widely; Spain used no beclomethasone, instead using budesonide in 28% of asthma prescriptions. Northern Ireland used fluticasone in 4.5%—more than three times the frequency in any other country. In all other countries beclomethasone was predominantly the steroid of choice accounting for 15% of all asthma prescriptions. \( \beta_2 \)-agonist use (long- and short-acting combined) varied from 24% of all prescribed items for asthma in Italy to 67% in Spain for children (mean 45%, SD 13).

Combination drug items accounted for less than 1.3% of asthma prescriptions for children. Cromoglicate use alone varied from 0% in Spain to 7.3% in Italy (mean 3.6%, SD 2.7). Methylxanthine use varied from none in England to 8.8% in Ireland (mean 3.8%, SD 3.0). Antibiotic prescribing in children at consultations for asthma varied from none in Spain and Portugal to 7.3% in Belgium (mean 2.9%, SD 2.5).

ADULTS

Prescribed inhaled medications varied from 55% in Italy to 85% in Spain (mean 70%, SD 10) (Table 4). Inhaled corticosteroid usage varied from 14% in Italy to 31% in
Spain used beclomethasone in 6% of asthma prescriptions but budesonide in 22% and Northern Ireland used beclomethasone in 16% but budesonide in 13%. In all other countries beclomethasone was again predominantly the steroid of choice, accounting for 17% of asthma prescriptions overall.

### TABLE 1. Overall number of participating GPs and patient consultations, number and percentage of patient consultations for asthma, proportion of asthma patients receiving treatment for their condition and percentage of (treated) patients receiving inhaled corticosteroids

<table>
<thead>
<tr>
<th>Country</th>
<th>No. GPs</th>
<th>No of patient consultations</th>
<th>Total No (%) patient consultations for asthma</th>
<th>Mean % (SEM) asthma patients with a prescription for asthma</th>
<th>% of treated asthma patients receiving inhaled corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>10</td>
<td>3829</td>
<td>89 (2.3)*</td>
<td>100 (–)*</td>
<td>46</td>
</tr>
<tr>
<td>England</td>
<td>27</td>
<td>14 629</td>
<td>622 (4.2)</td>
<td>8 (1-6)</td>
<td>40</td>
</tr>
<tr>
<td>Ireland</td>
<td>35</td>
<td>16 508</td>
<td>965 (5.8)</td>
<td>94 (1-4)</td>
<td>31</td>
</tr>
<tr>
<td>Italy</td>
<td>40</td>
<td>17 741</td>
<td>324 (1.8)</td>
<td>94 (2.7)</td>
<td>23</td>
</tr>
<tr>
<td>N. Ireland</td>
<td>13</td>
<td>6809</td>
<td>351 (5.2)</td>
<td>87 (2.2)</td>
<td>47</td>
</tr>
<tr>
<td>Portugal</td>
<td>39</td>
<td>10 674</td>
<td>204 (1.9)</td>
<td>98 (1-0)</td>
<td>30</td>
</tr>
<tr>
<td>Scotland</td>
<td>40</td>
<td>20 980</td>
<td>811 (3.9)</td>
<td>84 (2.0)</td>
<td>27</td>
</tr>
<tr>
<td>Spain</td>
<td>31</td>
<td>10 374</td>
<td>229 (2.2)</td>
<td>98 (0-7)</td>
<td>48²</td>
</tr>
<tr>
<td><strong>ANOVA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P &lt; 0.0001</td>
<td>P &lt; 0.0001</td>
</tr>
</tbody>
</table>

¹Some GPs fell short of recording consecutive face to face consultations until 200 had resulted in a prescription.
²Belgium data was excluded from this analysis as it did not include consultations where a prescription was not given.
³In Spain the formulation of budesonide was unclear, it was assumed to be inhaled.

### TABLE 2. Number of items prescribed for asthma per country and the percentage of the total items prescribed

<table>
<thead>
<tr>
<th>Country</th>
<th>Belgium</th>
<th>England</th>
<th>Ireland</th>
<th>Italy</th>
<th>N. Ireland</th>
<th>Portugal</th>
<th>Scotland</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed items for asthma in children 0–15 years (% of total items prescribed)</td>
<td>41 (3.8)</td>
<td>273 (11)</td>
<td>568 (17)</td>
<td>41 (6-1)</td>
<td>223 (17)</td>
<td>52 (3.2)</td>
<td>322 (11)</td>
<td>18 (14)</td>
</tr>
<tr>
<td>Prescribed items for asthma in adults 16 years and above (% of total items prescribed)</td>
<td>161 (2.6)</td>
<td>534 (4.2)</td>
<td>923 (5.3)</td>
<td>430 (1.9)</td>
<td>217 (3.5)</td>
<td>346 (1.8)</td>
<td>646 (3.5)</td>
<td>364 (2)</td>
</tr>
</tbody>
</table>

### TABLE 3. Asthma prescribing by drug group in terms of the number of items prescribed per country in children 0–15 years

<table>
<thead>
<tr>
<th>Drug Group</th>
<th>Belgium</th>
<th>England</th>
<th>Ireland</th>
<th>Italy</th>
<th>N. Ireland</th>
<th>Portugal</th>
<th>Scotland</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. prescribed items for asthma</td>
<td>41</td>
<td>273</td>
<td>568</td>
<td>41</td>
<td>223</td>
<td>52</td>
<td>322</td>
<td>18</td>
</tr>
<tr>
<td>Short acting $\beta_2$-agonists</td>
<td>12</td>
<td>139</td>
<td>286</td>
<td>10</td>
<td>105</td>
<td>19</td>
<td>147</td>
<td>10</td>
</tr>
<tr>
<td>Long acting $\beta_2$-agonists</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Inhaled corticosteroids</td>
<td>6</td>
<td>68</td>
<td>73</td>
<td>8</td>
<td>76</td>
<td>6</td>
<td>86</td>
<td>5</td>
</tr>
<tr>
<td>Oral corticosteroids</td>
<td>1</td>
<td>27</td>
<td>66</td>
<td>2</td>
<td>17</td>
<td>2</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>Cromoglycate and related therapy</td>
<td>5</td>
<td>2</td>
<td>43</td>
<td>14</td>
<td>4</td>
<td>12</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Antimuscarinics</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Methylxanthines</td>
<td>2</td>
<td>0</td>
<td>50</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>3</td>
<td>8</td>
<td>27</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Asthma appliances</td>
<td>0</td>
<td>20</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>All other drugs prescribed for asthma</td>
<td>5</td>
<td>1</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Northern Ireland (mean 24%, sd 6.4). Spain used beclomethasone in 6% of asthma prescriptions but budesonide in 22% and Northern Ireland used beclomethasone in 16% but budesonide in 13%. In all other countries beclomethasone was again predominantly the steroid of choice, accounting for 17% of asthma prescriptions overall. $\beta_2$-agonist use (long- and short-acting combined) varied from 27% in Belgium to 48% in Spain (mean 40%, sd 7.0).
For adults, combination drug items accounted for less than 6.4% of prescription items for asthma. Methylxanthine use varied from 0.8% in England to 23% in Italy (mean 10.2%, SD 9.0). Antibiotic prescribing for adults varied from 0.6% in Portugal to 5.0% in Scotland (mean 2.9%, SD 1.3).

Discussion

Despite international consensus on asthma management (22), patterns of asthma prescribing in general practice vary considerably, as does the frequency of asthma diagnosis. If prescribing were more in concordance with published guidelines (28,29), one would expect more consistent asthma treatment, minimal antibiotic use and no prescribing of drugs of limited clinical value. The variation in proportions of patients with asthma suggests that there may well be differences in the labelling of asthma as indicated by other studies (12,15,30,31).

Some cautions should be considered in interpreting these data. Firstly is the volunteer nature of the participating GPs. Co-ordinators were asked to recruit up to 40 such doctors as it was not deemed possible to obtain a random sample in each of the participating countries. Despite the data recording task, there was no financial incentive to encourage the GPs to participate. However, any potential bias occurring as a consequence of recruiting more enthusiastic GPs would have tended to produce artificially good results and so the levels of drug utilization found would be likely to reflect more informed rather than average use, thus underestimating the variations that exist.

Secondly, the information on diagnoses and drugs prescribed was only collectable at the time of the consultation and so we were unable to check the quality of the data collated. Other difficulties were introduced as a result of this, including, for example, that the doctors’ record sheets were not always legible. Some of the apparently more bizarre drugs prescribed for asthma may in fact have reflected co-morbid prescribing, thus creating an artificial link with a diagnosis of asthma.

Thirdly, another important confounder is the difference in organization of general practice in the various countries and the difference in distribution of asthma patients between the primary and secondary care sector, which make it difficult to compare the patient populations in the various countries.

Lastly, in the calculation of the percentage of patients receiving inhaled corticosteroids (Table 1)—a potential quality marker—the number of treated asthma patients was used in order to enable comparison with the Belgian data. In addition, presenting the ratio between prescribed $\beta_2$-agonists compared with the country’s total percentage for inhaled drugs would not have been an entirely accurate measure as a small proportion of $\beta_2$-agonists may have been oral formulations.

The results detailed are not easily comparable with other published studies as the drug and morbidity data presented are solely based on consecutive face-to-face consultations with GPs. There was a highly significant difference in the mean percentage of patients consulting GPs with asthma between countries. Despite the variation in the number of participating GPs between the countries (Table 1), similar trends of high prevalence in the U.K. and Ireland and low in the Mediterranean countries have been reported (9,31,32). Different studies have varying methods of data collection, sample sizes and age groups, with some studies relying only on GP and patient recall and/or questionnaires. Whilst this study avoided these sources of bias, we recognize that there remains a problem with GP-labelled asthma diagnosis in all such studies. We acknowledge that variations in labelling may have varying effects on prescribing patterns but our study did not permit examination of this.

The levels of inhaled drug use appear to be high in all the countries for children. In adults, there appears to be a
much greater variation in inhaled drug use between countries, with high levels in the U.K. centres and low levels in the other countries. There was a low prevalence of inhaled steroids (both for children and adults) in Italy with a high prevalence in the U.K., which is consistent with data reported in the ECRHS (32). Inhaled bronchodilator use is also broadly similar between our study and the ECRHS.

For antibacterial drugs, higher levels were found to be prescribed for children in Belgium and Ireland and for adults in Scotland followed by Italy. Antibacterial drug prescribing for asthma is considered to be irrational (33). Higher levels of ‘all other drugs prescribed for asthma’ (largely consisting of drugs of limited clinical value: cough suppressants; expectorants; mucolytics; sympathomimetic decongestants) were seen in Belgium, Italy and Portugal and may also be perceived as indicators of inappropriate prescribing.

Overall, prescribing trends for adults, particularly in Belgium, Italy and the U.K. centres appear to be similar to the ECRHS results in the majority of these drug group areas.

The therapeutic management of asthma should now be relatively straightforward, although many challenges remain in its organizational management, especially in the long-term. However, it is known that the mere publication of guidelines, whether disease-specific or as formularies to guide prescribing, does not revolutionize therapeutics in the community (34). U.K. evidence on the actual management of a large number of asthma attacks in primary care after the publication of guidelines showed marked deficiencies (35). For instance, antibiotics were prescribed by GPs in 32% of attacks (35).

The considerable variation in most aspects of asthma prescribing between the countries sampled in this study suggests that there is still much room for improvement. If our results could be corroborated on a larger scale, coordinated efforts to improve asthma care across Europe would appear to be necessary.

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References


