

Developing a questionnaire to measure patients' beliefs about inhaler treatment: a pilot study

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ABSTRACT

Objective: To develop a valid and reliable questionnaire to assess patients' beliefs about inhaler treatment for asthma.

Design: A structured interview in which patients' beliefs about inhalers were individually rated. Factor analysis of those beliefs that had the highest correlations with estimated inhaler use.

Setting and subjects: A stratified random sample of 40 patients taking a combination of salbutamol and beclomethasone dipropionate in one general practice.

Results: Six factors explained 67.7% of the variance relating to beclomethasone dipropionate use: positive beliefs about the inhaler, satisfaction with the repeat prescription system, dissatisfaction with the doctor, collecting inhalers, a preference for tablets and concern about side-effects. Seven factors explained 69.9% of the variance relating to salbutamol use: no faith in prevention, a dislike of inhalers, relying on regular salbutamol, lack of disability, a preference for tablets, making decisions about inhalers and inhalers not lasting long enough.

Conclusions: Beliefs about inhaler treatment can be classified into relatively few factors that explain a significant proportion of the beliefs that relate to inhaler use. Development of the questionnaire is continuing to produce a valid questionnaire with reliable subscales.

INTRODUCTION

Adherence to treatment regimens in asthma remains a problem; over use of reliever inhalers and under use of inhalers for prevention is common.¹ The concept of adherence has moved away from the view of the passive patient complying with medical advice, to that of the patient actively making decisions with the doctor to improve their health. Patients' ideas about their illness and its treatment are clearly important in this negotiation.²

In the psychological field, social cognitive and self-regulatory models have been used to explain and predict health behaviours, including adherence.^{1,3} Relatively little has been done with asthma compared to other chronic diseases such as diabetes. Qualitative research has provided some insight. Issues such as the difficulty of assessing risks and benefits of preventive treatment, stigma, concern about side-effects and fear of dependency are common themes.^{4,5} Quantifying the issues has been less well researched, and few tools exist to identify those at risk of poor adherence in general practice. A set of questions that could link what patients think about their inhaler treatment to how they use inhalers would be helpful not only for identifying suboptimal use, but also for researching ways of improving adherence. We know that asking patients directly about adherence is associated with improved adherence, but what questions should be asked?⁶ This study aims to develop a valid and reliable questionnaire to measure patients' beliefs about inhaler treatment for asthma.

METHODS

Patient selection

A list of patients taking a combination of salbutamol and beclomethasone dipropionate inhalers was obtained by

computer search in the author's practice of 10,000 patients on the borders of Norfolk and Suffolk. A stratified sample was chosen to ensure a wide age range (17-83, median 56 years), equal numbers of men (20) and women (20) and patients representing each of the six general practitioners. The diagnosis of asthma was verified by either objective evidence from peak expiratory flow (PEF) readings (32 patients) or subjective evidence of cough and wheeze that responded to inhaler treatment (eight patients). Half of the patients had asthma for over 16 years (2-80, median 17.5 years). The patients were contacted by telephone; all agreed to participate. The structured interviews were conducted in the patients' homes by the author.

Development of the structured interview

Semi-structured interviews with eight patients were analysed qualitatively and eight main themes were identified. Patients' views were allocated to each theme, resulting in a structured interview of 102 statements, 92 of which covered beliefs about inhaler treatment.⁷

Interview procedure and estimation of inhaler use

The statements were read out from the interview schedule and the extent to which the patient agreed or disagreed was recorded on a five-point Likert scale (strongly agree to strongly disagree). The number of salbutamol and beclomethasone dipropionate inhalers ordered in the previous year was counted from both the computer and written records. Inhaler use was defined as the average number of puffs per day based on these figures.

Statistical analysis

The data were entered into the Statistical Package for Social Sciences. Spearman's rank correlations were calculated using the rating scores of the individual statements and the number of puffs per day of each inhaler. Statements were selected for entry into the factor analysis in order of the strength of their correlation with inhaler use until 10 positive and 10 negative statements were obtained. As there were 15 statements that had significant ($p < 0.01$) positive correlations with beclomethasone dipropionate use, all of these were used.

Factor analysis was performed in two steps; one for each inhaler. Principal component analysis was used with Varimax rotation and Kaiser normalisation. Factors with Eigenvalues greater than one were selected. Spearman's rank correlations were calculated using all the identified factors. The internal reliabilities of each multi-item beclomethasone dipropionate and salbutamol scale were tested using Cronbach's alpha co-efficient.

RESULTS

All of the statements were answered by all of the participants. A satisfactory spread of responses was seen, with only two items having markedly skewed responses. Two patients disagreed with the statement, 'I prefer my salbutamol inhaler to my beclomethasone inhaler' and nobody disagreed with, 'Preventing an

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asthma attack is better than waiting for one to happen’.

Six factors explained 67.7% of the variance relating to beclomethasone dipropionate use and for salbutamol use seven factors explained 69.9%. The statements, their factor loadings and variance of each factor are shown in Table 1 (beclomethasone dipropionate) and Table 2 (salbutamol). Table 3 shows the correlations between each of the scales. The Cronbach’s alpha co-efficients for the multi-item scales were between 0.28 and 0.92 (Tables 1 and 2).

DISCUSSION

Several of the beliefs and relationships identified in this study have been found by others. The influence of patient satisfaction on compliance has been known for some time.⁸ Concern about the side-effects of steroids, fears of dependency, and embarrassment using inhalers in public are all well documented.^{4,5,9} Although a dislike of asthma medication can exist independently of whether the medication is for prevention or relief, not all surveys distinguish between inhalers.^{10,11}

The factors identified in this study account for over two thirds of the variance relating to the estimated use of beclomethasone dipropionate and salbutamol inhalers. A factor loading greater than 0.45 is an acceptable correlation with a factor and, using this criterion, only two items loaded onto more than one factor.¹² Whilst the interpretation of factors is subjective, some of those that emerged in this analysis have face validity and the potential for further development. The generally low inter-scale correlations demonstrate that the scales appear to measure different issues relating to adherence.

Given that a value of 0.7 for Cronbach’s alpha is usually taken as being acceptable for a scale, the reliability of three of the subscales was satisfactory, three were borderline and seven were poor (less than 0.6). Work is in progress to improve the reliability by adding additional items to the scales in a study with a larger number of subjects.

Beliefs relating to beclomethasone use (Table 1)

The first factor contains the positive beliefs that one would expect to underpin adherence to a preventive treatment regimen. The second and fourth factors relate to satisfaction with the practice’s system of supplying further supplies of treatment and to personal organisation in obtaining inhalers. The third factor clearly represents dissatisfaction with the doctor. Factor five points to a preference for taking tablets, and factor six relates to concerns about side-effects.

Table 1: Beliefs relating to beclomethasone use, with factor correlations of greater than 0.32 (with correlations below 0.45 in brackets) and percentage of variance explained by each factor.

BELIEFS	FACTOR CORRELATIONS					
	1	2	3	4	5	6
FACTOR 1:						
Positive beliefs about the inhaler; variance explained 25.5%; Eigenvalue 8.28; $\alpha=0.92$						
I think that I should take my inhaler regularly.	0.88					
I feel I should take my inhaler.	0.81					
Using my inhaler is just a matter of habit.	0.80			(0.33)		
I avoid using my inhaler if I can.	-0.73	(0.41)				
I am quite satisfied with my inhaler.	0.73					
I think my inhalers keep me feeling well.	0.72			(0.33)		
I think my inhaler does me good.	0.71					(-0.38)
I find having my inhaler by me is reassuring.	0.65				(-0.39)	
I should like to stop my inhaler to see how I am without it.	-0.58					
The beclomethasone is effective at preventing me from getting asthma.	0.57					
I am satisfied that my doctor is doing all that he/she can with respect to my inhaler treatment.	0.54		-0.50			(-0.36)
The inhaler I have for my asthma is as good as I can get.	0.51	(0.40)				(-0.36)
The salbutamol and beclomethasone have to be taken together to work properly.	0.46					
FACTOR 2:						
Satisfaction with the repeat prescription system; variance explained 9.1%; Eigenvalue 2.64; $\alpha=0.54$						
I am quite satisfied with the system for getting repeat prescriptions of my inhalers.		0.74				
The system for getting repeat prescriptions of my inhalers is inconvenient.		-0.69				
It should be possible to get my inhalers delivered to my house if I can't get them myself.		0.51		(0.38)		
FACTOR 3:						
Dissatisfaction with the doctor; variance explained 8.9%; Eigenvalue 1.80; $\alpha=0.71$						
There is never enough time to talk about how I feel about my inhaler treatment.			0.79			
Sometimes I think my doctor doesn't tell me the whole truth about my inhaler.			0.78			
FACTOR 4:						
Collecting inhalers; variance explained 8.5%; Eigenvalue 1.77; $\alpha=0.77$						
I prefer to collect my repeat prescriptions on a regular basis, then I know where I am.				0.76		
I usually plan ahead to get my inhalers		(0.34)		0.75		
FACTOR 5:						
Preference for tablets; variance explained 8.1%; Eigenvalue 1.25; $\alpha=0.57$						
I would prefer to take a tablet than use an inhaler.					0.71	
I avoid using an inhaler in public.				(-0.34)	0.68	
Taking inhalers is inconvenient.		(-0.38)			0.59	
FACTOR 6:						
Concern about side effects; variance explained 7.6%; Eigenvalue 1.18; $\alpha=0.47$						
I am worried about possible long-term side effects from my inhalers.			(0.33)			0.80
I think I should use my inhaler as little as possible.						0.59

Beliefs relating to salbutamol use (Table 2)

The interpretation of some of the salbutamol factors is not straightforward and these need further development. The first factor indicates that the patient has little faith in prevention with beclomethasone dipropionate, perhaps ‘explaining’ the third factor (relying on regular salbutamol). Factor five relates to a preference for tablets, factor six to making decisions about inhalers and factor seven to inhalers not lasting long enough. Factor two appears to indicate a dislike of inhalers, whilst factor four points to a relationship between lack of disability and the effects of steroid inhalers.

Relationships between the factors (Table 3)

There were only five significant correlations between the factors and two of these were at the 5% level of significance. Given that 78 correlations were performed, these two correlations may have occurred

Table 2: Beliefs relating to salbutamol use, with factor correlations of greater than 0.32 (with correlations below 0.45 in brackets), percentage of variance explained by each factor, Eigenvalues and alpha co-efficients

BELIEFS	FACTOR CORRELATIONS						
	1	2	3	4	5	6	7
FACTOR 1:							
No faith in prevention; variance explained 13.0%; Eigenvalue 3.73; $\alpha=0.69$							
The beclomethasone is effective at preventing me from getting asthma.	-0.81						
In the long-term, the beclomethasone is more likely than the salbutamol inhaler to keep my asthma under control.	-0.75						
Preventing an asthma attack is better than waiting for it to happen.	-0.61						
I prefer my salbutamol inhaler to my beclomethasone inhaler.	0.54		(0.43)			(0.34)	
FACTOR 2:							
Dislike of inhalers; variance explained 11.2%; Eigenvalue 2.80; $\alpha=0.62$							
I don't like the idea of being on a steroid inhaler.		0.86					
I would be happy to discuss my inhaler treatment with a practice nurse in a special asthma clinic.		0.62					
I don't like being dependent on my inhaler.		0.57			0.49		
Relaxing and keeping calm is sometimes more effective in controlling my asthma than using an inhaler.		-0.52		(0.36)	(0.43)		
It would be helpful to have a device to make taking my inhalers easier.		0.47					
FACTOR 3:							
Relying on regular salbutamol; variance explained 10.4%; Eigenvalue 2.09; $\alpha=0.60$							
I think that I should take my inhaler regularly.		0.75					
I really rely on my inhaler.		0.71		(-0.34)			
I should like to stop my inhaler and see how I am without it.		-0.63		(0.40)			
FACTOR 4:							
Lack of disability; variance explained 10.2%; Eigenvalue 1.79; $\alpha=0.56$							
The physical effect of getting a new supply of my inhalers is too much for me.			-0.76				
The inhaler has more of a local effect on my lungs than a general effect on my body.			0.70				
The beclomethasone inhaler does not have any effect that I can detect.		(0.36)	-0.60		(0.37)		
FACTOR 5:							
Preferences for tablets; variance explained 9.5%; Eigenvalue 1.41; $\alpha=$ not applicable							
I would prefer to take a tablet than use an inhaler.					0.79		
FACTOR 6:							
Making decisions about inhalers; variance explained 9.0%; Eigenvalue 1.12; $\alpha=0.49$							
I would be interested to try a new inhaler to see if it is any better for my asthma.						0.87	
The decision when to use my inhaler is mine alone.					(-0.44)	0.56	
FACTOR 7:							
Inhalers not lasting long enough; variance explained 6.6%; Eigenvalue 1.04; $\alpha=0.28$							
I find it difficult to know when my inhalers are running out.							0.76
The effect of the inhaler doesn't last long enough.		(0.35)	(-0.42)				0.64

by chance. The highest negative correlation was between the first beclomethasone dipropionate factor (positive beliefs) and the first salbutamol factor (no faith in prevention) and this is perfectly reasonable. The high correlation between both factor fives (tablet preference) was predictable. The negative correlation between beclomethasone dipropionate factor six (concern about side-effects) and salbutamol factor four, which contains beliefs about beclomethasone dipropionate having either a local or no discernable effect, is also understandable.

Limitations of the study

There are limitations to this study. First, it was performed in one practice where the author was known to most of the patients. However, patients did make some strong criticisms in the semi-structured interviews and in the structured interviews there was a good spread of responses in all but two of the items. It is important to know whether these views are more widely held and this is currently being tested in a number of practices.

The second criticism is that the relationships between a large number of variables were explored in a small sample of patients. In factor analysis there should be four times as many variables as subjects and as a general rule one should have at least 300 subjects. The analysis should, therefore, be considered exploratory rather than definitive. The method of selecting variables has some logic to it; i.e. choosing beliefs that have higher correlations with inhaler use, although not all the correlations were statistically significant.

Inhaler use is notoriously difficult to determine and even measuring use by incorporating computer devices has its problems.¹ The method chosen has the advantage of simplicity and is widely used, but relies on the premise that if someone orders an inhaler they intend to use it. Those ordering more inhalers are probably using their inhalers more, and rank correlations reflect this.

Finally, some of the older patients probably had chronic obstructive pulmonary disease as well as asthma, and their beliefs may well be different to those who just have asthma.

Future development

The factors that have emerged in this study need refining and the subscales developed by incorporating additional items to improve reliability. Further qualitative work is needed to define additional concepts to explain more of the variance of patient behaviour. Development of the questionnaire will provide an instrument that can be used not only to estimate adherence to treatment, but also to evaluate the

effectiveness of educational interventions.

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Table 3: Correlations between beclomethasone dipropionate and salbutamol factors (Spearman's rho) with two-tailed significance levels

	S1	S2	S3	S4	S5	S6	S7	B1	B2	B3	B4	B5	B6
S1	1.000												
S2	0.071	1.000											
S3	0.033	0.025	1.000										
S4	0.033	-0.113	0.083	1.000									
S5	0.087	0.045	0.022	-0.060	1.000								
S6	0.022	-0.004	0.048	0.031	0.019	1.000							
S7	-0.43	-0.13	0.013	0.002	-0.059	0.067	1.000						
B1	-0.652**	-0.47	0.123	-0.017	-0.188	-0.264	0.029	1.000					
B2	0.019	0.182	0.163	0.190	-0.057	-0.016	0.107	0.030	1.000				
B3	0.085	0.324*	-0.127	0.168	-0.076	0.096	-0.020	0.144	-0.055	1.000			
B4	0.067	0.061	0.164	-0.094	0.141	-0.294	-0.163	0.062	0.060	0.073	1.000		
B5	0.122	0.211	-0.379*	-0.168	0.537**	0.072	0.245	-0.110	0.107	-0.084	-0.232	1.000	
B6	0.088	0.213	-0.244	-0.489**	-0.131	0.161	-0.083	-0.083	0.105	-0.048	-0.040	0.094	1.00
	** P<0.001												
	* P<0.05												

Summary of statistical terms

- Spearman's correlation co-efficient (rho): a measure of association between two variables that are not normally distributed (non-parametric test).
- Cronbach's alpha: a measure of internal reliability or consistency of a multiple-item scale that relies upon the associations of each item with each other (inter-item correlation).
- Factor analysis: a complex statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. It is usually done in four steps:
 - Correlation: variables that do not appear related to other variables are identified.
 - Factor extraction: the number of factors needed to represent the data is determined.
 - Rotation: the factors are transformed to make them more interpretable.
 - Factor scoring: scores for each factor are computed for each case.

Concerns and misconceptions regarding steroid therapy in asthma: findings and impact of a public meeting

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SUMMARY

Anxiety concerning long-term steroid therapy may be translated into non-compliance with prescribed asthma treatment; this was addressed at a public meeting. Questionnaire responses indicated an immediate, positive impact on participants' attitudes to, and misconceptions of, anti-asthma steroid therapy.

INTRODUCTION

Patient non-compliance is one factor limiting the efficacy of inhaled steroids in asthma management.¹ Whilst many factors can contribute to patients' non-adherence to therapy, one key element is anxiety about steroid side-effects.² Media reports constantly fuel fears and patients often present with 'scare stories'. Following one particular television programme some patients in a Norwich practice reduced, and others even suspended, steroid therapy.

Collaboration between the local Health and Health Education Authorities, the local branch of the

National Asthma Campaign, general practices, secondary carers and patients brought the problem into focus. A group approach can be as effective as asthma education programmes conducted on a one-to-one basis³ and its adoption would reap benefits in terms of resources management. A decision was therefore taken to tackle steroid phobia 'en masse' and hold a public meeting where the concerns of patients, parents and others could be addressed.

METHODS

Feedback from a Norwich 'asthma awareness' day laid the foundations for the meeting, which was advertised across the city via local newspapers, television and radio. On arrival at the meeting, participants were invited to complete a questionnaire which examined their attitudes to asthma treatment, perceived benefits and side-effects of steroids, degree of concern regarding side-effects and perceived impact of media reporting, using a mix of open questions and Likert scales. Additional space to list queries and concerns was provided. One parent