Asthma treatment plans should take into account patients’ goals and preferences

Asthma treatment and monitoring

By Anna Murphy, MSc, MRPharmS

British guidelines on the management of asthma first appeared in 1990 and have come to be respected as a clear and practical statement of best practice. This article describes the options for managing and monitoring asthma in the context of the most recent British guidelines, published in 2009 by the British Thoracic Society and the Scottish Intercollegiate Guidelines Network.

The goals of asthma treatment, as stated in the guidelines, are to:

- Minimise or eliminate the occurrence of symptoms
- Maximise lung function
- Prevent exacerbations
- Minimise the need for medication
- Minimise the adverse effects of treatment
- Provide enough information and support to facilitate self-management
- Promote adherence with medication

With appropriate treatment and care, these goals can generally be achieved and a patient’s asthma can be well controlled (see Box 1, p210) so that the individual can enjoy a healthy and active life.

It should always be borne in mind that asthma is a complex disease, with a range of clinical presentations and causative factors, and it is therefore essential that each patient’s treatment is personalised. Treatment plans should take into account a patient’s environment, exercise levels, ability to use an inhaler device, potential adherence problems, understanding of both the disease and his or her treatment as well as disease severity. Individual patients may have goals slightly different from those listed above and may wish to balance the benefits of asthma treatment against the potential side effects or inconvenience of taking the medicines necessary to achieve “perfect” control.

General approach

In Stedman’s ‘Twentieth Century Practice’, actually published at the end of the 19th century in 1896, the following was written:

“The treatment of asthma involves the treatment of the patient during fits and between fits: the general indications are:

1. To allay the spasm during the paroxysm;
2. To find out and remove the exciting cause;
3. To treat complications and sequelae and to improve general health.”

Thus, more than 100 years ago it was recognised that asthma is not only an episodic disease but also a chronic condition. Indeed, the general approach to asthma management was similar then to what it is today: acute “rescue” treatment, chronic “controller” treatment and prevention of long-term complications.

Chronic treatment

The BTS/SIGN asthma guideline recommends a stepwise approach to the treatment of chronic asthma (see Figure 1, p210). Treatment is started at a particular level, according to the severity of the patient’s symptoms. The aim is to achieve early control and maintain this by stepping up treatment as necessary and stepping down when control is good. A decision to move to the next step should not be made until it has been confirmed that a patient:

- Has satisfactory inhaler technique
- Has access to and is taking his or her treatment
- Is taking adequate measures to avoid allergens or irritants

Once control has been achieved, treatment should be reviewed every three to six months with a view to moving the patient to a lower step. The basic principles of this approach can be applied to infants and young children.
Two types of medicines are used to treat chronic asthma:

- Controllers (preventers), which are taken daily on a long-term basis to keep asthma under control
- Relievers (sometimes referred to as rescue medication), which are used on an as-needed basis to reverse bronchoconstriction quickly

**Controller medicines**

**Inhaled corticosteroids** Inhaled corticosteroids (ICSs) are the most effective drugs to control asthma in both adults and children. They should be prescribed (at step 2) for patients who confirm at least one of the following:

- Have experienced an exacerbation of asthma in the past two years
- Use a short-acting \( \beta_2 \) agonist (SABA; see below) three or more times per week
- Experience asthma symptoms three or more times per week
- Wake at least one night per week with symptoms

ICSs have an array of anti-inflammatory actions and they non-specifically reduce non-bronchial hyper-responsiveness. However, it is important to note that they do not cure asthma and, when they are discontinued, deterioration of clinical control follows within weeks to months in most patients. Not all patients benefit equally from an ICS. Current and recent smokers, for example, are less likely to derive the same antiasthmatic effects as non-smokers. The choice of which ICS to use is based on factors such as availability of delivery devices, patient acceptability and cost. ICSs differ in potency and bioavailability but, because of their relatively flat dose-response curves in asthma, few studies have been able to demonstrate that these differences have clinical relevance. (See Box 2, p212, for the approximately equipotent doses of the different ICSs.)

Most of the benefit from an ICS is achieved in adults at relatively low doses, equivalent to 400µg beclometasone (CFC-containing product) per day. Increasing the dose, provides little further benefit in terms of asthma control but increases the risk of side effects (see Box 3, p213).

**Long-acting \( \beta_2 \) agonists** The long-acting \( \beta_2 \) agonists (LABAs) most frequently prescribed are salmeterol and formoterol. These medicines have a rapid onset of action, but increases the risk of side effects (see Box 3, p213).

**Inhaled corticosteroids**

- **Controller (preventer)**
  - Inhaled corticosteroid (BDP-CFC or equivalent)
  - 200–800µg/day (adults and children aged >12 years), 200–400µg/day for children aged 5–12 years — 400µg/day is a suitable starting dose for most adults or 200µg/day for 5–12-year-olds
  - **STEP 2**

**Moderate persistent — Initial add on therapy**

- **Controller (preventer)**
  - Inhaled corticosteroid (BDP-CFC or equivalent)
  - 400–800µg/day (adults), 290–400µg/day for 5–12 years of age; plus long-acting \( \beta_2 \) agonist
  - **STEP 3**

**Severe persistent/continuous symptoms**

- **Controller (preventer)**
  - Daily prednisolone in lowest dose possible for adequate control
  - Inhaled corticosteroid (BDP-CFC or equivalent)
  - up to 2,000µg/day (adults), 800µg/day 5–12 years of age; plus long-acting \( \beta_2 \) agonist
  - **STEP 5**

**Controller (preventer)**

- Reliever
  - Short-acting \( \beta_2 \) agonist (eg, salbutamol or terbutaline)
  - **STEP 4**

**Controller (preventer)**

- Reliever
  - Short-acting \( \beta_2 \) agonist (eg, salbutamol or terbutaline)

**STEP 1**

- **Mild intermittent asthma**
  - Controller (preventer)
    - None needed
  - Reliever
    - Short-acting \( \beta_2 \) agonist (eg, salbutamol or terbutaline)

**STEP 2**

- **Mild persistent asthma — regular preventer therapy**
  - Controller (preventer)
    - Inhaled corticosteroid (BDP-CFC or equivalent)
    - 200–800µg/day (adults and children aged >12 years), 200–400µg/day for children aged 5–12 years — 400µg/day is a suitable starting dose for most adults or 200µg/day for 5–12-year-olds
  - Reliever
    - Short-acting \( \beta_2 \) agonist (eg, salbutamol or terbutaline)

**STEP 3**

- **Persistent poor control**
  - Controller (preventer)
    - Inhaled corticosteroid (BDP-CFC or equivalent)
    - up to 2,000µg/day (adults), 800µg/day 5–12 years of age; plus long-acting \( \beta_2 \) agonist
  - Reliever
    - Short-acting \( \beta_2 \) agonist (eg, salbutamol or terbutaline)

**STEP 4**

- **Severe persistent/continuous symptoms**
  - Controller (preventer)
    - Daily prednisolone in lowest dose possible for adequate control
  - Inhaled corticosteroid (BDP-CFC or equivalent)
    - up to 2,000µg/day (adults), 800µg/day 5–12 years of age; plus long-acting \( \beta_2 \) agonist
  - **STEP 5**

**Controller (preventer)**

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**Box 2: Equivalent steroid dosages**

<table>
<thead>
<tr>
<th>Corticosteroid</th>
<th>Equivalent Daily Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beclometasone CFC</td>
<td>400μg</td>
</tr>
<tr>
<td>Budesonide</td>
<td>400μg</td>
</tr>
<tr>
<td>Fluticasone</td>
<td>200–300μg</td>
</tr>
<tr>
<td>Mometasone</td>
<td>200μg</td>
</tr>
<tr>
<td>Ciclesonide</td>
<td>200μg</td>
</tr>
</tbody>
</table>

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**Phonolol Sulfate**


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**Leukotriene-receptor antagonists**

The leukotriene-receptor antagonists (LTRAs) montelukast and zafirlukast achieve bronchodilation within one hour of administration and can be effective in limiting the late phase response of asthma. Taken orally, an LTRA is an option for adults and children aged five years and over who do not respond to a LABA or who are taking a high dose of ICS and a LABA but are still experiencing poor asthma control. For children aged two to five years who are already receiving a SABA, montelukast is an alternative to an ICS if steroids cannot be tolerated, or is first-choice add-on therapy if regular ICS therapy is already being used concurrently.
or systemic corticosteroids unmasking the underlying disease, but a causal association cannot be fully excluded.

**Methylxanthines** Theophylline is a bronchodilator which, when given in a lower dose, has modest anti-inflammatory properties. In patients who have persistent symptoms, despite the maximum use of inhaled bronchodilators and corticosteroids, a trial of theophylline or aminophylline (a mixture of theophylline and ethylenediamine) may be indicated. Theophylline has a narrow therapeutic window between benefit and toxicity. To reduce the likelihood of side effects, treatment is initiated at a low dose and titrated upwards. Treatment should be discontinued if no benefit is seen. Clearance (and consequently serum levels) of theophylline is affected by many factors including age, diet, food, smoking habits and concomitant medicines.

**Cromones** The role of sodium cromoglycate and nedocromil sodium in the long-term treatment of asthma is limited. Efficacy has been reported in patients with mild persistent asthma (step 2) and exercise-induced bronchospasm. Their anti-inflammatory effect is weak and they are less effective than a low dose of ICS.

**Omalizumab** The recombinant humanised monoclonal antibody omalizumab selectively binds to IgE forming an omalizumab-IgE complex. This inhibits the binding of IgE to its receptor sites on mast cells and reduces the release of inflammatory mediators and the subsequent allergic and inflammatory response. Omalizumab is recommended by the National Institute for Health and Clinical Excellence for use, within its licensed indication, as a possible treatment for adults and young people over 12 years of age with severe persistent allergic (IgE-mediated) asthma who meet specific criteria.

**Reliever medicines**

**Short-acting beta<sub>2</sub> agonists** SABAs, for example salbutamol or terbutaline, are the medicines of choice to relieve asthma symptoms or for use just before exercise.

SABAs have an onset of action within five minutes or less and a peak effect in four to six hours. The decision about which SABA to use is based on a patient’s age, the availability of devices and patient preference. SABAs should only be used on an as-needed basis because regular administration does not improve outcomes. Monitoring of SABA use is helpful in assessing asthma control. Increased use is a warning of deterioration of asthma control and indicates the need to reassess treatment. Good asthma control is associated with little or no need for SABAs.

**Anticholinergics** Inhaled ipratropium bromide is a less effective reliever medicine for asthma than the SABAs. Compared with beta<sub>2</sub> agonists alone, a combination of ipratropium and beta<sub>2</sub> agonists seems more effective at improving lung function and at reducing hospital admission rates in people with acute asthma. The prescribing of ipratropium for the long-term management of asthma is currently not recommended.

**Preventing attacks**

Preventing asthma attacks is a key component of effective asthma control. As well as the appropriate prescribing of treatment regimens, other factors to consider include identifying and avoiding triggers, educating and monitoring patients and ensuring appropriate inhaler technique.

**Risk factor avoidance** Identifying risk factors that trigger asthma attacks and removing appropriate allergens and irritants from a patient’s environment can reduce the frequency of symptoms and hospital admissions and the need for medication. Allergens should only be avoided where there is evidence that the patient is indeed allergic to that specific allergen. If not, then allergen avoidance is not recommended.

**Patient education and monitoring** Education is essential to enable patients to make the decisions needed to control their asthma and to empower them to react appropriately to signs of deteriorating control.

Patients should have a personalised treatment plan agreed between themselves and their health professionals. The use of such plans is associated with a decrease in hospital admissions for, and deaths from, asthma. Plans can be symptom- or peak expiratory flow (PEF)-based — both have been shown to be equally effective. However, many patients with asthma have poor recognition of their symptoms and poor perception of symptom severity.

Measurements of PEF provide an objective measurement of airflow limitation and thus are valuable in the monitoring of asthma. Other methods can be employed to monitor asthma control, eg, validated tools such as the “Asthma control test”, sputum eosinophil counts and exhaled nitric oxide. The Royal College of Physicians’s “three questions” is another tool which asks patients the following about their symptoms in the previous week (or month):

**Box 3: Inhaled corticosteroid side effects**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Reduce risk by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoarse voice (dysphonia)</td>
<td>Use of a chamber/spacer device (usually not totally effective)</td>
</tr>
<tr>
<td></td>
<td>Trying dry-powder device</td>
</tr>
<tr>
<td>Oral candidiasis</td>
<td>Rinsing/gargling with water after use</td>
</tr>
<tr>
<td></td>
<td>Use of a chamber/spacer device</td>
</tr>
<tr>
<td>Reflex cough following inhalation (upper-airway irritation)</td>
<td>Instructing patients to inhale slowly</td>
</tr>
<tr>
<td></td>
<td>Use of a chamber/spacer device</td>
</tr>
<tr>
<td>Systemic</td>
<td>Maintaining on lowest dose of inhaled corticosteroid that will control asthma (risk depends on the dose and duration of therapy)</td>
</tr>
</tbody>
</table>

**Adrenal suppression**

**Bruising**

**Osteoporosis**

**Cataracts**

**Glaucoma**
Inhaler technique Close attention must be paid to a patient’s inhaler technique. This is likely to be the single most important factor in determining the efficacy of treatment. Published studies show that most patients make at least one mistake when using an inhaler. Inhalers should only be prescribed after patients have received training in the use of the device and have demonstrated satisfactory technique. Patients often require reinforcement of technique by repeated advice and encouragement.

Acute asthma

As mentioned above, the aim of asthma treatment is to control the condition such that exacerbations are prevented. However, should an attack occur, it is important that its severity is assessed promptly — failure to recognise that an attack is severe is a major factor contributing to death. Treatment with oxygen, bronchodilators, corticosteroids, magnesium and/or aminophylline should be initiated (see Box 4) depending on severity.

References


Box 4: Prescribing points — acute asthma

Oxygen

- Hypoxaemia is the most common cause of death in asthma exacerbations
- High concentrations of oxygen (usually 40–60%) should be given urgently to correct hypoxaemia
- There is little risk of inducing hypercapnia with high-flow oxygen in acute asthma, unlike in patients with chronic obstructive pulmonary disease
- Hypercapnia indicates the development of near-fatal asthma and the need for emergency intervention
- Aim to maintain oxygen saturation level of 94–98%

Bronchodilators

- Short-acting beta2 agonists (SABAs), eg, salbutamol or terbutaline, should be given in high doses and as early as possible to relieve bronchospasm
- Reserve intravenous beta2 agonists for those patients for whom inhaled therapy cannot be used reliably
- Ipratropium bromide should be added to nebulised beta2 agonist treatment for patients with acute severe or life-threatening symptoms and for patients who show a poor response to administration of beta2 agonist alone
- The continued prescribing of ipratropium bromide once the condition is stable is not beneficial
- In acute asthma, except in life-threatening cases, administration of bronchodilators via a metered dose inhaler and spacer is preferable to the nebulised route

Corticosteroids

- Should be given in adequate doses (eg, prednisolone 40–50mg daily [adults], 30–40mg daily [age 5–12 years], 20mg daily [age 2–5 years], for at least five days or until recovery) to all cases of acute asthma
- Steroids reduce mortality, relapses, subsequent hospital admission and requirement for beta2 agonist therapy; the earlier they are given in an acute attack the better the outcome
- Steroid tablets are as effective as parenteral steroids, provided the tablets can be swallowed and retained and there is no problem with absorption

Magnesium

- Magnesium relaxes smooth muscle in vitro and is a weak bronchodilator
- Consider a single dose of intravenous magnesium 1.2–2g over 20 minutes for patients with either acute severe asthma who have not had a good initial response to inhaled bronchodilator therapy or patients with life-threatening or near fatal asthma

Aminophylline

- Ipratropium bromide should be added to nebulised beta2 agonist treatment
- In patients for whom inhaled therapy cannot be used reliably

Leukotriene-receptor antagonists

- In children with a mild asthma exacerbation, starting montelukast early after the onset of acute asthma symptoms can result in improved asthma control and a reduction in the need for subsequent hospital admission or GP visits

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