

# Influenza vaccination in patients with asthma: why is the uptake so low?

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## ABSTRACT

### Background

Patients with asthma are particularly susceptible to serious complications from influenza. The Chief Medical Officer recommends annual influenza vaccination for adult patients with asthma. The uptake of influenza vaccination by patients with asthma is only 40% and, unlike other high-risk groups, has failed to increase in recent years.

### Aim

To investigate the contribution of sociodemographic factors, asthma morbidity, and health beliefs to influenza vaccination uptake in patients with asthma.

### Design of study

Cross-sectional questionnaire study.

### Setting

Single urban British general practice, Exeter, UK.

### Method

A questionnaire survey was sent to adult patients with asthma. Participants were aged 16–65 years, were receiving  $\beta_2$  agonists and inhaled steroids, and had been invited for influenza vaccination in September 2003. Data were examined using univariate analysis and logistic regression.

### Results

A total of 136/204 (66.7%) patients responded to the survey. Influenza vaccination uptake in the study population was 40%. Younger patients were less likely to have undergone vaccination than older patients. There was no difference in vaccination uptake rates between groups of patients defined by other sociodemographic factors. Asthma morbidity was similar in vaccinated and non-vaccinated groups of patients. Vaccinated individuals had a greater belief in the efficacy of the vaccination and medical advice regarding the vaccination, and felt more susceptible to influenza and its complications when compared with non-vaccinated individuals. A fear of side-effects was associated with declining the invitation for vaccination. These health beliefs were the only independent predictors of uptake of influenza vaccination among this group of patients with asthma.

### Conclusion

Improving vaccination uptake in patients with asthma is unlikely unless individual health beliefs are taken into account.

### Keywords

asthma; health beliefs; influenza vaccination; vaccination uptake.

## INTRODUCTION

Influenza vaccination for patients with asthma has been routinely recommended for the past 30 years.<sup>1</sup> A recent Cochrane review concluded that influenza vaccination is safe in patients with asthma.<sup>2</sup> There is evidence that the vaccination of patients with asthma may result in reduced numbers of GP consultations, asthma exacerbations, pneumonias, hospitalisations, and deaths.<sup>3</sup> Despite the strong recommendations for influenza vaccination in patients with asthma, and the introduction of payments to GPs attaining associated government targets, vaccination uptake is low among patients with asthma. The reported uptake is only 40%.<sup>4</sup> In contrast, the uptake in other high-risk groups has increased.<sup>5,6</sup> These findings have been mirrored throughout North America and Europe.<sup>6</sup> Research is needed into reasons for non-compliance and ways of increasing uptake in patients with asthma.

Many studies have been conducted to examine possible ways of increasing influenza vaccination uptake and the reasons for declining vaccination.<sup>7,8</sup> Organisational factors that influence immunisation uptake have been identified, and clear recommendations have been made including systems for patient recall.<sup>9</sup> Many studies have reviewed patient factors contributing to immunisation uptake, including sociodemographic factors and elements from the Health Belief Model.<sup>7,8</sup> The current authors are not aware of any similar studies conducted in a British general

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## How this fits in

The uptake of influenza vaccination for patients with asthma is low, despite its recommendation for these patients. This is in contrast to increasing uptake in other high-risk groups. The current study explores the contribution of sociodemographic factors, asthma morbidity, and health beliefs to rates of influenza vaccination uptake in patients with asthma. Younger patients were less likely to accept influenza vaccination than older patients, and immunised participants differed from non-immunised participants in their reported health beliefs. Only health beliefs were independent predictors of vaccination uptake. Improving vaccination uptake of patients with asthma will require careful consideration of their personal health beliefs.

practice setting examining patient factors associated with uptake of influenza vaccination in patients with asthma.

### METHOD

#### Study population

Participants were registered patients recruited from a single urban British general practice (list size 6717, five GP partners). The sample included all patients on the practice asthma register, aged 16–65 years, who had received a prescription for a  $\beta_2$  agonist and inhaled or oral steroids in the year preceding the study.

All patients identified for the study received a formal written invitation from the practice in September 2003 to attend for influenza vaccination. The practice recorded whether patients had received an influenza vaccination. Patients were excluded if they had any recorded contraindication to influenza vaccination, such as an allergy to eggs, or if their GP felt that they were unsuitable for inclusion in the study.

The questionnaire was sent to all eligible participants in June 2004. Each patient was sent an individually addressed invitation letter from their GP inviting them to participate in the study, an

information sheet from the researcher, and a copy of the questionnaire. Non-responders were sent a reminder and a further questionnaire 3 weeks after the original questionnaire was sent.

#### Questionnaire

The questionnaire included items on a variety of areas considered significant in affecting the decision whether to have the influenza vaccination. The areas included sociodemographic factors, aspects of the Health Belief Model,<sup>10</sup> and asthma morbidity. In rating aspects of the Health Belief Model, responders were provided with a seven-point Likert scale ('strongly disagree' to 'strongly agree') for each health belief statement (including a question on 'own health' status, answered using a seven-point rating scale from 'good' to 'not good'). The questionnaire was designed to incorporate questions from influenza vaccination studies from the Netherlands,<sup>7,8</sup> and three standardised asthma outcomes questions, recommended by the Royal College of Physicians, to review current asthma morbidity.<sup>11</sup>

#### Statistical analysis

Data analyses were performed using SPSS (version 11.5). Data on the whole study population were collected for influenza vaccination status, age, and sex. Descriptive analyses of the study population were performed, and questionnaire responders and non-responders were compared in relation to demographic profile. Characteristics of vaccinated and unvaccinated groups were compared using  $\chi^2$  tests for nominal data, and *t*-tests and Mann-Whitney tests for continuous data.<sup>12</sup> Further analysis using forward stepwise logistic regression techniques was performed to identify independent factors associated with uptake of influenza vaccination.<sup>13</sup>

### RESULTS

A total of 211 patients met the study criteria for inclusion. After the return of the questionnaires, seven further exclusions to the study were made: self-reported allergy to eggs ( $n = 2$ ), completion error ( $n = 1$ ), and undelivered ( $n = 4$ ). This left a final eligible study population of 204 participants. A total of 136 completed questionnaires were returned (response rate = 66.7%).

Non-responders ( $n = 68$ ) were similar to responders ( $n = 136$ ) in the study with respect to sex ( $n = 29$  [42.6%] versus  $n = 55$  [40.4%] males,  $\chi^2 = 0.09$ ,  $P = 0.77$ ), but differed in respect of age (median range 34 [17–63] versus 44.5 [17–66] years,  $U = 3536$ ,  $P = 0.006$ ) and influenza immunisation status ( $n = 15$  [22.1%] versus  $n = 67$  [49.3%] immunised,  $\chi^2 = 14.0$ ,  $P < 0.001$ ).

**Table 1. Comparison of responses to the asthma outcomes questions.**

Asthma outcome question	Flu vaccination	No flu vaccination	<i>n</i>	$\chi^2$	<i>P</i> -value
Difficulty sleeping because of asthma?					
Yes	18	25	136	1.379	0.24
No	49	44			
Daytime symptoms of asthma?					
Yes	41	49	136	1.465	0.23
No	26	20			
Asthma interfering with usual activities?					
Yes	19	21	135	0.044	0.83
No	47	48			

Overall immunisation uptake in the study population was 82 out of 204 (40.2%). Immunised patients were similar to non-immunised patients with respect to sex ( $n = 31$  [37.8%] versus  $n = 53$  [43.4%] males,  $\chi^2 = 0.422$ ,  $P = 0.47$ ) but differed in age, with older patients being more likely to have undergone vaccination (median 51 [range 18–66] versus median 34 years [range 17–65],  $U = 2955$ ,  $P < 0.001$ ). No significant difference was found between immunised and non-immunised groups in respect of marital status ( $n = 45$  [69.2%] versus 44 [63.8%] married,  $\chi^2 = 0.818$ ,  $P = 0.66$ ), accommodation ( $n = 49$  [74.2%] versus  $n = 46$  [66.7%] owner occupied,  $\chi^2 = 2.029$ ,  $P = 0.36$ ), employment ( $n = 53$  [79.1%] versus  $n = 56$  [81.2%] in employment,  $\chi^2 = 4.59$ ,  $P = 0.20$ ) or education ( $n = 36$  [53.7%] versus  $n = 37$  [53.6%] not progressing beyond secondary education,  $\chi^2 = 0.134$ ,  $P = 0.94$ ).

### Asthma morbidity

No significant difference was found between the immunised and non-immunised groups demonstrated in current asthma morbidity (Table 1).

### Health beliefs

Immunised and non-immunised individuals had similar self-appraised health status, but differed in all other aspects of health beliefs (Table 2). Immunised patients reported feeling more susceptible to influenza, more at risk from complications of influenza, and held a stronger belief in the efficacy of the vaccination and in medical advice regarding the vaccination. Non-immunised patients reported concern regarding vaccine side-effects, and appeared more influenced by the advice of friends and family regarding immunisation.

### Predictors of vaccine uptake

Variables considered for stepwise logistic regression included age and health beliefs. A belief that complications following influenza vaccination could be dangerous (health belief [HB] 3), a belief in the efficacy of the vaccination (HB 5), and a belief in recommendations of the GP regarding influenza vaccination (HB 7), were independently associated with vaccine uptake. In contrast, beliefs that influenza vaccination can make you unwell (HB 6), and that influenza is not a 'serious illness' (HB 4) were independently associated with not having the vaccination (Table 3). Age was not an independent predictor of vaccine uptake.

## DISCUSSION

### Summary of main findings

The study explored the contribution of

**Table 2. Health beliefs (HBs) of patients with asthma accepting or declining influenza vaccination.<sup>a</sup>**

Health belief statements	Flu vaccination	<i>n</i>	<i>P</i> -value <sup>b</sup>
HB 1. How would you rate your own health	Yes	67	0.793
	No	69	
	Total	136	
HB 2. I am rather susceptible to flu	Yes	66	0.002
	No	68	
	Total	134	
HB 3. Complications of flu could be dangerous for me	Yes	67	0.001
	No	68	
	Total	135	
HB 4. Catching flu is not a serious problem for me	Yes	66	0.004
	No	68	
	Total	134	
HB 5. Influenza vaccination gives a good protection against flu	Yes	67	<0.001
	No	65	
	Total	132	
HB 6. Influenza vaccination can make you unwell	Yes	67	<0.001
	No	66	
	Total	133	
HB 7. My GP recommended the vaccination	Yes	66	<0.001
	No	67	
	Total	133	
HB 8. My friends or family advised me to have the flu vaccination	Yes	65	0.012
	No	64	
	Total	129	
HB 9. My friends or family advised me against the flu vaccination	Yes	65	0.039
	No	63	
	Total	128	
HB 10. I wanted to have the flu vaccination but couldn't come or forgot	Yes	63	<0.001
	No	64	
	Total	127	

<sup>a</sup>The health belief questionnaire incorporated questions from influenza vaccination studies<sup>7,8</sup> with domains from the Health Belief Model.<sup>10</sup> <sup>b</sup>Mann-Whitney U test.

**Table 3. Logistic regression of health beliefs (HBs) as independent predictors of influenza vaccination uptake.**

Health belief	<i>Z</i>	<i>P</i> -value	Odds ratio	95% CI
HB 3. Complications of flu could be dangerous for me	2.27	0.023	1.34	1.04 to 1.73
HB 4. Catching flu is not a serious problem for me	-2.10	0.035	0.74	0.56 to 0.98
HB 5. Influenza vaccination gives a good protection against flu	4.06	<0.001	2.05	1.45 to 2.89
HB 6. Influenza vaccination can make you unwell	-2.26	0.024	0.72	0.55 to 0.96
HB 7. My GP recommended the vaccination	2.30	0.021	1.33	1.04 to 1.69

sociodemographic factors, asthma morbidity, and health beliefs on the uptake of influenza vaccination. Younger patients were less likely to have accepted influenza vaccination. Immunised and non-immunised patients with asthma were similar with respect to all other sociodemographic factors including education, marital status, sex, accommodation, and education. No difference was demonstrated between the two groups with respect to asthma morbidity. Immunised patients differed from non-immunised patients in their reported health beliefs. Immunised patients appeared more accepting of medical advice, and reported greater perceived vulnerability to influenza and its complications when compared with non-immunised patients. These health beliefs were shown to be independent predictors of influenza vaccination uptake among this group of patients with asthma.

#### **Strengths and limitations of the study**

The overall response rate for the questionnaire was good and compared well with other studies.<sup>7,8,14</sup> The study was conducted in a practice with a well-established influenza immunisation programme. The practice has, for many years, endeavoured to maximise its uptake of influenza immunisation in all risk groups through sending personal invitations, and developing a high level of awareness among the primary healthcare team. Despite this approach, vaccination uptake in patients with asthma was only 40%. The study was conducted in single practice which minimises between-practice organisational factors associated with non-compliance, thus facilitating the exploration of patient-specific factors. However, the practice study population contained very few ethnic minority groups, with little deprivation, and therefore may not be representative of inner-city areas.

A potential limitation of this study is the delay between the administration of the questionnaire (June) and the actual decision making with regard to whether to have the vaccination (October). However, many other studies of influenza vaccination uptake have been conducted at a similar time of year to this study, as there is the potential to influence the decision whether to have the vaccination if studies are conducted in the winter months.<sup>8</sup> Furthermore, patients' decisions about influenza vaccination have been shown to remain relatively constant over the years.<sup>15,16</sup> There is also the possibility of a response bias in this study, with younger patients being less likely to respond to the questionnaire, and also being less likely to receive the vaccination. However, the

comparator groups were of a similar size in this study.

The decision of whether to undergo influenza vaccination is complex, and the reasons underlying the decision may vary over time. Use of the Health Belief Model to examine the decision-making process has been explored in similar studies.<sup>7,8,17</sup> However, the Health Belief Model, like other models of health behaviour, has limitations: decisions on healthcare use are potentially complex and personal, with the possibility of other factors contributing to the decision-making process that are not allowed for in this model.

#### **Comparison with existing literature**

This study presents findings similar to those of other studies of influenza vaccination uptake among high-risk patients, including studies from the Netherlands and US, by identifying age and health beliefs as significant factors associated with vaccination uptake.<sup>8,16,18</sup> The findings are concordant with findings from studies examining patients' beliefs about prescribed medicines and their role in adherence to treatment; such studies have identified health beliefs as being more powerful predictors of reported adherence than clinical and sociodemographic factors.<sup>19</sup> This study is the first to explore the factors associated with influenza vaccination uptake in patients with asthma in a British general practice setting, and also considers the potential contribution of asthma morbidity.

#### **Implications for future research and clinical practice**

Health beliefs and age both affected the decision to accept influenza vaccination in asthmatic patients; however, only health beliefs were independent predictors of vaccination uptake. Intensive targeted health education is needed for all patients with asthma, regardless of the severity of their asthma. Information on the benefits of influenza vaccination should be given to patients. Further studies on the provision of such information are required to evaluate the effect on vaccination uptake.

Changing health beliefs through education may not necessarily lead to a change in health behaviour with regard to influenza vaccination,<sup>15</sup> as there may be other factors not explored in this study that contribute to the reasons why patients with asthma choose whether or not to have the vaccination. Further studies using qualitative methodology may be valuable in identifying other significant factors influencing vaccination uptake.

Given that an estimated 4% of the adult

population have asthma, the potential adverse public health impact of low influenza vaccination uptake is substantial.<sup>20</sup> Effective interventions are needed in primary care to improve influenza vaccination uptake among this susceptible group of patients.

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### Ethics committee

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### Competing interests

The authors have stated that there are none

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## REFERENCES

1. Department of Health. *Influenza immunisation. CM0's Update*. London: The Stationery Office, 2004.
2. Cates CJ, Jefferson TO, Bara AI, Rowe BH. Vaccines for preventing influenza in people with asthma. In: Cochrane Collaboration. *Cochrane Library* Issue 2. Oxford: Update Software, 2004.
3. Hak E, Buskens E, van Essen GA. Clinical effectiveness of influenza vaccination in persons younger than 65 years with high-risk medical conditions: the PRISMA study. *Arch Intern Med* 2005; **165**: 274–280.
4. Watkins J. Effectiveness of influenza vaccination policy at targeting patients at high risk of complications during winter 1994–5: cross sectional survey. *BMJ* 1997; **315**: 1069–1070.
5. Lewis-Parmar H, McCann R. Achieving national influenza vaccine targets — an investigation of the factors affecting influenza vaccine uptake in older people and people with diabetes. *Commun Dis Public Health* 2002; **5**: 119–126.
6. Ford ES, Mannino DM, Williams SG. Asthma and influenza vaccination: findings from the 1999–2001 National Health Interview Surveys. *Chest* 2003; **124**: 783–789.
7. Van Essen GA, Kuyvenhoven MM, de Melker RA. Why do healthy elderly people fail to comply with influenza vaccination? *Age Ageing* 1997; **26**: 275–279.
8. Van Essen GA, Kuyvenhoven MN, de Melker RA. Compliance with influenza vaccination: its relation with epidemiologic and sociopsychological factors. *Arch Fam Med* 1997; **6**: 157–162.
9. Szilagyi P, Vann J, Bordley C, et al. Interventions aimed at improving immunization rates. In: Cochrane Collaboration. *Cochrane Library* Issue 4. Oxford: Update Software, 2002.
10. Rosenstock I. Historical origins of the Health Belief Model. *Health Educ Monogr* 1974; **2**: 328.
11. Pearson M, Bucknall C (eds). *Measuring clinical outcome in asthma: a patient focused approach*. London: Royal College of Physicians, 1999.
12. Bryman A, Cramer D. *Quantitative data analysis with SPSS release 8 for Windows. A guide for social scientists*. London: Routledge, 1999.
13. Field A. *Discovering statistics using SPSS for Windows*. London: Sage, 2000.
14. Evans MR, Watson PA. Why do older people not get immunised against influenza? A community survey. *Vaccine* 2003; **21**: 2421–2427.
15. Buchner DM, Carter WB, Inui TS. The relationship of attitude changes to compliance with influenza immunization. A prospective study. *Med Care* 1985; **23**: 771–779.
16. Hutchinson HL, Norman LA. Compliance with influenza immunization: a survey of high-risk patients at a family medicine clinic. *J Am Board Fam Pract* 1995; **8**: 448–451.
17. Szilagyi PG, Rodewald LE, Savageau J, et al. Improving influenza vaccination rates in children with asthma: a test of a computerized reminder system and an analysis of factors predicting vaccination compliance. *Pediatrics* 1992; **90**: 871–875.
18. Nichol KL, MacDonald R, Hauge M. Factors associated with influenza and pneumococcal vaccination behavior among high-risk adults. *J Gen Intern Med* 1996; **11**: 673–677.
19. Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *J Psychosom Res* 1999; **47**: 555–567.
20. Levy M, Hilton S. *Asthma in practice*. 1999, London: Royal College of General Practitioners, 1999; 22–23.