Respiratory Medicine (2005) **99**, 793–815

respiratoryMEDICINE

REVIEW

Clinical practice guidelines: Medical follow-up of patients with asthma—Adults and adolescents

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Received 21 January 2005; accepted 9 March 2005

KEYWORDS
Guideline;
Asthma;
Follow-up;
Control

Summary The follow-up of patients with asthma should focus on asthma control (disease course over a number of weeks)

→ **There are 3 levels of asthma control**

- Acceptable: All control criteria (Table 1 below) are met
- Unacceptable: One or more criteria are not met
- Optimal: All control criteria are normal or, in a patient with acceptable control, the best compromise has been achieved between degree of control, acceptance of treatment and possible side effects

Table 1 Criteria defining acceptable asthma control.

Criterion	Value or frequency*
Day-time symptoms	<4 days/week
Night-time symptoms	<1 night/week
Physical activity	Normal
Exacerbations	Mild, infrequent
Absence from work or school	None
Use of short-acting β_2-agonists	<4 doses/week
FEV_1 or PEF	>85% of personal best
PEF diurnal variation (optional)	<15%

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0954-6111/$ - see front matter
doi:10.1016/j.rmed.2005.03.011

*Mean during control assessment period (1 week–3 months).
FEV: forced expiratory volume; PEF: peak expiratory flow.

→ Follow-up includes monitoring of treatment side effects and adherence.

→ Treatment should be adjusted to level of control and current long-term therapy.

- If control is unacceptable:
  - Check: that the disease is asthma, adherence, correct use of inhalation devices.
  - Look for and treat: aggravating factors, concomitant disease, specific clinical forms.
  - Adjust long-term therapy (see Table 2 below) in steps of 1–3 months.
- If control is acceptable or optimal:
  - Find the minimum effective treatment to maintain at least acceptable and ideally optimal control. Each step should last 3 months.

Table 2 Adjusting long-term therapy if control is unacceptable.

Current therapy	New treatment[a]	
	Option 1	Option 2
No ICS	Average-dose ICS	Average ICS dose+AM[b]
Patients on ICS only		
Low- or average-dose ICS	Add AM	Increase ICS dose with or without AM
High-dose ICS	Add AM	
Patients on ICS and additional medication (AM)		
Low dose of ICS (+1 AM)	Increase ICS dose	
Average dose of ICS (+1 AM)	Increase ICS dose	Add second AM with or without increasing ICS dose
Heavy dose of ICS (+1 AM)	Add second AM	Oral corticosteroids[c]
Heavy dose of ICS (+2 AMs)	Oral corticosteroids[c]	Add third AM

[a]The choice between options will depend on symptom frequency and respiratory function (particularly post-bronchodilator FEV_1).
[b]Additional medication (AM) covers long-acting β_2-agonists, cysteinyl-leukotriene receptor antagonists, theophylline and its derivatives (bamiphylline).
[c]Oral corticosteroids are rarely used in adolescents.

→ Frequency of follow-up visits (V) and lung function tests (LFTs) according to the dose of inhaled corticosteroids (ICS) needed for acceptable control (see Table 3 below)

Table 3 Frequency of follow-up visits and LFTs.

ICS dose	V (months)	LFT (months)
High	3	3–6
Low or average	6	6–12
None	12	12 or +

Low, average and high daily dose of ICS (μg/day) in adults.

	Low dose	Average dose	High dose
Beclomethasone[a]	<500	500–1000	>1000
Budesonide	<400	400–800	>800
Fluticasone	<250	250–500	>500

[a]Dose should be halved for QVAR® and NEXXAIR®

Synopsis

Title	Medical follow-up of patients with asthma—adults and adolescents
Publication date	September 2004
Requested by	French National Health Directorate
Produced by	Anaes—French National Agency for Accreditation and Evaluation in Healthcare (Guidelines Department)
Intended for	All health professionals who manage patients with asthma
Assessment method	• Systematic review of the literature (with evidence levels) • Discussion among members of an ad hoc working group • External validation by peer reviewers (see Anaes guide ''Recommandations pour la pratique clinique—base méthodologique pour leur réalisation en France—1999'')
Objectives	Address the practical aspects of long-term medical follow-up of patients with asthma (adults and adolescents only)
Literature search	January 1997–December 2003 2957 articles identified of which 696 analysed
Economic study	None
Anaes project leader(s)	Dr. Philippe Martel (Department head: Dr. Patrice Dosquet) (Literature search: Emmanuelle Blondet with the help of Maud Lefèvre (Department head: Rabia Bazi); secretarial work: Elodie Sallez)
Authors of draft report	Dr. Hugues Morel, chest physician, Dinan Dr. Nicolas Roche, chest physician, Paris
Collaborations and participants (Appendix A)	• Learned societies • Steering committee • Working group (Chair: Professor Philippe Godard, chest physician/allergologist, Montpellier) • Peer reviewers

Internal validation	Anaes Scientific Council (Referees: Professor Bruno Housset, chest physician, Créteil; Michel Paparemborde, Head of physiotherapy training college, Lille) Validated on September 2, 2004
Other Anaes publications on the topic	Medical follow-up is complemented by ongoing patient education, which is dealt with in the guidelines ''Therapeutic education for patients with asthma—adults and adolescents'' (Anaes 2001)

Contents

Introduction

Objective

Asthma is a chronic condition. If follow-up is regular, its management can be tuned to changes in the course of the disease. The aim of follow-up is to improve the patient's quality of life and prognosis. The aim of these guidelines is to address the long-term medical follow-up of patients with asthma (adults and adolescents only).

Scope of the guidelines

These guidelines:

- define follow-up criteria for patients with asthma,
- assess the role of investigations during follow-up: peak expiratory flow rate (PEF), lung function tests (LFTs) including arterial blood gas, chest radiograph, laboratory tests (blood eosinophils and eosinophils in induced sputum),

- define patients at risk of severe acute asthma and death from asthma,
- propose methods for monitoring side effects and adherence to treatment,
- propose ways of adjusting long-term therapy,
- propose a schedule for medical follow-up,
- describe specific aspects of follow-up in occupational asthma.

The guidelines do not cover:

- initial diagnosis of asthma,
- management of acute episodes (attacks, exacerbations and severe acute asthma),
- allergy-related aspects of management, notably elimination of allergens and hyposensitisation,
- education for patients with asthma,*
- efficacy of asthma treatments,
- the role of nitric oxide measurement in exhaled air, examination of exhaled breath condensates, or devices for ambulatory monitoring of forced expiratory volume in 1 s (FEV_1), as these tests and devices are still experimental.

Assessment method

The guidelines were produced using the method described in Appendix B:

- a critical appraisal of the literature published from January 1997 to December 2003,
- discussions within a multidisciplinary working group (three meetings),
- comments by peer reviewers.

They were graded on the basis of the strength of the evidence of the supporting studies (Appendix B). If no grade is given, they are based on agreement among professionals within the working group after taking into account the comments of peer reviewers.

Despite the extensive body of published data on asthma, there are insufficient long-term data to produce guidelines on follow-up criteria and schedules that are supported by strong evidence. Some of the classifications proposed here were therefore determined on the basis of agreement among professionals. Members of the working group were especially keen to provide healthcare professionals with a practical decision-making tool suited to most clinical situations, while emphasising that recommendations can be adapted for specific circumstances.

Asthma control: definition and criteria

Asthma control should be assessed over at least 1 week up to 3 months on the basis of clinical and functional respiratory events, and their effects on daily life. According to the working group and peer reviewers,

- follow-up of asthma patients should focus on asthma control,
- asthma control should be assessed at each follow-up visit.

Control is graded in three levels: *unacceptable, acceptable* and *optimal*. The criteria used to define acceptable control are adapted from the Canadian asthma consensus report† (Table 1). They are based on agreement among professionals and have not been validated.

- *Unacceptable control*: One or more of the criteria in Table 1 are not met. A change in disease management is required.
- *Acceptable control*: All the criteria are met. This is the minimum target level for all patients.
- *Optimal control* (i.e. best possible control):
  - all the control criteria are either absent or normal
  - or, in a patient with acceptable control, the best compromise has been achieved between degree of control, acceptance of treatment and possible side effects.

Severity is also used to assess asthma. It refers to the course of the disease over a long period (6–12 months). The severity criteria defined in the guideline on therapeutic education for patients with asthma are not given here, as follow-up should focus on criteria for asthma control. Severity may be defined simply as the minimum level of treatment required for lasting disease control.

*See "Therapeutic education for patients with asthma – adults and adolescents" (Anaes 2001).

†Boulet LP, Becker A, Bérubé D, Beveridge R, Ernst P. Canadian asthma consensus report. *Can Med Assoc J* 1999;**161**(Suppl 11):S1–S61.

Table 1 Criteria defining acceptable asthma control.

Criterion	Mean value or frequency during control assessment period (1 week–3 months)
Day-time symptoms	<4 days/week
Night-time symptoms	<1 night/week
Physical activity	Normal
Exacerbations*	Mild†, infrequent
Absence from work or school	None
Use of short-acting β_2-agonists	<4 doses/week
FEV_1 or PEF	>85% of personal best
PEF diurnal variation (optional)	<15%

*See definition in Appendix 3.
†Mild exacerbation: exacerbation managed by patient, requiring only a temporary increase (for a few days) in daily use of short-acting β_2-agonists.

Role of investigations during follow-up

Ambulatory peak expiratory flow (PEF) measurement

PEF should be measured at follow-up visits. Results should be expressed as a percentage of the patient's best value.

PEF monitoring at home using an ambulatory device may be proposed:

- for patients at risk of severe acute asthma (see definition in Appendix C) or death from asthma,
- to "poor perceiver" patients, i.e. when the patient's symptoms are not proportional to the degree of bronchial obstruction measured by PEF or FEV_1,
- when a high-risk period is anticipated (notably the pollen season),
- during periods of unacceptable asthma control,
- when treatment is being changed.

However, it has not been demonstrated that routine follow-up of all patients with home measurement of PEF improves disease control.

PEF is a tool that can be used as part of the patient's therapeutic education to help them assess their asthma and understand their disease.‡

Lung function tests (LFTs)

LFTs should be carried out during follow-up of patients with asthma (for recommended schedule, see Section "Follow-up schedule"). Long-term therapy should not be interrupted before the LFTs in order to be able to assess the bronchial obstruction that persists despite therapy.

- *Spirometry* and in particular measurement of FEV_1, slow vital capacity and forced vital capacity (FVC) are sufficient in most cases for assessing the functional impact of asthma. These variables should be measured before and after administration of fast-acting, short-duration bronchodilators. Bronchial obstruction is given by relating FEV_1 after use of bronchodilator to the theoretical value. In asthma that is difficult to control, particularly in smokers, and while treatment is being reduced, specialists may choose to assess bronchial obstruction by measuring residual volume, small airway obstruction, and examining the general shape of the forced expiration curve.
- *Bronchial hyperresponsiveness* (BHR) measurement should not be used routinely for adjusting treatment, particularly the dose of inhaled corticosteroids (ICS). Although BHR may be useful in dose adjustment (one level 2 study), follow-up values cannot be measured routinely outside specialist centres.
- *Arterial blood gas measurement* is indicated in severe acute asthma. It is not indicated during follow-up except in chronic respiratory failure.

Chest radiography

Chest radiography is used at initial diagnosis but should not be a routine part of follow-up in patients with asthma. It is indicated in severe exacerbations, if there are problems with long-term disease control or if complications are suspected (pneumothorax, pneumonia).

‡"Therapeutic education for patients with asthma – adults and adolescents", Anaes 2001.

Laboratory tests

The course of asthma should not be monitored:

- by eosinophil counts or activation,
- by measuring eosinophils in induced sputum. Although this may be useful in adjusting long-term therapy (one level 2 study), it cannot be monitored outside specialist centres.

Treatment follow-up

Follow-up of side effects

- *Long-term β_2-agonists or anticholinergics*
  No specific form of follow-up is recommended within the limits given in the French marketing authorisations of β_2-agonists or anticholinergics.
- *Theophylline*
  Patients should be monitored at each visit, especially clinically, as theophylline has a narrow therapeutic margin, and drug interactions and side effects are common. If side effects occur or the drug is felt to be clinically ineffective, blood theophylline concentration should be measured. Measurements after treatment has started may be routine and should be so if there are risk factors for side effects, e.g.
  - young children,
  - the elderly,
  - acute heart failure (reduce the dose because of risk of overdose),
  - coronary insufficiency,
  - obesity (adjust the dose in relation to ideal weight),
  - hyperthyroidism,
  - impaired liver function,
  - history of seizures,
  - prolonged fever ($>38\,^{\circ}C$) lasting more than 24 h, particularly in young children (halve the dose because of risk of overdose),
  - concomitant therapy likely to increase blood theophylline concentration, or discontinuation of drugs likely to reduce it.[§]
- *Long-term ICS*
  During follow-up
  - look for local side effects (candidiasis of the mouth, dysphonia) and skin fragility,
  - monitor growth in adolescents,
  - refer patients with a history or risk of cataracts or glaucoma to an ophthalmologist.
  Extended prescription or sudden withdrawal of high doses of ICS should be avoided if possible.
  No specific monitoring of bone effects from ICS is recommended when doses are low or average or when treatment lasts <5 years (Grade A). However, the safety of high ICS doses for periods >5 years and in patients with other risk factors for osteopenia has not been assessed.
  Unexplained asthenia in patients taking long-term, high-dose ICS should prompt investigation for adrenal insufficiency or Cushing's syndrome; rare cases of acute adrenal insufficiency have been described, mainly in children.
- *Long-term oral corticosteroids*
  Patients should be monitored as recommended in the French marketing authorisations of the drugs concerned.
- *Leukotriene receptor antagonists*
  No specific form of follow-up is recommended within the limits given in the French marketing authorisation of the drugs concerned.

Monitoring treatment adherence

Patients should be asked regularly about the medications they are taking, but the risk of overestimating adherence persists. This risk can be reduced by telling patients that it is in their interest to report as accurately as possible what medication they have taken so that treatment can be adjusted to their real needs (Grade C). They can be asked to keep a diary during the week or weeks preceding each visit (including a record of medication and asthma control criteria).

Patients with known or suspected lack of adherence may be motivated by scheduling more frequent follow-up sessions. Structured therapeutic education may help.[¶]

Adjusting treatment during follow-up

These guidelines do not cover the initial management strategy or management of acute events

[§] *Drugs that increase blood theophylline concentration* are allopurinol, cimetidine, fluconazole, ciprofloxacin, norfloxacin, pefloxacin, fluvoxamine, clarithromycin, erythromycin, josamycin, roxithromycin, mexiletine, pentoxifylline, stiripentol.
Drugs that reduce blood theophylline concentration (i.e. discontinuation is likely to increase blood theophylline concentration) are enzyme inducers such as carbamazepine, phenobarbital, phenytoin, primidone, rifampicin, rifabutin, griseofulvin, ritonavir, lopinavir, nelfinavir.
The range of active ingredients likely to interfere with theophylline metabolism will vary as new drugs are licensed.

[¶] See "Therapeutic education for patients with asthma – adults and adolescents", Anaes 2001.

Table 2 Low, average and high daily dose of ICS (μg/d) in adults.

	Low dose	Average dose	High dose
Beclomethasone*	<500	500–1000	>1000
Budesonide	<400	400–800	>800
Fluticasone	<250	250–500	>500

*Dose should be halved for QVAR® and NEXXAIR®.

(attacks, exacerbations, severe acute asthma). Treatment should be adjusted to:

- degree of asthma control,
- current long-term therapy.

If asthma control is unacceptable (see Section Definition and Criteria)
Management should be improved in three stages, as follows:

- ***Stage* 1**: Check that:
  - the disease is actually asthma; this is especially relevant if bronchial obstruction cannot be reversed,
  - adherence to current treatment is satisfactory,
  - the patient is using inhalation devices correctly.
- ***Stage* 2**: Look for and treat:
  - aggravating factors such as exposure to allergens, rhinitis, active or passive smoking, medication (e.g. β-blockers), exposure to air pollution, ENT infection, gastro-oesophageal reflux,
  - concomitant disease such as COPD or heart failure,
  - rare specific clinical forms such as allergic bronchopulmonary aspergillosis, Churg–Strauss vasculitis.
- ***Stage* 3**: Adjust long-term therapy (see Table 3) to medication taken to date, particularly to current ICS dose (see Table 2).
  - *Patients not taking long-term therapy*: An ICS should be started at the average dose. If symptoms are frequent and FEV_1 is significantly reduced, give additional medication (AM) (long-acting β_2-agonists, cysteinyl-leukotriene receptor antagonists or theophylline and its derivatives).
  - *Patients on low- or average-dose ICS*: Give AM or increase the dose of ICS. If symptoms are frequent and FEV_1 is significantly reduced, increase ICS dose and give AM.
  - *Patients on high-dose ICS*: Give AM.
  - *Patients on low-dose ICS with AM*: Increase dose of ICS.
  - *Patients on average-dose ICS with AM*: Increase dose of ICS or add a second AM. If symptoms are frequent and FEV_1 is significantly reduced, increase ICS dose and give AM.
  - *Patients on high-dose ICS with AM*: Give a second AM. If symptoms are frequent and FEV_1 is significantly reduced, suggest oral corticosteroids.
  - *Patients on high-dose ICS with two AMs*: Start oral corticosteroids, probably as long-term therapy, or add a third AM.

Stage 3 guidelines are summarised in Table 3.

Oral corticosteroids should be avoided if possible, particularly in adolescents. If it is difficult to decide on the best treatment, consult a specialist.

If symptoms are frequent and/or FEV_1 is considerably reduced, an increase in long-term therapy may be combined initially with short-term oral corticosteroids (<15 days at a dose of 0.5–1 mg/kg/d) to achieve faster control.

Each stage of treatment lasts from 1 to 3 months depending on clinical and functional response. If acceptable control is not achieved despite maximal therapy, patients should be referred to a specialist.

If asthma control is acceptable or optimal
Once control has been achieved, the minimum effective therapy to maintain acceptable—and ideally optimal—control should be found. In adolescents, the younger the patient, the more desirable it is to achieve optimal control.

Generally, long-term therapy should be reduced in 3-month steps but no studies have compared different step durations. ICS can be reduced in 25–50% steps. There are no data to support a specific program for discontinuing AM.

If there are any side effects with long-term therapy or if the patient is at risk of side effects, reassess benefit/risk ratio more often.

In patients who receive long-term oral corticosteroids from the start, the dose should be reduced

Table 3 Adjusting long-term therapy (Stage 3).

Current therapy	New treatment*	
	Option 1	Option 2
No ICS	Average-dose ICS	Average ICS dose+AM
Patients on ICS only		
Low or Average-dose ICS	Add AM	Increase ICS dose with or without AM
High dose ICS	Add AM	
Patients on ICS and additional medication (AM)†		
Low dose of ICS (+1 AM)	Increase ICS dose	
Average dose of ICS (+1 AM)	Increase ICS dose	Add 2nd AM with or without increasing ICS dose
Heavy dose of ICS (+1 AM)	Add second AM	Oral corticosteroids‡
Heavy dose of ICS (+2 AMs)	Oral corticosteroids‡	Add third AM

*The choice between options will depend on symptom frequency and function (particularly post-bronchodilator FEV_1).
†Additional medication (AM) covers long-acting β_2-agonists, cysteinyl-leukotriene receptor antagonists, theophylline and its derivatives (bamiphylline).
‡Oral corticosteroids are rarely used in adolescents.

Table 4 Frequency of visits* and LFT during follow-up depending on ICS dose.

ICS dose	Minimum follow-up (months)		Optimal follow-up (months)	
	Visits	LFT	Visit	LFT
High	3†	6	3	3
Low or average	6	12	6	6
None	12	12 or +	12	12

*Visit with clinical examination including determination of PEF.
†An appointment with a specialist should be considered.

very gradually, and concomitant high-dose ICS and long-acting β_2-agonists should be given. Each step may last about 3 months, and complete withdrawal may take several years.

Follow-up schedule

The proposed follow-up schedule should be adjusted to each individual patient. For example it does not take account of therapeutic education sessions, visits because of an intercurrent event or possible increased frequency of visits during initial management or changes in therapy.

- When control is acceptable or optimal
  The minimum and optimum frequency of visits when control is acceptable or optimal is given in Table 4.
- When control is unacceptable
  - *Patient on short-term oral corticosteroids*: Visit with at least a clinical examination including determination of PEF, and ideally LFT, during the week following withdrawal of oral corticosteroids and 1 month later. An appointment with a specialist should be considered.
  - *Patient not taking short-term oral corticosteroids*: Visit with at least a clinical examination including determination of PEF, and ideally LFT, 1–3 months after change in therapy.
- In the presence of risk factors
  Follow-up frequency should be increased in patients at risk of severe acute asthma or death from asthma and in patients experiencing frequent exacerbations, i.e. asthma that is difficult to control. These patients may benefit from
  - scheduled visits after they leave hospital,
  - structured therapeutic education,
  - a rigorous search for and elimination of trigger factors (allergens, tobacco, domestic and industrial toxins),

- possibly a home visit from a domestic environment adviser.

The case of occupational asthma

Follow-up of occupational asthma involves both medical and socioprofessional aspects, which are complementary and inseparable.

Patients who are no longer exposed to the risk should be followed-up medically for a long time, as symptoms and non-specific bronchial hyperresponsiveness persist in $>50\%$ of cases (Grade C).

Work-related (determination of ability to work) and medical/legal aspects (compensation) are further reasons for objective assessment of the disease by spirometry and methacholine challenge testing.

Elimination or reduction of exposure to risk, continued employment and/or maintenance of income requires a support network around the patient—doctors, social workers, and advisers from work reclassification services. The main tools that can be used are notification of occupational disease, a request for classification as a handicapped worker and visiting the occupational physician before going back to work.

Acknowledgements

We thank Emmanuelle Blondet for her thorough search of the literature and the members of the working group for their highly professional participation in the production of these guidelines. We also thank Pippa Sandford of the Kiwi Consultants translating group for translating these guidelines.

Appendix A. Participants

Learned societies consulted

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Association française de recherche et d'évaluation en kinésithérapie
Association nationale des kinésithérapeutes salariés
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Appendix B. Assessment method

The Anaes method for producing these clinical practice guidelines** comprised the following steps:

Defining the scope of the guidelines (Steering committee). Anaes invited representatives from learned societies concerned by the topic to take part in a steering committee whose job was to define the scope of the guidelines, to review previous work on the subject and to nominate professionals to take part in a working group or act as peer reviewers.

Literature search (Documentation Department of Anaes): See below

Drafting the guidelines (Working group). The Anaes project manager formed a working group of 19 professionals from a number of disciplines, working in public or private practice, from all over the country. The chair of the working group coordinated the production of the guidelines with the help of the project manager whose job was to ensure conformity with the methodological principles of guideline production. Two members of the working group identified, selected, and analysed relevant studies (from a literature search performed by the Anaes Documentation Department) and wrote a draft report. This draft report was discussed by the working group over three meetings and amended in the light of comments from other members of the working group and from peer reviewers. Proposals for future studies and action were made.

External validation (Peer reviewers). Peer reviewers were appointed according to the same criteria as working group members. They were consulted by post after the second working group meeting, primarily with regard to the readability and applicability of the guidelines (scores from 1 to 9). The Anaes project manager summarised their comments and submitted them to the working group prior to the third meeting. Peer reviewers were asked to undersign the final document.

Internal validation (Evaluation Section of the Anaes Scientific Council). Two members of the Council acted as referees reporting to the Council, together with the Anaes report manager. The working group finalised the guidelines with due regard to the Council's suggestions.

- ***Literature search and analysis (general procedure)***

  The scope of the literature search was defined by the steering committee and the project manager. The search was carried out by the Anaes Documentation Department and focused on searching
  - medical and scientific databases over an appropriate period, with special emphasis on retrieving clinical practice guidelines, consensus conferences, articles on medical decision-making, systematic reviews, meta-analyses and other assessments already published nationally or internationally (articles in French or English),
  - specific and/or financial/economic databases, if necessary,
  - all relevant websites (government agencies, professional societies, etc.),
  - the grey literature (documents not identified through the usual information distribution circuits),
  - legislative and regulatory texts.

  Further references were obtained from citations in the articles retrieved above and from working group members' and peer reviewers' own reference sources. The search was updated until the project was completed.

**Full details are given in ''Recommandations pour la pratique clinique – base méthodologique pour leur réalisation en France – 1999'' (Anaes).

Table 5 Grading of guidelines.

Level of published scientific evidence	Grade
Level 1	
Randomised controlled trials of high power	A: Established scientific evidence
Meta-analyses of randomised controlled trials	
Decision analyses based on properly conducted studies	
Level 2	
Randomised controlled trials of low power	B: Presumption of scientific foundation
Properly conducted non-randomised controlled trials	
Cohort studies	
Level 3	
Case-control studies	
Level 4	
Comparative studies with major bias	C: Low level of evidence
Retrospective studies	
Case series	

The articles selected were analysed according to the principles of a critical appraisal of the literature, using a checklist, to allocate a level of scientific evidence to each study. Whenever possible, the working group based their guidelines on this review of the literature. Guidelines were graded from A to C as shown in Table 5 depending on the level of the evidence of the supporting studies. If no grading is given, they are based on agreement among professionals.

- Specifics of the literature search for this study
  The following databases were searched
  - Medline (National Library of Medicine, United States)
  - Embase (Elsevier, Netherlands)
  - Pascal (CNRS-INIST, France)
  - Cochrane Library (Great Britain)
  - National Guideline Clearinghouse (United States)
  - HTA Database (International network of agencies for health technology assessment—INAHTA)
  - BDSP (Public health database, Rennes)

The strategy for searching the Medline, Embase and Pascal databases is given in Table 6. The search terms were either thesaurus terms (MeSH descriptors for Medline) or terms from titles or abstract (free text).

Appendix C. Definitions

Asthma attack: A paroxystic episode of symptoms lasting a short time ($\leqslant$1 day).

Exacerbation: An episode of gradual deterioration, over several days, in one or more clinical signs, and functional parameters of bronchial obstruction. It is classed as severe if oral corticosteroids are needed or if PEF falls by more than 30% below baseline values for 2 consecutive days.

Severe acute asthma: defined in adults by one of the following signs:

- pulse $>$110/min, respiratory rate $\geqslant$25/min,
- inability to finish sentences in a single respiratory cycle,
- PEF $\leqslant$50% of theoretical value or patient's best-known value,
- bradycardia,
- hypotension,
- no sounds audible on auscultation,
- cyanosis,
- confusion or coma,
- exhaustion.

- Risk factors for severe acute asthma and death by asthma (level of evidence 3):
  - poor socioeconomic circumstances,
  - adolescent or elderly subjects,
  - history of "nearly fatal" asthma or hospitalisation in intensive care with asthma,
  - $FEV_1 < 40\%$ of theoretical value,
  - $>$50% reversibility on β_2-agonist treatment,

Table 6 Search strategy.

Type of study/subject	Terms used	Search period
Guidelines		1997–2003
Stage 1	Asthma	
AND Stage 2	Guideline* OR Practice guideline OR Health planning guideline OR Guideline [title] OR Consensus development conference OR Consensus development conference, NIH OR Consensus conference[title] OR Consensus statement[title]	
Meta-analyses, literature reviews		1997–2003
Stage 1		
AND Stage 3	Meta analysis OR Review literature OR Literature review OR Systematic review	
Management during follow-up		1997–2003
Stage 1		
AND Stage 4	Management (in title) OR [(Therapy OR Drug therapy OR Rehabilitation) AND Follow up OR Follow-up studies OR Follow*]	
Care programmes for patients with asthma		1997–2003
Stage 1		
AND Stage 5	Self management program	
Lung function tests		1997–2003
Stage 1		
AND Stage 6	(Peak expiratory flow rate OR Expiratory flow rate OR Forced expiratory flow rates OR Forced expiratory volume OR Bronchial hyperreactivity OR Respiratory function tests OR Respiratory sound* OR Spirometry) AND (Follow up OR Follow-up studies OR Follow*)	
Physical examination during follow-up		1997–2003
Stage 1		
AND Stage 6	(Physical examination OR Clinical examination) AND (Follow up OR Follow-up studies OR Follow*)	
Radiography		1997–2003
Stage 1		
AND Stage 7	Mass chest X-ray	
Patient compliance		2000–2003
Stage 1		
AND Stage 8	Patient compliance OR Patient acceptance of health care OR Patient education	
Asthma control during follow-up		1997–2003
Stage 9	Asthma control	
Quality of life questionnaires		1997–2003
Stage 1		
AND Stage 10	Quality of life AND Questionnaire OR Juniper E (as author)	
Rhinitis		1997–2003

Table 6 (*continued*)

Type of study/subject	Terms used	Search period
Stage 1 AND Stage 11	Rhinitis AND (*Follow up* OR *Follow-up studies* OR *Follow**)	
French literature		1993–2003
Stage 1 AND Stage 12	Asthma* Control* OR *Suivi* OR *Surveillance*	
Total number of references found		2957
Total number of articles studied		696
Number of articles cited		296

* Truncature

- frequent visits to accident and emergency or GP or repeated hospital admissions,
- elevated blood eosinophils ($>1000/mm^3$),
- patients who are ''poor perceivers'' of their degree of bronchial obstruction,
- smoking >20 packs/year,
- poor adherence and/or denial of disease,
- use of three (or more) asthma medications,
- corticosteroid therapy stopped in last 3 months.

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