Asthma management

Part 1: assessing severity and optimising lung function

Although Australia has one of the highest rates of asthma in the world, asthma mortality has fallen significantly in the past decade. Well managed asthma shifts the burden of medical care from the hospital to general practice. This two-part article discusses the optimal management of asthma in the general practice setting.

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Asthma is a common disease in Australia, affecting over two million Australians, including one in four primary school children, one in seven teenagers and one in 10 adults.[1] The prevalence of asthma in children has increased dramatically over the last two decades but appears to have remained stable in adults.[2-4] Australia has one of the highest rates of asthma in the world, together with countries such as the UK, New Zealand and the Republic of Ireland.[3]

According to the Australian Bureau of Statistic's National Health Survey, the self-reported prevalence of asthma has increased from 85 per 1000 persons in 1989–1990 to 113 per 1000 persons in 1995.[1] The reasons underlying the high prevalence of asthma in Australia are not well understood, although a genetic predisposition combined with high allergen exposure, especially to house dust mites and fungi, is thought to be important.

More recently, evidence has accumulated suggesting that early life exposure to particular infective agents may be important in stimulating development of a type 1 immune response rather than type 2 allergic-type responses. This theory suggests, firstly, that in the first two years of life some infections may be protective against the development of allergy, and, secondly, that the use of antibiotics early in life may reduce the value of such infections in stimulating type 1 immunity.[5]

Despite the high prevalence of asthma in Australia, asthma mortality has fallen significantly over the last decade. For the last three years in succession, the number of deaths from asthma has been less than half that of the early 1990s (Figure 1).

IN SUMMARY

- **The six-step asthma management plan remains the blueprint for outlining the principles of asthma management in Australia.**
- **The assessment of asthma severity should include both current symptoms and past history; assessment of asthma control includes only an assessment of the current situation – symptoms and lung function.**
- **Spirometry is the gold standard for the diagnosis and assessment of airway obstruction.**
- **The diagnosis of asthma may be missed if peak flow readings are used as this method is highly effort dependent and not sensitive to mild degrees of airflow limitation.**
- **When achievable, allergen avoidance has particular benefit to patients with asthma in that it reduces the risk of an ongoing stimulus to airway inflammation.**

Asthma management in general practice

Well managed asthma shifts the burden of medical care from the hospital to general practice, with fewer people presenting at emergency departments or requiring admission. Asthma is the sixth most frequently managed problem by GPs (32 per 1000 encounters), accounting for 2.2% of problems managed in 1998 to 1999.[6] GPs are likely to see patients more often if they are managing asthma in an ongoing partnership. As this has the potential to make a significant impact on the disease in Australia, it is crucial that GPs are able to manage asthma optimally, thereby improving patients' quality of life and long term outcomes and reducing the risks of poorly controlled disease.

Although the six-step Australian asthma management plan was an expert consensus statement,[7] the underlying principles remain essentially unchallenged, and an evidence-based review supports this approach.[8] The sixth step – educate and review regularly – now forms the basis of the Federal Government's Practice Incentives Program for the proactive management of asthma. This was introduced in November 2001, and reimburses GPs for reviewing and educating patients with moderate to severe asthma in three visits over a minimum of four months. The important components of this are:

- assessing asthma severity
- reviewing medication and triggers
- educating patients in self-management
- writing an action plan.

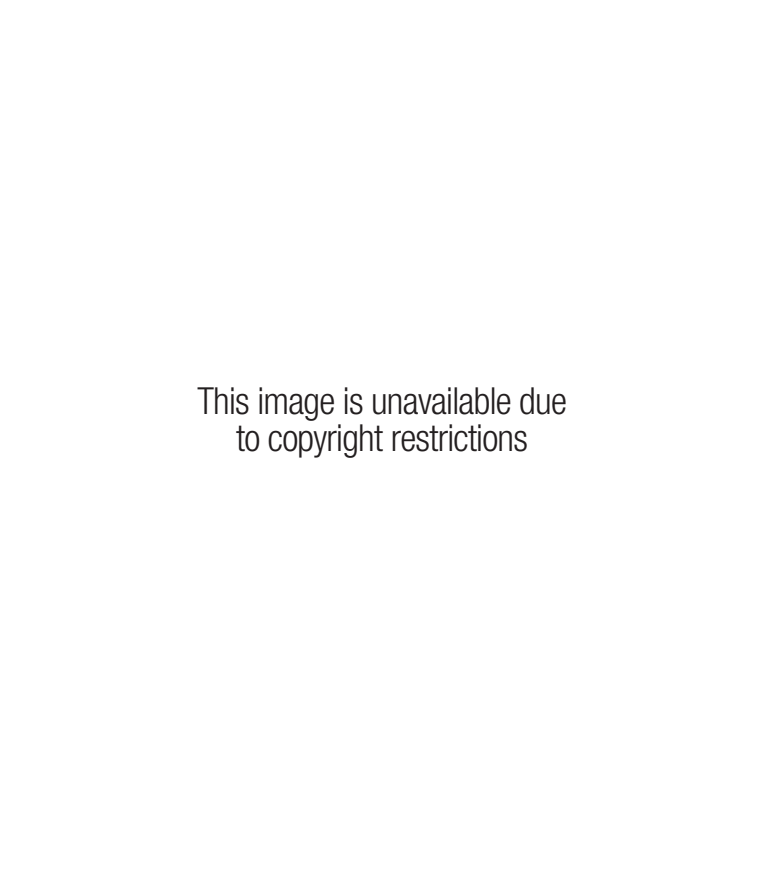
Although the wording is confusing, it is important to recognise the differences between an asthma management plan and an action plan.

A management plan encompasses the total approach to asthma care – hence the six-step plan that covers all aspects of management. Optimally, doctors use these plans to guide them in the steps that need to be covered in a global approach to asthma care.

An action plan is written and individualised to the patient and outlines the steps that must be taken to identify and manage a deterioration in asthma control – and the steps that should be taken once good control returns.

Both plans are crucial in caring for patients with asthma, and both should be undertaken in

Asthma management



It is crucial that GPs are able to manage asthma optimally, thereby improving patients' quality of life and long term outcomes and reducing the risks of poorly controlled disease. GPs are likely to see patients more often if they manage asthma in an ongoing partnership.

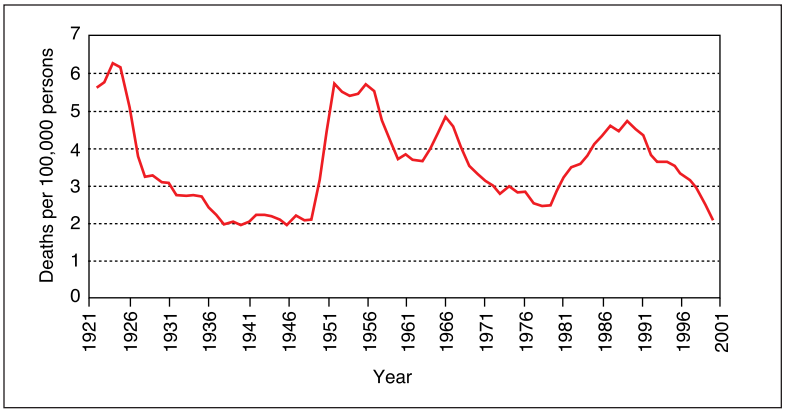


Figure 1. All age asthma mortality in Australia, 1920 to 2000. Mortality expressed as a three-year moving average.

continued

The six-step asthma management plan

Step 1
Assess asthma severity
Step 2
Achieve best lung function
Step 3
Maintain best lung function: identify and avoid triggers
Step 4
Maintain best lung function: optimise medication
Step 5
Develop an action plan
Step 6
Educate and review regularly

partnership with the patient.

The six-step asthma management plan (see the box on this page) remains the blueprint for outlining the principles of asthma management.[9] There is level 1 evidence that the sixth step – educate and review regularly – results in better outcomes for patients with asthma. Regular medical review, self-management education and a written action plan result in fewer days off school and work, improved quality of life, fewer out-of-hours visits to GPs or emergency departments and improved lung function.[8] This recommendation is a crucial element in asthma management: it enshrines the core principles around which optimum therapy can further improve outcomes.

To cover all the relevant issues in the optimal care of patients with asthma, I will discuss asthma management under the headings of the six-step plan. This article covers the first three steps; part 2, to be published in next month's *Medicine Today*, will cover steps 4 to 6.

Step 1. Assess asthma severity

The assessment of asthma severity is vital in determining the likely level of treatment required. Persistent asthma in adults, whether mild, moderate or severe, requires long term treatment. Although there are no level 1 studies to demonstrate whether assessment of severity results in better outcomes for asthma, severity assessment is important to determine:

- immediate treatment requirements
- ongoing treatment needs
- long term prognosis.

Table. Assessment of asthma severity*†

Symptoms	Mild	Moderate	Severe
Wheeze, tightness, cough, dyspnoea	Occasional, e.g. with viral infection or exercise	More than 2–3 times a week but not daily	Most days
Symptoms on waking	Absent	Infrequent	>Once/week
Nocturnal symptoms	Absent	Infrequent or only with respiratory tract infection	>Once/week
Hospital admission or emergency visit in last 12 months	No	Usually not	Usually
Life threatening asthma attack or ICU admission in last 12 months	No	Usually not	Usually
Bronchodilator use	Infrequent, <2 times/week	2–3 times/week in addition to during exercise	>2–3 times/week in addition to during exercise
FEV_1, % predicted	Normal	Occasionally abnormal	Persistently abnormal
Minimum waking PEF	>90% best	80–90% best	<80% best
Min%max over 2 weeks	>90%	80–90%	<80%

* Adapted from the National Asthma Council's Asthma Management Handbook.[9]
† Any one of these features assigns the patient's asthma overall to the category of severity in which it is described.

When assessing severity it is important to distinguish between acute and chronic symptoms. For example, a patient may present with acute severe symptoms, but on a background of previously mild disease, which through undertreatment may have resulted in the acute attack. The acute attack must be dealt with first; long term preventive therapy can be initiated effectively as soon as practical following this.

There is evidence that delay in starting preventive treatment with inhaled corticosteroids can result in loss of lung function that does not fully recover. Longer periods with no preventive medication are associated with more severe airway obstruction and reduced reversibility to normal.

Traditionally, we have used the terms asthma severity and asthma control interchangeably; however, they are not synonymous.

For simplicity, assessment of severity should include both current symptoms and past history – it includes events such as previous hospitalisation and frequency of exacerbations that give an overview and help predict treatment requirements, pattern of disease and prognosis. Asthma control, however, includes only an assessment of the current situation – symptoms and lung function.

Asthma severity

In the assessment of asthma severity, the following factors are important:

- the amount of preventive medication required to achieve and maintain stability
- the presence of persistent airway obstruction
- the frequency of symptoms and exacerbations
- the severity of exacerbations (previous hospital admission or near fatal asthma).

The guide to assessment of asthma severity in the *Asthma Management Handbook*[9] is the commonly agreed approach (Table). It is not based on level 1 evidence as there are no randomised controlled trials that assess the benefits of this. However, it is logical and similar severity criteria are used worldwide.

Mild asthma

Mild asthma can be considered as intermittent or persistent. Some patients experience seasonal or intermittent asthma symptoms and are completely well for the rest of the year.

Generally, it is accepted that mild intermittent asthma requires treatment on the basis of symptom frequency and can be ceased when patients are asymptomatic and have normal lung function. The rule of thumb is that patients whose symptoms necessitate the use of short acting $ß_2$-agonists three or more times

per week (excluding for exercise) need preventive medication. Generally, the following low dose inhaled corticosteroids are used as preventive medication for mild asthma:

- budesonide (Pulmicort) 400 µg daily
- beclomethasone dipropionate (Becotide, Respocort) 400 µg daily
- beclomethasone dipropionate CFC free (Qvar) 200 µg daily
- fluticasone propionate (Flixotide) 200 to 250 µg daily.

Whether patients with mild asthma ought to be treated long term is controversial, and definitive studies concerning the natural history of mild asthma, either untreated or treated with intermittent inhaled corticosteroids, are needed.

Moderate asthma

Moderate asthma is characterised by the presence of symptoms on most days and a history of exacerbations that may require treatment with oral corticosteroids. These patients may not have normal lung function between exacerbations.

Patients with moderate asthma should receive regular inhaled corticosteroids (400 to 800 µg beclomethasone dipropionate or budesonide daily or fluticasone propionate 200 to 500 µg daily) plus a long acting $ß_2$-agonist. The goal is to minimise symptoms, prevent exacerbations and normalise lung function. An effective level of asthma control is indicated by the use of reliever medication less than three times a week and sustained lung function within 90% of previous best. Most patients will benefit from combination therapy with a long acting bronchodilator, which helps to control symptoms and reduce the dose of inhaled steroids needed to maintain optimal control.

Severe asthma

Severe asthma is characterised by persistent symptoms, lung function abnormality and exacerbations despite appropriate medication. These patients have a history of frequent or severe exacerbations often necessitating hospital admission.

Most patients with severe asthma require doses of inhaled corticosteroids of at least 1000 µg/day beclomethasone dipropionate or budesonide or 500 µg/day fluticasone propionate plus a long acting $ß_2$-agonist – and despite this, some never achieve really acceptable asthma control.

Asthma control

In the assessment of asthma control, the following factors should be considered:

- current symptom frequency and severity
- current bronchodilator use
- recent exacerbations
- lung function.

It is very important to assess asthma control at each visit so the adequacy of treatment can be judged. Usually patients can accurately recall only two to four weeks of recent symptoms and reliever use, so this is the period over which control is best assessed.

Assessment of control can be made readily and quickly by assessing lung function and asking the following three simple questions:

- Over the last two to four weeks how often have you used your reliever medication?
- Over the last two to four weeks how often have you woken at night or in the morning with asthma?
- Over the last two to four weeks how often have you had asthma symptoms during the day?

Lung function is assessed optimally by spirometry in the surgery. Good asthma control is indicated by an FEV_1 that is greater than 90% of previous best, or if it has not been done before, greater than 90% of predicted value in association with good symptom control (use of reliever medication less than three times per week).

Lung function can also be assessed by peak flow monitoring over two to four weeks. Min%max is a sensitive measure and is easier to calculate than diurnal variability. It is the lowest morning peak expiratory flow (PEF) in the previous two weeks, expressed as percentage highest PEF in that period. Values over 90% are indicative of good asthma control, 80 to 90% as suboptimal and less than 80% as poor.

Failure to achieve good asthma control should prompt a search for triggers that need to be addressed. These include postnasal drip and poorly controlled allergic rhinitis, gastro-oesophageal reflux, unsuspected allergen exposure, occupational triggers and obstructive sleep apnoea (which can aggravate asthma). Food sensitivity, especially to salicylates and sulfites, or concomitant administration of aspirin (and NSAIDs) or ß-blockers (including eye drops) may be reasons for poor control in some patients.

If suboptimal asthma control persists, specialist opinion should be sought. Alternative diagnoses need to be considered, including bronchiectasis, vocal cord dysfunction, chronic bronchitis, COPD and allergic bronchopulmonary aspergillosis.

Step 2. Achieve best lung function

Spirometry is the gold standard for the diagnosis and assessment of airway obstruction. The diagnosis of asthma may be missed if peak flow monitoring is used; this method is highly effort dependent and not sensitive to mild degrees of airflow limitation.

Bronchodilator reversibility should be assessed by performing spirometry and assessing FEV_1 before and 15 minutes after 200 to 400 µg salbutamol (Airomir, Asmol, Epaq Inhaler, Genrx Salbutamol, Ventolin) or 500 µg terbutaline (Bricanyl). The accepted improvement in FEV_1 that defines reversibility diagnostic of asthma is greater than 12% change from baseline FEV_1, or a greater than 10% change in %predicted FEV_1. A change in FEV_1 of more than 200 mL is also outside the normal range of variability and indicates reversible airway obstruction. Simple

instructions for patients to ensure optimal performance of spirometry is given in the box on this page).

Achievement of best lung function takes many months in most patients. However, patients taking inhaled corticosteroids alone achieve 90% of the improvement in FEV_1 in the first three to four weeks of treatment. It takes longer for morning peak flow to plateau – often several months. Improvement in airway responsiveness to histamine usually plateaus between six and 18 months after starting treatment, but it can take up to two years. This is believed to be a reflection of continued resolution of airway wall inflammation and is one reason why doses of inhaled corticosteroids should not be reduced too quickly after commencement (Figure 2). It should not be assumed that best lung function has been achieved just because FEV_1 is within 80% of predicted. Rather, lung function is reflected by a number of measures: office spirometry, morning peak flow, min%max and airway hyperresponsiveness all represent different aspects of lung function.

Most guidelines suggest that inhaled corticosteroid doses should not be reduced until patients have achieved stability in asthma control for a minimum of three months. Several studies suggest that after this, dose reductions can be undertaken at three monthly intervals if symptoms and lung function remain optimally controlled.

Step 3. Maintain best lung function: identify and avoid triggers

Asthma is an inflammatory condition, primarily caused by allergen exposure. It was thought until recently that nonallergic triggers (such as smoke, fumes, cold air and exercise) did not cause airway inflammation and therefore were causes of bronchoconstriction in people with twitchy airways. They were not believed to be causes of ongoing inflammatory changes and airway hyper-responsiveness. However, there is some evidence that extreme drying and cooling of the airways, such as occurs in elite cross country skiers, may cause airway inflammatory changes and alterations in airway hyper-responsiveness. Generally, however, triggers that do not cause airway inflammation are to be avoided simply to avoid symptoms – or where it is important not to avoid them, such as exercise, steps need to be taken to avoid the consequences of the trigger.

Allergen avoidance (see the box on page 26) has particular benefit in that it reduces the risk of an ongoing stimulus to airway inflammation.

For some years it has been believed that allergen exposure in early life is a crucial determinant of the development of atopy and allergic airways disease. A high level of allergen load in Australia, especially in temperate coastal regions, is associated with high levels of house dust mites. Despite intense regimens to reduce the load, it cannot be reduced to levels that are known to be associated with fewer asthma symptoms, lower prevalence and better airway responsiveness – as has been achieved in studies conducted in the Northern Hemisphere. Genetic predisposition combined with high allergen exposures has been considered to be the critical mix that resulted in high asthma prevalence rates in Australia, New Zealand and the UK. However, some allergen exposure in early life may not be harmful and may even be protective against the development of airway sensitisation. Other environmental factors may be synergistic with allergen exposure, especially low rates of early life infection or frequent use of antibiotics in infancy and early childhood.

In Australia, 40% of adults are atopic. The major allergens are:

- *Dermataphagoides pteronyssinus*
- *Dermataphagoides farinii*
- cat allergen
- dog allergen
- several moulds, e.g. *Penicillium* sp., *Aspergillus* sp. and *Alternaria* sp.
- pollens, especially rye grass pollen.

Some doubt remains about the significance of pollen sensitivity as a cause of asthma: pollen grains are large and generally are not deposited in the lower airways. However, in rural areas where changes in barometric pressures associated with

Spirometry: patient instructions

- Take in as deep a breath as possible
- Seal your lips around the mouthpiece
- Blow out hard and continue blowing until you have emptied your lungs completely

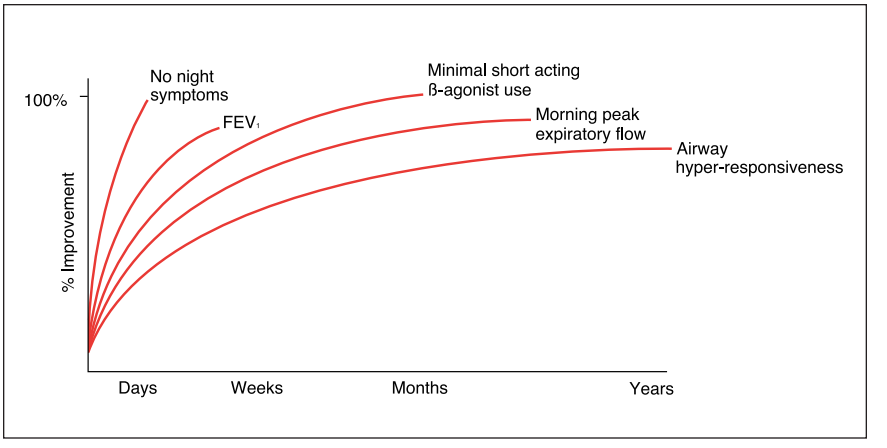


Figure 2. Time course of effects of inhaled corticosteroids on asthma control.

continued

Allergen avoidance measures for people with asthma

House dust mites

Wash bedding and stuffed toys in hot water

Minimise carpet in houses

Use house dust mite-protective mattress covers

Moulds

Remove visible mould from walls

Ensure good ventilation

Pets

Do not allow cats and dogs in bedrooms

Avoid close contact with pets; wash hands after handling them

thunderstorm activity cause rye grass pollen grains to swell and rupture, asthma occurs as a result of the smaller pollen fragments reaching the bronchial tree.

Nonallergic triggers of acute asthma symptoms include foods containing metabisulfite, salicylates or MSG. Clinically important sensitivity to salicylates probably occurs in fewer than 10% of patients with asthma. Metabisulfite is a more frequent trigger, but generally results in mild symptoms that are short lived and respond promptly to reliever medication.

Gastro-oesophageal reflux may be a trigger of worsening asthma or cough despite an unimpressive history of frank reflux or heartburn. If asthma is proving difficult to control, a trial of a proton pump inhibitor may be warranted.

Obstructive sleep apnoea may also contribute to suboptimal asthma control, and a sleep study should be considered if snoring or sleep disordered breathing is suggested by the history.

Summary

These are the first steps in the process of assessing the severity and identifying the triggers that may provoke asthma attacks and prevent achievement of optimal asthma control. In the second part of this article, treatment options and management approaches that help to maintain optimal asthma control will be discussed. MT

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