

# Management of acute asthma attacks in general practice

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**SUMMARY.** A prospective study was carried out in a semi-rural group practice between June 1988 and December 1989 to investigate acute asthmatic attacks treated with nebulized salbutamol. Questionnaires were completed by the attending doctor and by the patient (or his or her parent). Sixty nine episodes, occurring in 52 patients, were recorded during the 18 month study period. The majority of the attacks were managed exclusively in the community, with hospital admission occurring on only three occasions, one patient being admitted twice. A large proportion of the patients had a severe attack of asthma as judged by their previous history. Oral steroids were prescribed in 62.3% of attacks, oral theophyllines in 31.9% and antibiotics in 37.7%; the salbutamol nebulizer was used on more than one occasion during 41.2% of attacks. Significant morbidity was experienced by the patients during the studied attack, with 85% suffering sleep disturbance and two thirds being unable to attend work or school. Only 52.5% of patients were on prophylactic treatment and 37.5% of the patients had discontinued some aspect of their asthma therapy in the three months prior to the attack. Patients' and doctors' views about the cause of the attacks differed widely: patients most commonly cited infection (26/41) and allergy (8/41) with only two patients citing poor compliance or inadequate treatment. Although doctors also attributed the cause of many attacks to infection (33/64), they cited poor compliance or inadequate treatment in 28 of 64 responses.

The study revealed that many patients receiving emergency care for asthma had had previous attacks, yet the condition was not being adequately managed, particularly with regard to maintenance on prophylactic treatment with inhaled steroids or cromoglycate. This suggests that an acute asthmatic attack should lead to a review of the patient's management and compliance, with regular follow up and objective measurements of respiratory function where possible.

## Introduction

THE improvement of care in asthma has been recognized as a challenge for general practice.<sup>1,2</sup> Asthma is probably the commonest chronic disease in the United Kingdom and its prevalence is thought to be rising.<sup>3</sup> Despite advances in the understanding of the pathogenesis of asthma and improved treatments, mortality from asthma continues to rise.<sup>4</sup> Nebulized beta agonists are the mainstay in the management of acute severe asthma in the UK and many general practitioners now use nebulizers for treatment of acute asthma. While this may enable more acute episodes to be managed at home, concerns have arisen about nebulizer usage in general practice and in the home.<sup>5</sup>

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This prospective study of the care of patients with acute asthma was confined to patients receiving nebulized salbutamol treatment from the general practitioner. It was thought that this group of patients was likely to include those most at risk from their disease. The aims of the study were to identify the characteristics of patients requiring such treatment; the management and outcome of the acute episode; and the views of patients and doctors as to the cause of the acute asthma attack. In addition, the study aimed to determine whether such attacks were preventable by assessing the use of prophylactic therapy.

## Method

The Windrush practice is located in Witney, Oxfordshire and is a six partner practice. The practice has a list of approximately 14 000 patients drawn from the town and surrounding villages. Five partners, one locum, two part-time doctors and two trainee general practitioners contributed patients to the study. Patients over the age of 18 months presenting with an acute asthmatic attack and considered by the doctor to require nebulized salbutamol were studied over a period of 18 months. No specific criteria for nebulizer use were imposed on general practitioners as it was our aim to study normal practice. Patients with home nebulizers were not included unless nebulizer treatment was given by the general practitioner during an acute episode. The study involved assessing patients' previous history of asthma and its management prior to the attack; concurrent therapies used by different general practitioners in the acute episode; and examining immediate outcomes as well as changes occurring up to a minimum of six months after the acute asthma attack.

Patients were treated with salbutamol 2.5 mg pre-diluted in a nebulizer, delivered via a compressed air nebulizer. Doctors were asked to document patient details, observations such as a patient's difficulty in speaking, and measurements of pulse rate, respiratory rate and peak expiratory flow rate before and at least 20 minutes after each nebulization. They were also asked to record other treatments used to manage the attack, and suggest possible precipitating factors for the attack. These details were entered on a specifically designed form which had been piloted previously. Patients (or their parents) were provided with a questionnaire requesting patient details including height; current therapy at recruitment into the study; duration of sleep disturbance preceding the acute episode; ability to work or attend school; and perceived causes and severity of the acute episode. Severity was graded as mild, moderate, severe or very severe. Patients were asked to return this questionnaire within two weeks of their acute episode. Reminders with a stamped addressed envelope and a further copy of the questionnaire were sent one month later to patients not returning their original copies.

Patient records were reviewed six months after the acute asthma attack. Details of the management of the acute episode were confirmed and patient contacts with the general practitioner for respiratory symptoms in the year preceding the asthma attack were counted. Previous hospital specialist referral, together with hospital specialist follow up, maintenance treatment and occurrence of other acute asthma attacks during the intervening six months were recorded.

Statistical analysis was carried out using the computer programme, *Quickstat*. Mann Whitney U tests were used to compare groups and Fischer's exact test where appropriate. All quoted *P* values are two tailed.

## Results

Nebulized salbutamol was given by general practitioners in 69 acute asthma attacks among 52 patients. No other nebulized beta agonists or other nebulized agents were used. There was a large variation in the number of patients entered into the study by different general practitioners. Details from both doctors and patients were available for 51 episodes, from doctors only in 16 episodes and patients only in two instances. However, some forms were incomplete, and baseline numbers therefore vary. Review of patient records was possible in 62 episodes for 45 patients. In the seven other cases, patients had either moved away or had been treated as temporary residents.

A total of 52 patients comprised the study group. The median age of the group was 17 years (range 2–85 years) and comprised 26 males and 26 females (median ages nine and 35 years respectively;  $P < 0.01$ , Mann Whitney  $U$  test). Twenty one (40%) patients were aged 12 years or younger and 14 of these children were under five years old. For patients receiving attention on more than one occasion during the study period the first episode is used for these details. The finding that 37.5% of patients had had previous hospital admissions and 70.8% had had nebulizer treatments in the past (Table 1) indicated that a large proportion of patients had had experience of previous severe asthmatic attacks. Seven per cent of patients were smokers, and 34.1% of patients were exposed to tobacco smoke in the home. Four patients owned a home nebulizer and 10 patients owned their own peak flow meter.

Build up to an asthma attack took a median of two days (range 1–60 days); sleep disturbance was present in 39 of 46 patients for a median of two nights (range 0–28 days); and two thirds of patients were unable to attend work or school during an acute episode. Approximately half of the patients (21/40, 52.5%) were taking some form of prophylactic treatment (inhaled steroids or sodium cromoglycate) at the onset of the attack. Fifteen patients (37.5%) had discontinued some aspect of their asthma treatment within the three months preceding the acute attack.

Patients were asked to assess the severity of the attack prior

**Table 1.** Characteristics of patients suffering an acute asthmatic attack.<sup>a</sup>

	Number (%) of patients
<i>Past asthma treatment</i>	
Nebulizer treatment	34 (70.8)
Oral steroid	22 (46.8)
Inhaled prophylactic treatment (steroids or sodium cromoglycate)	22 (45.8)
Hospital admission for asthma	18 (37.5)
<i>Smoking status</i>	
Smoker	3 (7.1)
Smoker in household	14 (34.1)
<i>Specialized equipment</i>	
Home nebulizer	4 (7.7)
Peak flow meter	10 (19.2)
<i>Drug treatment at onset of asthma attack</i>	
Inhaled beta agonists	36 (90.0)
Inhaled steroids	18 (45.0)
Oral theophylline	6 (15.0)
Inhaled sodium cromoglycate	4 (10.0)
Oral beta agonist	3 (7.5)
Discontinued an aspect of treatment in previous 3 months	15 (37.5)

<sup>a</sup> Data not available for all patients.

to treatment. None of the patients graded their attack as very severe. Patients graded their attack as severe in 32 of 51 episodes, moderate in 18 episodes and mild in one. General practitioners recorded patients' difficulty with speech in 43.5% of episodes (27/62). A respiratory rate of 25 or more breaths per minute before the salbutamol nebulization was recorded in 44.8% of patients aged over 12 years (13/29). The majority (77.8%) of patients aged 12 years and less had a respiratory rate above 25 breaths per minute. Median peak expiratory flow rate before the nebulization, expressed as a percentage of predicted normal, was 42% (range 12–96%) and was below 40% in 43.2% of attacks (16/37). Median peak expiratory flow rate before the nebulization, expressed as a percentage of the patient's previously recorded maximum was 51% (range 20–90%) and was below 40% in 25.6% of attacks (11/43). Median pulse rate before nebulizer use was 98 beats per minute (standard deviation (SD) 17) in those aged over 12 years and 120 (SD 20) in those aged 12 years or less.

New treatments prescribed by the doctor in the management of the acute attack are summarized in Table 2. Nebulizer usage was required on more than one occasion in 41.2% of cases and such individuals were more likely to have a history of previous oral steroid use ( $P < 0.05$ ; Fischer's exact test). Children under the ages of five years and 12 years or less were just as likely as adults to be treated with more than one nebulizer treatment and to be treated with oral corticosteroids. Significant improvements in both peak expiratory flow rate and respiratory rate were shown after nebulizer use (median peak expiratory flow rate 165 l min<sup>-1</sup> before nebulization versus 230 l min<sup>-1</sup> after nebulization; median respiratory rate 28 breaths per minute before nebulization versus 20 breaths per minute after nebulization;  $P < 0.001$ ; Mann Whitney  $U$  test), but no significant change in pulse rate occurred.

**Table 2.** New treatments prescribed by doctors in the management of the 69 episodes of acute asthma.

	Number (%) of episodes
Oral steroids	43 (62.3)
Nebulizer use more than once <sup>a</sup>	28 (41.2)
Antibiotics	26 (37.7)
Oral theophyllines	22 (31.9)
Inhaled steroids	12 (17.4)
Hospital admission <sup>b</sup>	3 (4.3)
Intravenous steroids	0 (0.0)

<sup>a</sup> Data available for 68 episodes. <sup>b</sup> One patient admitted twice.

Oral steroids were prescribed in 62.3% of acute asthma attacks, this use was significantly associated with past oral steroid therapy ( $P < 0.01$ ; Fischer's exact test). Oral steroid treatment was not associated with the patient's age. However, it was more likely to be prescribed for patients with a lower peak expiratory flow rate (median peak expiratory flow rate expressed as a percentage of predicted normal was 36% in those receiving oral steroids compared with 57% in those not given oral steroids ( $P < 0.05$ ; Mann Whitney  $U$  test). No patient received intravenous steroids. Twenty eight patients took oral theophyllines during the acute asthma attack which had been prescribed either as part of maintenance therapy or as additional treatment acutely. Antibiotics were prescribed in 37.7% of episodes and this use was significantly related to respiratory rate ( $P < 0.05$ ; Mann Whitney  $U$  test) at the time of nebulizer treatment. Hospital admissions occurred on three occasions, one patient being admitted twice.

Factors thought to have contributed to the acute event are listed in Table 3. Infection and allergy were frequently perceived

**Table 3.** Causes of episodes of acute asthma perceived by 64 doctors and 41 patients.<sup>a</sup>

Cause	Number (%) of episodes	
	Patient's view <sup>b</sup>	Doctor's view
Infection	26 (63.4)	33 (51.6)
Allergy	8 (19.5)	22 (34.4)
Damp weather	3 (7.3)	0 (0.0)
Poor compliance/inadequate treatment	2 (4.9)	28 (43.8)
Exercise	2 (4.9)	1 (1.6)
Others	4 (9.8)	3 (4.7)

<sup>a</sup> More than one cause could be recorded for each episode. <sup>b</sup> Response from patient or his/her parent.

to be causes of acute episodes by both doctors and patients. Doctors felt that poor compliance or inadequate treatment were important factors in 43.8% of episodes; poor compliance or inadequate treatment were rarely cited as causes by patients.

When patients' practice notes were reviewed six months or more after the acute attack, it was found that 77.1% of patients were being prescribed prophylactic therapy. This was greater than before the acute episode. However, this difference can be partly explained by therapy initiated at the acute attack. Patients' records revealed that 44.4% of patients (20/45) had had a further acute asthma attack in the six months after the studied event and 22.2% (10/45) had had two further acute episodes. Eight out of 45 patients (17.8%) were being seen by a hospital physician for their asthma, although no new referrals had resulted from the acute asthma attacks studied.

## Discussion

This was a prospective study of the management of acute asthma attacks treated with nebulized salbutamol. Sixty nine acute asthma episodes occurred in the 18 month study period. We believe that this represents the majority of acute asthma attacks in the practice, as the nearest accident and emergency department is 13 miles away, and it is our impression that the patients rarely refer themselves to hospital without seeking prior advice from the general practitioner. There was, however, a large variation in the number of patients entered into the study by different general practitioners, perhaps reflecting incomplete recruitment by some general practitioners, but also owing to partnership and trainee changes during the study period. Although equal numbers of male and female patients were entered into the study, males were significantly younger than females. This age difference between males and females has been noted before,<sup>6</sup> and is in part due to the increased prevalence of asthma in boys,<sup>7</sup> but perhaps also reflects a difference between the sexes in adult asthma.<sup>6</sup>

Patients' past medical histories confirmed the presence of a severe form of asthma; 38% of patients had been admitted to hospital for asthma in the past, and 71% had had nebulized beta agonists. Only 47% of patients, however, had received oral steroids in the past although the younger children with a shorter history of symptoms included in the study may account for this low figure.

Treatment with nebulized beta agonists in an acute asthmatic attack implies a degree of severity. However, when patients (or their parents) were asked to grade the perceived severity of their attack, none of these episodes were rated as very severe. In the absence of reliable means of assessing asthma severity symptomatically, objective measures such as peak expiratory flow rates

or forced expiratory volumes need to be recorded.<sup>8,9</sup> There are obvious difficulties in young children but where possible it is highly desirable that patients with chronic severe asthma have access to a peak flow meter. We found that 10 patients owned a peak flow meter, although several were available in the practice for lending purposes during an acute event so the patient is able to record an objective measure of severity. At the time of the study, peak flow meters were not available on National Health Service prescription; it is hoped that wider availability will lead to improvements in asthma care.

Doctors were not asked to grade the severity of the asthma attacks but some insight can be gained from their observations and objective measurements. Patients' difficulty with speech was observed in 44% of attacks. In patients aged over 12 years, 45% had a respiratory rate greater than 25 breaths per minute and in 26% of attacks patients had a peak expiratory flow rate below 40% of their best recorded value. Recently published guidelines for the management of acute severe asthma in adults suggest that a respiratory rate of 25 or more and a peak expiratory flow rate of less than 40% of predicted normal or previous best obtainable result, are potentially life threatening features.<sup>10</sup> It is well known that both patients and doctors often underestimate the severity and speed of onset of an asthmatic attack.<sup>8,9</sup> This fact has been cited as an important cause of mortality in acute asthma.<sup>11</sup> It has been suggested that chronic asthma sufferers tolerate a degree of airflow obstruction, partly owing to a poor perception of their disability but perhaps also owing to a poor expectation of health.<sup>12</sup> Significant morbidity was reported by the patients in this study with sleep disturbance being almost universal and inability to attend work or school being present in two thirds of cases. We had the strong impression from the questionnaires that both patients and doctors expected and accepted that acute episodes would occur; this attitude may undermine commitment to prophylactic therapy.

Management of the acute episode occurred almost exclusively in the community with only two patients being admitted to hospital, one being admitted on a second occasion. The efficacy of beta agonists delivered by nebulizers is well documented<sup>5</sup> and as expected, significant improvements in respiratory rate and peak expiratory flow rate were recorded. In 59% of episodes, one nebulizer treatment sufficed. A study of nebulizer use for children with acute asthma in general practice has suggested that this was often the only treatment required.<sup>13</sup> However, we found that children were just as likely as adults to be treated with more frequent use of the nebulizer and to require oral steroids in acute asthma. Four patients owned a home nebulizer. This study focused on patients seeking medical attention and no attempt was made to study nebulizer usage in patients owning a home nebulizer who did not feel that their asthma was out of control. Many concerns have been expressed about the use of nebulizers in general practice and in the domiciliary setting. These include the possibility that a temporary improvement in the patient's condition may result in a false sense of security, and consequently a failure to present in a subsequent attack for further treatment including steroids and hospitalization.<sup>5,14</sup> Clearly, nebulizer treatment should not be regarded as a panacea and should not diminish the need for adequate assessment, follow up and effective prophylaxis in patients with asthma.

The role of oral steroids is well established in acute severe asthma.<sup>15</sup> In our study oral steroids were prescribed in 62% of episodes; patients with lower peak expiratory flow rates and previous treatment with oral steroids were more likely to have them prescribed. Oral steroid therapy did not reduce the need for further treatment with salbutamol and it was not possible to assess the effect of oral steroids on subsequent hospital admissions owing to the small numbers concerned. Other measures

used during the attacks included changes in inhaled therapy, with advice to restart discontinued inhaled steroids or sodium cromoglycate. Antibiotics and theophyllines were frequently prescribed. The prescription of antibiotics appeared to be due to the perceptions, shared by both patients and doctors, that many of the acute events were triggered by infection. This is contrary to the available evidence against bacterial infection being a precipitating factor in acute asthma.<sup>16</sup> Both doctors and patients felt that allergy was also an important contributing factor. Doctors considered poor compliance or inadequate treatment to be causes of acute asthma in 44% of episodes, but these were rarely cited as causes by patients.

Despite the underlying severity of asthma in this group of patients, only 53% were on prophylactic treatment at entry into our study and only 18% were being seen by a hospital physician for their asthma. No new specialist referrals had resulted from the asthma attacks being studied. It was notable that 38% of patients had stopped some aspect of their treatment in the three months preceding the attack although it is difficult to distinguish those patients who had stopped treatment because of doctor's orders from those patients who had stopped treatment in spite of doctor's orders. This is a complex issue as it may reflect poor patient understanding of prophylactic treatment, poor follow up, or poor compliance. Twenty out of 45 patients (44%) went on to have a further acute attack and 22% had two further acute attacks in the six months following the studied acute event. Seventy seven per cent of patients were recorded as taking prophylactic treatment when their medical records were reviewed six months later, although the adequacy of their understanding of asthma and effectiveness of their inhaler use are uncertain. The asthma sufferers appeared to be receiving repetitive cycles of emergency treatment rather than adequate prophylactic treatment.

It seems clear therefore that any acute asthma episode should lead to a review of the patient's management, including consideration of a patient's compliance with treatment. Improved patient education is required to address effective inhaler use, to advise of the adverse effects of smoking (a disturbing number of patients were exposed to cigarette smoke), and of preventive measures such as allergen avoidance. Possible misunderstandings between doctor and patient, and lack of consensus between different doctors involved in the patient's care should also be considered. Wider acceptance of more recent concepts of the inflammatory and chronic nature of moderate and severe asthma should lead to more widespread acceptance of long term anti-inflammatory treatment, as is now recommended for all but the mildest cases.<sup>17</sup> Our study, like the retrospective inquiry of the British Thoracic Society on asthma mortality<sup>11</sup> suggests that the routine management of asthma is inadequate and implies that this contributes to acute exacerbations. The reluctance of both doctors and patients to perceive asthma as a chronic condition<sup>12,18</sup> may contribute to irregular use or cessation of prophylactic treatment. The patients' involvement in the management of their asthma is desirable and recent experience with self management programmes has shown that a reduction in asthma morbidity can be achieved.<sup>19</sup> Mini-clinics in general practice have also been described and are growing in number,<sup>20</sup> although their effectiveness in reducing asthma morbidity has yet to be demonstrated.

In conclusion, our study has shown that many patients receiving care from their general practitioner for an acute episode of asthma had a history of severe asthma and yet were receiving less than adequate treatment. Over one third of the patients had discontinued some aspect of prophylactic therapy in the three months prior to the attack. The use of prophylactic drugs in-

creased following the acute episode although many patients went on to have further attacks. This study suggests that an acute episode should lead to a review of the patient's asthma management including objective and regular monitoring of the condition and a review of the patient's understanding of the condition and his or her compliance with therapy. Adoption of such changes in practice may improve the care of asthmatic patients.

This study forms the first part of an audit cycle. Deficiencies in care have been identified and recommendations for changes in clinical practice made. Further study is needed to establish whether improvements in clinical care result and indeed to see if changes in behaviour occur to complete this cycle.<sup>21</sup>

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