

# Current issues in childhood asthma

## Part 1: diagnosis and management

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This two-part article will assist GPs in their role of managing most children with asthma:

here, Part 1 outlines current concepts. Next month, Part 2 will present common questions and answers about asthma management in childhood.

### Approach: childhood v. adult asthma

There are important differences in the approach to treatment of asthma in children compared with treating adults.

It is important to recognise these and not regard children with asthma as 'little adults' and apply adult treatment regimens. The differences include the following:

- Asthma in children is more frequently episodic than persistent, so continuous preventive treatment is needed less often than in adults.
- Asthma in children is more often seasonal – many children require treatment only during winter.
- Growth is an important issue in childhood asthma, with both undertreatment and overtreatment with inhaled steroids impairing growth in some children (for further detail see Part 2).
- The pattern and severity of symptoms can change over time. For most children with asthma, the disease improves with time.

### Diagnosis: younger v. older children In infants and young children

In recent years, there has been agreement that asthma is due to an inflammatory reaction in the airway. While accurate pathologically, this definition is of little use to the practising clinician seeing children with respiratory symptoms. It is, in fact, difficult to provide definitive clinical guidelines for making a diagnosis of asthma in infants and children. In 1992, an international consensus statement described asthma as 'episodic wheeze and/or coughing in a clinical setting where asthma is likely and other rarer conditions have been excluded'.<sup>1</sup>

### Wheezing in infancy

Recent studies have improved our understanding of the relationship between wheezing in infancy and the subsequent risk of asthma, and between the symptom pattern of persistent cough and a diagnosis of asthma (see 'Coughing' below). It is also becoming clear that children who wheeze only with viral infections

### IN SUMMARY

- Most children with asthma can be managed by their GP.
- Accurate diagnosis is essential – persistent wheezing or coughing in childhood are not always due to asthma.
- An agreed management plan for both prevention and acute attacks is essential – including an age appropriate delivery device.
- Specialist referral is indicated when the diagnosis is in doubt or reasonable treatment is ineffective.

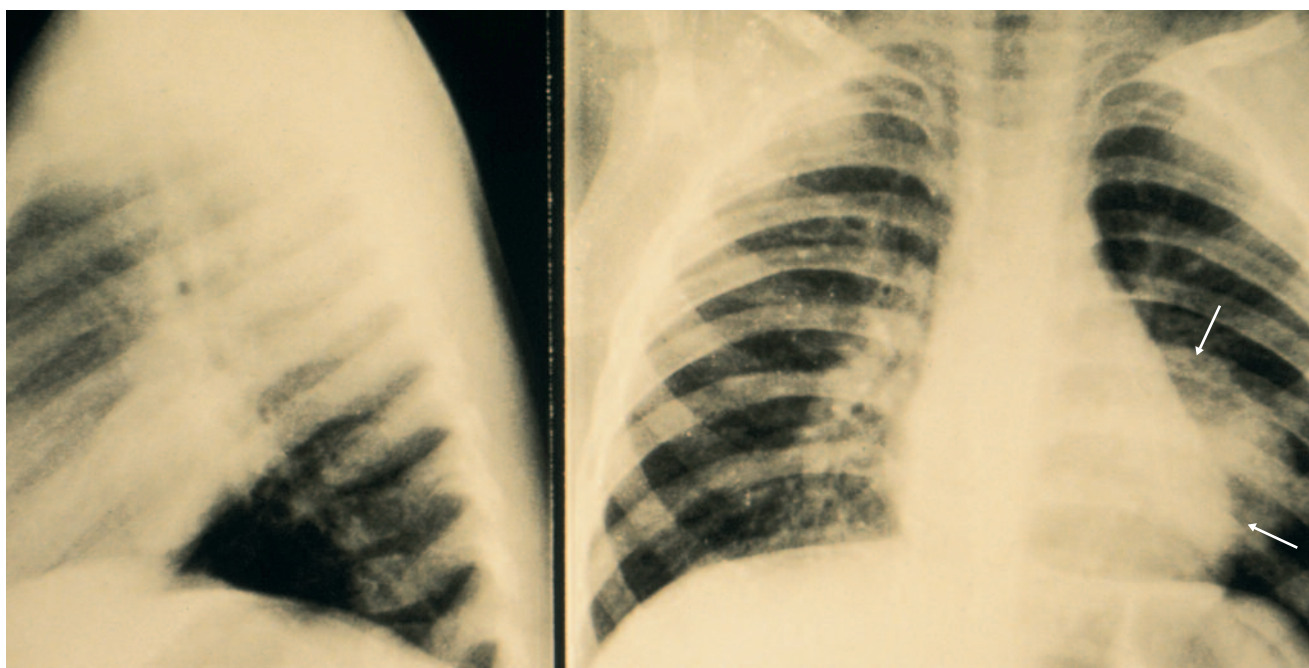


Figure 1. Bronchogenic cyst causing airway compression (rounded shadow lateral to heart border and indicated by arrows).

have a different clinical course from those who also wheeze with other triggers.

**Wheezing in the first 6 months of life.** It is almost impossible to make a diagnosis of asthma in the first 6 months of life and even if there is a good clinical reason to suggest the diagnosis, response to therapy is uncommon. The onset of persistent wheeze in the first 6 months may be due to an underlying congenital abnormality (e.g. vascular ring compression, bronchogenic cyst) and a chest x-ray should be obtained.

**Wheezing in the first 18 months of life.** At least 30% of all infants have a wheezy respiratory illness in the first 18 months of life, but only one-third of these ‘early wheezers’ have asthma later in childhood. One should therefore be cautious in making a diagnosis of asthma in this age group and, in particular, in prescribing continuing treatment with inhaled steroids. However, asthma can begin in the first year of life and the diagnosis should be considered when there is a history of recurrent episodes of wheeze in the presence of a strong family history of asthma or atopy, particularly when the infant has other atopic features. As

noted above, the onset of persistent wheeze in the first few months can be due to an underlying congenital abnormality and a chest radiograph should always be obtained in this setting (see Figure 1).

### Coughing

There are current concerns that asthma is overdiagnosed in children with recurrent cough in the absence of wheeze and that this leads, in turn, to overprescribing of inhaled steroids. Although persistent cough can occasionally be the only symptom of asthma, not all coughs in children are due to asthma. However, asthma should be considered if there is associated wheeze or other atopic features.

Although persistent night-time cough or cough with exercise may be the presenting symptom in a child with asthma, be cautious about making a diagnosis of asthma when the symptoms are intermittent and only occur with viral infections. In particular, be cautious about prescribing regular inhaled steroids for short term symptoms – a cough that does not respond within a week to appropriate asthma therapy is unlikely to be due to asthma.

Persistent cough in the absence of wheeze is rarely due to asthma. For further discussion

continued

about the management of persistent cough in childhood see Part 2.

**In older children**

Asthma can reasonably be diagnosed in older children when there have been recurrent episodes of wheeze, chest tightness or shortness of breath. Cough may be an associated symptom.

As for younger children, symptoms are often worse at night and with exercise. Supportive features include a history of eczema or allergic rhinitis and a history of asthma or atopy in a close relative.

**Treatment: goals**

The goals of asthma treatment in children are to:

- minimise asthma symptoms
- maximise and maintain best lung function
- identify trigger factors to allow for avoidance strategies to be planned
- reduce the frequency of acute episodes
- achieve the best quality of life for the child with asthma

- avoid unnecessary side effects from medication.

**Treatment: steps**

The initial step in managing asthma is to confirm the diagnosis. After confirming the diagnosis, the treatment of childhood asthma involves another four steps:

- assessing the pattern and severity of symptoms as well as identifying trigger factors
- prescribing appropriate treatment
- selecting an age-appropriate delivery device
- reviewing regularly.

**Step 1. Assessing disease**

A guide to assessing the pattern and severity of symptoms of asthma (as well as preventive therapy) is presented in Table 1.

It is also important to identify trigger factors when possible – in particular, it is important to question parents about their smoking habits. Environmental control measures to reduce house dust mite exposure at home are reasonable,

although there is limited evidence of their efficacy.

**Step 2. Prescribing treatment**

The flowchart on page 49 outlines preventive treatment for asthma in childhood.

**Infrequent episodic asthma**

Generally, no regular preventive treatment is required. However, occasional episodes may be troublesome, or even severe, and require the use of oral corticosteroids.

**Frequent episodic asthma**

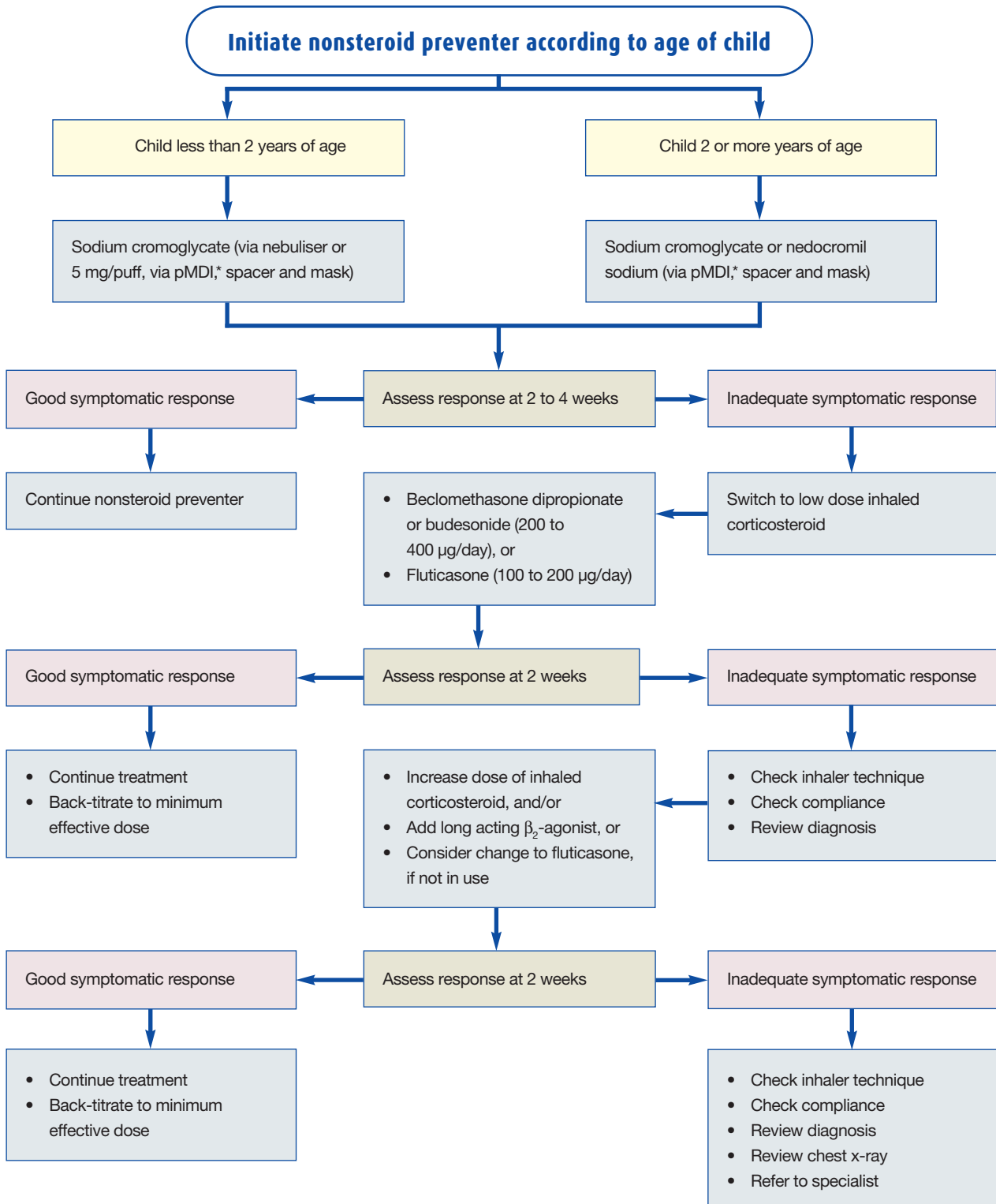
Regular preventive, anti-inflammatory medication is generally warranted in children with frequent episodic asthma. Regular preventive treatment should be commenced when:

- the child requires a  $\beta_2$ -adrenergic agonist more than three to four times a week or uses more than one canister every three months
- spirometry shows reversible airflow obstruction during asymptomatic phases

**Table 1. Childhood asthma: a guide to assessing disease and to preventive therapy**

| CLASSIFICATION OF SEVERITY                                  | PATTERNS OF SYMPTOMS  | PREVENTIVE THERAPY   |
|---|---|--|
| <b>Infrequent episodic</b><br>(75% of all childhood asthma) | <ul style="list-style-type: none"> <li>• Episodes more than 6 to 8 weeks apart</li> <li>• No interval symptoms</li> </ul>   | <ul style="list-style-type: none"> <li>• No preventive treatment required</li> <li>• p.r.n. use of short acting <math>\beta_2</math>-agonists</li> <li>• p.r.n. use of oral steroids for acute attacks</li> </ul>  |
| <b>Frequent episodic</b><br>(20% of all childhood asthma)   | <ul style="list-style-type: none"> <li>• Episodes less than 4 to 6 weeks apart</li> <li>• Attacks may be more severe, some interval symptoms</li> </ul>                 | <ul style="list-style-type: none"> <li>• p.r.n. use of short acting <math>\beta_2</math>-agonists</li> <li>• Start with sodium cromoglycate (Intal Forte CFC-free) or nedocromil sodium (Tilade), two to four puffs twice daily</li> <li>• If not effective, start low dose inhaled corticosteroids</li> </ul> |
| <b>Persistent</b><br>(5% of all childhood asthma)           | <ul style="list-style-type: none"> <li>• Symptoms most days and nocturnal asthma more than once a week</li> <li>• Daily use of <math>\beta_2</math>-agonists</li> </ul> | <ul style="list-style-type: none"> <li>• Inhaled corticosteroids using minimum effective dose</li> <li>• Try adding other drugs to minimise steroid use (e.g. long acting <math>\beta_2</math>-agonists, theophylline or nonsteroid preventers)</li> </ul>   |

## Flowchart of preventive treatment for childhood asthma



\* pMDI = pressurised metered dose inhaler

continued

**Table 2. Childhood asthma: selecting delivery devices according to age (years)**

| Route of administration | Less than 2 | 2 to 4 | 5 to 7   | 8 or more |
|-------------------------|-------------|--------|----------|-----------|
| pMDI,* spacer, mask     | Yes         | Yes    | No       | No        |
| pMDI,* spacer           | No          | Yes    | Yes      | Yes       |
| pMDI* alone             | No          | No     | No       | Yes       |
| Accuhaler               | No          | No     | Possibly | Yes       |
| Turbuhaler              | No          | No     | Possibly | Yes       |
| Aerolizer               | No          | No     | Possibly | Yes       |
| Autohaler               | No          | No     | No       | Yes       |

\* pMDI = pressurised metered dose inhaler

- there are symptoms, other than with exercise, more than three to four times per week between acute attacks
- asthma significantly interferes with physical activity despite appropriate pretreatment
- exacerbations occur more frequently than every six to eight weeks
- the child wakes more than once a week on a regular basis because of asthma symptoms.

The type of preventive medication used should be appropriate to the age of the child and the severity of asthma.

**In children less than 2 years of age.**

Younger children with frequent episodic asthma should initially be started on sodium cromoglycate – usually as a pressurised metered dose inhaler (Intal Forte CFC-free) – together with a small volume spacer device (e.g. Aerochamber, Airflow Space Chamber or Breath-

A-Tech) and a mask. (For more information on delivery devices see ‘Step 3. Selecting a delivery device’ below and Table 2.)

If the clinical response to a trial of sodium cromoglycate, usually for two to four weeks, is unsatisfactory then low dose inhaled corticosteroids should be substituted. For example, 200 to 400 µg per day of beclomethasone dipropionate (Becotide, Respocort) or budesonide (Pulmicort), or 100 to 200 µg per day of fluticasone propionate (Flixotide). Again, this should be administered via a pressurised metered-dose inhaler, small volume spacer and mask.

**In children 2 or more years of age.**

For older children, first line medication should be either sodium cromoglycate (Intal Forte CFC-free) or nedocromil sodium (Tilade) by pressurised metered dose inhaler and spacer. A mask should be used with the spacer until about 3 years of age.

As for younger children, if the response is inadequate, low dose inhaled corticosteroids (at the same doses as for younger children – see above) via pressurised metered dose inhaler and spacer should be substituted. Nedocromil sodium may also be of particular benefit in treating asthmatic cough.



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Figure 2. A small volume spacer with face mask is an appropriate delivery system for infants with asthma.

Figure 3. Use of a spacer reduces the co-ordination problems and any oropharyngeal adverse effects of metered dose inhaler therapy.

The validity of this approach to preventive therapy has been confirmed in a recent study from Finland by Korhonen et al who reported that over 70% of children with asthma can be satisfactorily controlled with cromones.<sup>2</sup>

### Persistent asthma

Inhaled steroids remain the cornerstone of treatment for persistent asthma. If the initial response is inadequate, add a long acting  $\beta_2$ -agonist.

If symptom control remains poor, the dose of inhaled steroid should be increased further after assessing inhaler technique, ensuring compliance and reconsidering the diagnosis. Once good symptomatic control is achieved, the inhaled corticosteroid should be reduced to the lowest dose that maintains symptom control.

If continued treatment with high dose inhaled corticosteroids is required, referral to a paediatric specialist is strongly recommended (for further discussion about when to refer to a specialist see Part 2).

In persistent asthma, other drugs may have a role as supplementary treatment, in order to minimise the dose of inhaled steroid used – particularly when side effects are encountered. Such drugs include theophylline (Austyn, Neulin Syrup, Theo-dur), demonstrated to have anti-inflammatory effects at lower concentrations than those required for bronchodilatation, nedocromil sodium and the leukotriene receptor antagonist montelukast (Singulair). For further discussion about inhaled corticosteroid, long acting  $\beta_2$ -agonist and leukotriene receptor antagonist use, see Part 2.)

### Step 3. Selecting a delivery device

The age of the child is important when considering which delivery device to use – compliance may be improved with careful choice of an age-appropriate delivery device (see Table 2). With respect to spacers, children less than 3

## Protocols for home treatment of acute exacerbations of asthma

### Short acting $\beta_2$ -adrenergic agonist

Use an inhaled short acting  $\beta_2$ -adrenergic agonist up to three or four hourly as needed, using either of the following two delivery devices:

- metered dose inhaler – for example, salbutamol, two puffs for mild symptoms or up to eight puffs (for more troublesome wheeze, use six puffs for children less than 6 years of age and up to 12 puffs in older children)
- nebuliser – for example, salbutamol, 2.5 mg nebule for children less than 5 years of age and 5 mg nebule for children aged 5 or more.

When using a spacer, load with one puff per breath. Loading multiple actuations at one time significantly reduces the delivered dose.

Avoid the use of dry powder devices for the management of acute asthma. If patients use a dry powder device when well, they need another device for acute episodes.

### Inhaled corticosteroids

In some circumstances, for children on regular preventive treatment with inhaled steroids, the dose of steroids may be doubled during the episode (but evidence to support this approach is lacking).

### Oral corticosteroids

Oral corticosteroids should be commenced in an exacerbation at home when:

- short acting  $\beta_2$ -adrenergic agonist treatment is required more often than three hourly
- short acting  $\beta_2$ -adrenergic agonist treatment is required every three to four hours for more than six doses
- symptoms return within one hour of treatment.

### Urgent medical attention

Those who have recently had a severe attack or a life-threatening episode of asthma should proceed directly to hospital after initiating treatment.

Other indications for the parent or patient to seek urgent medical attention include:

- a lack of improvement within one hour of commencing treatment
- worsening of the child's asthma as indicated by a need for increasingly frequent doses of bronchodilator.

years of age should use a 150 mL (small volume) spacer (Figure 2), and children three or more years of age should use a 750 mL (large volume) spacer (see Figure 3).

School aged children will often avoid using a large volume spacer in front of their peers but may be happy to use a pressurised metered dose inhaler or breath-activated inhaler (Autohaler, Turbuhaler or Accuhaler). However, a spacer should be used when inhaled corticosteroids are given

by pressurised metered dose inhaler (Figure 3).

Further, dry powder devices (Accuhaler, Turbuhaler and Aerolizer) are not suitable for patients with low inspiratory flow rates.

To achieve efficient delivery of medication, it is essential to educate the child or parent in how to use the device and to reassess its use periodically.

Nebulisers are now rarely necessary for children with asthma, even for treatment of acute symptoms.

continued

### Step 4. Reviewing regularly

It is important to recall patients for regular review so that:

- symptom control can be reviewed
- patient-initiated changes to treatment can be reviewed
- the dose of inhaled corticosteroid can be back-titrated to the minimum effective dose
- inhaler technique can be checked, especially if symptom control is poor
- education and compliance with treatment can be reinforced
- management plans can be reviewed and updated if necessary
- growth can be monitored (for further discussion on monitoring growth see Part 2).

### The asthma management plan

The individual patient's asthma management plan sets out the first steps in home treatment of an acute exacerbation for those previously diagnosed with asthma. A protocol for treatment of acute episodes at home is presented in the box on page 53. The essential elements of this approach are:

- to educate all parents of children with asthma (and the child when age-appropriate) to recognise the trigger factors and early deterioration of their asthma
- for all children with more than mild, occasional, asthma symptoms to have a written asthma management plan to guide prompt intensification of treatment
- to promote prompt communication between patient and doctor.

The goals of home management of acute exacerbations are to:

- avoid delay in instituting appropriate treatment
- enable patients (or parents) skilled in self-management to acquire a sense of control over their lives and their illness
- avoid delay in seeking medical help when the exacerbation is severe or if

the response to treatment is not prompt and sustained.

The home management strategy must be individualised, and will depend on the skill and competence of the patient or parents and access to emergency care. Parents of children with asthma should be instructed on the home treatment of asthma as soon as possible after diagnosis.

### Early warning signs

Frequently, patients present with a 'sudden asthma attack' without recognising the more gradual increase in

symptoms and decline in lung function that typically precede the acute event. The asthma management plan should emphasise detection of the early warning signs of an acute exacerbation. Studies of children presenting to hospital with acute asthma show that prodromal symptoms were present for six hours or more in the majority of cases prior to presentation. Importantly, the prodromal symptoms tend to be the same with each episode, so parents or the patient can recognise the pattern and react when they first recognise the prodromal symptoms, rather than waiting for the onset of obvious asthma

symptoms. Early recognition of trigger factors and deterioration in asthma, accompanied by a prompt intensification of treatment, will frequently prevent or abort an acute exacerbation.

### Peak flow monitoring

Measurement of peak flow can sometimes be useful in home monitoring of asthma, but peak flow meters can be inaccurate and not detect exacerbations. Readings are effort-dependent and may be inaccurate, especially in young children. Symptom-based asthma management plans are generally preferred in children. For further discussion of peak flow monitoring see Part 2.

### Conclusion

Most children with asthma can be managed by their GP. However, it is important for the diagnosis of asthma to be accurate and for management to include appropriate regular preventive treatment when indicated, an age-appropriate treatment delivery device and a written asthma management plan for initial home treatment of acute exacerbations. MT

### References

1. Asthma: a follow-up statement from an international paediatric asthma consensus group. *Arch Dis Child* 1992; 67: 240-248.
2. Korhonen K, Korppi M, Remes S, Reijonen T, Remes K. Lung function in school aged children with inhaled cromoglycate, nedocromil and corticosteroid therapy. *Eur Respir J* 1999; 13: 82-86.

*Next month, Part 2 of this article presents answers to common questions about management – for example, what to do when a patient remains symptomatic on seemingly appropriate therapy, when to refer, when and how to use peak flow measurement and what is the role of the newer agents.*