Variations in asthma treatment in five European countries—judgement analysis of case simulations

Rolf Wahlström, Eva Hummers-Pradier, Cecilia Stålsby Lundborg, Maria Muskova, Per Lagerløv, Petra Denig, Thimothy Oke, D Mark Chaput de Saintonge and the Drug Education Project group


Objective. The aim of this study was to explore and compare treatment decisions and the influence of specific patient characteristics on asthma management in five European countries, and to relate this to existing guidelines.

Methods. Using the technique of clinical judgement analysis, doctors in The Netherlands, Norway, Germany, Sweden and the Slovak Republic (40–100 doctors per country) were presented with sets of written simulated cases on asthma treatment. Patient characteristics were varied to determine their influence on the doctors’ decisions. Decisions indicating over- and under-prescribing in relation to a gold standard derived from guidelines were also determined.

Results. Doctors in The Netherlands prescribed more oral steroid courses and fewer antibiotics than doctors in Norway and Sweden, whereas doctors in Germany and the Slovak Republic prescribed the least oral steroids and the most antibiotics. Partially, this variation could be explained by differences in the underlying propensity to prescribe, but differences in the use of patient characteristics also contributed to the variation. Norwegian doctors were most inclined to increase the maintenance treatment of inhaled corticosteroids, which could best be explained by their relatively high focus on the patient’s peak expiratory flow value. Compared with the gold standard, there was 25–56% under-prescribing of oral steroids, and 21–45% over-prescribing of antibiotics.

Conclusions. The variation in treatment of asthma patients between doctors in different countries may, in part, be attributed to variations in the underlying propensity to prescribe, and in part to different use of clinical patient characteristics. These findings can be used in tailoring educational programmes to improve treatment practices.

Keywords. Asthma, case simulations, clinical judgement analysis, decision making, drug use.

Introduction

International guidelines for the management of asthma promote step-wise introduction of anti-inflammatory therapy. Oral corticosteroids are recommended during severe exacerbations. Routine treatment with antibiotics should be avoided. However, there is evidence that both inhaled and oral corticosteroids are underused, and that antibiotics are over-prescribed. Better understanding of the reasons should provide important information for tailoring continuing medical education (CME) aiming at improving prescribing quality.

Physicians choose between drug treatment alternatives by taking account of perceived—rather than evidence-based—efficiency, personal experience, expected adverse
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These ‘treatment characteristics’ account for some of the variation in decisions, but much usually remains unexplained. Although situational factors, varying in different health care settings, can influence treatment decisions,7 patient characteristics are proposed to be of primary relevance when understanding clinical decision making.8

Clinical judgement analysis (CJA) has been advocated to reveal the determinants of clinical decisions in both individuals and groups of doctors.9,10 This approach uses written case simulations to control the many confounding factors present in real patient records and consultations. CJA has been widely used to investigate and compare diagnosis setting and prescribing among doctors.11–15

This study is part of the Drug Education Project (DEP), in which a model for an educational intervention to improve prescribing for asthma patients in general practice was developed and tested in five countries.16 Within this project, baseline observations showed significant differences in the proportions of asthmatic patients on treatment with inhaled corticosteroids.17 An interview study conducted in four of the countries also showed differences between the doctors’ views of asthma management.18

The aim of the study was to identify patient characteristics that can explain observed variations in treatment decisions, and to assess deviations from guidelines on drug therapy of asthma in general practice in five European countries. CJA was used to estimate the policy used by the doctors in each country when making treatment decisions on case simulations. Comparisons were made between GPs in The Netherlands, Norway, Germany and Sweden, and lung specialists/allergologists in the Slovak Republic.

Methods

Study population and design

The physicians participating in this study were all enrolled in the DEP. In Sweden and The Netherlands, pre-existing groups of GPs were recruited, while in Norway and Germany GPs were recruited as individuals. In the Slovak Republic, GPs do not treat asthma independently, and therefore lung specialists/allergologists at out-patient departments were recruited individually for the study. In all countries, all eligible groups or individual doctors in a pre-defined geographical area had been invited to participate. Half of the doctors were randomized to take part in educational sessions on the treatment of asthma. As part of the DEP study,16 these doctors (Table 1) were asked to give their treatment decisions for two sets of case simulations.19

Development of cases

Patient characteristics likely to influence a GP’s decision to prescribe were identified by the research group (six GPs, one internist/clinical pharmacologist and four pharmacists) in collaboration with asthma experts (one allergologist, four lung physicians and three GPs), and these characteristics were varied in two sets of cases: (i) treatment of an exacerbation with a short course of an oral steroid and/or an antibiotic; and (ii) adjustment of suboptimal maintenance treatment. In each case, five characteristics were varied on two or three levels (see Appendix 1 for details). A few patient characteristics were kept constant. For the case set on treatment of an exacerbation, the doctors were asked two questions: (i) would you prescribe a short oral steroid course for this patient (yes/no); and (ii) would you prescribe an antibiotic (yes/no). For the case set on maintenance treatment, the doctors were asked whether they would increase the treatment with inhaled steroids (yes/no).

The cases were first constructed in English, translated into the respective languages and then back-translated. All case material was tested in pilot studies in the various countries. In The Netherlands, Norway, Germany and the Slovak Republic, the cases were orthogonal sets of 18 case variations, selected randomly from the possible cases. In Sweden, sets of 26 case variations were used, which had also been orthogonally derived and randomly selected, but where a few cases that were interpreted as unrealistic by the investigators were discarded. The main reason for the different sets of case simulations was that Sweden was the first country to implement the intervention, and one conclusion was that fewer cases should

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics of the participating doctors and response rates to case simulations</th>
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<tbody>
<tr>
<td></td>
<td>The Netherlands</td>
</tr>
<tr>
<td>Participants</td>
<td>90</td>
</tr>
<tr>
<td>Percentage of those invited</td>
<td>25</td>
</tr>
<tr>
<td>Percentage women</td>
<td>11</td>
</tr>
<tr>
<td>Percentage vocationally trained</td>
<td>100</td>
</tr>
<tr>
<td>Solo practices</td>
<td>53</td>
</tr>
<tr>
<td>Respondents (%)</td>
<td>79 (88%)</td>
</tr>
</tbody>
</table>
be used in the other countries. The different sets of cases have implications when comparing treatment decisions, but not for comparison of the modelled policies.

The GPs were encouraged to make treatment decisions for each case in the same way as they would do in real practice, and not to aim at giving what they might regard as the ‘best’ answer according to standards or recommendations. The cases were either sent to the participants by post (The Netherlands, Norway and Germany) and returned by the same route, or presented at a preparatory meeting (the Slovak Republic and Sweden), and returned directly.

Data analysis
For each case simulation, the decisions of all GPs of a country were pooled case-wise, thus obtaining the proportion of ‘yes’ answers. This proportion was used as dependent (outcome) variable. The independent (predictor) variables, i.e. the various patient characteristics, were scored on ordinal scales. The scoring had one step for each cue level, and the highest score always meant a more serious condition within the cue domain, thus making the policy analysis more consistent. Multiple linear regression analysis was used to identify the influence of patient characteristics (cues) on the doctors’ judgements in each country and to generate a model of the ‘national’ policy.20 The fit of each model was tested with an F-test. In the case of a good fit ($P < 0.05$), the significance of the coefficient of each independent variable was tested using the $t$-test. The standardized estimate of each coefficient gives the extent to which the corresponding patient characteristic contributes to a change in the decision studied. The adjusted $R$-square of each fitted model gives the proportion of variance explained by the policy model.

The treatment decisions could only be compared directly between the countries that had exactly the same sets of cases. In such a case, one way analysis of variance (ANOVA) was performed, with ‘country’ as an independent variable to test for any difference in the percentages of ‘yes’ answers. The Bonferroni correction was used to account for the multiple comparison scheme from the same sample, and exact $P$-values of the corresponding $F$-tests are reported in the case of significance.

To allow for a comparison between countries with differing data sets (Sweden for both case sets, and the Slovak Republic for the case set on treatment of an exacerbation), a number of predicted judgements were calculated by applying the aggregated national decision policy of the specific country to the patient data set used by the other countries. Differences in the predicted judgements were taken as evidence that the policies were different. Predicted judgements were also generated to provide supporting evidence for hypotheses explaining the observed differences between national prescribing rates. In such cases, either coefficients or intercepts from the regression equations of dissimilar policies were substituted to estimate their contribution to the difference between policies. For all these comparisons between pairs of countries, we used the pair-wise $t$-test for independent samples, with a significance level of 0.01.

In order to compare the observed decisions with the guidelines, a management standard was developed by the research team. This ‘gold standard’ was derived directly from the recommendations in the guidelines and was applied to the cases (see Appendix 2). Thus, for each case simulation in the case sets, an optimal decision was derived. For case 1, 14 of the case simulations should be treated with an oral steroid, six with an antibiotic (of which five also with an oral steroid) and three should not get any drugs at all. For the set of cases used in Sweden, the corresponding figures were 20, nine (seven) and four. For case 2, eight of the cases should be recommended a higher dose of inhaled steroids, and three were optional. In Sweden, the medication should be increased for 12, and two were optional. The mean proportion of these gold standard decisions for each case was compared with the mean proportion of treatment decisions for each country, and the deviation estimated. Furthermore, for each case simulation, we determined the number of decisions in each country that differed from the gold standard decision, which was recorded as either over- or under-prescribing (depending on the gold standard). The percentage of over-prescribing thus shows the number of decisions to prescribe in relation to the number of case simulations where this is not recommended by the gold standard, and vice versa for under-prescribing.

The study was approved by ethics committees in the respective countries.

Results
The characteristics of the participating doctors and the response rates are shown in Table 1. The response rates were relatively high (77–100%) in all countries, except Germany (36%). Within countries, there were differences in the prescribing rates between doctors for both sets of case simulations. These differences were, however, of the same magnitude in all five countries, thus not invalidating comparisons between countries.

Treatment of exacerbations
Prescribing an oral steroid course. The frequencies of decisions to prescribe an oral steroid course show that Dutch GPs prescribed an oral steroid course for two-thirds of the simulated ‘patients’, while Norwegian and Swedish GPs decided on a prescription for about half of the cases (Table 2). The German and Slovakian doctors offered this treatment opportunity to slightly more than one-third of the patient cases. The decisions of the German doctors differ significantly from those of The Netherlands, Norway and Sweden; The Netherlands
from Norway, the Slovak Republic and Sweden; Norway from the Slovak Republic and Sweden; and the Slovak Republic from Sweden. When performing the ANOVA on the data from The Netherlands, Norway and Germany, a significant difference was detected among the means ($F = 5.2; P < 0.009$). The post hoc test showed that there was a significant difference between The Netherlands and Germany ($P < 0.007$).

The policies derived from the doctors’ judgements show that the intercepts for the regression equations, which represent the underlying propensity to prescribe, differ between the five countries (Table 2). The extent to which this propensity contributes to the observed differences in treatment decisions can be estimated by adjusting the regression equations for the differences in the intercepts. Performing these calculations, the differences in treatment decisions between the doctors in Germany on the one side, and the doctors in Sweden and Norway on the other side, disappear, while the other differences remain.

In Germany, the Slovak Republic and Sweden, only two of the cues have significantly influenced the doctors’ decisions, while three cues were used by the Norwegian doctors and four cues by the Dutch doctors. The relative influence of each cue also differed between the countries (Table 2).

All countries showed a lower mean prescribing than the gold standard (Table 2), varying from 11 (The Netherlands) to 43% (Germany). The under-prescribing varied between 25 and 56%, lowest in The Netherlands and highest in Germany and the Slovak Republic.

**Prescribing of antibiotics.** Dutch GPs’ decisions to prescribe an antibiotic were for about one-third of the cases, while the Norwegian and Swedish doctors decided on a prescription for slightly less than half of the cases, and the Slovakian and German doctors for slightly more (Table 3). In their decisions, the GPs in The Netherlands are significantly different from Norway, Germany, the Slovak Republic and Sweden, while Norwegian doctors differ from Germany and the Slovak Republic. When performing the ANOVA on the data from The Netherlands, Norway and Germany, no significant difference was detected among the means.

The prescribing policies show that the intercept terms are somewhat different between the countries (Table 3). However, when the intercepts were adjusted, all the significant differences in treatment decisions disappeared, apart from the difference between Norway and the Slovak Republic.

For all countries, body temperature was by far the most influential cue, and for the Slovak Republic this

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**Table 2** Influence of patient characteristics (cues) on the decisions to prescribe an oral steroid course for case simulations of an asthmatic man with an exacerbation, and relationship to gold standard decisions

<table>
<thead>
<tr>
<th></th>
<th>The Netherlands</th>
<th>Norway</th>
<th>Germany</th>
<th>Slovakia</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of GPs</td>
<td>79</td>
<td>77</td>
<td>20</td>
<td>40</td>
<td>98</td>
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<tr>
<td>Mean proportion of decisions to prescribe an oral steroid course</td>
<td>0.669</td>
<td>0.500</td>
<td>0.350</td>
<td>0.372</td>
<td>0.557</td>
</tr>
<tr>
<td>Cues (standardized coefficient estimates)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.28</td>
<td>0.15</td>
<td>n.s.</td>
<td>n.s</td>
<td>n.s.</td>
</tr>
<tr>
<td>Asthma symptoms</td>
<td>0.68</td>
<td>0.43</td>
<td>0.87</td>
<td>0.21</td>
<td>0.62</td>
</tr>
<tr>
<td>Other symptoms</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Body temperature</td>
<td>0.18</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>PEF level</td>
<td>0.63</td>
<td>0.86</td>
<td>0.40</td>
<td>0.95</td>
<td>0.55</td>
</tr>
<tr>
<td>Intercept of regression equation</td>
<td>$-0.557$</td>
<td>$-0.631$</td>
<td>$-0.650$</td>
<td>$-0.422$</td>
<td>$-0.509$</td>
</tr>
<tr>
<td>Adjusted $R$-square</td>
<td>0.96</td>
<td>0.94</td>
<td>0.93</td>
<td>0.93</td>
<td>0.91</td>
</tr>
<tr>
<td>Mean proportion of gold standard decisions to prescribe an oral steroid course</td>
<td>0.778</td>
<td>0.778</td>
<td>0.778</td>
<td>0.778</td>
<td>0.769</td>
</tr>
<tr>
<td>Deviation from gold standard decisions$^b$</td>
<td>$-0.109$</td>
<td>$-0.278$</td>
<td>$-0.428$</td>
<td>$-0.406$</td>
<td>$-0.212$</td>
</tr>
<tr>
<td>Proportion of decisions indicating under-prescribing$^c$</td>
<td>0.247</td>
<td>0.378</td>
<td>0.564</td>
<td>0.536</td>
<td>0.314</td>
</tr>
<tr>
<td>Proportion of decisions indicating over-prescribing$^d$</td>
<td>0.310</td>
<td>0.062</td>
<td>0.100</td>
<td>0.030</td>
<td>0.233</td>
</tr>
</tbody>
</table>

n.s., not significant as predictor at the 5% level.

$^a$ See text for significance testing of differences between countries.

$^b$ Difference between the mean proportion of decisions to prescribe an oral steroid course for each country, and the gold standard.

$^c$ Number of decisions not to prescribe/number of cases where the gold standard recommends prescribing.

$^d$ Number of decisions to prescribe/number of cases where the gold standard does not recommend prescribing.
was the only cue to affect the decisions (Table 3). In the four other countries, both asthma symptoms and other symptoms such as cough and phlegm were also taken into account; in The Netherlands and Norway, the peak expiratory flow (PEF) levels were also taken into account to some extent.

The mean prescribing rate in The Netherlands was close to the gold standard (Table 3), but all other countries showed a higher mean prescribing rate than the guidelines, varying from 12% (Sweden) to 22% (Germany and the Slovak Republic). The rate of over-prescribing varied between 21% (The Netherlands) and 45% (the Slovak Republic).

**Maintenance treatment**

**Optimal treatment with inhaled corticosteroids.** In four of the countries, the doctors’ decisions to increase the maintenance treatment with inhaled corticosteroids were made for close to half of the cases (47–49%), whereas the Norwegian doctors did this for 58% of the cases (Table 4). The GPs in Norway were significantly different from those of The Netherlands, Germany and Sweden. When performing the ANOVA on the data from The Netherlands, Norway, Germany and the Slovak Republic, no significant difference was detected among the means.

Looking at the policies (Table 4), the major difference between Norway and the other countries appears to be the high reliance on PEF. If the Norwegian value for this regression weight is substituted in the regression equations of the other countries, the differences disappear.

All cues, except age, affect the policies for doctors in all countries, except Sweden where the use of β2 agonists does not appear to influence the decisions (Table 4). However, there is considerable variation between countries in the doctors’ use of symptoms and reported PEF levels.

In all countries, the proportion of decisions to increase treatment with inhaled corticosteroids are close to, or slightly above, the lower end of the gold standard range (Table 4).

**Discussion**

The study showed significant differences between the doctors in the five countries in their treatment decisions and policies for similar cases. Doctors in The Netherlands prescribed more oral steroid courses and fewer antibiotics than doctors in Norway and Sweden, whereas doctors in Germany and the Slovak Republic prescribed the least oral steroids and the most antibiotics. Norwegian doctors were most inclined to increase the maintenance treatment of inhaled corticosteroids. Compared with guidelines, there was clinically important under-prescribing of oral steroids and over-prescribing.
of antibiotics. The significance levels of the differences regarding comparisons of decisions should be interpreted with some caution as testing with ANOVA and Bonferroni correction gave different results for some of the comparisons.

A possible explanation for part of the differences in prescribing rates of an oral corticosteroid in cases of exacerbation between doctors in Germany on the one hand, and Sweden and Norway on the other hand, could lie in their underlying propensity to prescribe steroids. The German doctors’ lower rate of prescribing decisions may be attributable to a higher tendency to withhold steroids than is prevalent among the Swedish and Norwegian GPs. Other differences may be attributable to variation in policies. All the national guidelines for treatment of exacerbations of asthma recommend taking asthma symptoms and PEF levels into account. These cues affected the policies of all participating countries, but other less relevant cues were also of importance for doctors in some of the countries.

Although the lower tendency for the Slovakian doctors to prescribe an oral steroid course cannot be fully explained by their policies, the higher relative influence of PEF levels and the lower relative influence of asthma symptoms can play a role. The different set of case simulations might also contribute. It does, however, accord with our observation that, generally, the Slovakian doctors seem to have a lower level of agreement with the international guidelines.\textsuperscript{17} It should be noted that the Slovakian guidelines had not been distributed to all doctors at the time of our study. The policies of the German doctors are quite different, and this could have been anticipated from their lower level of agreement with national guidelines found elsewhere, in particular a lower emphasis on PEF values.\textsuperscript{18}

Regarding prescribing of an antibiotic in cases of an exacerbation, the guidelines recommend careful consideration of signs of bacterial infection before deciding on treatment. Symptoms such as cough and phlegm cannot be equated automatically with a bacterial infection. However, high fever for several days would be one recommended predictor, but four of the countries have a policy including several cues, although with clear emphasis on body temperature. The Slovakian doctors, on the other hand, show a completely different pattern by having only body temperature as a significant cue. As their prescribing is the highest, in particular the rate of over-prescribing, this can only be explained by a lower cut-off point than the gold standard, which only takes the highest cue level into account. The Dutch doctors show the lowest tendency to prescribe an antibiotic and also the lowest rate of over-prescribing. However, when the effect of their intercept term was adjusted for, the differences from the other countries disappeared. The analysis has thus shown that, apart from Norway and the Slovak Republic, whatever the apparent differences in the policies, the observed differences in prescribing could be explained on the basis of differences in the underlying propensity to prescribe antibiotics.

The greater willingness to increase the treatment of inhaled corticosteroids among the Norwegian doctors can be explained by their higher emphasis on PEF levels

| TABLE 4 | Influence of patient characteristics (cues) on the decision to increase treatment with inhaled corticosteroids for case simulations of an asthmatic woman on maintenance treatment, and relationship to gold standard decisions\textsuperscript{a} |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
|                             | The Netherlands | Norway | Germany | Slovakia | Sweden |
| No. of GPs                  | 79              | 77     | 20      | 40        | 98      |
| Mean proportion of decisions to increase treatment with inhaled corticosteroids | 0.495 | 0.584 | 0.474 | 0.481 | 0.489 |

Cues (standardized coefficient estimates)

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</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Use of β\textsubscript{2}-agonist</td>
<td>0.40</td>
<td>0.36</td>
<td>0.36</td>
<td>0.43</td>
<td>n.s.</td>
</tr>
<tr>
<td>Level of inhaled steroid</td>
<td>−0.67</td>
<td>−0.59</td>
<td>−0.73</td>
<td>−0.58</td>
<td>−0.86</td>
</tr>
<tr>
<td>Symptoms</td>
<td>0.42</td>
<td>0.36</td>
<td>0.39</td>
<td>0.48</td>
<td>0.24</td>
</tr>
<tr>
<td>PEF level at home</td>
<td>0.39</td>
<td>0.55</td>
<td>0.32</td>
<td>0.42</td>
<td>0.19</td>
</tr>
<tr>
<td>Intercept of regression equation</td>
<td>0.104</td>
<td>0.131</td>
<td>0.164</td>
<td>−0.130</td>
<td>0.733</td>
</tr>
<tr>
<td>Adjusted R\textsuperscript{-}square</td>
<td>0.92</td>
<td>0.87</td>
<td>0.89</td>
<td>0.90</td>
<td>0.85</td>
</tr>
<tr>
<td>Mean proportion of gold standard decisions to increase treatment with inhaled corticosteroids (range)\textsuperscript{b}</td>
<td>0.500–0.611</td>
<td>0.500–0.611</td>
<td>0.500–0.611</td>
<td>0.500–0.611</td>
<td>0.462–0.538</td>
</tr>
<tr>
<td>Deviation from gold standard decisions\textsuperscript{c}</td>
<td>−0.005</td>
<td>+0.084</td>
<td>−0.026</td>
<td>−0.019</td>
<td>+0.027</td>
</tr>
</tbody>
</table>

n.s., not significant as predictor at the 5% level.

\textsuperscript{a} See text for significance testing of differences between countries.

\textsuperscript{b} The range indicates that the guidelines do not clearly indicate one single choice for all case simulations.

\textsuperscript{c} Difference between the mean proportion of decisions to increase the treatment with inhaled corticosteroids for each country, and the gold standard (measured from the lowest level of the interval).
at home. The Swedish doctors show a different policy model, taking mostly the level of ongoing treatment with inhaled steroids into account. This is also in line with a greater emphasis on maintenance treatment elicited in the interview study. 18

The doctors’ decisions were less congruent with the gold standard decisions for the case of treatment of an exacerbation than for increasing suboptimal treatment of inhaled steroids. This is in line with our previously reported findings regarding the doctors’ knowledge, attitudes and views about these two aspects of asthma management. 17,18

The relatively high rates of under-prescribing of oral corticosteroids (25–56%) and over-prescribing of antibiotics (21–45%) are of definite clinical importance, if the same occurs in real practice. These findings indicate a need to address this part of asthma management in tailoring CME activities.

Case simulations have been used to compare GPs’ decisions in a standardized situation. 14,21 Although these methods have met with some criticism, 22,23 there is evidence that they elicit lifelike judgements. 24,25 Participants of this study were a particularly motivated group, willing to take part in a new interactive educational programme. These doctors might be somewhat more interested and involved in keeping up to date in comparison with their colleagues. There were between-country differences among the participating GPs, particularly with regard to frequency of solo practices and gender, which represent typical differences in general practice settings between the countries.

The total response rate for Germany was particularly low. Only limited general conclusions should be drawn from such a small number. It should also be noted that the differences shown between doctors in the five countries only relate to the doctors participating in the study. Any more definite generalization regarding the level of treatment decisions must be extremely cautious due to the voluntary recruitment of participants. Another partial limitation of our study is that, as we pooled decisions on the cases to develop a national model, the policies of the individual doctor may be quite different.

In summary, some general policy models for optimal therapeutic decisions could be identified, and in some of the cases the differences in decisions on treatment could be explained either by different utilization of information cues on patient characteristics or by variations in the underlying propensity to prescribe. Unexplained differences could be due to the fact that the doctors’ decisions are influenced at different thresholds of the information cues. This means that for cues with three levels, the doctor’s decision can be influenced by the information on either the second or third level, 26 but the decision will still be the same.

There are only a few published studies looking at propensity to prescribe antibiotics, 27,28 but not particularly for asthma cases. A comparison of sales of antibiotics in the countries in the European Union showed that The Netherlands had the lowest total sales, followed by Denmark, Sweden and Germany. 27 Expressed as daily defined doses per 1000 inhabitants, the figures for these countries were 8.9, 11.3, 13.5 and 13.6, respectively. We have not found any other studies comparing the use of inhaled or oral corticosteroids.

One conclusion of our study is that in order to harmonize the management of asthma with existing guidelines, influencing doctors’ underlying propensities to prescribe may be as important as increasing the attention paid to important patient characteristics. However, both kinds of information are useful for designing educational interventions.

Acknowledgements

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References


Variations in asthma treatment in five European countries

Appendix 1

Asthma case set I

Your patient is a man with asthma. Otherwise he is healthy. He normally treats himself with an inhalation corticosteroid and a β2-agonist as needed. He does not smoke.

He comes to see you today for a semi-emergency visit. He explains that his asthma symptoms have gradually worsened over the last week. He has increased his daily dose of inhalation corticosteroid to 1600 mg and inhaled from his β2-agonist more than twice daily.

A. Age
1) 22–27 years
2) 42–47 years

B. Current symptoms
1) Slight difficulties breathing. Physical activity not obviously affected. Moderate amount of rhonchi on auscultation.
2) Obvious physical limitation due to respiratory problems with auxiliary breathing and wheezing. Prolonged expirium and high amount of rhonchi on auscultation.

C. Other symptoms
1) No cough or phlegm.
2) Cough.
3) Cough and phlegm.

D. Body temperature
1) Afebrile.
2) Fever for 2 days.
3) Fever for more than 3 days.

E. PEF measurement after inhalation of five times
1) 90% of normal value.
2) 55% of normal value.
3) 70% of normal value.

Question 1. Would you prescribe a short-term, high-dose treatment with an oral corticosteroid for this patient? No/Yes

Question 2. Would you prescribe an antibiotic for this patient? No/Yes
Asthma case set 2
Your patient is a woman with asthma. Otherwise she is healthy. Today she visits your practice to renew her prescription. She normally treats herself with an inhalation corticosteroid twice daily and a short-acting β2-agonist as needed. Her asthma is not triggered by any allergic reaction. She has demonstrated good inhalation technique and she regularly measures her PEF values at home. She does not smoke.

A. Age
1) 22–27 years
2) 42–47 years

B. Current use of the β2-agonist
1) On demand, maximum 2 days per week.
2) Several times a week, almost daily.
3) Daily (including nights), often more than twice.

C. Treatment level with inhaled corticosteroids
1) Low (300–400 mg/day).
2) Medium (600–800 mg/day).
3) High (1200–1600 mg/day).

D. Symptoms lately
1) Mild symptoms, not daily.
2) Mild symptoms daily (coughing/wheezing/shortness of breath), sometimes at night.
3) Moderate symptoms daily (coughing/wheezing/shortness of breath), sometimes coughing/wheezing at night or early morning. Some physical limitations.

E. PEF at home
1) 90–100% of individual maximum level.
   Daytime variation less than 10%.
2) 70–80% of individual maximum level.
   Daytime variation about 10%.
3) 70–80% of individual maximum level.
   Daytime variation ~30%.

Question. Would you make any change in the treatment with inhaled corticosteroids? No/Yes
Increase? No/Yes
Decrease? No/Yes

Appendix 2

‘Gold standard’ management

Decision rules for ‘Yes’ answers

Case set 1
Question 1. Would you prescribe a short-term, high-dose treatment with an oral corticosteroid for this patient?
Decision rule: B2 a/o E2 a/o E3
Question 2. Would you prescribe an antibiotic for this patient?
Decision rule: D3

Case set 2
Question 2. Would you increase the treatment with inhaled corticosteroids?
Decision rules:
Always C1 or C2
In addition B3 a/o D3 a/o E3; or (B2 + D2 + E2)

For the combinations of C1 or C2 with (B2 + D2) or (B2 + E2) or (D2 + E2), we regarded the recommendations as optional and therefore accepted a decision both to increase the treatment and to maintain the same level of treatment with inhaled corticosteroids to be in line with the guidelines.