

Management of acute asthma exacerbations by general practitioners: a cross-sectional observational survey

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SUMMARY

Background: General practitioners (GPs) have a central place in the management of asthma, particularly in the context of acute exacerbations.

Aim: To evaluate the management of asthma exacerbations by GPs, and to investigate the ability of risk factors for near fatal asthma to predict the severity of asthma attacks in the community.

Design of study: A 1-month multicentre cross-sectional survey.

Setting: One thousand and ninety-four GPs of the French Sentinel Network were contacted; 365 responded.

Method: Asthma exacerbations were classified according to severity at presentation. Univariate and multivariate analyses were performed by logistic regression to identify those factors associated with severe exacerbations.

Results: Exacerbations were described in 219 patients with asthma. Over half (54%) of exacerbations were severe. Peak expiratory flow was recorded during the consultation in 55% of patients who were more than 5 years old. β_2 agonists were prescribed to 93% of patients, systemic corticosteroids to 71%, and antibiotics to 64%. Only 42% of patients had a written action plan for self-management of exacerbations. Risk factors for near fatal asthma, identified in 26% of patients, were not significantly associated with severe asthma exacerbations. Short duration of exacerbation before consultation (<3 hours) was associated with an increase in relative risk of severe exacerbation of 3.38, 95% confidence intervals (CIs) = 1.19 to 9.61, compared with duration of >3 hours.

Conclusion: Risk factors for near fatal asthma identified in previous studies were not predictive of a severe exacerbation in general practice, with the exception of short duration of exacerbation before consultation. This suggests that new methods to predict risk in the outpatient settings should be developed.

Keywords: Asthma; general practitioners; patient care management; risk factors.

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Introduction

ASTHMA affects an estimated 130 million people worldwide and leads to 60 000 deaths annually.¹ In France, it affects 6% of the population,² and results in 2000 deaths annually.³

National and international guidelines have been developed over the last 10 years to improve control of the disease.^{4,5} In France, disease severity is classified into four severity ranks from intermittent to severe, and new therapies have been introduced, which target the inflammatory component of the disease in particular. However, several studies have shown that practitioners underprescribe prophylactic medications for persistent asthma, and that this practice varies across countries.⁶⁻¹⁰ In the treatment of acute asthma systemic corticosteroids and nebulised bronchodilators are underused in general practice¹¹⁻¹³ and in accident and emergency (A&E) departments.^{14,15}

Most patients have outpatient visits for asthma only during exacerbations rather than for the prevention of exacerbations.¹⁰ In the United Kingdom from 1991 to 1992, and 1993 to 1994, some 90-95% of patients with asthma exacerbations were seen initially by general practitioners (GPs).¹¹⁻¹³ Among the patients involved, 11% were referred to A&E departments, and less than 1% were admitted to hospital. This emphasises the central role of GPs in the management of acute asthma.

Risk factors for death or near fatal asthma have been identified primarily in hospital settings and include:

- previous history of mechanical ventilation for near fatal asthma,
- hospital referral during the previous year,
- aspirin or non-steroidal anti-inflammatory drug (NSAID) intolerance,
- poor compliance,
- old age at consultation,
- male sex, and
- rapid onset asthma.^{4,16-19}

Risk factors for hospitalisation or regular A&E department consultations also include:

- psychological disorders,
- age at the diagnosis of asthma of less than 5 years old
- moderate to severe disease, and
- moderate to severe respiratory impairment.^{18,20,21}

The aim of our study was to evaluate the management of asthma exacerbations by GPs, and to investigate the predictive value of these previously published risk factors in asthma attacks when presenting to the GP.

HOW THIS FITS IN*What do we know?*

Recent reports suggest that treatment of asthma is often inadequate. Risk factors for death or near fatal asthma have primarily been studied in hospital settings, and the predictive value of risk factors for severe asthma exacerbations in general practice, which have been useful for near fatal asthma, has not previously been estimated.

What does this paper add?

Risk factors for near fatal asthma or death identified in previous studies are not predictive of a severe exacerbation in general practice, with the exception of short duration (<3 hours) of exacerbation before consultation. This suggests that new methods to predict risk in this population should be developed.

**Method***Patients and study design*

The study was a 1-month multicentre cross-sectional survey of 1094 GPs who participate in the French Sentinel Network, and took place from 15 January until 15 February 2002. The GPs were asked to include, prospectively, the first patient who presented with an asthma exacerbation, which was defined as wheezing or cough associated with breathlessness. Patients were excluded if left ventricular heart failure or exacerbation of chronic bronchitis was suspected. In this analysis only patients with a former history of asthma were included and there was no age limitation.

As in the study of Salmeron *et al*,¹⁵ diagnosis of acute asthma exacerbation was considered to be certain if a patient had none of the following criteria; probable if a maximum of two criteria were present; and unlikely if all criteria were present:

- aged ≥ 60 years at diagnosis of asthma,
- coexisting diagnosis of chronic bronchitis associated with smoking or a former smoking habit, and
- coexisting heart disease.

Data were collected by means of a postal form completed by physicians, which included questions on the patient's sociodemographic characteristics, asthma symptoms in the previous month, age at diagnosis of asthma, and current exacerbation. The following known risk factors for death or near fatal asthma were also collected: a previous history of mechanical ventilation for near fatal asthma, hospital referral for near fatal asthma during the previous year, aspirin or NSAID intolerance, poor compliance with therapy, and current treatment with systemic corticosteroids.

Exacerbations were defined as severe if the patient showed one or more of the following signs: orthopnea, use of accessory muscles, sweating, inability to talk, agitation, heart rate ≥ 120 /min, respiratory rate ≥ 30 /min, confusion, silent chest, collapse or cyanosis, and/or a peak expiratory flow (PEF) value of $< 30\%$ of the predicted value. Exacerbation was defined as moderate if the patient showed

none of the clinical signs listed above, and when the PEF was $> 30\%$ predicted.

A clinical and a therapeutic classification (adapted from the French guidelines,⁴ and those of GINA [Global Initiative for Asthma], a National Institute of Health [NIH] working group⁵) for the severity of the underlying asthma were combined (Table 3), as recommended by GINA.

Statistical analysis

All statistical analyses were performed using SAS software (SAS Institute, Inc, Cary, NC). We assessed the associations between covariables and severity of exacerbations with logistic regression models. In the multivariate analysis the significant *P*-value was 0.05. Variables were entered into two stepwise forward multivariate regression models, provided that the univariate association was below 0.15 or the factor was a known risk factor for near fatal asthma.

The first model included eight elementary covariables: previous history of mechanical ventilation for near fatal asthma, hospital referral for near fatal asthma during the previous year, aspirin or NSAID intolerance, current smoking, therapeutic classification, age at the beginning of asthma, duration of asthma history, and duration of exacerbation before consultation. The second model included the variables mentioned above as a combined variable for the first three factors plus use of oral corticosteroids (risk factors for near fatal asthma), and as primary variables for the others.

Table 1. Demographic characteristics of patients.

Characteristic	Number of patients (%)
Sex (<i>n</i> = 219)	
Male	95 (43)
Female	124 (57)
Age (years) (<i>n</i> = 218)	
<16	61 (28)
16–30	48 (22)
>30	109 (50)
Ethnic origin (<i>n</i> = 208)	
Caucasian	125 (60)
Other	83 (40)
Current smokers (adult patients) (<i>n</i> = 157)	
Yes	47 (30)
No	110 (70)
Previous history of atopy (<i>n</i> = 219)	117 (53)
Age (years) at the beginning of asthma (<i>n</i> = 194)	
<16	126 (65)
16–30	25 (13)
>30	43 (22)
Duration (years) of asthma history (<i>n</i> = 194)	
<16	128 (66)
≥ 16	66 (34)
Previous history of mechanical ventilation for asthma attacks (<i>n</i> = 214)	12 (6)
Hospitalisation for asthma attacks during the past year (<i>n</i> = 218)	38 (17)
>1 risk factor for near fatal asthma ^a (<i>n</i> = 219)	57 (26)

^aOne or more of the following factors: previous history of mechanical ventilation for near fatal asthma, hospital referral for near fatal asthma during the past year, aspirin or NSAID intolerance, use of oral corticosteroids.

Table 2. Patients' care (use of lung function testing, follow-up, and regular treatment).

Type of care	Number of patients (n (%))
Previous consultation for asthma ^a (n = 216)	
Lung specialist only	78 (36)
Allergologist only	27 (13)
Lung specialist and allergologist	57 (26)
No specialist	54 (25)
Lung function test (>5 years old) (n = 168)	
Yes	136 (81)
No	32 (19)
Regular treatment (n = 219)	
Anti-inflammatory agents	148 (68)
Inhaled corticosteroids	128 (58)
Oral corticosteroids	3 (1)
Leukotriene inhibitors	18 (8)
Cromolyn	1 (0)
Bronchodilators	
Long-acting inhaled β_2 agonists ^b	108 (49)
Oral long-acting β_2 agonists	5 (2)
Oral theophylline	10 (5)
Compliance (as reported by the physician) (n = 136)	
Yes	91 (67)
No	45 (33)
Peak flow meter at home (>5 years old) (n = 162)	
Yes	28 (17)
No	134 (83)

^a at least once in the patient's lifetime; ^b long-acting inhaled β_2 agonists and corticosteroids (n = 10).

Results

A total of 365 (33%) of the 1094 GPs who were contacted, responded. Of the responders, 116 reported no exacerbation during the whole month. Reported patients without a former history of asthma (30/249, 12%) were not included in this analysis. Reports of 219 asthma exacerbations were available for analysis, 197 of them were assessed as certain, and 22 as probable.

Table 3. Asthma severity classification (n = 219 patients).

Clinical status ^a	Therapeutic status ^b				Total (%)
	Intermittent	Mild	Moderate	Severe	
Intermittent	47 ^c	11 ^d	10 ^e	0 ^f	68 (31)
Mild persistent	6 ^d	2 ^e	12 ^f	0 ^f	20 (9)
Moderate persistent	7 ^e	5 ^f	11 ^f	1 ^f	24 (11)
Severe persistent	20 ^f	20 ^f	65 ^f	2 ^f	107 (49)
Total (%)	80 (37)	38 (17)	98 (45)	3 (1)	219 (100)

^aClinical classification: severe/persistent (step 4): daily use of β_2 agonists OR dyspnoea within exacerbations OR nocturnal asthma every night OR physical activities limited by asthma OR peak expiratory flow (PEF) rate <60% of predicted; moderate persistent (step 3): daily asthma symptoms OR nocturnal asthma >once a week but <every night OR PEF rate range 60–80% of predicted or its variability >30%; mild persistent (step 2): asthma symptoms once a week but <once a day OR night time asthma >2 x month but \leq once a week OR PEF >80% of predicted but its variability 20–30%; intermittent (step 1): asthma symptoms < once a week AND night time asthma <2 x month AND no physical activities limitation AND PEF >80% of predicted AND its variability <20%. ^bTreatment classification: severe persistent (step 4): oral corticosteroid whatever the associated treatment could be; moderate persistent (step 3): inhaled corticosteroid AND long acting inhaled β_2 agonist and/or long acting theophylline and/or oral β_2 agonist and/or leukotriene inhibitor; mild persistent (step 2): cromone and/or long acting theophylline and/or inhaled long acting β_2 agonist without inhaled corticosteroid OR inhaled corticosteroid alone; intermittent (step 1): no current asthma medications.

^{c,d,e,f}Final GINA classifications: ^cintermittent; ^dmild; ^emoderate; ^fsevere.

Patient characteristics

The characteristics of patients with asthma exacerbations are shown in Table 1. Of this cohort, 95 (43%) were men. Mean age was 33 \pm 23 years (\pm standard deviation [SD]), ranging from 5 months to 85 years, and 61 (28%) were young people (aged <16 years). Thirty per cent of young people were current smokers. Asthma began during childhood for 126 (65%) patients. The mean duration of asthma history was 14 \pm 13 years (\pm SD). There were 12 patients (6%) with a previous history of mechanical ventilation, and 38 patients (17%) had contact with a hospital for near fatal asthma during the previous year. Risk factors for near fatal asthma were present in 26% of patients.

Asthma management is detailed in Table 2. There were 162 (75%) patients who consulted an asthma specialist at least once in their lifetime; 81% of patients aged >5 years had lung function tests. There were 148 (68%) patients being treated for their asthma at the time of the study; 128 (58%) were prescribed inhaled corticosteroids, 18 (8%) received leukotriene inhibitors, and 10 (5%) patients were given long-acting inhaled β_2 agonists alone without corticosteroids. GPs reported that 91 (67%) patients were compliant with therapy. Only 17% of patients aged >5 years had a peak flow meter at home.

Asthma severity was classified using clinical and treatment criteria (Table 3). Based on clinical status, 68 (31%) patients had intermittent asthma and 107 (49%) had severe asthma. According to therapeutic status, 80 patients (37%) had no routine medication, and only 3 (1%) had a treatment corresponding to severe asthma (including oral corticosteroids). In the final GINA classification, which combines the clinical and therapeutic classifications, 47 patients (21%) had intermittent asthma, 17 (8%) mild asthma, 19 (9%) moderate asthma, and 136 (62%) severe asthma.

Characteristics of asthma exacerbations are shown in Table 4. A minority were evaluated by the GP within 3 hours of the exacerbation, 46% of patients consulted between 3 and 24 hours after the beginning of the exacerbation, and

Table 4. Characteristics of exacerbations.

Characteristic	Number of patients (%)
Duration (hours) of exacerbation (<i>n</i> = 218)	
< 3	24 (11)
3–24	100 (46)
>24	94 (43)
Place of consultation (<i>n</i> = 206)	
Practitioner's office	154 (75)
Patient's home	52 (25)
Trigger (as reported by the GP) ^a (<i>n</i> = 219)	
Viral infection	170 (78)
Weather conditions	46 (21)
Tobacco exposure	35 (16)
Dust exposure	26 (12)
Air pollution	20 (9)
Psychological factors	19 (9)
Exposure to pets	15 (7)
Physical effort	13 (6)
Interruption of current treatment	12 (5)
Pollen exposure	3 (1)
Drug exposure	1 (0)
Severity of exacerbation at presentation ^b (<i>n</i> = 219)	
Mild to moderate	101 (46)
Severe	118 (54)
Measurement of peak expiratory flow (PEF) (>5 years old) (<i>n</i> = 186)	
Yes	103 (55)
No	83 (45)
Self-medication before consultation (<i>n</i> = 218)	
Yes	146 (67)
Short acting β_2 agonists alone	126 (58)
Short acting β_2 agonists plus corticosteroids	17 (8)
Oral corticosteroids alone	3 (1)
No	71 (33)
Action plan for self-management (<i>n</i> = 203)	
Yes	86 (42)
Patient did begin treatment	64 (74)
No	117 (58)
Patient did begin treatment	76 (65)

^a Several triggering factors could be suspected; ^b From clinical symptoms, according to the French guidelines (ANAES, 1999).

43% >24 hours after the exacerbation. In 75% of cases, the consultation took place at the GP's office. The most frequent suspected triggers reported by GPs were viral infections (78%), weather (21%), tobacco (16%), and dust exposure (12%). Exacerbation was severe for 118 (54%) patients.

Of those aged >5 years old, 55% had a peak flow recorded during the GP consultation. Two-thirds of patients (*n* = 147) began treatment at home, most frequently with short-acting β_2 agonists alone (86% of these patients). There were 86 patients (42%) with a written action plan for managing exacerbations, 64 of these (74%) did begin treatment. Among 117 patients with no written action plan, 76 (65%) began a treatment. Treatment for exacerbations consisted of short-acting β_2 agonists, systemic corticosteroids and antibiotics (Table 5). Patients were more often prescribed systemic corticosteroid and subcutaneous β_2 agonists for severe exacerbation (80% versus 61%, *P* = 0.003) than for moderate exacerbation (15% versus 6% *P* = 0.03).

Univariate and multivariate logistic regression analysis of severe exacerbations risk factors

In the univariate analysis, variables associated with an increased risk of severe exacerbations were:

- a history of hospitalisation for near fatal asthma during the previous year,
- an age at the diagnosis of asthma from 16–30 years old compared with the age at diagnosis of <16 years old,
- an intermittent or severe therapeutic asthma status,
- a short duration of exacerbation before consultation, and
- risk factors for near fatal asthma.

An age of >30 years at the diagnosis of asthma was associated with a decreased risk of severe exacerbation. In the multivariate analysis, the only variable that was independently significantly associated with severe exacerbations in general practice was duration of exacerbation of <3 hours before consultation (odds ratio = 3.71, 95% confidence interval [CI] = 1.35 to 10.19) in reference to more than 24 hours. Among the other non-significant variables that were investigated (Supplementary Table 1), only a moderate to severe underlying treatment asthma status reaches an odds ratio above 2 (odds ratio = 2.07, 95% CI = 0.97 to 4.43).

Discussion

Summary of main findings

None of the known risk factors for near fatal asthma or death were predictive of a severe exacerbation in general practice, with the exception of short duration (<3 hours) of exacerbation. These factors had been identified in previous studies (most of which were conducted in hospital settings), but had not been evaluated in the community before.

Strengths and limitations

This study was undertaken among GPs of the French Sentinel Network, who are spread out all over France. This network comprises 1094 voluntary, unpaid GPs, a quarter of whom connect over the Internet at least every week to report cases of several infectious diseases, and of asthma. They also participate in *ad hoc* epidemiological studies.

Compared to French GPs as a whole, the sample of GPs who took part in our survey worked more often in group practices, and provided slightly more consultations than

Table 5. Treatment of asthma exacerbations according to severity.

Treatment	Moderate exacerbations (%) (<i>n</i> = 101)	Severe exacerbations (%) (<i>n</i> = 118)	<i>P</i> -value
Short-acting β_2 agonist	94 (93%)	109 (92%)	0.84
β_2 agonist by subcutaneous injection	6 (6%)	18 (15%)	0.03
Systemic corticosteroids	62 (61%)	94 (80%)	0.003
Antibiotics	60 (59%)	81 (69%)	0.15
Hospital referral	2 (2%)	8 (7%)	0.11

most French GPs, but the distribution of the age of their patients did not differ. Non-responders did not differ from responders according to sex, group activity, frequency of consultations, or distribution of age of patients; they were, however, slightly older (aged 49.6 years versus 48.3 years). The number of practitioners who gave at least one consultation for an asthma exacerbation during the month was slightly greater in responders than in a sample of non-responders, who were further investigated. One strength of the study was the particular attention paid to the careful monitoring and quality checks. Cases were validated according to predefined criteria, and details on clinical signs were recorded. Doubtful responses were controlled by a telephone call to the GP, and data capture was verified.

The study had several limitations: in the absence of a PEF value, the severity of asthma attacks was based on clinical symptoms only; however, this does correspond with what happens in practice. Although dosing of corticosteroids is a key variable, this could not be appropriately assessed in our study because of the high number of missing data on that variable. Moreover, recommended medications by disease severity using NIH and French guidelines differ slightly. This results in it being impossible to estimate the exact level of underprescription of prophylactic medications compared to symptoms over the previous month.

Comparison with existing literature

Severe exacerbations represented more than half of our cases, which was a greater proportion than that found in general practice in the UK 10 years ago,^{11,12} where 27–34% of patients were breathless and distressed, and 50–52% were moderately breathless. In these UK studies, clinical signs were not detailed. The frequency of severe exacerbations was also lower in the UK than that observed in A&E departments in France,¹⁵ where 75% of exacerbations were severe (49%) or life-threatening (26%). The frequency of recorded peak flow was lower in our study (55% of patients aged >5 years) than in the UK from 1991 to 1992 (82%), but in the same order of magnitude in another UK study conducted from 1992 to 1993.^{11,12}

More than 70% of patients were prescribed systemic corticosteroids for their asthma exacerbation, which is a greater proportion than that found in patients interviewed attending the A&E department in France from 1997 to 1998 (48%).¹⁵ This proportion was 56% in UK from 1991 to 1992, and 71% from 1992 to 1993.^{11,12} Antibiotics were prescribed to 64% of patients in our study, a greater proportion than in the UK studies,^{11,12} although this prescription is not recommended for asthma exacerbations. In our study, 42% of patients had a written action plan to manage exacerbations, compared with 34% in the UK from 1991 to 1992. Only 17% of patients had a peak flow meter at home, consistent with observations in A&E departments in France (16%). In the United States (US) from 1997 to 1998, this proportion was greater (52%).⁷ Although the severity of exacerbations is difficult to compare between surveys due to methodological differences, management of acute exacerbations seems rather similar in our survey and in the UK 10 years ago.

The only factor found to be associated with severe asthma in our study was short duration (<3 hours) of

exacerbation before consultation. This finding could be related to rapid onset of asthma due to an environmental exposure, but this needs further investigation. Risk factors for near fatal asthma, mostly described in hospital settings from case-control studies, were not independently associated with severe exacerbations in our study. This fact could be due to the difference between severe exacerbations and near fatal asthma, or to a lower frequency of severe, and especially life-threatening, asthma in general practice than in the hospital setting. In our study, with 101 severe exacerbations and 118 non-severe asthma exacerbations, the minimal detectable relative risk was 2.5 (and 3) with respectively exposed proportion of 20% (and 10%) ($\alpha = 0.05$, $1 - \beta = 0.80$, two-tailed formulate).

Follow-up of patients after the consultation (in particular, death) was not recorded, even if hospitalisation occurred; hospitalisation represented only 10 cases. This would have been of interest, especially if near fatal asthma had occurred. In France patients can access consultants or clinics directly in an exacerbation so it could be that patients with risk factors for near fatal asthma consulted directly in hospital for any severe exacerbations. However, patients seen by GPs in our study were not very different from those who were seen in emergency settings in France:¹⁵ frequency of previous intubation for asthma was similar in general practice and in A&E departments (6% versus 7%), frequency of hospitalisation for asthma attacks during the previous year was slightly greater in A&E departments than in general practice (30% versus 18%).

We cannot exclude the possibility that risk factors for near fatal asthma could be associated with severe exacerbations in general practice in other countries that have a different organisation of primary care. However, we feel the importance of this study highlights the limitations of current risk factors in identifying patients with asthma, who are at risk of severe asthma events.

Implications for future research and clinical practice

Of importance to the GP is that patients with no risk factors for near fatal asthma can present in the consultation with a severe asthma exacerbation. The association of a short duration of exacerbation before presentation to the GP with severe exacerbation needs further investigation to determine if some factors contribute to severe exacerbations and could be used for patient education.

Early use of short-acting β -agonists, systemic steroids based on severity of symptoms and the use of peak flow in the acute setting compared with baseline measurements should be recommended to GPs. If peak flow is less than 50% of normal, early initiation of β -agonists and steroids could have an impact on the disease outcome.

Guidelines could be addressed to patients regarding early management of acute exacerbations, and when and where (that is, whether at a GP's office or directly at an A&E department) a patient should consult a physician. In a few years, further investigations should measure the improvement of GPs' knowledge of guidelines, and how their practice has evolved in accordance with them.

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Supplementary information

Additional information accompanies this paper at:
<http://www.rcgp.org.uk/journal/index.asp>

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