ORIGINAL RESEARCH

The value of self-report assessment of adherence, rhinitis and smoking in relation to asthma control

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Abstract

Aims: To explore the utility of self-report measures of inhaled corticosteroid (ICS) adherence, degree of rhinitis and smoking status and their association with asthma control.

Methods: Patients prescribed ICS for asthma at 85 UK practices were sent validated questionnaire measures of control (Asthma Control Questionnaire; ACQ) and adherence (Medication Adherence Report Scale), a two-item measure of smoking status, and a single-item measure of rhinitis.

Results: Complete anonymised questionnaires were available for 3916 participants. Poor asthma control (ACQ $\geq$1.5) was associated with reported rhinitis (OR = 4.62; 95% CI: 3.71-5.77), smoking (OR = 4.33; 95% CI: 3.58-5.23) and low adherence to ICS (OR = 1.35; 95% CI: 1.18-1.55). The degree of rhinitis was important, with those reporting severe rhinitis exhibiting the worst asthma control, followed by those reporting mild rhinitis and then those reporting no rhinitis symptoms (F(2, 3913)=128.7, p<.001). There was a relationship between the number of cigarettes smoked each day and asthma control (F(5,655)=6.08, p<.001).

Conclusions: Poor asthma control is associated with self-reported rhinitis, smoking and low medication adherence. These potentially modifiable predictors of poor asthma control can be identified through a brief self-report questionnaire, used routinely as part of an asthma review.

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Introduction

The aim of asthma management is to achieve and maintain control of asthma – characterised by minimal or no symptoms, no emergency visits to physicians or hospitals, minimal need for reliever medications, no limitations on normal activities, nearly normal lung function, and minimal or no side-effects from medication.[1,2] Large, multi-national, population-based studies suggest, however, that a minority of adults with asthma achieve good control,[3-5] with one recent European study reporting that only 15% of adults prescribed inhaled corticosteroids (ICS) have completely controlled symptoms.[6] The cost of poor control is high, both in terms of the patient's quality of life[7,8] and demand on healthcare resources.[9-12] It is therefore important to identify

current asthma control and address modifiable determinants of poor control where it exists.

The International Primary Care Respiratory Group (IPCRG) has suggested an approach to asthma control based on establishing control and identifying clinical and behavioural factors associated with poor control.[13] Clinical factors include medication triggers (e.g. aspirin, beta-blockers)[14-16] and co-morbid conditions such as allergic rhinitis[17,18] and obesity.[19,20] Behavioural factors include non-adherence,[21,22] poor inhaler technique[20,23,24] and smoking.[25-28]

If modifiable determinants of poor control can be identified in routine practice, they can be addressed in order to improve asthma control. The aim of this study therefore

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was to assess the association of simple self-report measures of adherence, rhinitis and smoking with asthma control.

Methods

Design and sample

This was a cross-sectional survey of asthma patients participating in a questionnaire-based audit of asthma control in 85 UK general practices. The practices were selected to be representative of UK general practice. They were situated across England (n=67), Wales (n=9), Scotland (n=5) and Northern Ireland (n=4).

Procedure

The general practices identified from their practice computer systems all those patients prescribed asthma treatment at Step 2 and above who were eligible for a questionnaire-based review of their asthma control. Inclusion criteria were adults (over 18 years of age) who were prescribed ICS for physician-diagnosed asthma. These patients were sent a questionnaire by their GP, with a stamped addressed envelope for its return. Routine clinical and demographic data were downloaded from the practice database (e.g. age, gender, prescribed medications). Ethics approval for analysis of the anonymised audit data was obtained from the Optimum Patient Care (OPC) Research Ethics Committee (reference 0004).

Measures

Patients were sent the Minimum Asthma Assessment Tool (MAAT[29]), a brief (two sides of A4) set of questionnaires developed from validated measures to identify patients with poor asthma control and potentially modifiable causes of poor control. This included:

i) The Asthma Control Questionnaire™ (ACQ)[30]: a validated six-item questionnaire to assess asthma control over the past week. Items address: a) how frequently the patient was woken by their asthma; b) how bad their symptoms were when they woke up; c) how limited they were in their activities; d) how much shortness of breath they had; e) how much of the time they wheezed; and f) the average number of puffs of short-acting bronchodilator they used each day. Patients respond to each item on a 7-point scale (0-6) and a mean score is calculated. Patients with a mean score of ≥ 1.5 are considered to have poorly controlled asthma.[31]

ii) The Medication Adherence Report Scale (MARS). This short self-report measure of adherence has demonstrated good psychometric qualities in a range of illness groups, including asthma.[32] Five items assess how participants use their preventer inhaler (e.g. "I forget to take my preventer inhaler", "I take my preventer inhaler less than instructed") on a five point Likert-type scale: "always"; "often"; "sometimes"; "rarely"; or "never". Those that report always or often engaging in one or more of the

non-adherent behaviours are classified as low adherers.

iii) A single-item self-report measure of rhinitis and its impact was derived from the ARIA[33] and IPCRG definition of rhinitis[34]: "Do you have any of these symptoms: itchy, runny, blocked nose or sneezing when you don't have a cold?" Patients were provided with five response options: "no"; "occasionally and little bother"; "occasionally but quite a bother"; "most days but little bother"; "most days and a lot of bother". Patients were classified as having severe rhinitis ("occasionally but quite a bother", "most days and a lot of bother"), mild rhinitis ("occasionally and little bother" and "most days but little bother") or no rhinitis ("no").

iv) A two-item self-report measure of smoking status was used: "Do you smoke?" ("Yes – current smoker", "ex-smoker" or "never") and "How many cigarettes do you smoke per day?" (for current smokers). In addition, those who reported that they were current smokers were asked to indicate whether they would be willing to attend smoking cessation advice sessions ("yes"/"no").

Statistical analysis

All analyses were conducted using SPSS 12. There were three phases to the statistical analysis plan:

1) Descriptive statistics (means, frequencies) were used to explore sample characteristics.

2) Relationships between asthma control (ACQ scores) and clinical, demographic and self-report variables were explored using Pearson's correlation (age), Independent samples t-tests (gender, adherence), and one way ANOVAs with Tukey's post-hoc test (degree of rhinitis, smoking status).

3) Variables that were significantly associated with ACQ scores in Step 2 were entered into a multiple logistic regression to predict ACQ control.

Results

Sample characteristics

Of the 4429 patients involved in the asthma review, 3916 completed all sections of the questionnaire relevant to the analysis (88% completion rate). The mean age was 45 years (range 18–94) and 2313 (59%) participants were female. 2199 (56%) participants reported mild rhinitis and 924 (24%) participants reported severe rhinitis. 671 (17%) participants reported being current smokers. Of these, 341 (51%) indicated that they would be willing to attend smoking cessation advice sessions. 1993 (51%) participants reported that they always or often engaged in one or more non-adherent behaviours with their ICS and were classified as low adherers.

Prevalence of poor control

The distribution of ACQ scores is presented in Figure 1. 1474 (38%) participants had ACQ scores of ≥ 1.5, indicating that these

patients were highly likely to have poorly controlled asthma.

Relationship between demographic factors and asthma control

There was a significant positive correlation between ACQ scores and age, indicating that older age was associated with poorer asthma control (r=.07, p<.001). There was no significant relationship between gender and asthma control (χ^2 = .68, p=.41).

Relationship between self reported adherence and asthma control

As shown in Figure 2, participants reporting low adherence had significantly higher ACQ scores than those reporting high adherence (t(3914)=6.15, p<.001).

Relationship between self reported degree of rhinitis and asthma control

Levels of control differed across reported rhinitis groups (F(2,

3913)=128.7, p<.001); those reporting severe rhinitis had significantly higher ACQ scores than those reporting mild rhinitis, who in turn had significantly higher ACQ scores than those reporting no rhinitis (see Figure 3).

Relationship between smoking status and asthma control

As shown in Figure 4, non-smokers had significantly lower ACQ scores than ex-smokers, who had significantly lower ACQ scores than current smokers (F(2, 3913)=201.51, p<.001). Among smokers, there was a significant relationship between the number of cigarettes smoked per day and asthma control (F(5,655)=6.08, p<.001). Figure 5 illustrates this relationship, showing that the more cigarettes patients reported smoking each day, the worse their asthma control.

Predicting poor asthma control

As shown in Table 1, multiple logistic regression revealed that
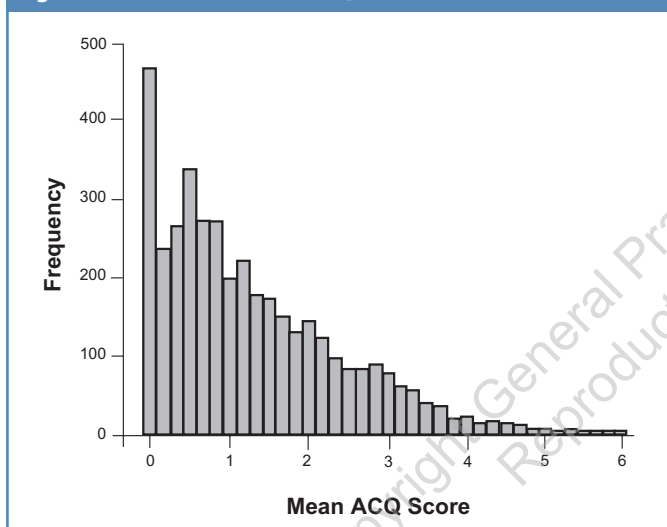

Figure 1. Distribution of ACQ scores.

Figure 2. Differences in ACQ scores between high and low adherers (higher ACQ scores indicate poorer control).
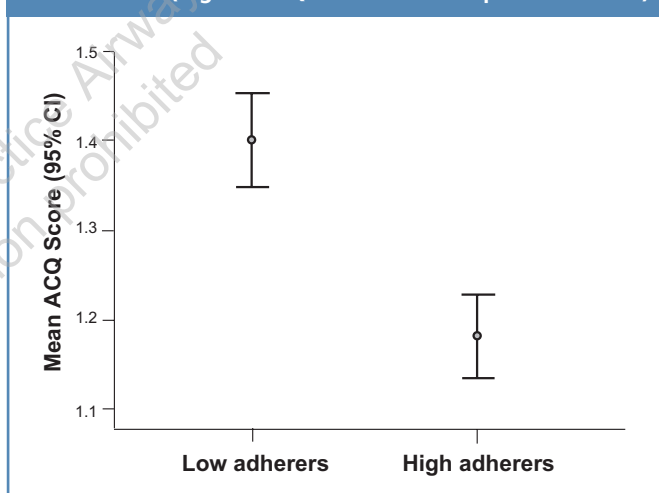

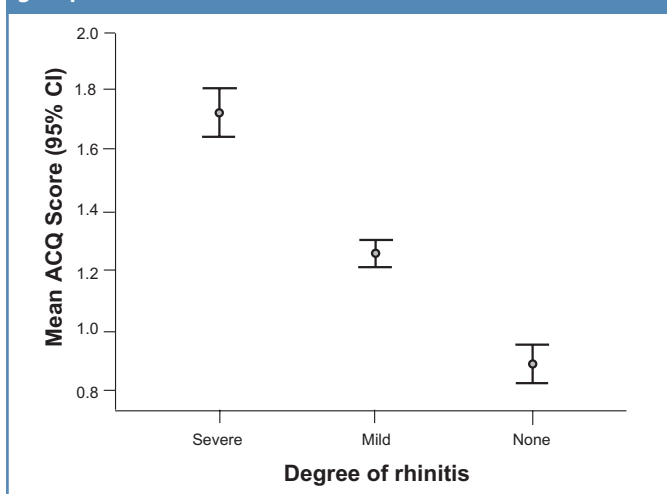Figure 3. Differences in ACQ scores across rhinitis groups.

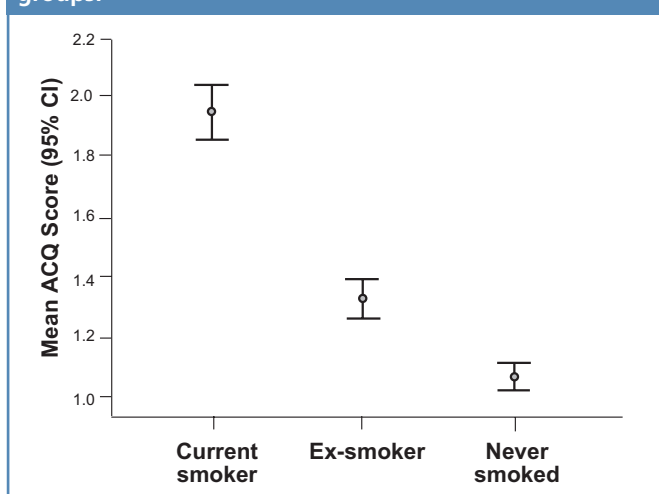Figure 4. Differences in ACQ scores across smoking groups.

Self-report predictors of asthma control

Figure 5. Relationship between the number of cigarettes smoked per day and asthma control.
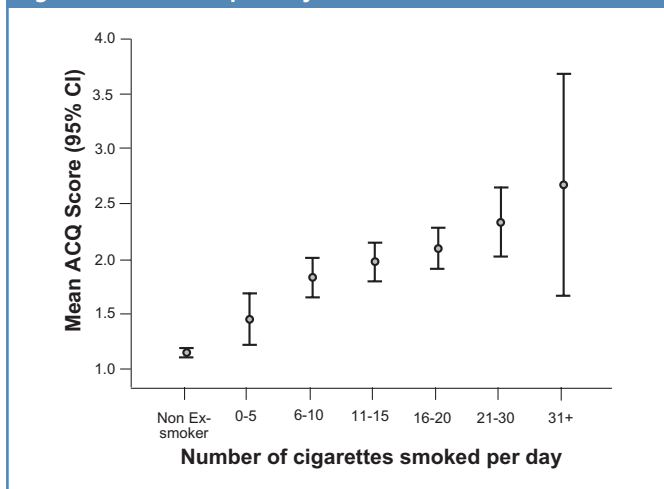
Table 1. Multiple logistic regression predicting poor asthma control (ACQ≥1.5)

Variable		OR	95% CI	p
Age	Years	1.01	1.01–1.02	<.001
Rhinitis	Compared to no rhinitis:			
	Significant rhinitis	4.62	3.71–5.77	<.001
	Mild rhinitis	2.09	1.72–2.54	<.001
Smoking	Compared to never smoking:			
	Current smoker	4.33	3.58 – 5.23	<.001
	Ex-smoker	1.59	1.36 – 1.87	<.001
Adherence	Compared to high adherers:			
	Low adherers	1.35	1.18–1.55	<.001

for every one year increase in age, the odds of having poorly controlled asthma increased by 1%. Compared to those with no rhinitis, the odds of having poor control were more than doubled among those with mild rhinitis and more than quadrupled among those with severe rhinitis. Compared to non-smokers, the odds of poor asthma control were 60% higher among ex-smokers and were quadrupled among current smokers. Low adherers to ICS also had 35% higher odds of having poor asthma control than high adherers.

Discussion

Three potentially modifiable predictors of poor asthma control were identified through the use of a simple, self-report questionnaire; the degree of rhinitis, smoking status, and low adherence to medication. These predictors of poor asthma control were common in this sample; of the 1474 patients defined as having poorly controlled asthma (ACQ≥1.5), 1158 (79%) reported that they smoked, had severe rhinitis and/or were non-adherent with their ICS medication. There is clearly scope to intervene to improve the quality of life of a significant number of people with poorly controlled asthma.

The relationship between rhinitis and asthma control is well documented in the literature.[17,18] This study found that the degree of rhinitis reported was important, with those reporting severe rhinitis exhibiting the worst asthma control, followed by those reporting mild rhinitis and then those reporting no rhinitis symptoms; possible mechanisms are a correlation between the degree of upper and lower airways inflammation, or that upper airways inflammation acts as a driver to lower airways inflammation.[34] There is some preliminary evidence to suggest that treatment of allergic rhinitis can improve asthma symptoms[35-37] and guidelines recommend the treatment of concomitant rhinitis in asthma patients.[34]

As expected based on previous research,[26-28,38] patients who reported that they smoked had worse asthma control than non-smokers. The more cigarettes patients reported smoking each day the worse their asthma control. This may be because smoking reduces patients' sensitivity to the effects of corticosteroids.[25] In line with the findings of previous research,[39] the negative impact of smoking on asthma control appears to be at least partially reversible, as patients who had quit smoking reported significantly better asthma control than current smokers but not as good control as never-smokers. It is encouraging that 51% of smokers reported that they would be willing to attend smoking cessation advice sessions, highlighting the potential for improving asthma control in a large proportion of patients through a smoking cessation intervention. Indeed, GINA guidelines recommend that smoking cessation advice is offered to all asthma patients who smoke.[40] Another potential reason for apparent poor asthma control among smokers is misdiagnosis of chronic obstructive pulmonary disease (COPD) as asthma. Research suggests that up to one third of smokers over the age of forty with an asthma diagnosis may in fact have COPD.[41]

Patients reporting low adherence to ICS had poorer asthma control than high adherers. Poor adherence may be unintentional (e.g. forgetting, misunderstanding instructions for use) or intentional (e.g. choosing not to take the medication on the basis of beliefs about asthma and its treatment). The types of beliefs associated with non-adherence to ICS include low perceived need for treatment[32,42] (particularly likely when symptoms are not present or when patients do not believe the treatment is effective), and concerns about side effects or long term effects of treatment.[32,43] One third of patients in this sample reported low adherence and could potentially benefit from intervention to address perceptual and practical barriers to adherence.

In conclusion, there may be the potential to improve asthma control by increasing levels of adherence to ICS, treating concomitant rhinitis and facilitating smoking cessation. Trials are now needed to determine the extent to which these determinants of asthma control are indeed modifiable and to explore the impact of intervening on asthma control. The use of a brief, self-report questionnaire during asthma review would enable health care practitioners to identify current asthma control as well as those who may benefit from such interventions.

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Conflict of interest

DP has consultant arrangements with, Aerocrine, Boehringer Ingelheim, GlaxoSmithKline, Merck generics, Merck, Sharpe and Dohme, Schering-Plough and Teva. He or his team have received grants and research support for research in respiratory disease from the following organisations: UK National Health Service, Aerocrine, AstraZeneca, Boehringer Ingelheim, GlaxoSmithKline, Merck, Sharpe and Dohme, Novartis, Pfizer, Schering Plough and Teva. He has spoken for: Boehringer Ingelheim, GlaxoSmithKline, Merck, Sharpe and Dohme and Pfizer. He is director of Optimum Patient Care Ltd.

RH provides occasional consultancy and speaker services for pharmaceutical industry, including GlaxoSmithKline, Boehringer Ingelheim, Schering Plough, ALTANA Pharma and Merck, Sharpe and Dohme. His academic research in respiratory disease has been supported by grants from the National Institute for Health Research, Asthma UK, ALTANA Pharma, Boehringer Ingelheim, GlaxoSmithKline and Schering Plough. He is director of Optimum Patient Care Ltd. JC has provided consultancy services for Optimum Patient Care Ltd.

DR has delivered lectures on behalf of and/or provided consultancy services to and /or received sponsorship from: AstraZeneca, GlaxoSmithKline,Novartis Pharma, Altana Pharma, Trinity Chiesi, Boehringer-Ingleheim, Ivax-Teva, MerckSharpeDohme, Alk-Abello, Pharmacia, UCB Pharma.

JH has provided occasional consultancy or speaker services for AstraZeneca, Merck, Sharpe and Dohme, Novartis and Teva.

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