The principles of managing asthma in adults and adolescents, including initial assessments and treatment, adjusting treatment to maintain optimal asthma control without over-medicating, and providing information and support to help people manage their asthma.
ABBREVIATIONS

CFC  chlorofluorocarbon
COPD  chronic obstructive pulmonary disease
COX  cyclo-oxygenase
ED  emergency department
EIB  exercise-induced bronchoconstriction
FEV₁  forced expiratory volume over one second
FVC  forced vital capacity
FSANZ  Food Standards Australia and New Zealand
GORD  gastro-oesophageal reflux disease
HFA  formulated with hydrofluoralkane propellant
ICS  inhaled corticosteroid
ICU  intensive care unit
IgE  Immunoglobulin E
IV  intravenous
LABA  long-acting beta₂-adrenergic receptor agonist
LAMA  long-acting muscarinic antagonist
LTRA  leukotriene receptor antagonist
MBS  Medical Benefits Scheme
NIPPV  non-invasive positive pressure ventilation
NSAIDs  nonsteroidal anti-inflammatory drugs
OCS  oral corticosteroids
OSA  obstructive sleep apnoea
PaCO  carbon dioxide partial pressure on blood gas analysis
PaO₂  oxygen partial pressure on blood gas analysis
PBS  Pharmaceutical Benefits Scheme
PEF  peak expiratory flow
pMDI  pressurised metered-dose inhaler or ‘puffer’
SABA  short-acting beta₂-adrenergic receptor agonist
LAMA  long-acting muscarinic antagonist
TGA  Therapeutic Goods Administration

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ENDORSEMENT
The Australian Asthma Handbook has been officially endorsed by:
- The Royal Australian College of General Practitioners (RACGP)
- The Australian Primary Health Care Nurses Association (APNA)
- The Thoracic Society of Australia and New Zealand (TSANZ)

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National Asthma Council Australia would like to acknowledge the support of the sponsors of Version 1.2 of the Australian Asthma Handbook:
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Managing asthma in adults

Overview

Asthma management in adults is based on:

- confirming the diagnosis
- assessing asthma control (recent asthma symptom control and risk factors)
- identifying management goals in collaboration with the patient
- choosing initial treatment appropriate to recent asthma symptom control, risk factors and patient preference
- reviewing and adjusting drug treatment periodically
- providing information, skills and tools for self-management, including:
  - training in correct inhaler technique
  - information and support to maximise adherence
  - a written asthma action plan
  - information about avoiding triggers, where appropriate
- managing flare-ups when they occur
- managing comorbid conditions that affect asthma or contribute to respiratory symptoms
- providing advice about smoking, healthy eating, physical activity, healthy weight and immunisation.

Figure. Stepped approach to adjusting asthma medication in adults

Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

Table. Guide to selecting and adjusting asthma medication for adults and older adolescents

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newly diagnosed asthma</td>
<td>Consider low-dose ICS (plus SABA as needed)</td>
</tr>
<tr>
<td></td>
<td>If symptoms severe at initial presentation, consider one of:</td>
</tr>
<tr>
<td></td>
<td>• ICS plus a short course of oral corticosteroids</td>
</tr>
<tr>
<td></td>
<td>• a short initial period of high-dose ICS then step down</td>
</tr>
<tr>
<td></td>
<td>• (private prescription) combination ICS/LABA†</td>
</tr>
<tr>
<td></td>
<td>See: Table. Initial treatment choices (adults and adolescents not already using a preventer)</td>
</tr>
<tr>
<td>Good recent asthma symptom control</td>
<td>If maintained 2–3 months, no flare-up in previous 12 months and low risk for flare-ups, step down where possible (unless already on low-dose ICS)</td>
</tr>
<tr>
<td>Partial recent asthma symptom control</td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td></td>
<td>If no improvement, consider increasing treatment by one step and reviewing (if still no improvement, return to previous step, review diagnosis and consider referral)</td>
</tr>
<tr>
<td></td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td>Clinical situation</td>
<td>Action</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Poor recent asthma symptom control</td>
<td>Confirm that symptoms are likely to be due to asthma</td>
</tr>
<tr>
<td></td>
<td>Consider increasing treatment until good asthma control is achieved,</td>
</tr>
<tr>
<td></td>
<td>then step down again when possible</td>
</tr>
<tr>
<td>Difficult-to-treat asthma ‡</td>
<td>Consider referral for assessment or add-on options</td>
</tr>
<tr>
<td>Patient with risk factors §</td>
<td>Tailor treatment to reduce individual risk factors</td>
</tr>
</tbody>
</table>

† PBS status as at October 2016: ICS/LABA combination therapy as first-line preventer treatment is not subsidised by the PBS, except for patients with frequent symptoms while taking oral corticosteroids.
‡ Poor recent asthma symptom control despite ICS/LABA combination at high–medium dose with good adherence and inhaler technique.
§ Risk factors for asthma events or adverse treatment effects, irrespective of level of recent asthma symptom control.

Asset ID: 5

### Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>- Daytime symptoms ≤2 days per week</td>
<td>- Daytime symptoms &gt;2 days per week</td>
<td></td>
</tr>
<tr>
<td>- Need for reliever ≤2 days per week †</td>
<td>- Need for reliever &gt;2 days per week †</td>
<td></td>
</tr>
<tr>
<td>- No limitation of activities</td>
<td>- Any limitation of activities</td>
<td></td>
</tr>
<tr>
<td>- No symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
<td></td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

**Note:** Recent asthma symptom control is based on symptoms over the previous 4 weeks.

**Adapted from:**
Asset ID: 33

### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Inhaled corticosteroid</td>
<td>Daily dose (mcg)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Beclometasone dipropionate †</strong></td>
<td>100–200</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td>200–400</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td>80–160</td>
</tr>
<tr>
<td><strong>Fluticasone furoate</strong></td>
<td>—</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).
*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

**Note:** The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**
Asset ID: 22

- By mid-adolescence (around 14–16 years), the guidance for managing asthma in adults will apply in most situations.

**In this section**

**Confirming diagnosis**
Confirming the diagnosis of asthma

**Initial assessments**
Assess control, risk and goals before starting treatment

**Initial treatment**
Select initial treatment in adults

**Stepped adjustment**
Adjusting treatment by stepping up or stepping down
<table>
<thead>
<tr>
<th><strong>Reviewing asthma</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and conducting asthma review</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Flare-ups</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing flare-ups when they occur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Self-management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing support for self-management, including education, training in inhaler technique and a written asthma action plan</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Difficult asthma</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing high-risk and difficult-to-control asthma</td>
</tr>
</tbody>
</table>
Figure. Stepped approach to adjusting asthma medication in adults

Before considering stepping up, check symptoms are due to asthma, inhaler technique is correct, and adherence is adequate.

Consider stepping up if good control is not achieved.

When asthma is stable and well controlled for 2–3 months, consider stepping down (e.g. reducing inhaled corticosteroid dose, or stopping long-acting beta₂ agonist if inhaled corticosteroid dose is already low).

ICS: inhaled corticosteroid; SABA: short-acting beta₂ agonist; LABA: long-acting beta₂ agonist

* Reliever means rapid-onset beta₂ agonist and includes:
  - short-acting beta₂ agonists
  - low-dose budesonide/formoterol combination – only applies to patients using this combination in a maintenance-and-reliever regimen. (This combination is not classed as a reliever when used in a maintenance-only regimen).

§ In addition, manage flare-ups with extra treatment when they occur, and manage exercise-related asthma symptoms as indicated.
Confirming the diagnosis of asthma in adults

Recommendations

Before starting preventer treatment, confirm the diagnosis of asthma if possible (unless symptoms are severe).

*How this recommendation was developed*

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Aaron et al. 2008
- Lucas et al. 2008
- Luks et al. 2010
- Marklund et al. 1999

For patients who report the diagnosis of asthma made in the past or elsewhere, confirm the diagnosis if possible.

*Table. Confirming the diagnosis of asthma in a person using preventer treatment*

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/9

*How this recommendation was developed*

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Aaron et al. 2008
- Lucas et al. 2008
- Luks et al. 2010
- Marklund et al. 1999

For a patient with a diagnosis of asthma and new respiratory symptoms, confirm the symptoms are due to asthma.

*How this recommendation was developed*

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

*Confirming the diagnosis of asthma in adults and adolescents*

A prior diagnosis of asthma reported by a patient should be corroborated by documentation of how the diagnosis was confirmed at the time, or by current evidence.

Reports from around the world show that 25–35% of people with a diagnosis of asthma in primary care may not actually have asthma.\(^2,^3,^4,^5\) Wheezing and other respiratory symptoms do not always mean a person has asthma. Airflow
limitation demonstrated on spirometry can be transient and does not necessarily mean that the person has asthma (e.g., when recorded during a severe acute viral infection of the respiratory tract). Ideally, airflow limitation should be confirmed when the patient does not have a respiratory tract infection. Once a person is already taking regular treatment with a preventer, it may be more difficult to confirm the diagnosis because variability in lung function often decreases with treatment.

Table. Confirming the diagnosis of asthma in a person using preventer treatment
Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/9

**Definition of variable expiratory airflow limitation**
Most of the tests for variable expiratory airflow limitation are based on showing variability in FEV₁. While reduced FEV₁ may be seen with many other lung diseases (or due to poor spirometric technique), a reduced ratio of FEV₁ to FVC indicates airflow limitation.³⁶ Normal FEV₁/FVC values derived from population studies vary,³⁶ but are usually greater than:⁷

- 0.85 in people aged up to 19 years
- 0.80 in people aged 20–39 years
- 0.75 in people aged 40–59 years
- 0.70 in people aged 60–80 years.

In children, it is less useful to define expiratory airflow limitation according to a specific cut-off for FEV₁/FVC ratio, because normal values in children change considerably with age.⁸ Some spirometers provide predicted normal values specific to age group. If these are available, a FEV₁/FVC ratio less than the lower limit of normal (i.e., less than the 5th percentile of normal population) indicates airflow limitation.

Variable expiratory airflow limitation (beyond the range seen in healthy populations) can be documented if any of the following are recorded:

- a clinically important increase in FEV₁ (change in FEV₁ of at least 200 mL and 12% from baseline for adults, or at least 12% from baseline for children) 10–15 minutes after administration of bronchodilator
- clinically important variation in lung function (at least 20% change in FEV₁) when measured repeatedly over time (e.g., spirometry on separate visits)
- a clinically important reduction in lung function (decrease in FEV₁ of at least 200 mL and 12% from baseline on spirometry, or decrease in peak expiratory flow rate by at least 20%) after exercise (formal laboratory-based exercise challenge testing uses different criteria for exercise-induced bronchoconstriction)
- a clinically important increase in lung function (at least 200 mL and 12% from baseline) after a trial of 4 or more weeks of treatment with an inhaled corticosteroid
- a clinically important variation in peak expiratory flow (diurnal variability of more than 10%)
- a clinically important reduction in lung function (15–20%, depending on the test) during a test for airway hyperresponsiveness (exercise challenge test or bronchial provocation test) measured by a respiratory function laboratory.

**Notes**
Patients referred to a respiratory function laboratory may be asked not to take certain medicines within a few hours to days before a spirometry visit.

A clinically important increase or decrease in lung function is defined as a change in FEV₁ of at least 200 mL and 12% from baseline for adults, or at least 12% from baseline for children, or a change in peak expiratory flow rate of at least 20% on the same meter.⁹⁶ A clinically important increase in FVC after administering bronchodilator may also indicate reversible airflow limitation, but FVC is a less reliable measure in primary care because FVC may vary due to factors such as variation in inspiratory volume or expiratory time.

The finding of ‘normal’ lung function during symptoms reduces the probability that a patient has asthma, but a clinically important improvement in response to bronchodilator or inhaled corticosteroid can occur in patients whose baseline value is within the predicted normal range.

The greater the variation in lung function, the more certain is the diagnosis of asthma. However, people with longstanding asthma may develop fixed airflow limitation.

Reversibility in airflow limitation may not be detected if the person is already taking a long-acting beta₂ agonist or inhaled corticosteroid.

Airflow limitation can be transient and does not necessarily mean that the person has asthma (e.g., when recorded during a severe acute infection of the respiratory tract). Ideally, airflow limitation should be confirmed when the patient does not have a respiratory tract infection. Reduction in lung function during a respiratory tract infection with improvement in lung function after its resolution, commonly occurs in people with asthma, but can also be seen in patients with COPD or in healthy people without either asthma or COPD.¹⁰¹¹
References

Table. Confirming the diagnosis of asthma in a person using preventer treatment

<table>
<thead>
<tr>
<th>Clinical profile</th>
<th>Lung function</th>
<th>Interpretation or action</th>
</tr>
</thead>
</table>
| **Typical variable respiratory symptoms** | Variable airflow limitation demonstrated | Consistent with asthma diagnosis.  
**Note:** In a patient with a confirmed diagnosis of asthma, these features are consistent with sub-optimal (poor or partial) asthma control and suggest treatment should be reviewed. |
|                              | Variable airflow limitation not demonstrated        | Obtain historical documentation of variable airflow limitation if possible.  
If not available, test again (either of):  
• Repeat lung function test during and after symptoms  
• Withhold bronchodilator treatment for required time then repeat spirometry before and 10–15 minutes after salbutamol.  
If diagnosis still not confirmed, consider bronchial provocation (challenge) test.  
**Note:** a negative challenge test would not rule out asthma in a person taking inhaled corticosteroids.  
Consider referral to a specialist respiratory physician to confirm the diagnosis. |
| **Current respiratory symptoms** | Fixed (irreversible or incompletely reversible) airflow limitation (post-bronchodilator FEV₁/FVC < lower limit of normal for age and FEV₁ <80% predicted) | Obtain historical documentation of variable airflow limitation if possible.  
Ask about age at onset of symptoms and whether there were typical asthma symptoms earlier in life.  
Consider alternative (or additional) diagnosis (e.g. COPD in adults).  
Consider referral to a specialist respiratory physician to confirm the diagnosis, if lung function does not improve after 3-6 months of treatment with inhaled corticosteroids. |
| **Few respiratory symptoms** | Variable airflow limitation not demonstrated        | Obtain historical documentation of variable airflow limitation if possible. |


<table>
<thead>
<tr>
<th>Clinical profile</th>
<th>Lung function</th>
<th>Interpretation or action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>If not available, consider back-titrating preventer by one step:†</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduce inhaled corticosteroid dose by 50%.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2–3 weeks later reassess lung function by spirometry before and 10–15 minutes after salbutamol.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If still no evidence of variable airflow limitation, consider stopping preventer treatment (with close monitoring) and repeating spirometry another 2–3 weeks later.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If preventer is ceased and symptoms do not return at 2–3 weeks, review within 6 months.</td>
</tr>
</tbody>
</table>

Table applies to patients taking maintenance inhaled corticosteroid or combination inhaled corticosteroid/long-acting beta<sub>2</sub> agonist

§ When spirometry is performed as a diagnostic test, inhaled bronchodilators should be withheld before the test. Withholding times vary between medicines:

- at least 4 hours for short-acting beta<sub>2</sub> agonists (e.g. salbutamol, terbutaline) and short-acting muscarinic antagonists (e.g. ipratropium)
- at least 12 hours for preventers containing long-acting beta<sub>2</sub> agonists for which twice-daily dosing is recommended (e.g. formoterol, salmeterol)
- at least 24 hours for long-acting muscarinic antagonists (e.g. aclidinium, glycopyrronium, tiotropium) and preventers containing long-acting beta<sub>2</sub> agonists with once-daily dosing (e.g. fluticasone furoate plus vilanterol).

**Note:** Requested withholding times may vary between centres that conduct formal lung function testing.

† For patients using inhaled corticosteroid/long-acting beta<sub>2</sub> agonist combinations, reduce the dose of inhaled corticosteroid component by 50%. For those already using the lowest possible dose of inhaled corticosteroid/long-acting beta<sub>2</sub> agonist combination, consider switching to low-dose inhaled corticosteroid or stopping preventer.

Before stepping down, document the patient’s current asthma status and risk factors, and ensure that the person has a written asthma action plan and an appointment for asthma review.
Conducting initial assessments in adults before starting treatment

In this section

<table>
<thead>
<tr>
<th>Symptom control and risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess recent symptom control and risk of adverse asthma outcomes before starting treatment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify management goals in collaboration with the patient</td>
</tr>
</tbody>
</table>
## Table. Risk factors for adverse asthma outcomes in adults and adolescents

<table>
<thead>
<tr>
<th>Factors associated with increased risk of flare-ups</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor asthma control</td>
<td>Poor asthma control</td>
<td>Poor lung function (even if few symptoms)</td>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
</tr>
<tr>
<td>Any asthma flare-up during the previous 12 months</td>
<td>Any asthma flare-up during the previous 12 months</td>
<td>Difficulty perceiving airflow limitation or the severity of flare-ups</td>
<td>Socioeconomic disadvantage</td>
</tr>
<tr>
<td>Other concurrent chronic lung disease</td>
<td>Other concurrent chronic lung disease</td>
<td>Eosinophilic airway inflammation§</td>
<td>Use of illegal substances</td>
</tr>
<tr>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
<td>Sensitivity to an unavoidable allergen (e.g. Alternaria species of common moulds)</td>
<td>Major psychosocial problems</td>
</tr>
<tr>
<td>2 or more hospitalisations for asthma in past year</td>
<td>2 or more hospitalisations for asthma in past year</td>
<td></td>
<td>Mental illness</td>
</tr>
<tr>
<td>3 or more ED visits for asthma in the past year</td>
<td>3 or more ED visits for asthma in the past year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High short-acting beta₂ agonist use (&gt;2 canisters per month)</td>
<td>High short-acting beta₂ agonist use (&gt;2 canisters per month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of delayed presentation to hospital during flare-ups</td>
<td>History of delayed presentation to hospital during flare-ups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of sudden-onset acute asthma</td>
<td>History of sudden-onset acute asthma</td>
<td></td>
<td></td>
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<tr>
<td>Cardiovascular disease</td>
<td>Cardiovascular disease</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors associated with increased risk of life-threatening asthma</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic mucus hypersecretion</td>
<td>Chronic mucus hypersecretion</td>
<td>Poor lung function</td>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
</tr>
<tr>
<td>Poor lung function</td>
<td>Poor lung function</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors associated with accelerated decline in lung function</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor lung function</td>
<td>Poor lung function</td>
<td></td>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
</tr>
<tr>
<td>Medical history</td>
<td>Investigation findings</td>
<td>Other factors</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Severe asthma flare-up in a patient not taking ICS</td>
<td>Eosinophilic airway inflammation</td>
<td>Occupational asthma</td>
<td></td>
</tr>
</tbody>
</table>

**Factors associated with treatment-related adverse events**

- Long-term high-dose ICS
- Frequent use of OCS

- Anxiety disorder (due to increased sensitivity to asthma symptoms and reluctance to reduce ICS dose when asthma well controlled)
- Euphoria with OCS use

§ White cell differential count on a peripheral blood sample is not routinely recommended in the investigation and management of asthma, except for patients with severe refractory asthma. In research studies, peripheral blood eosinophilia suggests the presence of eosinophilic airway inflammation.

**Sources**


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Asset ID: 40
Identifying management goals for adults

Recommendations

Before offering treatment options and advice:

- find out what the person understands about their asthma (e.g. ask ‘Do you think you have asthma all the time or only when you have symptoms?’)
- check smoking status and asthma triggers, if known
- discuss the person’s goals for treatment
- gauge the person’s ability to self-manage.

Aim to:

- engage the person in managing their asthma
- minimise impact of asthma on quality of life
- optimise asthma symptom control with the minimal medication (number of medicines and doses) necessary
- minimise risk of flare-ups and loss of lung function
- minimise adverse effects of treatment.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Health system initiatives that support asthma care

Chronic Disease Management Medicare items
Patients with asthma are eligible for Chronic Disease Management Medicare items. These include:

- Preparation of a GP Management Plan (Item 721)
- Review of a GP Management Plan (Item 732)
- Coordination of Team Care Arrangements (Item 723) for patients who need ongoing care from a multidisciplinary team of at least three health or care providers
- Coordination of a Review of Team Care Arrangements (Item 732)
- Contribution to a multidisciplinary care plan being prepared by another health or care provider (Item 729)
- Contribution to a multidisciplinary care plan being prepared for a resident of an aged care facility (Item 731).

GPs can be assisted by practice nurses, Aboriginal and Torres Strait Islander health practitioners, Aboriginal health workers and other health professionals.

Go to: Australian Government Department of Health’s Chronic Disease Management (CDM) Medicare Items webpage

Asthma cycle of care
The Asthma cycle of care is an Australian Government initiative to support primary care health professionals (GPs, other medical practitioners and trainees) to provide asthma care. It is implemented through the Practice Incentives Program (PIP) Asthma Incentive and applies to the clinical care of people with moderate-to-severe asthma, generally defined as people with (any of):  

- symptoms on most days
- use of preventative medication
- bronchodilator use at least three times per week
- hospital attendance or admission following an acute asthma flare-up.

The Asthma cycle of care involves at least two asthma-related consultations within 12 months for a patient with moderate-to-severe asthma, of which at least one visit is a planned asthma review. Each consultation includes:

- documenting the diagnosis, assessing asthma severity and assessing level of recent asthma symptom control
- reviewing the patient’s use of and access to asthma medicines and inhaler devices
- providing a written asthma action plan (or documented alternative, if the patient is unable to use a written action plan)
- providing asthma self-management education
- reviewing the written or documented asthma action plan.

Go to: Australian Government Department of Health’s Asthma cycle of care
Go to: Medicare’s Practice Incentive Program (PIP)

The Personally Controlled eHealth Record System

The eHealth record is an electronic record for a patient that contains a summary of their health information. Patients can choose to register for an eHealth record. Authorised healthcare professionals can access a patient’s record and upload information to the record if their healthcare organisation has registered for the eHealth record system.

Go to: Australian Government Department of Health’s eHealth Resources for Healthcare Providers

Health system initiatives for Aboriginal and Torres Strait Islander people

Health system initiatives to support the care of Aboriginal and Torres Strait Islander people include:

- Health Assessment Medicare items
- The Indigenous Chronic Disease Package
- The Asthma Spacer Ordering System.

See: Asthma in Aboriginal and Torres Strait Islander peoples

References

Selecting initial treatment in adults

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<table>
<thead>
<tr>
<th>Relievers</th>
<th>Prescribe a reliever and train the patient to use it correctly</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Preventers</th>
<th>Consider regular preventer treatment with ICS or other preventer</th>
</tr>
</thead>
</table>
Prescribing relievers for adults

Recommendations

Advise all patients with asthma to carry a reliever containing a rapid-onset inhaled beta<sub>2</sub> agonist at all times and use it when they experience difficulty breathing.

Rapid-onset beta<sub>2</sub> agonist relievers include:

- short-acting beta<sub>2</sub> agonists (salbutamol, terbutaline)
- low-dose budesonide/formoterol (for people using budesonide/formoterol as both maintenance and reliever).
- Formoterol alone should not be prescribed as a reliever inhaler.
- For all inhalers: Train the patient how to use their inhaler correctly (including spacer, if used). A physical demonstration is essential.

Short-acting beta<sub>2</sub> agonists should be used only on an as-needed basis for asthma symptoms (e.g. wheezing or breathlessness), and at the lowest dose and frequency required.

Warn patients:

- that frequent use of short-acting beta<sub>2</sub> agonists is a sign of poorly controlled asthma, and may indicate or increase risk of asthma flare-ups
- not to take their reliever when they do not have asthma symptoms (except before exercise, if indicated).

Where more than one reliever option is appropriate, explain the options and take into consideration:

- the person's preference
- the person's ability to use the device
- cost
- potential adverse effects.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).
Correct use of inhaler devices

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique.\(^8\), \(^9\)

High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported,\(^10\), \(^11\), \(^12\), \(^13\), \(^14\) even among regular users.\(^15\) Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.\(^16\)

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers.\(^10\), \(^17\), \(^18\), \(^19\) In patients with asthma or COPD, incorrect technique is associated with a 50% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.\(^15\)

Correcting patients’ inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.\(^20\), \(^21\)

Common errors and problems with inhaler technique

Common errors with manually actuated pressurised metered dose inhalers include: \(^16\)

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include: \(^16\)

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

How to improve patients’ inhaler technique

Patients’ inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique.\(^16\) The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration.\(^22\), \(^10\), \(^23\), \(^24\) Patients do not learn to use their inhalers properly just by reading the manufacturer’s leaflet.\(^23\) An effective method is to assess the individual’s technique by comparing with a checklist specific
to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device).\textsuperscript{8, 21}

The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD.

Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.\textsuperscript{20, 30, 11}

\begin{itemize}
\item Go to: National Asthma Council Australia’s Using your inhaler webpage for information, patient resources and videos on inhaler technique
\item Go to: National Asthma Council Australia’s information paper for health professionals on Inhaler technique for people with asthma or COPD
\item Go to: NPS MedicineWise information on Inhaler devices for respiratory medicines
\end{itemize}

**Short-acting beta-2 agonist relievers for adults and adolescents**

Short-acting beta\textsubscript{2} agonists are used to:

- relieve asthma symptoms
- prevent exercise-induced bronchoconstriction
- relieve exercise-induced bronchoconstriction.

The duration of therapeutic effect is approximately 4 hours.

When using a pressurised metered-dose inhaler for salbutamol, the use of a large-volume spacer increases the proportion of drug delivered to the lung.\textsuperscript{25} For adults, it is not essential to use a spacer with salbutamol for day-to-day symptoms if adequate relief is obtained with a pressurised metered dose inhaler alone.

Patients with well-controlled asthma do not need to use their reliever on more than 2 days per week, not counting doses taken before exercise to prevent exercise-induced bronchoconstriction.

Increased use of short-acting beta\textsubscript{2} agonists for relief of asthma symptoms, especially daily use, indicates worsening asthma control.\textsuperscript{2, 26}

Note: Routine preventive doses of short-acting beta\textsubscript{2} agonist taken before exercise are not counted when assessing recent asthma symptom control. However, persistent exercise-induced bronchoconstriction generally indicates inadequate asthma control.

### Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>• Daytime symptoms ≤2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
</tr>
<tr>
<td>• Need for reliever ≤2 days per week\textsuperscript{†}</td>
<td>• Need for reliever &gt;2 days per week\textsuperscript{†}</td>
<td>• Need for reliever &gt;2 days per week\textsuperscript{†}</td>
</tr>
<tr>
<td>• No limitation of activities</td>
<td>• Any limitation of activities</td>
<td>• Any limitation of activities</td>
</tr>
<tr>
<td>• No symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

\textsuperscript{†} Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Adapted from:

Over-use of short-acting beta-2 agonists

High use of short-acting beta\(_2\) agonists may, itself, increase the risk of asthma flare-ups:\(^4,5\)

- Data from population and case-control studies has led to concerns that the frequent use of short-acting beta\(_2\) agonists, including salbutamol, is associated with increased risk of asthma deaths.\(^7\) The risk of asthma deaths was greatest for fenoterol, which has since been withdrawn from use.\(^4\) For salbutamol, the risk is greatest for doses above 1000 mcg/day (10 puffs).
- Regular use of salbutamol 16 puffs/day (rather than as-needed use during symptoms) was associated with increased risk of asthma flare-ups requiring oral corticosteroids in a placebo-controlled clinical trial.\(^6\) Subsequent statistical modelling showed that the risk was associated with increased fluctuation in lung function.\(^1\)
- Regular use of short-acting beta\(_2\) agonists leads to receptor tolerance (down-regulation) to their bronchoprotective and bronchodilator effects. Tolerance becomes more apparent with worsening bronchoconstriction. In severe asthma, this could result in a poor response to emergency treatment.\(^3\)

When high doses of short-acting beta\(_2\) agonist are needed (e.g. dose repeated at intervals of less than 4 hours in a person with acute severe asthma), the patient should be under medical supervision and should usually also be receiving systemic corticosteroids.

▶ See: Managing acute asthma in clinical settings

Combination budesonide/formoterol maintenance-and-reliever regimen in adults and adolescents: overview of efficacy

Low-dose budesonide/formoterol combination can be used as reliever for asthma symptoms (instead of using a short-acting beta\(_2\) agonist reliever), in addition to its use as regular long-term preventer treatment.\(^27, 28, 29, 30, 31, 32\) The following formulations can be used in maintenance-and-reliever regimens:

- dry-powder inhaler (Symbicort Turbuhaler) 100/6 mcg or 200/6 mcg
- pressurised metered-dose inhaler (Symbicort Rapihaler) 50/3 mcg or 100/3 mcg.

Neither the 400/12 mcg dry-powder inhaler nor the 200/6 mcg pressurised metered-dose inhaler should be used in this way.

Overall, clinical trials show that budesonide/formoterol combination as maintenance and reliever reduces the risk of flare-ups that require oral corticosteroids, compared with other current preventer regimens and compared with a fixed higher dose of inhaled corticosteroids.\(^33\)

Pooled data from five randomised controlled trials assessing budesonide/formoterol maintenance-and-reliever regimens showed that similar or better levels of asthma control were achieved with budesonide/formoterol maintenance-and-reliever compared with the conventional maintenance regimen comparators.\(^29\)

- higher-dose budesonide
- same dose budesonide/formoterol
- higher-dose inhaled corticosteroid/long-acting beta\(_2\) agonist (budesonide/formoterol or fluticasone propionate/salmeterol).

In randomised clinical trials in patients with a history of asthma flare-up within the previous 12 months (and therefore at greater risk of flare-up in the next 12 months), the use of formoterol/budesonide as maintenance-and-reliever regimen reduced the risk of asthma flare-ups that required treatment with oral corticosteroids, compared with the use of any of the following (plus a short-acting beta\(_2\) agonist reliever as needed):\(^29, 34, 35\)

- the same combination as maintenance treatment only
- higher-dose combination as maintenance treatment only
- higher-dose inhaled corticosteroids.

Meta-analysis of six randomised controlled trials found that maintenance-and-reliever treatment with budesonide/formoterol reduced the risk of severe asthma flare-ups (use of oral corticosteroids for 3 days or more, hospitalisation or emergency department visits), compared with higher-dose inhaled corticosteroid alone, or in combination with a long-acting beta\(_2\) agonist.\(^36\)
In open-label studies in which patients were not selected for a previous history of flare-ups, there was no overall difference in time to first flare-up between budesonide/formoterol as maintenance-and-reliever regimen and conventional maintenance regimens (including inhaled corticosteroid or inhaled corticosteroid/long-acting beta\textsubscript{2} agonist combinations, leukotriene receptor antagonists, xanthines or any other asthma medicines) with rapid-onset beta\textsubscript{2} agonist reliever (selected according to clinician’s choice).\textsuperscript{37} However, the inhaled corticosteroid dose was higher with conventional maintenance regimens.

Note: The fluticasone propionate/formoterol combination is approved by the Therapeutic Goods Administration only for regular maintenance therapy.

### Ipratropium for adults

Regular ipratropium bromide in addition to as-needed short-acting beta\textsubscript{2} agonist does not appear to provide clinically significant benefit over as-needed short-acting beta\textsubscript{2} agonists alone.\textsuperscript{38}

Note: Ipratropium bromide may be used in the management of severe acute asthma.

► See: Managing acute asthma in clinical settings

### Technical notes: pressurised metered-dose inhalers with spacers

Manufacturers of most delivery devices recommend shaking the device before actuating. The physical characteristics of each formulation, including the effects of shaking, differ widely,\textsuperscript{39} but for simplicity it is best always to recommend shaking.

Pressurised metered-dose inhalers (except for those that are breath-actuated) can be used with a spacer. When a spacer is used with a pressurised metered-dose inhaler, delivery of the medicine to the patient’s airways is maximised when the patient takes a slow, deep breath from the spacer after each actuation.\textsuperscript{40,41} Multiple actuations of a pressurised metered-dose inhaler into a spacer can reduce the amount of respirable medicine available because aerosol particles can agglomerate into larger particles or become attached to the spacer walls.\textsuperscript{40}

Therefore, the ideal way to deliver inhaled medicines via pressurised metered-dose inhaler and spacer is to shake the device, ask the person to breathe out all the way into the spacer, fire a single actuation into the spacer, and have the person immediately take a slow deep breath from the spacer, then hold their breath for 5 seconds. This process should be repeated until the total intended number of actuations is taken. Patients should be trained to follow these instructions when using their inhalers. Inhaling slowly with a single breath maximises delivery of the medicine to the lungs and minimises deposition in the upper airways when using a manually actuated pressurised metered-dose inhaler with or without a spacer, or when using a breath-actuated pressurised metered-dose inhaler.\textsuperscript{42} However, slow breathing may not be possible for patients with acute asthma.

Therefore, tidal breathing through the spacer (e.g. four breaths in and out without removing the spacer) is used in acute asthma and for very young children. First aid instructions should include how to use inhaler and spacer.

In practice, optimal delivery of inhaled medicines involves a balance between maximising the proportion of respirable medicine and maximising efficiency of inhalation by the patient within real-world constraints. The optimal delivery of salbutamol in real-world circumstances is not well defined. For day-to-day use of salbutamol, most adults gain sufficient relief from symptoms when using a pressurised metered-dose inhaler on its own. A spacer may only be needed during a flare-up. By contrast, the use of a spacer is always recommended for inhaled corticosteroids delivered by manually actuated pressurised metered-dose inhalers, to reduce the risk of local adverse effects and increase delivery to the airways.

Many available in vitro studies of aerosol particle deposition in the airways were performed using older CFC-propelled formulations, which are now obsolete. Similar studies have not been performed for current non-CFC pressurised metered-dose inhalers.

► Go to: National Asthma Council Australia’s first aid charts

References


Prescribing regular preventer treatment for adults

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<table>
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<th>General considerations</th>
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<td>General considerations when prescribing regular preventer treatment for adults and adolescents</td>
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<tr>
<th>ICS-based preventers</th>
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<tbody>
<tr>
<td>Considerations for regular treatment with ICS-based preventers for adults and adolescents</td>
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</table>

<table>
<thead>
<tr>
<th>Other preventers</th>
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</thead>
<tbody>
<tr>
<td>Considerations for regular treatment with other preventers for adults and adolescents</td>
</tr>
</tbody>
</table>
General considerations when prescribing regular preventer treatment for adults

Recommendations

Consider regular preventer treatment according to pattern of symptoms and the person’s ability to use the device. Explain to the patient that preventers should be taken every day and continued long term to reduce the risk of flare-ups.

**Table. Initial treatment choices (adults and adolescents not already using a preventer)**

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Suggested starting regimen †</th>
<th>Alternative options and notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms less than twice per month and no flare-up that required oral corticosteroids within previous 12 months</td>
<td>SABA as needed</td>
<td></td>
</tr>
</tbody>
</table>
| Symptoms twice per month or more                                                  | Regular ICS starting at a low dose (plus SABA as needed) | Montelukast‡  
Cromones§ |
| Waking due to asthma symptoms at least once during the past month                  | Regular ICS starting at a low dose (plus SABA as needed) | If patient also has frequent daytime symptoms consider either of:  
• medium- to high-dose ICS (plus SABA as needed)  
• (private prescription) combination low-dose ICS/LABA# |
| Oral corticosteroids required for an asthma flare-up within the last 12 months (even if symptoms infrequent, e.g. less than twice per month on average) | Regular ICS starting at a low dose (plus SABA as needed) |                                                                   |
| History of artificial ventilation or admission to an intensive care unit due to acute asthma (even if symptoms infrequent, e.g. less than twice per month on average) | Regular ICS starting at a low dose (plus SABA as needed) | Monitor frequently                                                 |
Clinical situation | Suggested starting regimen † | Alternative options and notes
--- | --- | ---
*Patient not currently taking a preventer whose symptoms are severely uncontrolled or very troublesome* | Regular ICS (plus SABA as needed)
For very uncontrolled asthma at presentation (e.g. frequent night waking, low lung function), consider (either of):
- high-dose ICS (then down-titrated when symptoms improve)
- a short course of oral corticosteroids in addition to ICS | Consider (private prescription) combination ICS/LABA *

† When prescribing inhaled asthma medicines, take into account the person’s preferences, ability to use the device, and cost issues.
§ Requires multiple daily doses and daily maintenance of inhaler.
‡ PBS status as at October 2016: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for Department of Veteran’s Affairs gold card holders or white card holders with approval for asthma treatments.
# PBS status as at October 2016: ICS/LABA combination therapy as first-line preventer treatment is not subsidised by the PBS, except for patients with frequent symptoms while taking oral corticosteroids.

Asset ID: 32

### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate †</td>
<td>100–200</td>
</tr>
<tr>
<td>Budesonide</td>
<td>200–400</td>
</tr>
<tr>
<td>Ciclesonide</td>
<td>80–160</td>
</tr>
<tr>
<td>Fluticasone furoate*</td>
<td>—</td>
</tr>
<tr>
<td>Fluticasone propionate</td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).
*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**
Where more than one preventer option is appropriate, explain the options and take into consideration:

- the person’s preference
- the person’s ability to use the device
- cost
- potential adverse effects.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

When prescribing any preventer medicine, consider each treatment adjustment as a treatment trial.

**Table. Steps for conducting a treatment trial**

1. Document baseline lung function.
2. Document baseline asthma control using a validated standardised tool such as the Asthma Score.
3. Discuss treatment goals and potential adverse effects with the person.
4. Run treatment trial for agreed period (e.g. 4–8 weeks, depending on the treatment and clinical circumstances, including urgency).
5. At an agreed interval, measure asthma control and lung function again and document any adverse effects.
6. If asthma control has not improved despite correct inhaler technique and good adherence, resume previous treatment and consider referral for specialist consultation.

See: *Asthma Score (Asthma Control Test)*

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

After starting a new treatment regimen or making any adjustments to the treatment regimen, set a date to review response (e.g. 6–8 weeks) and follow up the patient, to ensure ineffective or unnecessary medication is not continued, or that the patient has not inappropriately stopped taking the treatment.

How this recommendation was developed

Consensus
Review asthma control periodically to step up or down as necessary to maintain good asthma control at the lowest effective dose.

**Figure. Stepped approach to adjusting asthma medication in adults**

Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

**Table. Guide to selecting and adjusting asthma medication for adults and older adolescents**

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newly diagnosed asthma</td>
<td>Consider low-dose ICS (plus SABA as needed)</td>
</tr>
<tr>
<td></td>
<td>If symptoms severe at initial presentation, consider one of:</td>
</tr>
<tr>
<td></td>
<td>• ICS plus a short course of oral corticosteroids</td>
</tr>
<tr>
<td></td>
<td>• a short initial period of high-dose ICS then step down</td>
</tr>
<tr>
<td></td>
<td>• (private prescription) combination ICS/LABA†</td>
</tr>
<tr>
<td></td>
<td>See: Table. Initial treatment choices (adults and adolescents not already using a preventer)</td>
</tr>
<tr>
<td>Good recent asthma symptom control</td>
<td>If maintained 2–3 months, no flare-up in previous 12 months and low risk for flare-ups, step down where possible (unless already on low-dose ICS)</td>
</tr>
<tr>
<td>Partial recent asthma symptom control</td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td></td>
<td>If no improvement, consider increasing treatment by one step and reviewing (if still no improvement, return to previous step, review diagnosis and consider referral)</td>
</tr>
<tr>
<td>Poor recent asthma symptom control</td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td></td>
<td>Confirm that symptoms are likely to be due to asthma</td>
</tr>
<tr>
<td></td>
<td>Consider increasing treatment until good asthma control is achieved, then step down again when possible</td>
</tr>
<tr>
<td>Difficult-to-treat asthma ‡</td>
<td>Consider referral for assessment or add-on options</td>
</tr>
<tr>
<td>Patient with risk factors §</td>
<td>Tailor treatment to reduce individual risk factors</td>
</tr>
</tbody>
</table>

† PBS status as at October 2016: ICS/LABA combination therapy as first-line preventer treatment is not subsidised by the PBS, except for patients with frequent symptoms while taking oral corticosteroids.

‡ Poor recent asthma symptom control despite ICS/LABA combination at high–medium dose with good adherence and inhaler technique.

§ Risk factors for asthma events or adverse treatment effects, irrespective of level of recent asthma symptom control.

Asset ID: 5
### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td><strong>Medium</strong></td>
</tr>
<tr>
<td><em>Beclometasone dipropionate †</em></td>
<td>100–200</td>
</tr>
<tr>
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<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
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† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

### Sources


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<tbody>
<tr>
<td></td>
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<td><strong>Budesonide</strong></td>
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Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources


Asset ID: 22

How this recommendation was developed
Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

**Adherence to preventer treatment: adults and adolescents**

Most patients do not take their preventer medication as often as prescribed, particularly when symptoms improve, or are mild or infrequent. Whenever asthma control is poor despite apparently adequate treatment, poor adherence, as well as poor inhaler technique, are probable reasons to consider.

Poor adherence may be intentional and/or unintentional. Intentional poor adherence may be due to the person's belief that the medicine is not necessary, or to perceived or actual adverse effects. Unintentional poor adherence may be due to forgetting or cost barriers.

Common barriers to the correct use of preventers include:

- being unable to afford the cost of medicines or consultations to adjust the regimen
- concerns about side effects
- interference of the regimen with the person's lifestyle
- forgetting to take medicines
- lack of understanding of the reason for taking the medicines
- inability to use the inhaler device correctly due to physical or cognitive factors
- health beliefs that are in conflict with the belief that the prescribed medicines are effective, necessary or safe (e.g. a belief that the prescribed preventer dose is ‘too strong’ or only for flare-ups, a belief that asthma can be overcome by psychological effort, a belief that complementary and alternative therapies are more effective or appropriate than prescribed medicines, mistrust of the health professional).
Adherence to preventers is significantly improved when patients are given the opportunity to negotiate the treatment regimen based on their goals and preferences.\(^1\)

Assessment of adherence requires an open, non-judgemental approach.

Accredited pharmacists who undertake Home Medicines Reviews can assess adherence while conducting a review.

**Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment**

1. *Many people don’t take their medication as prescribed. In the last four weeks:*  
   - how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).  
   - how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)  
   - each time, how many puffs would you take? One? Two? (etc).

2. *Do you find it easier to remember your medication in the morning, or the evening?*


**Inhaled corticosteroids for adults: overview**

**Inhaled corticosteroid preventer medicines available in Australia**

The following inhaled corticosteroids are registered by the TGA:

- beclometasone dipropionate (low to high doses available)  
- budesonide (low to high doses available, including in combination with a long-acting beta\(_2\) agonist)  
- ciclesonide (low to high doses available)  
- fluticasone furoate (medium to high doses available, including in combination with a long-acting beta\(_2\) agonist)  
- fluticasone propionate (low to high doses available, including in combination with a long-acting beta\(_2\) agonist)

**Table. Definitions of ICS dose levels in adults**

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† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

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**Sources**


**Clinical benefits**
Inhaled corticosteroids are the most effective preventer medicines for adults. ², ³, ⁴

Inhaled corticosteroids are effective in reducing asthma symptoms, improving quality of life, improving lung function, decreasing airway hyperresponsiveness, controlling airway inflammation, reducing the frequency and severity of asthma flare-ups, and reducing the risk of death due to asthma. ², ³, ⁵, ⁶, ⁷, ⁸, ⁹, ¹⁰, ¹¹, ¹², ¹³

**Most adults with asthma benefit from regular inhaled corticosteroid treatment**
The current recommendation to initiate inhaled corticosteroid treatment for adults with asthma symptoms twice or more during the past month, or who experience waking due to asthma symptoms once or more during the past month, is based on consideration of clinical trial evidence that even patients with infrequent symptoms benefit from regular use of inhaled corticosteroids:

- In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial). ⁷, ⁹, ¹⁰
- In small clinical trials in adults with symptoms or reliever use twice per week or less, the use of regular inhaled corticosteroids (fluticasone propionate 250 mcg/day) improved lung function, reduced airway hyperresponsiveness and inflammation, ¹⁴, ¹⁵ and reduced the risk of mild flare-ups. ¹⁴, ¹⁵

The current recommendation replaces the previous higher threshold for inhaled corticosteroid treatment (asthma symptoms three times a week or more, or waking at least one night per week with asthma symptoms), which was based on consensus.

**Clinical benefits are achieved with low doses**
Low doses of inhaled corticosteroids are sufficient to achieve benefits in most patients:

- Regular use of low-dose inhaled corticosteroids reduced the risk of hospitalisation for acute asthma and death due to asthma (evidence from a large population cohort study). ¹¹ In that study, breaks in the use of inhaled corticosteroid of up to 3 months were associated with increased risk of death. ¹²
- In adults and adolescents with mild asthma who were not taking inhaled corticosteroids, starting low-dose inhaled corticosteroid (budesonide 200 mcg/day) reduced the risk of asthma flare-ups severe enough to require oral corticosteroids, and improved symptom control (evidence from a large clinical trial). ⁸
- In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial). ², ⁹, ¹⁰

**Note:** PBS status as at October 2016: Fluticasone furoate is not subsidised by the PBS, except in combination with vilanterol.
Inhaled corticosteroid/long-acting beta-2 agonist combinations for adults: overview

- To avoid the possibility of patients taking a long-acting beta_2_ agonist without an inhaled corticosteroid, long-acting beta_2_ agonists should (whenever possible) be prescribed as inhaled corticosteroid/long-acting beta_2_ agonist combination in a single inhaler, rather than in separate inhalers. If no combination product is available for the desired medications, carefully explain to the patient that it is very important that they continue taking the inhaled corticosteroid.

Meta-analysis of evidence from randomised controlled clinical trials shows that, for adult patients already taking an inhaled corticosteroid, concomitant treatment with an inhaled corticosteroid and a long-acting beta_2_ agonist:

- reduces the risk of flare-ups, compared with increasing the dose of corticosteroids
- reduces the risk of flare-ups, compared with inhaled corticosteroids alone.

The studies included in this meta-analysis evaluated mainly budesonide/formoterol and fluticasone propionate/salmeterol.

Each of the following inhaled corticosteroid/long-acting beta_2_ agonist combinations is available as a single inhaler:

- budesonide/formoterol
- fluticasone furoate/vilanterol
- fluticasone propionate/salmeterol
- fluticasone propionate/formoterol.

There are two types of dosing regimens for inhaled corticosteroid/long-acting beta_2_ agonist combination therapy:

- maintenance-only regimens (applicable to all available combinations)
- maintenance-and-reliever regimen (applicable only to the budesonide/formoterol combination).

### Maintenance-only regimens

The fluticasone propionate/salmeterol combination and budesonide/formoterol combination appear to be equally effective when used for regular maintenance treatment, based on meta-analysis of evidence from clinical trials. Most of the evidence for inhaled corticosteroid/long-acting beta_2_ agonist combination therapy is from studies using these combinations.

Less evidence from double-blind randomised controlled clinical trials is available for the newer combinations: fluticasone furoate/vilanterol and fluticasone propionate/formoterol:

- The fluticasone furoate/vilanterol combination is equivalent to a medium-to-high dose of inhaled corticosteroids. In adults and adolescents already taking inhaled corticosteroids, once-daily fluticasone furoate/vilanterol 100/25 mcg reduced the risk of severe flare-ups (requiring oral corticosteroids or hospitalisation) and improved lung function, compared with fluticasone furoate alone. Efficacy data for the comparison of fluticasone furoate/vilanterol with other inhaled corticosteroid/long-acting beta_2_ agonist combinations is not available.
- In adults and adolescents with persistent asthma and FEV_1_ 50–80% at baseline, fluticasone propionate/formoterol achieved improvement in FEV_1_ comparable to that achieved with budesonide/formoterol in a 12-week randomised double-blind clinical trial. Other 12-week open-label studies have reported that fluticasone propionate/formoterol was as effective as budesonide/formoterol in improving lung function in adults and adolescents with poorly controlled asthma, and was as effective as fluticasone propionate/salmeterol in adults.

Long-acting beta_2_ agonists should not be used without inhaled corticosteroids in the management of asthma.

Long-acting beta_2_ agonists are well tolerated when given in combination with inhaled corticosteroids.

### Maintenance-and-reliever regimen

The low-dose budesonide/formoterol combination can be used as both maintenance and reliever. Under this regimen, the combination is used for relief of asthma symptoms (instead of using a short-acting beta_2_ agonist reliever), in addition to its use as regular maintenance treatment.

**Combination budesonide/formoterol maintenance-and-reliever regimen in adults and adolescents: overview of efficacy**
Low-dose budesonide/formoterol combination can be used as reliever for asthma symptoms (instead of using a short-acting beta$_2$ agonist reliever), in addition to its use as regular long-term preventer treatment.\textsuperscript{27, 28, 29, 30, 31, 32} The following formulations can be used in maintenance-and-reliever regimens:

- dry-powder inhaler (\textit{Symbicort Turbuhaler}) 100/6 mcg or 200/6 mcg
- pressurised metered-dose inhaler (\textit{Symbicort Rapihaler}) 50/3 mcg or 100/3 mcg.

Neither the 400/12 mcg dry-powder inhaler nor the 200/6 mcg pressurised metered-dose inhaler should be used in this way.

Overall, clinical trials show that budesonide/formoterol combination as maintenance and reliever reduces the risk of flare-ups that require oral corticosteroids, compared with other current preventer regimens and compared with a fixed higher dose of inhaled corticosteroids.\textsuperscript{33}

Pooled data from five randomised controlled trials assessing budesonide/formoterol maintenance-and-reliever regimens showed that similar or better levels of asthma control were achieved with budesonide/formoterol maintenance-and-reliever compared with the conventional maintenance regimen comparators: \textsuperscript{29}

- higher-dose budesonide
- same dose budesonide/formoterol
- higher-dose inhaled corticosteroid/long-acting beta$_2$ agonist (budesonide/formoterol or fluticasone propionate/salmeterol).

In randomised clinical trials in patients with a history of asthma flare-up within the previous 12 months (and therefore at greater risk of flare-up in the next 12 months), the use of formoterol/budesonide as maintenance-and-reliever regimen reduced the risk of asthma flare-ups that required treatment with oral corticosteroids, compared with the use of any of the following (plus a short-acting beta$_2$ agonist reliever as needed): \textsuperscript{29, 34, 35}

- the same combination as maintenance treatment only
- higher-dose combination as maintenance treatment only
- higher-dose inhaled corticosteroids.

Meta-analysis of six randomised controlled trials found that maintenance-and-reliever treatment with budesonide/formoterol reduced the risk of severe asthma flare-ups (use of oral corticosteroids for 3 days or more, hospitalisation or emergency department visits), compared with higher-dose inhaled corticosteroids alone, or in combination with a long-acting beta$_2$ agonist.\textsuperscript{36}

In open-label studies in which patients were not selected for a previous history of flare-ups, there was no overall difference in time to first flare-up between budesonide/formoterol as maintenance-and-reliever regimen and conventional maintenance regimens (including inhaled corticosteroid or inhaled corticosteroid/long-acting beta$_2$ agonist combinations, leukotriene receptor antagonists, xanthines or any other asthma medicines) with rapid-onset beta$_2$ agonist reliever (selected according to clinician’s choice).\textsuperscript{37} However, the inhaled corticosteroid dose was higher with conventional maintenance regimens.

\textbf{Note:} The fluticasone propionate/formoterol combination is approved by the Therapeutic Goods Administration only for regular maintenance therapy.

\textbf{Correct use of inhaler devices}

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique.\textsuperscript{38, 39}

High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported,\textsuperscript{40, 41, 42, 43, 44} even among regular users.\textsuperscript{45} Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.\textsuperscript{46}

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers.\textsuperscript{40, 47, 48, 49} In patients with asthma or COPD, incorrect technique is associated with a 50% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.\textsuperscript{35}

Correcting patients’ inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.\textsuperscript{50, 51}

\textbf{Common errors and problems with inhaler technique}
Common errors with manually actuated pressurised metered dose inhalers include:\(^{46}\)

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:\(^{46}\)

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

**How to improve patients’ inhaler technique**

Patients’ inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique.\(^ {46}\) The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration.\(^ {52, 40, 53, 54}\) Patients do not learn to use their inhalers properly just by reading the manufacturer’s leaflet.\(^ {38, 51}\) An effective method is to assess the individual’s technique by comparing with a checklist specific to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device).\(^ {38, 51}\)

The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD.

Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.\(^ {30, 40, 41}\)

Go to: National Asthma Council Australia’s [Using your inhaler](http://www.nationalasthma.com.au/) webpage for information, patient resources and videos on inhaler technique

Go to: National Asthma Council Australia’s information paper for health professionals on [Inhaler technique for people with asthma or COPD](http://www.nationalasthma.com.au/health-professionals/inhaler-technique/

Go to: NPS MedicineWise information on [Inhaler devices for respiratory medicines](http://www.nps.org.au/)

**References**


Prescribing inhaled corticosteroid-based preventers for adults

Recommendations

Prescribe a regular inhaled corticosteroid for all adults and adolescents who report any of the following:

- asthma symptoms twice or more during the past month
- waking due to asthma symptoms once or more during the past month
- an asthma flare-up in the previous 12 months.

For all inhalers: Train the patient how to use their inhaler correctly. A physical demonstration is essential.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Sin et al. 2004
- Global Initiative for Asthma, 2012
- Adams et al. 1999
- Adams et al. 2005
- Busse et al. 2008
- Adams et al. 2008
- Reddel et al. 2008
- Boulet et al. 2009
- O’Byrne et al. 2001
- O’Byrne et al. 2009
- Pauwels et al. 2003
- Suissa et al. 2002
- Suissa et al. 2000

When starting regular inhaled corticosteroids, begin at a low dose and review response 6–8 weeks later. (Also review during this interval, if appropriate.)

Follow the steps for conducting a treatment trial.

Table. Steps for conducting a treatment trial

1. Document baseline lung function.
2. Document baseline asthma control using a validated standardised tool such as the Asthma Score.
3. Discuss treatment goals and potential adverse effects with the person.
4. Run treatment trial for agreed period (e.g. 4–8 weeks, depending on the treatment and clinical circumstances, including urgency).
5. At an agreed interval, measure asthma control and lung function again and document any adverse effects.
6. If asthma control has not improved despite correct inhaler technique and good adherence, resume previous treatment and consider referral for specialist consultation.
Table. Definitions of ICS dose levels in adults

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† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources
Advise all patients using inhaled corticosteroids to rinse their mouth with water and spit after each dose, if possible.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- National Asthma Council Australia, 2008
- Rachelefsky et al. 2007
- Yokoyama et al. 2007

Advise patients not to increase the dose of any preventer treatment without discussing first (except as instructed in their written asthma action plan).

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

Long-acting beta\_2 agonists should only be used when an inhaled corticosteroid is taken concurrently – never as monotherapy for asthma.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Ducharme et al. 2011
- Walters et al. 2007
- Chowdhury and Dal Pan G, 2010
- Chowdhury et al. 2011

Where possible, avoid prescribing long-acting beta\_2 agonists in single-agent inhalers separate from inhaled corticosteroids, to prevent patients using a long-acting beta\_2 agonist alone.

Note: Occasionally patients may need to use separate devices, e.g. if the person needs an inhaled corticosteroid that is not available in combination with long-acting beta\_2 agonist (ciclesonide or beclometasone dipropionate). In this case, clearly instruct patients not to take long-acting beta\_2 agonist alone and explain the risks.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

For adults prescribed low-dose ICS for an indefinite period, explain that:

- the main purpose of long-term low-dose ICS-based preventer is to reduce the risk of flare-ups, even if day-to-day symptoms are infrequent
- even if the person has not experienced asthma symptoms for some time, they should not stop taking their preventer without discussing first.
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### Sources


Asset ID: 22

#### How this recommendation was developed

**Consensus**

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### More information

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Common barriers to the correct use of preventers include:

- being unable to afford the cost of medicines or consultations to adjust the regimen
- concerns about side effects
- interference of the regimen with the person’s lifestyle
- forgetting to take medicines
- lack of understanding of the reason for taking the medicines
• inability to use the inhaler device correctly due to physical or cognitive factors
• health beliefs that are in conflict with the belief that the prescribed medicines are effective, necessary or safe (e.g. a belief that the prescribed preventer dose is 'too strong' or only for flare-ups, a belief that asthma can be overcome by psychological effort, a belief that complementary and alternative therapies are more effective or appropriate than prescribed medicines, mistrust of the health professional).

Adherence to preventers is significantly improved when patients are given the opportunity to negotiate the treatment regimen based on their goals and preferences.\textsuperscript{21}

Assessment of adherence requires an open, non-judgemental approach.

Accredited pharmacists who undertake Home Medicines Reviews can assess adherence while conducting a review.

**Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment**

1. *Many people don't take their medication as prescribed. In the last four weeks:*  
   - how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).
   - how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)
   - each time, how many puffs would you take? One? Two? (etc).

2. *Do you find it easier to remember your medication in the morning, or the evening?*


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**Clinical benefits**

Inhaled corticosteroids are the most effective preventer medicines for adults.\(^1\),\(^2\),\(^22\)

Inhaled corticosteroids are effective in reducing asthma symptoms, improving quality of life, improving lung function, decreasing airway hyperresponsiveness, controlling airway inflammation, reducing the frequency and severity of asthma flare-ups, and reducing the risk of death due to asthma.\(^1\),\(^2\),\(^3\),\(^4\),\(^5\),\(^9\),\(^10\),\(^11\),\(^12\),\(^13\),\(^23\)

**Most adults with asthma benefit from regular inhaled corticosteroid treatment**

The current recommendation to initiate inhaled corticosteroid treatment for adults with asthma symptoms twice or more during the past month, or who experience waking due to asthma symptoms once or more during the past month, is based on consideration of clinical trial evidence that even patients with infrequent symptoms benefit from regular use of inhaled corticosteroids:

- In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial).\(^5\),\(^10\),\(^11\)
- In small clinical trials in adults with symptoms or reliever use twice per week or less, the use of regular inhaled corticosteroids (fluticasone propionate 250 mcg/day) improved lung function,\(^7\) reduced airway hyperresponsiveness and inflammation,\(^7\),\(^8\) and reduced the risk of mild flare-ups.\(^7\),\(^8\)

The current recommendation replaces the previous higher threshold for inhaled corticosteroid treatment (asthma symptoms three times a week or more, or waking at least one night per week with asthma symptoms), which was based on consensus.

**Clinical benefits are achieved with low doses**

Low doses of inhaled corticosteroids are sufficient to achieve benefits in most patients:

- Regular use of low-dose inhaled corticosteroids reduced the risk of hospitalisation for acute asthma and death due to asthma (evidence from a large population cohort study).\(^12\) In that study, breaks in the use of inhaled corticosteroid of up to 3 months were associated with increased risk of death.\(^13\)
In adults and adolescents with mild asthma who were not taking inhaled corticosteroids, starting low-dose inhaled corticosteroid (budesonide 200 mcg/day) reduced the risk of asthma flare-ups severe enough to require oral corticosteroids, and improved symptom control (evidence from a large clinical trial).7

In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial).5, 10, 11

Note: PBS status as at October 2016: Fluticasone furoate is not subsidised by the PBS, except in combination with vilanterol.

Inhaled corticosteroids for adults: doses

Most of the benefit of inhaled corticosteroid is achieved with doses at the upper limit of the low-dose range (i.e. equivalent to 400 mcg budesonide per day,24, 25 200 mcg HFA beclometasone, 160 mcg ciclesonide or 200 mcg fluticasone propionate).

On average, higher doses provide relatively little extra benefit, but are associated with a higher risk of adverse effects.2 However, a small proportion of individuals may need a higher dose to achieve asthma control.2, 24, 25

The recommendation to start inhaled corticosteroid at low dose is based on the following evidence.

A meta-analysis of results from randomised controlled trials comparing different doses of inhaled corticosteroids showed:

- An effective starting dose is 200–400 mcg/day for fluticasone propionate, 400–800 mcg/day for budesonide, or 200 –400 mcg/day beclometasone.26
- A starting dose higher than 800 mcg/day budesonide, 400 mcg/day fluticasone propionate, or 400 mcg beclometasone does not provide enough clinical benefit over lower doses to warrant routinely starting with high doses.26
- Starting with a moderate dose of inhaled corticosteroid is as effective as commencing with a high dose and down-titrating.26 Although it may be reasonable to use a high starting dose then reduce the dose, down-titration cannot be ensured in practice (e.g. if the person does not return for planned review).
- High doses of inhaled corticosteroids may be more effective than a moderate or low dose for controlling airway hyperresponsiveness,26 but this may not equate to a clinical benefit.

Meta-analyses6, 27 of inhaled corticosteroid safety have shown that the risk of local adverse effects (e.g. hoarseness, oral candidiasis) and the risk of systemic adverse effects (e.g. changes in hypothalamic-pituitary-adrenal function) increase significantly at higher doses. The risk of adrenal suppression should be considered whenever high doses are used (particularly of more potent inhaled corticosteroids), or when the patient uses concomitant medicines that inhibit cytochrome P450 (e.g. ritonavir, erythromycin or ketoconazole).

Notes

Dose equivalent for beclometasone applies to Qvar CFC-free formulation. Other brands may differ.

Do not use beclometasone dose recommendations from outdated or overseas guidelines based on older formulations containing CFC propellant – doses are different.

<table>
<thead>
<tr>
<th>Inhaled corticosterone</th>
<th>Daily dose (mcg)</th>
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<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate †</td>
<td>100–200</td>
</tr>
<tr>
<td>Budesonide</td>
<td>200–400</td>
</tr>
<tr>
<td>Ciclesonide</td>
<td>80–160</td>
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<tr>
<td>Fluticasone furoate*</td>
<td>–</td>
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<tr>
<td>Fluticasone propionate</td>
<td>100–200</td>
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<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
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<tbody>
<tr>
<td>Low</td>
<td>Medium</td>
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</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

**Note:** The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**
Asset ID: 22

**Inhaled corticosteroids for adults: adverse effects**

**Local adverse effects**
Hoarseness (dysphonia) and candidiasis are the most common local adverse effects of inhaled corticosteroids with both pressurised metered-dose inhalers and dry-powder inhalers:

- The rate of dysphonia among patients taking inhaled corticosteroids has been estimated at 5–20%. However, higher rates of up to 58% have been reported in some studies. The risk varies with the device used.
- The rate of oropharyngeal candidiasis among adults using inhaled corticosteroids has been estimated at 5–7%, with positive mouth culture for *Candida albicans* in approximately 25% of patients. However, higher rates of up to 70% have been reported in some studies. The risk depends on the formulation, dose and dose frequency.

When taking inhaled corticosteroids via pressurised metered-dose inhalers, the use of a spacer reduces the risk of dysphonia and candidiasis. Spacers improve delivery of the medicine to the airways.

Rinsing the mouth with water after inhaling reduces the risk of oropharyngeal candidiasis. Quick mouth rinsing immediately after inhaling effectively removes a high proportion of remaining medicine.

The incidence of dysphonia and candidiasis is significantly lower with ciclesonide than with equivalent doses of fluticasone propionate. This may be an important consideration for patients who experience dysphonia, particularly for those for whom voice quality is important (e.g. singers, actors, teachers). With ciclesonide, the rate of adverse effects may not differ when taken with or without a spacer.

**Systemic adverse effects**
Cross-sectional population studies have reported lower bone mineral density with long-term use of high doses of inhaled corticosteroid, but the effect on fracture risk in patients with asthma is unclear.

A meta-analysis of randomised controlled trials in adults older than 40 years with COPD (in which osteoporosis is more common) or asthma found no association between the use of inhaled corticosteroid and fracture risk overall, but found a slight increase in fracture risk among those using high doses.

Cross-sectional studies show a dose–response relationship between inhaled corticosteroid use for asthma or COPD, and risk of cataracts in adults.

Long-term inhaled corticosteroid use for asthma or COPD is associated with a small increase in the risk of developing diabetes, and in the risk of diabetes progression. These risks are greatest at higher doses (equivalent to fluticasone propionate 1000 mcg/day or higher).

The incidence of osteoporosis, cataracts and diabetes increases with age, and these conditions are also more common in smokers and in patients with COPD. Few studies have assessed risk specifically in patients with asthma.
Patients at risk of osteoporosis should be referred for bone density screening, screened for vitamin D and/or calcium deficiency, and provided with advice about maintaining bone health.

Go to: Australian and New Zealand Bone and Mineral Society’s Vitamin D and health in adults in Australia and New Zealand: a position statement
Go to: Osteoporosis Australia’s Building healthy bones throughout life: an evidence-informed strategy to prevent osteoporosis in Australia

Patient concerns about adverse effects

The prevalence of side effects that patients consider troubling increases with increasing dose of inhaled corticosteroids. Mid and high doses are consistently associated with a higher intensity and a higher prevalence of reported adverse effects, after controlling for other factors.

A high proportion of people with asthma may have misunderstandings and fears about using inhaled corticosteroids, such as fears about weight gain, unwanted muscle development, bone fractures, susceptibility to infections and reduction of efficacy of the medicine over time. Most people do not discuss their concerns about inhaled corticosteroid treatment with health professionals. Safety concerns are a major reason for poor adherence, particularly general concerns about corticosteroids rather than concerns about specific adverse effects.

Inhaled corticosteroids for adults and adolescents: particle size

Medicines with small particle size (CFC-free beclometasone [Qvar] and ciclesonide) achieve a greater proportion of medicine deposited in the lungs, and are potentially distributed more widely in the large, intermediate, and small airways. However, the clinical implications have not been established.

Randomised controlled trials comparing ciclesonide with fluticasone propionate in adults and adolescents have observed lower rates of patient-reported side-effects, and confirmed dysphonia and oral candidiasis, among patients using ciclesonide than among those using fluticasone propionate.

Inhaled corticosteroid/long-acting beta-2 agonist combinations for adults: overview

- To avoid the possibility of patients taking a long-acting beta2 agonist without an inhaled corticosteroid, long-acting beta2 agonists should (whenever possible) be prescribed as inhaled corticosteroid/long-acting beta2 agonist combination in a single inhaler, rather than in separate inhalers. If no combination product is available for the desired medications, carefully explain to the patient that it is very important that they continue taking the inhaled corticosteroid.

Meta-analysis of evidence from randomised controlled clinical trials shows that, for adult patients already taking an inhaled corticosteroid, concomitant treatment with an inhaled corticosteroid and a long-acting beta2 agonist:

- reduces the risk of flare-ups, compared with increasing the dose of corticosteroids
- reduces the risk of flare-ups, compared with inhaled corticosteroids alone.

The studies included in this meta-analysis evaluated mainly budesonide/formoterol and fluticasone propionate/salmeterol.

Each of the following inhaled corticosteroid/long-acting beta2 agonist combinations is available as a single inhaler:

- budesonide/formoterol
- fluticasone furoate/vilanterol
- fluticasone propionate/salmeterol
- fluticasone propionate/formoterol.

There are two types of dosing regimens for inhaled corticosteroid/long-acting beta2 agonist combination therapy:

- maintenance-only regimens (applicable to all available combinations)
- maintenance-and-reliever regimen (applicable only to the budesonide/formoterol combination).

Maintenance-only regimens

The fluticasone propionate/salmeterol combination and budesonide/formoterol combination appear to be equally effective when used for regular maintenance treatment, based on meta-analysis of evidence from clinical trials. Most of the evidence for inhaled corticosteroid/long-acting beta2 agonist combination therapy is from studies using these combinations.
Less evidence from double-blind randomised controlled clinical trials is available for the newer combinations: fluticasone furoate/vilanterol and fluticasone propionate/formoterol:

- The fluticasone furoate/vilanterol combination is equivalent to a medium-to-high dose of inhaled corticosteroids. In adults and adolescents already taking inhaled corticosteroids, once-daily fluticasone furoate/vilanterol 100/25 mcg reduced the risk of severe flare-ups (requiring oral corticosteroids or hospitalisation) and improved lung function, compared with fluticasone furoate alone. Efficacy data for the comparison of fluticasone furoate/vilanterol with other inhaled corticosteroid/long-acting beta$_2$ agonist combinations is not available.
- In adults and adolescents with persistent asthma and FEV$_1$ 50–80% at baseline, fluticasone propionate/formoterol achieved improvement in FEV$_1$ comparable to that achieved with budesonide/formoterol in a 12-week randomised double-blind clinical trial. Other 12-week open-label studies have reported that fluticasone propionate/formoterol was as effective as budesonide/formoterol in improving lung function in adults and adolescents with poorly controlled asthma, and was as effective as fluticasone propionate/salmeterol in adults.

Long-acting beta$_2$ agonists should not be used without inhaled corticosteroids in the management of asthma. Long-acting beta$_2$ agonists are well tolerated when given in combination with inhaled corticosteroids.

**Maintenance-and-reliever regimen**

The low-dose budesonide/formoterol combination can be used as both maintenance and reliever. Under this regimen, the combination is used for relief of asthma symptoms (instead of using a short-acting beta$_2$ agonist reliever), in addition to its use as regular maintenance treatment.

**Combination budesonide/formoterol maintenance-and-reliever regimen in adults and adolescents: overview of efficacy**

Low-dose budesonide/formoterol combination can be used as reliever for asthma symptoms (instead of using a short-acting beta$_2$ agonist reliever), in addition to its use as regular long-term preventer treatment. The following formulations can be used in maintenance-and-reliever regimens:

- dry-powder inhaler (Symbicort Turbuhaler) 100/6 mcg or 200/6 mcg
- pressurised metered-dose inhaler (Symbicort Rapihaler) 50/3 mcg or 100/3 mcg.

Neither the 400/12 mcg dry-powder inhaler nor the 200/6 mcg pressurised metered-dose inhaler should be used in this way.

Overall, clinical trials show that budesonide/formoterol combination as maintenance and reliever reduces the risk of flare-ups that require oral corticosteroids, compared with other current preventer regimens and compared with a fixed higher dose of inhaled corticosteroids.

Pooled data from five randomised controlled trials assessing budesonide/formoterol maintenance-and-reliever regimens showed that similar or better levels of asthma control were achieved with budesonide/formoterol maintenance-and-reliever compared with the conventional maintenance regimen comparators:

- higher-dose budesonide
- same dose budesonide/formoterol
- higher-dose inhaled corticosteroid/long-acting beta$_2$ agonist (budesonide/formoterol or fluticasone propionate/salmeterol).

In randomised clinical trials in patients with a history of asthma flare-up within the previous 12 months (and therefore at greater risk of flare-up in the next 12 months), the use of formoterol/budesonide as maintenance-and-reliever regimen reduced the risk of asthma flare-ups that required treatment with oral corticosteroids, compared with the use of any of the following (plus a short-acting beta$_2$ agonist reliever as needed):

- the same combination as maintenance treatment only
- higher-dose combination as maintenance treatment only
- higher-dose inhaled corticosteroids.

Meta-analysis of six randomised controlled trials found that maintenance-and-reliever treatment with budesonide/formoterol reduced the risk of severe asthma flare-ups (use of oral corticosteroids for 3 days or more, hospitalisation or emergency department visits), compared with higher-dose inhaled corticosteroid alone, or in combination with a long-acting beta$_2$ agonist.

In open-label studies in which patients were not selected for a previous history of flare-ups, there was no overall difference in time to first flare-up between budesonide/formoterol as maintenance-and-reliever regimen and...
conventional maintenance regimens (including inhaled corticosteroid or inhaled corticosteroid/long-acting beta\textsubscript{2} agonist combinations, leukotriene receptor antagonists, xanthines or any other asthma medicines) with rapid-onset beta\textsubscript{2} agonist reliever (selected according to clinician’s choice).\textsuperscript{59} However, the inhaled corticosteroid dose was higher with conventional maintenance regimens.

**Note:** The fluticasone propionate/formoterol combination is approved by the Therapeutic Goods Administration only for regular maintenance therapy.

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**Correct use of inhaler devices**

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10\% of patients use correct technique.\textsuperscript{60, 61} High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported,\textsuperscript{62, 63, 64, 65, 66} even among regular users.\textsuperscript{67} Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.\textsuperscript{68}

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers.\textsuperscript{62, 67, 69, 70, 71} In patients with asthma or COPD, incorrect technique is associated with a 50\% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.\textsuperscript{57}

Correcting patients’ inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.\textsuperscript{72, 73}

**Common errors and problems with inhaler technique**

Common errors with manually actuated pressurised metered dose inhalers include:\textsuperscript{68}

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:\textsuperscript{68}

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

**How to improve patients’ inhaler technique**

Patients’ inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique.\textsuperscript{68} The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration.\textsuperscript{74, 62, 75, 76} Patients do not learn to use their inhalers properly just by reading the manufacturer’s leaflet.\textsuperscript{75} An effective method is to assess the individual’s technique by comparing with a checklist specific
to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device).40, 73

The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD.

Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.72, 62, 63

Go to: National Asthma Council Australia’s Using your inhaler webpage for information, patient resources and videos on inhaler technique
Go to: National Asthma Council Australia’s information paper for health professionals on Inhaler technique for people with asthma or COPD
Go to: NPS MedicineWise information on Inhaler devices for respiratory medicines

References


Prescribing other preventers for adults

Recommendations

Although montelukast is less effective than inhaled corticosteroids for controlling asthma in adults, it may be considered as an alternative for (either of):

- people who experience intolerable dysphonia with inhaled corticosteroids despite correct inhaler technique and use of a spacer
- people who refuse other preventer options.

Note: PBS status as at October 2016: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders, or white card holders with approval for asthma treatments.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Ducharme 2004 
- Lazarus et al. 2007 
- Peters-Golden et al. 2006 
- Weiler et al. 2010

When starting regular montelukast, prescribe standard adult dose and review response 6–8 weeks later. (Also review during this interval, if appropriate.)

Follow the steps for conducting a treatment trial.

Table. Steps for conducting a treatment trial

1. Document baseline lung function.
2. Document baseline asthma control using a validated standardised tool such as the Asthma Score.
3. Discuss treatment goals and potential adverse effects with the person.
4. Run treatment trial for agreed period (e.g. 4–8 weeks, depending on the treatment and clinical circumstances, including urgency).
5. At an agreed interval, measure asthma control and lung function again and document any adverse effects.
6. If asthma control has not improved despite correct inhaler technique and good adherence, resume previous treatment and consider referral for specialist consultation.

See: Asthma Score (Asthma Control Test)

Asset ID: 36

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).
Although cromones are less effective than inhaled corticosteroid in controlling asthma and improving lung function, they may be considered for (any of):

- people who choose not to take inhaled corticosteroids
- people who cannot tolerate inhaled corticosteroids
- people with symptoms limited to exercise-induced bronchoconstriction.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Guevara et al. 2006
- Spooner et al. 2003
- Weiler et al. 2010

If considering sodium cromoglycate or nedocromil, explain to patients that the medicine must be taken multiple times per day, and that the device requires daily maintenance, and explain how to do this before prescribing. (Cromones are rarely prescribed to manage asthma in adults.)

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Montelukast for adults: efficacy

In adults and adolescents with asthma that is not controlled by low-dose inhaled corticosteroid, the addition of a leukotriene receptor antagonist is less effective than the addition of a long-acting beta₂ agonist in reducing the rate of asthma flare-ups that require treatment with oral corticosteroids. The addition of a leukotriene receptor antagonist is also associated with lesser improvement in lung function and quality of life than the addition of a long-acting beta₂ agonist.

Montelukast taken 1 hour before exercise can be used to manage exercise-induced bronchoconstriction, but it is less effective than short-acting beta₂ agonists.

Retrospective analysis of clinical trial data suggests that some people with asthma who smoke, or are obese, may achieve better asthma control with montelukast than an inhaled corticosteroid. However, prospective studies would be needed to confirm this.

Some individuals may also achieve better asthma control with montelukast than with an inhaled corticosteroid for reasons that are unknown and cannot be predicted from currently available data.

Although montelukast was previously thought to have particular benefits for people with aspirin-intolerant asthma, this has not been consistently demonstrated in clinical trials.

Within specialised severe asthma clinics, montelukast is sometimes prescribed as add-on treatment for adults.

See: Investigation and management of exercise-induced bronchoconstriction

Note: PBS status as at October 2016: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders or white card holders with approval for asthma treatments.

Montelukast for adults and adolescents: psychiatric effects

Post-marketing surveillance reports led to concerns about a possible association between leukotriene receptor antagonist use and suicide risk. A recent case-control study reported a statistically significant association between the
use of leukotriene receptor antagonists and suicide attempts in people aged 19–24 years. However, this association was no longer statistically significant after adjusting for potential confounding factors, including previous exposure to other asthma medicines and previous exposure to other medicines associated with suicide.\textsuperscript{7}

**Cromones for adults and adolescents**

Sodium cromoglycate is less effective than inhaled corticosteroids in controlling asthma and improving lung function.\textsuperscript{5} Cromolyn sodium and nedocromil sodium taken before exercise can be used to manage exercise-induced bronchoconstriction, but they are only effective in approximately 50% of patients\textsuperscript{4} and are less effective than short-acting beta\textsubscript{2} agonists.\textsuperscript{6} Cromones have a good safety profile and tolerance does not occur when either of these medicines is taken regularly.\textsuperscript{6} Maintenance of the CFC-free device is difficult for patients because the formulation is sticky and blocks the device unless it is washed and thoroughly dried every day. Therefore, patients need two mouthpieces to use alternately.

See: *Investigation and management of exercise-induced bronchoconstriction*

**Adherence to preventer treatment: adults and adolescents**

Most patients do not take their preventer medication as often as prescribed, particularly when symptoms improve, or are mild or infrequent. Whenever asthma control is poor despite apparently adequate treatment, poor adherence, as well as poor inhaler technique, are probable reasons to consider.

Poor adherence may be intentional and/or unintentional. Intentional poor adherence may be due to the person’s belief that the medicine is not necessary, or to perceived or actual adverse effects. Unintentional poor adherence may be due to forgetting or cost barriers.

Common barriers to the correct use of preventers include:

- being unable to afford the cost of medicines or consultations to adjust the regimen
- concerns about side effects
- interference of the regimen with the person’s lifestyle
- forgetting to take medicines
- lack of understanding of the reason for taking the medicines
- inability to use the inhaler device correctly due to physical or cognitive factors
- health beliefs that are in conflict with the belief that the prescribed medicines are effective, necessary or safe (e.g. a belief that the prescribed preventer dose is ‘too strong’ or only for flare-ups, a belief that asthma can be overcome by psychological effort, a belief that complementary and alternative therapies are more effective or appropriate than prescribed medicines, mistrust of the health professional).

Adherence to preventers is significantly improved when patients are given the opportunity to negotiate the treatment regimen based on their goals and preferences.\textsuperscript{8}

Assessment of adherence requires an open, non-judgemental approach.

Accredited pharmacists who undertake Home Medicines Reviews can assess adherence while conducting a review.

Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment

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<table>
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<tr>
<td>1.</td>
<td>Many people don’t take their medication as prescribed. In the last four weeks:</td>
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<td></td>
<td>◦ how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).</td>
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<td></td>
<td>◦ how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)</td>
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<td></td>
<td>◦ each time, how many puffs would you take? One? Two? (etc).</td>
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<tr>
<td>2.</td>
<td>Do you find it easier to remember your medication in the morning, or the evening?</td>
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Correct use of inhaler devices

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique.\(^9\) \(^10\)

High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported,\(^11\) \(^12\) \(^13\) \(^14\) \(^15\) even among regular users.\(^16\) Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.\(^17\)

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers.\(^11\) \(^18\) \(^16\) \(^19\) \(^20\) In patients with asthma or COPD, incorrect technique is associated with a 50% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.\(^16\)

Correcting patients’ inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.\(^21\) \(^22\)

Common errors and problems with inhaler technique

Common errors with manually actuated pressurised metered dose inhalers include:\(^17\)

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:\(^17\)

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

How to improve patients’ inhaler technique

Patients’ inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique.\(^17\) The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration.\(^23\) \(^11\) \(^24\) \(^25\) Patients do not learn to use their inhalers properly just by reading the
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References


## Adjusting treatment in adults by stepping up or stepping down

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<td>Stepping up asthma treatment in adults and adolescents</td>
<td>Stepping down asthma treatment in adults and adolescents</td>
</tr>
</tbody>
</table>
Stepping up treatment in adults

Recommendations

Before considering any increase in dose or addition to treatment regimen (step up), document the person’s current level of asthma control and risk factors. Carefully check (all of):

- adherence
- inhaler technique
- exposure to triggers
- the possibility that symptoms are due to comorbid or alternative diagnoses (e.g. allergic rhinitis or rhinosinusitis, de-conditioning, obesity, cardiac disease or upper airway dysfunction).

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>- Daytime symptoms ≤2 days per week</td>
<td>- Daytime symptoms &gt;2 days per week</td>
<td>- Daytime symptoms &gt;2 days per week†</td>
</tr>
<tr>
<td>- Need for reliever ≤2 days per week†</td>
<td>- Need for reliever &gt;2 days per week</td>
<td>- Need for reliever &gt;2 days per week†</td>
</tr>
<tr>
<td>- No limitation of activities</td>
<td>- Any limitation of activities</td>
<td>- Any limitation of activities</td>
</tr>
<tr>
<td>- No symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Adapted from:
Asset ID: 33

Table. Risk factors for adverse asthma outcomes in adults and adolescents

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Table. Management of risk factors for adverse asthma outcomes in adults

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any risk factor for flare-ups</td>
<td>Check patient has an appropriate action plan</td>
</tr>
<tr>
<td>Risk factor</td>
<td>Clinical action †</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Carefully check inhaler technique and adherence, and identify any</td>
<td>Carefully check inhaler technique and adherence, and identify any barriers to good adherence</td>
</tr>
<tr>
<td>barriers to good adherence</td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma or any asthma flare-up during the</td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td>previous 12 months</td>
<td></td>
</tr>
<tr>
<td>History of intubation or intensive care unit admission for asthma</td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
</tr>
<tr>
<td></td>
<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
</tr>
<tr>
<td>High SABA use (&gt;2 canisters per month)</td>
<td>Check lung function</td>
</tr>
<tr>
<td></td>
<td>If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g.</td>
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<td></td>
<td>short-term substitution of ipratropium for SABA</td>
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<tr>
<td>Long-term high-dose ICS</td>
<td>Consider gradual reduction of ICS dose if symptoms stable</td>
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<tr>
<td></td>
<td>Monitor regularly (e.g. assessment of bone density, regular eye examinations)</td>
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<td>For local side-effects, ensure inhaler technique is appropriate</td>
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<tr>
<td>Poor lung function (even if few symptoms)</td>
<td>Consider 3-month trial of higher ICS dose, then recheck lung function</td>
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<td></td>
<td>Consider referral for detailed specialist investigation</td>
</tr>
<tr>
<td>Sensitivity to unavoidable allergens (e.g. Alternaria species of common</td>
<td>Refer for further investigation and management</td>
</tr>
<tr>
<td>moulds)</td>
<td></td>
</tr>
<tr>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
<td>Emphasise the importance of avoiding smoke</td>
</tr>
<tr>
<td></td>
<td>Provide quitting strategies</td>
</tr>
<tr>
<td></td>
<td>Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)</td>
</tr>
<tr>
<td></td>
<td>Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of exacerbations</td>
<td>Regular PEF monitoring</td>
</tr>
<tr>
<td></td>
<td>Action plan should recommend early review and measurement of lung function</td>
</tr>
</tbody>
</table>
Risk factor | Clinical action †
---|---
No current written asthma action plan | Provide and explain written asthma action plan

† In addition to actions applicable to all risk factors
Asset ID: 41

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

If asthma is only partly controlled despite low-dose inhaled corticosteroids, good adherence and correct inhaler technique, consider stepping up to a low dose of an inhaled corticosteroid/long-acting beta<sub>2</sub> agonist combination.

Note: TGA-registered fluticasone furoate/vilanterol combinations contain moderate-to-high doses of inhaled corticosteroid (100/25 mcg and 200/25 mcg respectively).

Figure. Stepped approach to adjusting asthma medication in adults
Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

Table. Guide to selecting and adjusting asthma medication for adults and older adolescents

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Action</th>
</tr>
</thead>
</table>
| Newly diagnosed asthma | Consider low-dose ICS (plus SABA as needed)  
If symptoms severe at initial presentation, consider one of:  
• ICS plus a short course of oral corticosteroids  
• a short initial period of high-dose ICS then step down  
• (private prescription) combination ICS/LABA<sup>†</sup>  
See: Table. Initial treatment choices (adults and adolescents not already using a preventer) |
| Good recent asthma symptom control | If maintained 2–3 months, no flare-up in previous 12 months and low risk for flare-ups, step down where possible (unless already on low-dose ICS) |
| Partial recent asthma symptom control | Review inhaler technique and adherence – correct if suboptimal  
If no improvement, consider increasing treatment by one step and reviewing (if still no improvement, return to previous step, review diagnosis and consider referral) |
| Poor recent asthma symptom control | Review inhaler technique and adherence – correct if suboptimal  
Confirm that symptoms are likely to be due to asthma  
Consider increasing treatment until good asthma control is achieved, then step down again when possible |
|  | Consider referral for assessment or add-on options |
Clinical situation | Action
---|---
**Difficult-to-treat asthma ‡** |  
**Patient with risk factors §** | Tailor treatment to reduce individual risk factors

† PBS status as at October 2016: ICS/LABA combination therapy as first-line preventer treatment is not subsidised by the PBS, except for patients with frequent symptoms while taking oral corticosteroids.
‡ Poor recent asthma symptom control despite ICS/LABA combination at high–medium dose with good adherence and inhaler technique.
§ Risk factors for asthma events or adverse treatment effects, irrespective of level of recent asthma symptom control.

Asset ID: 5

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Sin et al. 2004¹
- Ducharme et al. 2010²
- Ducharme et al. 2010³
- Ducharme et al. 2011⁴
- Gibson et al. 2005⁵

The combination of budesonide/formoterol can be used as maintenance-and-reliever treatment.

For patients using the maintenance-and-reliever regimen, prescribe a standard initial maintenance dose of (any of):

- 100/6 mcg dry-powder inhaler – two actuations twice daily
- 200/6 mcg dry-powder inhaler – one or two actuations twice daily
- 50/3 mcg pressurised metered-dose inhaler – two or four actuations twice daily
- 100/3 mcg pressurised metered-dose inhaler – two or four actuations twice daily.

Instruct the patient to take extra as-needed doses for relief of symptoms (1 extra actuation for dry-powder inhalers or 2 actuations for pressurised metered-dose inhalers, repeated after several minutes if symptoms persist, up to a maximum of 72 mcg formoterol per day in total).

**Note:** The following formulations should not be used in maintenance-and-reliever regimens:

- 400/12 mcg dry-powder inhaler
- 200/6 mcg pressurised metered-dose inhaler.

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Aubier et al. 2011⁶
- Aubier et al. 2010⁷
- AstraZeneca Pty Ltd 2010⁸
- AstraZeneca Pty Ltd 2012⁹
- Bateman et al. 2010¹⁰
- Bousquet et al. 2007¹¹
- Demoly et al. 2009¹²
For most patients, high doses of inhaled corticosteroids should be used for short periods only. If a patient seems to need prolonged high-dose inhaled corticosteroids to control asthma, refer to a specialist for assessment.

**Table. Definitions of ICS dose levels in adults**

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Beclometasone dipropionate †</strong></td>
<td>100–200</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td>200–400</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td>80–160</td>
</tr>
<tr>
<td><strong>Fluticasone furoate</strong>*</td>
<td>—</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**


Asset ID: 22

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If a patient taking maintenance preventer treatment has been using frequent short-acting beta₂ agonist reliever for a prolonged period (e.g. 6–8 puffs per day for several weeks), and common causes of poor asthma control have been investigated and ruled out, consider referral to a respiratory physician.

**How this recommendation was developed**
Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).
Occasionally, for a person who experiences a predictable seasonal pattern of asthma symptoms, it may be appropriate to treat with inhaled corticosteroids beginning at least 1 month before, and continued during that period.

For example, for patients with asthma who have allergic rhinitis and are sensitised to rye grass pollen, consider prescribing an inhaled corticosteroid commencing 1 month before the spring and summer thunderstorm season and discontinuing after pollen levels decrease.

Note: This applies to a small proportion of patients only.

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

**More information**

### Assessing risk factors for adverse asthma outcomes in adults

**Predicting poor asthma outcomes**

As well as assessing recent asthma symptom control, it is necessary to assess each patient’s risk of future asthma events or adverse treatment effects. (Recent asthma symptom control and risk of adverse events are both components of overall asthma control.)

**Table. Risk factors for adverse asthma outcomes in adults and adolescents**

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

**Table. Risk factors for adverse asthma outcomes in adults and adolescents**

<table>
<thead>
<tr>
<th>Risk factors for adverse asthma outcomes in adults and adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors associated with increased risk of flare-ups</strong></td>
</tr>
<tr>
<td>Poor asthma control</td>
</tr>
<tr>
<td>Any asthma flare-up during the previous 12 months</td>
</tr>
<tr>
<td>Other concurrent chronic lung disease</td>
</tr>
<tr>
<td>Poor lung function (even if few symptoms)</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of flare-ups</td>
</tr>
<tr>
<td>Eosinophilic airway inflammation</td>
</tr>
<tr>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
</tr>
<tr>
<td>Socioeconomic disadvantage</td>
</tr>
<tr>
<td>Use of illegal substances</td>
</tr>
<tr>
<td>Major psychosocial problems</td>
</tr>
<tr>
<td>Mental illness</td>
</tr>
<tr>
<td><strong>Factors associated with increased risk of life-threatening asthma</strong></td>
</tr>
<tr>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
</tr>
<tr>
<td>2 or more hospitalisations for asthma in past year</td>
</tr>
<tr>
<td>Sensitivity to an unavoidable allergen (e.g. <em>Alternaria</em> species of common moulds)</td>
</tr>
<tr>
<td>Inadequate treatment</td>
</tr>
<tr>
<td>Experience of side-effects of OCS use (may contribute to undertreatment or delayed</td>
</tr>
<tr>
<td>Medical history</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>3 or more ED visits for asthma in the past year</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
</tr>
<tr>
<td>High short-acting beta\textsubscript{2} agonist use (&gt;2 canisters per month)</td>
</tr>
<tr>
<td>History of delayed presentation to hospital during flare-ups</td>
</tr>
<tr>
<td>History of sudden-onset acute asthma</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>Factors associated with accelerated decline in lung function</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Factors associated with treatment-related adverse events</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

§ White cell differential count on a peripheral blood sample is not routinely recommended in the investigation and management of asthma, except for patients with severe refractory asthma. In research studies, peripheral blood eosinophilia suggests the presence of eosinophilic airway inflammation.

**Sources**


Table. Management of risk factors for adverse asthma outcomes in adults

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<th>Risk factor</th>
<th>Clinical action †</th>
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</tr>
<tr>
<td></td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td><strong>Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months</strong></td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td><strong>History of intubation or intensive care unit admission for asthma</strong></td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
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<tr>
<td><strong>Hospitalisation or ED visit for asthma in the past month</strong></td>
<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
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<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
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<td><strong>Long-term high-dose ICS</strong></td>
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<td>------------------------------------------------</td>
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<td>Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)</td>
<td>Refer for assessment of asthma–COPD overlap</td>
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<tr>
<td>Difficulty perceiving airflow limitation or the severity of exacerbations</td>
<td>Regular PEF monitoring&lt;br&gt;Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td>No current written asthma action plan</td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors
Asset ID: 41

Poor clinical control, as indicated by frequent asthma symptoms and frequent reliever use, is a very strong predictor of the risk of flare-ups in the future. Any asthma flare-up during the previous 12 months indicates higher risk of flare-up over the next 12 months. A history of artificial ventilation due to acute asthma, and admission to an intensive care unit due to acute asthma have been associated with increased risk of near-fatal asthma, but there is not enough evidence to indicate how long this risk may persist over a person’s lifetime. Other risk factors indicate increased probability of future flare-ups or accelerated decline in lung function, independent of the person’s level of recent asthma symptom control.

Other factors may increase a person’s risk of treatment-associated adverse effects. The most important of these are prescription of high dose treatment and frequent courses of oral steroids.

People with risk factors need more frequent asthma review, a carefully tailored written asthma action plan, and close attention to adherence and correct inhaler technique.

Inflammatory markers

Inflammatory markers, such as sputum eosinophil percentage or exhaled nitric oxide, are used in research and for managing severe asthma in patients attending secondary or tertiary care. Elevated sputum eosinophil levels and, to a lesser extent, elevated exhaled nitric oxide, are associated with increased risk of flare-ups. At present, treatment based on inflammatory markers is not recommended for routine use in primary care.

The value of inflammatory markers is being evaluated:

- Adjusting asthma treatment by monitoring exhaled nitric oxide does not reduce the rate of flare-ups or improve asthma control in adults and children, compared with adjusting treatment according to clinical symptoms or spirometry, based on a meta-analysis of randomised controlled clinical trials. However, many of the studies were not optimally designed to answer this question, and some comparator regimens did not match current recommended treatment options.
- In some studies, asthma treatment algorithms based on monitoring sputum eosinophil counts reduced flare-ups, compared with control-based management. However, most studies assessing treatment guided by sputum eosinophilia have been conducted in selected populations in a few research centres, and therefore may not apply to the general community population. Assessment of sputum inflammatory cells is not generally available at present even in secondary care.
- Limited evidence suggests that patients whose symptoms do not match their degree of eosinophilic inflammation may benefit more from treatment monitoring using sputum eosinophil count than other patients.
- Monitoring inflammatory markers might enable safer down-titration of maintenance inhaled corticosteroid doses.

Inhaled corticosteroids for adults: overview

Inhaled corticosteroid preventer medicines available in Australia
The following inhaled corticosteroids are registered by the TGA:

- beclometasone dipropionate (low to high doses available)
- budesonide (low to high doses available, including in combination with a long-acting beta₂ agonist)
- ciclesonide (low to high doses available)
- fluticasone furoate (medium to high doses available, including in combination with a long-acting beta<sub>2</sub> agonist)
- fluticasone propionate (low to high doses available, including in combination with a long-acting beta<sub>2</sub> agonist)

### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
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<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate †</td>
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</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

**Note:** The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**
Asset ID: 22

### Clinical benefits

Inhaled corticosteroids are the most effective preventer medicines for adults.¹,²⁰,²⁷

Inhaled corticosteroids are effective in reducing asthma symptoms, improving quality of life, improving lung function, decreasing airway hyperresponsiveness, controlling airway inflammation, reducing the frequency and severity of asthma flare-ups, and reducing the risk of death due to asthma.¹,²⁰,²⁸,²⁹,³⁰,³¹,³²,³³,³⁴,³⁵,³⁶

### Most adults with asthma benefit from regular inhaled corticosteroid treatment

The current recommendation to initiate inhaled corticosteroid treatment for adults with asthma symptoms twice or more during the past month, or who experience waking due to asthma symptoms once or more during the past month, is based on consideration of clinical trial evidence that even patients with infrequent symptoms benefit from regular use of inhaled corticosteroids:

- In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial).²⁰,³²,³³
- In small clinical trials in adults with symptoms or reliever use twice per week or less, the use of regular inhaled corticosteroids (fluticasone propionate 250 mcg/day) improved lung function,³⁷ reduced airway hyperresponsiveness and inflammation,³⁷,³⁸ and reduced the risk of mild flare-ups.³⁷,³⁸
The current recommendation replaces the previous higher threshold for inhaled corticosteroid treatment (asthma symptoms three times a week or more, or waking at least one night per week with asthma symptoms), which was based on consensus.

**Clinical benefits are achieved with low doses**

Low doses of inhaled corticosteroids are sufficient to achieve benefits in most patients:

- Regular use of low-dose inhaled corticosteroids reduced the risk of hospitalisation for acute asthma and death due to asthma (evidence from a large population cohort study). In that study, breaks in the use of inhaled corticosteroid of up to 3 months were associated with increased risk of death.
- In adults and adolescents with mild asthma who were not taking inhaled corticosteroids, starting low-dose inhaled corticosteroid (budesonide 200 mcg/day) reduced the risk of asthma flare-ups severe enough to require oral corticosteroids, and improved symptom control (evidence from a large clinical trial).
- In patients with recent-onset (diagnosis within 2 years) mild asthma (45% with symptoms 2 days/week or less), low-dose inhaled corticosteroid (budesonide 400 mcg/day) reduced the risk of severe flare-ups, increased symptom-free days and lung function, and protected against long-term decline in lung function associated with severe asthma flare-ups (evidence from a 5-year large randomised clinical trial).

Note: PBS status as at October 2016: Fluticasone furoate is not subsidised by the PBS, except in combination with vilanterol.

### Inhaled corticosteroids for adults: doses

Most of the benefit of inhaled corticosteroid is achieved with doses at the upper limit of the low-dose range (i.e. equivalent to 400 mcg budesonide per day, 200 mcg HFA beclometasone, 160 mcg ciclesonide or 200 mcg fluticasone propionate).

On average, higher doses provide relatively little extra benefit, but are associated with a higher risk of adverse effects. However, a small proportion of individuals may need a higher dose to achieve asthma control.

The recommendation to start inhaled corticosteroid at low dose is based on the following evidence.

A meta-analysis of results from randomised controlled trials comparing different doses of inhaled corticosteroids showed:

- An effective starting dose is 200–400 mcg/day for fluticasone propionate, 400–800 mcg/day for budesonide, or 200–400 mcg/day beclometasone.
- A starting dose higher than 800 mcg/day budesonide, 400 mcg/day fluticasone propionate, or 400 mcg beclometasone does not provide enough clinical benefit over lower doses to warrant routinely starting with high doses.
- Starting with a moderate dose of inhaled corticosteroid is as effective as commencing with a high dose and down-titrating. Although it may be reasonable to use a high starting dose then reduce the dose, down-titration cannot be ensured in practice (e.g. if the person does not return for planned review).
- High doses of inhaled corticosteroids may be more effective than a moderate or low dose for controlling airway hyperresponsiveness, but this may not equate to a clinical benefit.

Meta-analyses of inhaled corticosteroid safety have shown that the risk of local adverse effects (e.g. hoarseness, oral candidiasis) and the risk of systemic adverse effects (e.g. changes in hypothalamic-pituitary-adrenal function) increase significantly at higher doses. The risk of adrenal suppression should be considered whenever high doses are used (particularly of more potent inhaled corticosteroids), or when the patient uses concomitant medicines that inhibit cytochrome P450 (e.g. ritonavir, erythromycin or ketoconazole).

**Notes**

Dose equivalent for beclometasone applies to Qvar CFC-free formulation. Other brands may differ.

Do not use beclometasone dose recommendations from outdated or overseas guidelines based on older formulations containing CFC propellant – doses are different.

**Table. Definitions of ICS dose levels in adults**

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</tr>
<tr>
<td>Beclometasone dipropionate †</td>
<td>100–200</td>
</tr>
</tbody>
</table>

Notes:

- PBS status as at October 2016: Fluticasone furoate is not subsidised by the PBS, except in combination with vilanterol.
- Dose equivalent for beclometasone applies to Qvar CFC-free formulation. Other brands may differ.
- Do not use beclometasone dose recommendations from outdated or overseas guidelines based on older formulations containing CFC propellant – doses are different.
### Inhaled corticosteroids for adults: adverse effects

#### Local adverse effects

Hoarseness (dysphonia) and candidiasis are the most common local adverse effects of inhaled corticosteroids with both pressurised metered-dose inhalers and dry-powder inhalers:

- The rate of dysphonia among patients taking inhaled corticosteroids has been estimated at 5–20%. However, higher rates of up to 58% have been reported in some studies. The risk varies with the device used.
- The rate of oropharyngeal candidiasis among adults using inhaled corticosteroids has been estimated at 5–7%, with positive mouth culture for *Candida albicans* in approximately 25% of patients. However, higher rates of up to 70% have been reported in some studies. The risk depends on the formulation, dose and dose frequency.

When taking inhaled corticosteroids via pressurised metered-dose inhalers, the use of a spacer reduces the risk of dysphonia and candidiasis. Spacers improve delivery of the medicine to the airways.

Rinsing the mouth with water after inhaling reduces the risk of oropharyngeal candidiasis. Quick mouth rinsing immediately after inhaling effectively removes a high proportion of remaining medicine. The incidence of dysphonia and candidiasis is significantly lower with ciclesonide than with equivalent doses of fluticasone propionate. This may be an important consideration for patients who experience dysphonia, particularly for those for whom voice quality is important (e.g. singers, actors, teachers). With ciclesonide, the rate of adverse effects may not differ when taken with or without a spacer.

#### Systemic adverse effects

Cross-sectional population studies have reported lower bone mineral density with long-term use of high doses of inhaled corticosteroid, but the effect on fracture risk in patients with asthma is unclear.

A meta-analysis of randomised controlled trials in adults older than 40 years with COPD (in which osteoporosis is more common) or asthma found no association between the use of inhaled corticosteroid and fracture risk overall, but found a slight increase in fracture risk among those using high doses.

---

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td>200–400</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td>80–160</td>
</tr>
<tr>
<td><strong>Fluticasone furoate</strong></td>
<td>—</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

**Note:** The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**


Asset ID: 22
Cross-sectional studies show a dose–response relationship between inhaled corticosteroid use for asthma or COPD, and risk of cataracts in adults.53 Long-term inhaled corticosteroid use for asthma or COPD is associated with a small increase in the risk of developing diabetes, and in the risk of diabetes progression. These risks are greatest at higher doses (equivalent to fluticasone propionate 1000 mcg/day or higher).54 The incidence of osteoporosis, cataracts and diabetes increases with age, and these conditions are also more common in smokers and in patients with COPD. Few studies have assessed risk specifically in patients with asthma. Patients at risk of osteoporosis should be referred for bone density screening, screened for vitamin D and/or calcium deficiency, and provided with advice about maintaining bone health.

Patient concerns about adverse effects

The prevalence of side effects that patients consider troubling increases with increasing dose of inhaled corticosteroids.55 Mid and high doses are consistently associated with a higher intensity and a higher prevalence of reported adverse effects, after controlling for other factors.55 A high proportion of people with asthma may have misunderstandings and fears about using inhaled corticosteroids,56,57 such as fears about weight gain, unwanted muscle development, bone fractures, susceptibility to infections and reduction of efficacy of the medicine over time.56 Most people do not discuss their concerns about inhaled corticosteroid treatment with health professionals.58 Safety concerns are a major reason for poor adherence, particularly general concerns about corticosteroids rather than concerns about specific adverse effects.58

**Inhaled corticosteroids for adults and adolescents: particle size**

Medicines with small particle size (CFC-free beclometasone [Qvar] and ciclesonide) achieve a greater proportion of medicine deposited in the lungs,59 and are potentially distributed more widely in the large, intermediate, and small airways.59 However, the clinical implications have not been established. Randomised controlled trials comparing ciclesonide with fluticasone propionate in adults and adolescents have observed lower rates of patient-reported side-effects,60 and confirmed dysphonia and oral candidiasis,49 among patients using ciclesonide than among those using fluticasone propionate.

**Inhaled corticosteroid/long-acting beta-2 agonist combinations for adults: overview**

- To avoid the possibility of patients taking a long-acting beta2 agonist without an inhaled corticosteroid, long-acting beta2 agonists should (whenever possible) be prescribed as inhaled corticosteroid/long-acting beta2 agonist combination in a single inhaler, rather than in separate inhalers. If no combination product is available for the desired medications, carefully explain to the patient that it is very important that they continue taking the inhaled corticosteroid.

Meta-analysis of evidence from randomised controlled clinical trials shows that, for adult patients already taking an inhaled corticosteroid, concomitant treatment with an inhaled corticosteroid and a long-acting beta2 agonist:1

- reduces the risk of flare-ups, compared with increasing the dose of corticosteroids
- reduces the risk of flare-ups, compared with inhaled corticosteroids alone.

The studies included in this meta-analysis evaluated mainly budesonide/formoterol and fluticasone propionate/salmeterol.1 Each of the following inhaled corticosteroid/long-acting beta2 agonist combinations is available as a single inhaler:

- budesonide/formoterol
- fluticasone furoate/vilanterol
- fluticasone propionate/salmeterol
- fluticasone propionate/formoterol.

There are two types of dosing regimens for inhaled corticosteroid/long-acting beta2 agonist combination therapy:
• maintenance-only regimens (applicable to all available combinations)
• maintenance-and-reliever regimen (applicable only to the budesonide/formoterol combination).

Maintenance-only regimens

The fluticasone propionate/salmeterol combination and budesonide/formoterol combination appear to be equally effective when used for regular maintenance treatment, based on meta-analysis of evidence from clinical trials. Most of the evidence for inhaled corticosteroid/long-acting beta\textsubscript{2} agonist combination therapy is from studies using these combinations.

Less evidence from double-blind randomised controlled clinical trials is available for the newer combinations: fluticasone furoate/vilanterol and fluticasone propionate/formoterol:

• The fluticasone furoate/vilanterol combination is equivalent to a medium-to-high dose of inhaled corticosteroids. In adults and adolescents already taking inhaled corticosteroids, once-daily fluticasone furoate/vilanterol 100/25 mcg reduced the risk of severe flare-ups (requiring oral corticosteroids or hospitalisation) and improved lung function, compared with fluticasone furoate alone. Efficacy data for the comparison of fluticasone furoate/vilanterol with other inhaled corticosteroid/long-acting beta\textsubscript{2} agonist combinations is not available.

• In adults and adolescents with persistent asthma and FEV\textsubscript{1} 50–80% at baseline, fluticasone propionate/formoterol achieved improvement in FEV\textsubscript{1} comparable to that achieved with budesonide/formoterol in a 12-week randomised double-blind clinical trial. Other 12-week open-label studies have reported that fluticasone propionate/formoterol was as effective as budesonide/formoterol in improving lung function in adults and adolescents with poorly controlled asthma, and was as effective as fluticasone propionate/salmeterol in adults.

Long-acting beta\textsubscript{2} agonists should not be used without inhaled corticosteroids in the management of asthma.

Long-acting beta\textsubscript{2} agonists are well tolerated when given in combination with inhaled corticosteroids.

Maintenance-and-reliever regimen

The low-dose budesonide/formoterol combination can be used as both maintenance and reliever. Under this regimen, the combination is used for relief of asthma symptoms (instead of using a short-acting beta\textsubscript{2} agonist reliever), in addition to its use as regular maintenance treatment.

\textbf{Inhaled corticosteroid/long-acting beta-2 agonist combinations for adults: stepping up from inhaled corticosteroid alone}

• To avoid the possibility of patients taking a long-acting beta\textsubscript{2} agonist without an inhaled corticosteroid, long-acting beta\textsubscript{2} agonists should (whenever possible) be prescribed as inhaled corticosteroid/long-acting beta\textsubscript{2} agonist combination in a single inhaler, rather than in separate inhalers. If no combination product is available for the desired medications, carefully explain to the patient that it is very important that they continue taking the inhaled corticosteroid.

\textbf{Note:} Before any step-up in asthma treatment is considered, inhaler technique and adherence should be assessed and corrected.

In adults who experience asthma symptoms when taking inhaled corticosteroids (any dose) the addition of a long-acting beta\textsubscript{2} agonist reduces the rate of asthma flare-ups that require treatment with oral corticosteroids, improves lung function, reduces symptoms, and also reduces requirement for short-acting beta\textsubscript{2} agonists by a small amount.

Most adults with asthma that is not controlled by low-dose inhaled corticosteroid alone (despite good adherence and correct inhaler technique) will achieve better asthma control by switching to the combination of an inhaled corticosteroid and a long-acting beta\textsubscript{2} agonist.

In adults whose asthma is not well controlled by taking low-dose inhaled corticosteroids:

• the combination of an inhaled corticosteroid and a long-acting beta\textsubscript{2} agonist as maintenance treatment is a little more effective (reducing the rate of asthma flare-ups that require treatment with oral corticosteroids, improving lung function, reducing symptoms and reducing requirement for short-acting beta\textsubscript{2} agonists) than a higher dose of inhaled corticosteroids.

• the addition of long-acting beta\textsubscript{2} agonists is more effective than the addition of leukotriene receptor antagonists in reducing the risk of asthma flare-ups that require treatment with oral corticosteroids.

• the combination of low-dose budesonide and formoterol in a maintenance-and-reliever regimen is much more effective in reducing the risk of asthma flare-ups that require treatment with oral corticosteroids than a higher dose of inhaled corticosteroids.
In adults using moderate-to-high doses of inhaled corticosteroid, the addition of a long-acting beta \(_2\) agonist can reduce the inhaled corticosteroid dose requirement.\(^5\)

The fluticasone furoate/vilanterol combination is suitable only for patients who require a moderate-to-high dose of inhaled corticosteroid in combination with a long-acting beta \(_2\) agonist. It should be prescribed only as one inhalation once daily.\(^6\) The higher dose of fluticasone furoate/vilanterol (200/25 mcg) should not be used for patients with asthma who also have COPD, because of the increased risk of pneumonia.

▶ See: Managing coexisting asthma and COPD

### Inhaled corticosteroid/long-acting beta-2 agonist combinations for adults: patients not already taking regular inhaled corticosteroid

Initial treatment with an inhaled corticosteroid/long-acting beta \(_2\) agonist combination is not generally recommended for patients who have not already begun taking inhaled corticosteroids.

In patients not taking regular inhaled corticosteroids, starting preventer treatment with a combination of long-acting beta \(_2\) agonist and inhaled corticosteroid:\(^7\)

- is not more effective in reducing the risk of asthma flare-ups that require treatment with oral corticosteroids than starting with the same dose of inhaled corticosteroid alone. However, starting with combination therapy improves lung function, reduces symptoms and marginally reduces requirement for short-acting beta \(_2\) agonists, compared with starting with the same dose of inhaled corticosteroid
- is less effective in reducing the risk of asthma flare-ups that require treatment with oral corticosteroids than starting with a higher dose of inhaled corticosteroid.

**Note:** PBS status as at October 2016: ICS/LABA combination therapy as first-line preventer treatment is not subsidised by the PBS, except for patients with frequent symptoms while taking oral corticosteroids.

### Combination budesonide/formoterol maintenance-and-reliever regimen in adults and adolescents: overview of efficacy

Low-dose budesonide/formoterol combination can be used as reliever for asthma symptoms (instead of using a short-acting beta \(_2\) agonist reliever), in addition to its use as regular long-term preventer treatment.\(^7\) \(^8\) \(^10\) \(^11\) \(^13\) \(^17\)

The following formulations can be used in maintenance-and-reliever regimens:

- dry-powder inhaler (Symbicort Turbuhaler) 100/6 mcg or 200/6 mcg
- pressurised metered-dose inhaler (Symbicort Rapihaler) 50/3 mcg or 100/3 mcg.

Neither the 400/12 mcg dry-powder inhaler nor the 200/6 mcg pressurised metered-dose inhaler should be used in this way.

Overall, clinical trials show that budesonide/formoterol combination as maintenance and reliever reduces the risk of flare-ups that require oral corticosteroids, compared with other current preventer regimens and compared with a fixed higher dose of inhaled corticosteroids.\(^73\)

Pooled data from five randomised controlled trials assessing budesonide/formoterol maintenance-and-reliever regimens showed that similar or better levels of asthma control were achieved with budesonide/formoterol maintenance-and-reliever compared with the conventional maintenance regimen comparators.\(^10\)

- higher-dose budesonide
- same dose budesonide/formoterol
- higher-dose inhaled corticosteroid/long-acting beta \(_2\) agonist (budesonide/formoterol or fluticasone propionate/salmeterol).

In randomised clinical trials in patients with a history of asthma flare-up within the previous 12 months (and therefore at greater risk of flare-up in the next 12 months), the use of formoterol/budesonide as maintenance-and-reliever regimen reduced the risk of asthma flare-ups that required treatment with oral corticosteroids, compared with the use of any of the following (plus a short-acting beta \(_2\) agonist reliever as needed):\(^10\) \(^15\) \(^16\)

- the same combination as maintenance treatment only
- higher-dose combination as maintenance treatment only
- higher-dose inhaled corticosteroids.
Meta-analysis of six randomised controlled trials found that maintenance-and-reliever treatment with budesonide/formoterol reduced the risk of severe asthma flare-ups (use of oral corticosteroids for 3 days or more, hospitalisation or emergency department visits), compared with higher-dose inhaled corticosteroid alone, or in combination with a long-acting beta2 agonist.14

In open-label studies in which patients were not selected for a previous history of flare-ups, there was no overall difference in time to first flare-up between budesonide/formoterol as maintenance-and-reliever regimen and conventional maintenance regimens (including inhaled corticosteroid or inhaled corticosteroid/long-acting beta2 agonist combinations, leukotriene receptor antagonists, xanthines or any other asthma medicines) with rapid-onset beta2 agonist reliever (selected according to clinician’s choice).12 However, the inhaled corticosteroid dose was higher with conventional maintenance regimens.

Note: The fluticasone propionate/formoterol combination is approved by the Therapeutic Goods Administration only for regular maintenance therapy.

**Combination budesonide/formoterol maintenance-and-reliever regimen: dosage considerations**

**Starting dose**

When switching from inhaled corticosteroid to budesonide/formoterol combination as maintenance and reliever, it is expected that the maintenance dose of inhaled corticosteroid will be reduced.

Most available evidence is from clinical trials using the dry-powder inhaler combination product:

- A maintenance dose of 200 budesonide/6 mcg formoterol via dry-powder inhaler (1 actuation) twice daily appears to be equally effective as double this dose, regardless of the person’s previous dose of inhaled corticosteroid.6
- For patients with poor lung function7 or those whose asthma is not well controlled on regular inhaled corticosteroid or by the combination of an inhaled corticosteroid plus a long-acting beta2 agonist combination via dry-powder inhaler, a starting dose of 200/6 mcg two actuations twice daily may be more effective than lower doses as starting dose.13

For the newer pressurised metered-dose inhaler combination product, an equivalent maintenance dose would be 100 mcg budesonide/3 mcg formoterol (2 actuations twice daily).

For dose instructions:

- Go to: TGA-approved product information (PI) Symbicort (budesonide and eformoterol fumarate dihydrate) Turbuhaler (PDF/255KB)
- Go to: TGA-approved product information (PI) Symbicort (budesonide and eformoterol fumarate dihydrate) Rapihaler (PDF/306KB)

**Corticosteroid exposure**

Compared with conventional inhaled corticosteroid/long-acting beta2 agonist maintenance regimens, the use of budesonide/formoterol via pressurised metered-dose inhaler as maintenance and reliever reduces oral corticosteroid requirement, and may either increase, decrease or have a neutral effect on the total dose of inhaled corticosteroid (depending on the regimen).

Most available evidence is from clinical trials using the dry-powder inhaler combination product:

- In a randomised clinical trial in adults with a recent flare-up, the use of budesonide/formoterol in a maintenance-and-reliever regimen (200 mcg/6 mcg 2 puffs via dry-powder inhaler twice daily maintenance; 200 mcg/6 mcg 1 actuations as needed for relief of symptoms) resulted in higher mean daily exposure to inhaled corticosteroids, but lower exposure to systemic corticosteroids, compared with the use of budesonide/formoterol as maintenance only (200 mcg/6 mcg 2 actuations via dry powder inhaler twice daily).15
- In a randomised clinical trial in adults and adolescents, a budesonide/formoterol maintenance-and-reliever regimen (200 mcg/6 mcg 2 actuations via dry powder inhaler twice daily plus 200 mcg/6 mcg as needed) and a conventional salmeterol/fluticasone propionate maintenance regimen (50 mcg/250 mcg twice daily) resulted in similar mean daily inhaled corticosteroid doses, while the budesonide/formoterol maintenance-and-reliever regimen significantly reduced severe flare-ups requiring oral corticosteroids.18
- In another randomised clinical trial in adults and adolescents who had experienced a flare-up within the previous year, a budesonide/formoterol maintenance-and-reliever regimen (200 mcg/6 mcg 2 actuations via dry powder inhaler twice daily plus 200 mcg/6 mcg as needed) resulted in a lower mean dose of inhaled corticosteroid than a conventional maintenance dose of salmeterol/fluticasone propionate 50 mcg/500 mcg twice daily and reduced the rate of flare-ups requiring oral corticosteroids.11

**Beta-2 receptor tolerance**
Short-acting beta₂ agonists

In laboratory studies, regular use of short-acting beta₂ agonists leads to receptor tolerance (down-regulation) to their bronchoprotective and bronchodilator effects.\textsuperscript{75}

In clinical trials, regular use of short-acting beta₂ agonists is associated with greater instability of lung function and a higher risk of asthma flare-ups.\textsuperscript{76, 77}

In clinical practice, frequent use of short-acting beta₂-agonists may lead to worsening of asthma symptoms. This may be improved by deliberately reducing short-acting beta₂ agonist use and, in some cases, using ipratropium bromide as an alternative reliever medicine medication to allow restoration of beta₂-receptor responsiveness.\textsuperscript{78}

Long-acting beta₂ agonists

In laboratory studies, regular use of long-acting beta₂ agonists results in reduced duration of protection against airway hyperresponsiveness, and prolonged recovery of airway function after short-acting beta₂ agonist, which is thought to be due to receptor tolerance (down-regulation) of beta₂ receptors in bronchial smooth muscle and mast cells (evidence from laboratory studies).\textsuperscript{79} These findings have led to concerns about reduced effectiveness of beta₂ agonists when needed for preventing exercise-induced bronchoconstriction or reversing acute asthma due to trigger exposure.\textsuperscript{79} Sensitivity to short-acting beta₂ agonists returns to normal within 72 hours of stopping long-acting beta₂ agonist treatment.\textsuperscript{79}

However, the clinical effects of beta receptor tolerance in patients taking long-acting beta₂ agonists are unclear.\textsuperscript{80} Clinical trials assessing regular use of long-acting beta₂ agonists in combination with inhaled corticosteroids have not reported clinically significant adverse effects attributable to beta receptor tolerance.\textsuperscript{70} Two Emergency Department studies in patients with acute asthma did not observe increased risk of hospitalisation among those taking salmeterol.\textsuperscript{81, 82}

The use of budesonide/formoterol as a reliever may result in lower total use of beta₂ agonist compared with the use of short-acting beta₂ agonist relievers, based on a study in patients taking regular maintenance budesonide/formoterol, which monitored inhaler actuations electronically.\textsuperscript{15}

Ipratropium for adults

Regular ipratropium bromide in addition to as-needed short-acting beta₂ agonist does not appear to provide clinically significant benefit over as-needed short-acting beta₂ agonists alone.\textsuperscript{83}

Note: Ipratropium bromide may be used in the management of severe acute asthma.

See: Managing acute asthma in clinical settings

References


34. Suissa S, Ernst P, Kezouh A. Regular use of inhaled corticosteroids and the long term prevention of hospitalisation for asthma. *Thorax*. 2002; 57: 880-884. Available from: [http://thorax.bmj.com/content/57/10/880.full](http://thorax.bmj.com/content/57/10/880.full)


Stepping down treatment in adults

Recommendations

If a patient taking moderate-dose or high-dose inhaled corticosteroid (with or without long-acting beta_2_ agonist) has experienced good asthma control for 2–3 months and is at low risk of flare-ups, consider stepping down by one step.

- Do not attempt dose reduction or step down if the person is about to travel, during a respiratory infection, or when at risk of a respiratory tract infection (e.g. during the colder winter months).

Table. Risk factors for adverse asthma outcomes in adults and adolescents
Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Figure. Stepped approach to adjusting asthma medication in adults
Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

Table. Guide to selecting and adjusting asthma medication for adults and older adolescents

<table>
<thead>
<tr>
<th>Clinical situation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Newly diagnosed asthma</strong></td>
<td>Consider low-dose ICS (plus SABA as needed)</td>
</tr>
<tr>
<td></td>
<td>If symptoms severe at initial presentation, consider one of:</td>
</tr>
<tr>
<td></td>
<td>• ICS plus a short course of oral corticosteroids</td>
</tr>
<tr>
<td></td>
<td>• a short initial period of high-dose ICS then step down</td>
</tr>
<tr>
<td></td>
<td>• (private prescription) combination ICS/LABA†</td>
</tr>
<tr>
<td></td>
<td>See: Table. Initial treatment choices (adults and adolescents not already using a preventer)</td>
</tr>
<tr>
<td><strong>Good recent asthma symptom control</strong></td>
<td>If maintained 2–3 months, no flare-up in previous 12 months and low risk for flare-ups, step down where possible (unless already on low-dose ICS)</td>
</tr>
<tr>
<td><strong>Partial recent asthma symptom control</strong></td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td></td>
<td>If no improvement, consider increasing treatment by one step and reviewing (if still no improvement, return to previous step, review diagnosis and consider referral)</td>
</tr>
<tr>
<td><strong>Poor recent asthma symptom control</strong></td>
<td>Review inhaler technique and adherence – correct if suboptimal</td>
</tr>
<tr>
<td></td>
<td>Confirm that symptoms are likely to be due to asthma</td>
</tr>
<tr>
<td></td>
<td>Consider increasing treatment until good asthma control is achieved, then step down again when possible</td>
</tr>
<tr>
<td></td>
<td>Consider referral for assessment or add-on options</td>
</tr>
</tbody>
</table>
Clinical situation | Action
--- | ---
**Difficult-to-treat asthma ‡** |  

**Patient with risk factors §** | Tailor treatment to reduce individual risk factors

‡ Poor recent asthma symptom control despite ICS/LABA combination at high–medium dose with good adherence and inhaler technique.

§ Risk factors for asthma events or adverse treatment effects, irrespective of level of recent asthma symptom control.

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Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beclometasone dipropionate †</strong></td>
<td></td>
<td>100–200</td>
<td>250–400</td>
<td>&gt;400</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td></td>
<td>200–400</td>
<td>500–800</td>
<td>&gt;800</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td></td>
<td>80–160</td>
<td>240–320</td>
<td>&gt;320</td>
</tr>
<tr>
<td>*<em>Fluticasone furoate</em> **</td>
<td>—</td>
<td>100</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td></td>
<td>100–200</td>
<td>250–500</td>
<td>&gt;500</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources


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How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).
During pregnancy, consider stepping down only if the woman is taking an inappropriately high dose of a medicine. Note: Stepping down is not a priority during pregnancy because of the risk of flare-up.

**How this recommendation was developed**

**Consensus**
Based on clinical experience and expert opinion (informed by evidence, where available).

Before stepping down:

- find out what dose and how often the person is actually taking their prescribed preventer medicines. (To elicit accurate information, ask in a non-judgemental, empathic way.)
- document current level of asthma control and risk factors
- make sure the patient’s written asthma action plan is up to date.

**Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment**

<table>
<thead>
<tr>
<th>1. Many people don’t take their medication as prescribed. In the last four weeks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).</td>
</tr>
<tr>
<td>◦ how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)</td>
</tr>
<tr>
<td>◦ each time, how many puffs would you take? One? Two? (etc).</td>
</tr>
</tbody>
</table>

2. Do you find it easier to remember your medication in the morning, or the evening?


**Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)**

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>• Daytime symptoms ≤2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week†</td>
</tr>
<tr>
<td>• Need for reliever ≤2 days per week†</td>
<td>• Need for reliever &gt;2 days per week†</td>
<td>• Need for reliever &gt;2 days per week†</td>
</tr>
<tr>
<td>• No limitation of activities</td>
<td>• Any limitation of activities</td>
<td>• Any limitation of activities</td>
</tr>
<tr>
<td>• No symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

**Adapted from:**
Table. Risk factors for adverse asthma outcomes in adults and adolescents

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Table. Management of risk factors for adverse asthma outcomes in adults

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
</table>
| **Any risk factor for flare-ups** | Check patient has an appropriate action plan  
Carefully check inhaler technique and adherence, and identify any barriers to good adherence  
Review frequently (e.g. every 3 months) |
| **Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months** | Ask about triggers for flare-ups, and lead time |
| **History of intubation or intensive care unit admission for asthma** | Ensure action plan recommends early medical review when asthma worsens |
| **Hospitalisation or ED visit for asthma in the past month** | Emphasise importance of maintaining regular ICS use after symptoms improve  
Confirm that patient has resumed using SABA only when needed for symptoms |
| **High SABA use (>2 canisters per month)** | Check lung function  
If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA |
| **Long-term high-dose ICS** | Consider gradual reduction of ICS dose if symptoms stable  
Monitor regularly (e.g. assessment of bone density, regular eye examinations)  
For local side-effects, ensure inhaler technique is appropriate |
| **Poor lung function (even if few symptoms)** | Consider 3-month trial of higher ICS dose, then recheck lung function  
Consider referral for detailed specialist investigation |
<p>| <strong>Sensitivity to unavoidable allergens (e.g. Alternaria species of common moulds)</strong> | Refer for further investigation and management |
| | Emphasise the importance of avoiding smoke |</p>
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
</table>
| **Exposure to cigarette smoke (smoking or environmental exposure)**        | Provide quitting strategies  
Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)  
Refer for assessment of asthma–COPD overlap                                                                 |
| **Difficulty perceiving airflow limitation or the severity of exacerbations** | Regular PEF monitoring  
Action plan should recommend early review and measurement of lung function                                                                 |
| **No current written asthma action plan**                                  | Provide and explain written asthma action plan                                                                                                         |

† In addition to actions applicable to all risk factors

Asset ID: 41

How this recommendation was developed

Consensus  
Based on clinical experience and expert opinion (informed by evidence, where available).

When stepping down, make small dose adjustments gradually (e.g. reduce inhaled corticosteroid by 25–50% at intervals of 2–3 months) by stepping down through the available doses.

- The fluticasone furoate/vilanterol combination is not available in a low dose

How this recommendation was developed

Consensus  
Based on clinical experience and expert opinion (informed by evidence, where available).

If after stepping down the person experiences an overall increase in symptoms and/or decrease in lung function, they should resume their previous dose.

How this recommendation was developed

Consensus  
Based on clinical experience and expert opinion (informed by evidence, where available).

For adults taking low-dose inhaled corticosteroid in combination with a long-acting beta₂ agonist, consider either of the following options if asthma is well controlled for 2–3 months:

- maintain this treatment long term  
- replace combination inhaler with an inhaled corticosteroid at the same dose.

- If withdrawal of long-acting beta₂ agonist leads to loss of asthma symptom control, this will usually be evident within the first few days and the person should resume combination treatment.

**Table. Definitions of ICS dose levels in adults**
### Table. Confirming the diagnosis of asthma in a person using preventer treatment

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/9

### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
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<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Beclometasone dipropionate †</strong></td>
<td>100–200</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
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</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
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</tr>
<tr>
<td><strong>Fluticasone furoate</strong></td>
<td>—</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

**Sources**


Asset ID: 22

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Reddel et al. 2010
- Thomas et al. 2011
- Brozek et al. 2012

For adults with a confirmed asthma diagnosis taking low-dose inhaled corticosteroid alone, maintain treatment long term to reduce the risk of flare-ups.

- Many patients who experience few asthma symptoms stop taking preventer treatment without discussing with their prescriber. Explain that regular low-dose inhaled corticosteroid will reduce their risk of flare-ups, even if day-to-day symptoms are infrequent.
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<thead>
<tr>
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Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources

Asset ID: 22

How this recommendation was developed
Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Rank et al. 2013

For adults prescribed low-dose ICS for an indefinite period, explain that:

- the main purpose of long-term low-dose ICS-based preventer is to reduce the risk of flare-ups, even if day-to-day symptoms are infrequent
- even if the person has not experienced asthma symptoms for some time, they should not stop taking their preventer without discussing first.

Table. Definitions of ICS dose levels in adults

<table>
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Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources


Asset ID: 22

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

For adolescents taking low-dose inhaled corticosteroid whose asthma has been well controlled for several months, consider a trial cessation of inhaled corticosteroid.
Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily. Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources

More information

Stepping down regular asthma medicines in adults
The main aim of medical treatment for asthma is to achieve good asthma control and minimise the risks of asthma with the lowest effective dose of preventer medicines for each individual.
Stepping down is considered when the patient has experienced good asthma control for 2–3 months and is at low risk of flare-ups.

Figure. Stepped approach to adjusting asthma medication in adults
Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

General tips
It is important to ascertain the person’s actual treatment regimen before stepping down, because many patients may already be taking their preventer only intermittently.

Those who deliberately avoid taking their preventer due to concerns about inhaled corticosteroids may accept regular daily treatment at a lower dose, with an action plan to deal with flare-ups.

Steps down should be planned before the patient has finished their current inhaler, so that the previous dose can be resumed immediately if asthma control deteriorates.

Patients should be advised to step back up if they or their clinician judge that their asthma is worse overall (not just after the first time they experience asthma symptoms after stepping down). Patients and clinicians should agree beforehand on criteria for worsening asthma control.

Some patients are very concerned about reducing their dose (despite the risk of treatment-related adverse effects) and may prefer to stay on high doses for long periods. To enable early detection of deterioration in control during step-down, patients can be asked to monitor their peak flow for 2 weeks before, and 3–4 weeks after, the dose reduction.

Stepping down inhaled corticosteroid dose
For many patients with well-controlled asthma taking inhaled corticosteroid/long-acting beta2 agonist combinations or inhaled corticosteroids alone, the inhaled corticosteroid dose can be reduced without loss of asthma control if downward dose adjustments are made gradually.1,5

The dose can be reduced by stepping down through the available formulations.

Note: TGA-registered fluticasone furoate/vilanterol combinations contain moderate-to-high doses of inhaled corticosteroid (100/25 mcg and 200/25 mcg respectively).

Ceasing inhaled corticosteroid
Patients with well-controlled asthma who stop taking regular low-dose inhaled corticosteroid treatment have an increased risk of flare-ups, compared with those who continue inhaled corticosteroids.4
It may sometimes be necessary to stop treatment temporarily in order to confirm the diagnosis of asthma in a person taking inhaled corticosteroids. In this situation, close monitoring of symptom control is needed.

### Table. Confirming the diagnosis of asthma in a person using preventer treatment

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/9

### Table. Definitions of ICS dose levels in adults

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<td></td>
<td>&gt;400</td>
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<tr>
<td>Budesonide</td>
<td>200–400</td>
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<tr>
<td></td>
<td>500–800</td>
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<td></td>
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<tr>
<td>Ciclesonide</td>
<td>80–160</td>
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<td></td>
<td>240–320</td>
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<td></td>
<td>&gt;320</td>
</tr>
<tr>
<td>Fluticasone furoate*</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>100</td>
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<tr>
<td></td>
<td>200</td>
</tr>
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**Note:** The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

### Sources


Asset ID: 22

### Ceasing long-acting beta2 agonist

Patients whose asthma is well controlled with an inhaled corticosteroid/long-acting beta2 agonist combination (either as conventional maintenance treatment plus short-acting beta2 agonist reliever, or as budesonide/formoterol maintenance-and-reliever therapy) can continue taking this regimen long-term. The dose can be reduced by stepping down through the available formulations.

Alternatively, for patients taking an inhaled corticosteroid/long-acting beta2 agonist combination as maintenance treatment, the combination can be replaced with an inhaled corticosteroid inhaler at the same dose. However, a meta-analysis of several studies reported deterioration in asthma control after ceasing long-acting beta2 agonist treatment in patients with asthma previously stabilised on inhaled corticosteroid/long-acting beta2 agonist combination. Therefore, if inhaled corticosteroid/long-acting beta2 agonist is replaced by inhaled corticosteroid only, patients should be advised to start taking their old combination inhaler again if asthma worsens within the first few days after switching.

**Note:** For patients taking fluticasone furoate/vilanterol, no studies are available to guide stepping down. Options include stepping down to inhaled corticosteroid alone (recommended in the TGA-approved Product Information), or stepping down to a different inhaled corticosteroid/long-acting beta2 agonist combination that will achieve a lower inhaled corticosteroid dose. (e.g. Stepping down from treatment with once-daily medium dose fluticasone furoate/vilanterol [100/25 mcg] can be achieved by switching to twice-daily low-dose fluticasone propionate/salmeterol [100/50 mcg or 50/25 mcg]). With either option, patients need careful explanation, including clear written instructions, to avoid potential confusion when changing between inhaler devices and dosing frequencies.
Safety of stepping down treatment during pregnancy

It may not be feasible to step down (e.g. reduce the inhaled corticosteroid dose or cease long-acting beta\(_2\) agonist) during pregnancy, because this is usually accomplished over several months while monitoring asthma control.

Several studies have reported deterioration in asthma control after ceasing long-acting beta\(_2\) agonist treatment in adults with asthma previously stabilised on inhaled corticosteroid/long-acting beta\(_2\) agonist combination.\(^3\)\(^,\)\(^2\) If inhaled corticosteroid/long-acting beta\(_2\) agonist combination is replaced by inhaled corticosteroid only, patients should be advised to start taking their old combination inhaler again if asthma worsens within the first few days after switching.

In a woman planning a pregnancy, a failed treatment trial of inhaled corticosteroid alone may demonstrate that she needs to continue taking combination therapy during pregnancy in order to maintain asthma control.

Ongoing monitoring of asthma in adults

Asthma monitoring includes both self-monitoring by patients and periodic assessments by the clinician.

Asthma management in primary care should include periodic reassessment of (both):\(^7\)

- **recent asthma symptom control** based on symptoms over the previous 4 weeks, with or without lung function testing.
  - In many patients in primary care, symptoms, reliever use and lung function are useful surrogate measures of the degree to which the underlying disease process is controlled.
- **risk factors** that predict poor asthma outcomes (e.g. flare-ups, accelerated decline in lung function, or treatment-related adverse effects) independent of the person’s level of recent asthma symptom control.

Planned asthma check-ups should be made at intervals determined by both the individual’s level of recent asthma symptom control and risk factors. The following is a guide:

- 1–3 months after each adjustment to medications
- yearly for a person with no flare-up in the past 12 months and good symptom control for at least a year
- every 6 months for a person who has had a flare-up within the past 12 months or who has other risk factors for flare-ups or life-threatening asthma (e.g. smoking, previous recording of poor lung function on spirometry, history of admission to an intensive care unit for asthma)
- at least every 3 months for a person with severe asthma, work-exacerbated asthma, poor perception of airflow limitation, frequent rhinosinusitis symptoms, or other comorbid conditions that affect asthma control
- every 4–6 weeks for pregnant women.

**Note:** For patients with occupational asthma, management and follow-up by a specialist with experience in occupational asthma is recommended.

See: Managing asthma during pregnancy

See: Work-related asthma

Written asthma action plans for adults

Every person with asthma should have their own written asthma action plan.

When provided with appropriate self-management education, self-monitoring and medical review, individualised written action plans consistently improve asthma health outcomes if they include two to four action points, and provide instructions for use of both inhaled corticosteroid and oral corticosteroids for treatment of flare-ups.\(^8\) Written asthma action plans are effective if based on symptoms\(^9\) or personal best peak expiratory flow (not on percentage predicted).\(^8\)

**How to develop and review a written asthma action plan**

A written asthma action plan should include all the following:

- a list of the person’s usual medicines (names of medicines, doses, when to take each dose) – including treatment for related conditions such as allergic rhinitis
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids) in all the following situations:
  - when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities)
  - when asthma symptoms get substantially worse (e.g. when needing reliever again within 3 hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
  - when peak flow falls below an agreed rate (for those monitoring peak flow each day)
During an asthma emergency.

- instructions on when and how to get medical care (including contact telephone numbers)
- the name of the person writing the action plan, and the date it was issued.

### Table. Options for adjusting medicines in a written asthma action plan for adults

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42

<table>
<thead>
<tr>
<th>Table. Checklist for reviewing a written asthma action plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Ask if the person (or parent) knows where their written asthma action plan is.</td>
</tr>
<tr>
<td>- Ask if they have used their written asthma action plan because of worsening asthma.</td>
</tr>
<tr>
<td>- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether they find it suitable and effective.</td>
</tr>
<tr>
<td>- Check that the medication recommendations are appropriate to the person's current treatment.</td>
</tr>
<tr>
<td>- Check that all action points are appropriate to the person's level of recent asthma symptom control.</td>
</tr>
<tr>
<td>- Check that the person (or parent) understands and is satisfied with the action points.</td>
</tr>
<tr>
<td>- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person's usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.</td>
</tr>
<tr>
<td>- Check that the contact details for medical care and acute care are up to date.</td>
</tr>
</tbody>
</table>

Asset ID: 43

### Templates for written asthma action plans

Templates are available from National Asthma Council Australia:

- National Asthma Council Australia colour-coded plan, available as a printed handout that folds to wallet size and as the Asthma Buddy smartphone application
- Asthma Cycle of Care asthma action plan
- A plan designed for patients using budesonide/formoterol combination as maintenance and reliever therapy
- Remote Indigenous Australian Asthma Action Plan
- Every Day Asthma Action Plan (designed for remote Indigenous Australians who do not use written English – may also be useful for others for whom written English is inappropriate).

Some written asthma action plans are available in community languages.

Software for developing electronic pictorial asthma action plans is available online.

**Go to:** National Asthma Council Australia’s [Asthma Action Plan Library](https://www.asthmahandbook.org.au)  
**Download:** Imperial College London’s [Electronic Asthma Action Plan (ZIP/9.9 MB)](https://www.asthmahandbook.org.au)

### Inhaled corticosteroids for adults: doses

Most of the benefit of inhaled corticosteroid is achieved with doses at the upper limit of the low-dose range (i.e. equivalent to 400 mcg budesonide per day, 200 mcg HFA beclometasone, 160 mcg ciclesonide or 200 mcg fluticasone propionate).

On average, higher doses provide relatively little extra benefit, but are associated with a higher risk of adverse effects. However, a small proportion of individuals may need a higher dose to achieve asthma control.

The recommendation to start inhaled corticosteroid at low dose is based on the following evidence.

A meta-analysis of results from randomised controlled trials comparing different doses of inhaled corticosteroids showed:

- An effective starting dose is 200–400 mcg/day for fluticasone propionate, 400–800 mcg/day for budesonide, or 200–400 mcg/day beclometasone.
- A starting dose higher than 800 mcg/day budesonide, 400 mcg/day fluticasone propionate, or 400 mcg beclometasone does not provide enough clinical benefit over lower doses to warrant routinely starting with high doses.
- Starting with a moderate dose of inhaled corticosteroid is as effective as commencing with a high dose and down-titrating. Although it may be reasonable to use a high starting dose then reduce the dose, down-titration cannot be ensured in practice (e.g. if the person does not return for planned review).
• High doses of inhaled corticosteroids may be more effective than a moderate or low dose for controlling airway hyperresponsiveness, but this may not equate to a clinical benefit.

Meta-analyses of inhaled corticosteroid safety have shown that the risk of local adverse effects (e.g. hoarseness, oral candidiasis) and the risk of systemic adverse effects (e.g. changes in hypothalamic-pituitary-adrenal function) increase significantly at higher doses. The risk of adrenal suppression should be considered whenever high doses are used (particularly of more potent inhaled corticosteroids), or when the patient uses concomitant medicines that inhibit cytochrome P450 (e.g. ritonavir, erythromycin or ketoconazole).

Notes
Dose equivalent for beclometasone applies to Qvar CFC-free formulation. Other brands may differ.
Do not use beclometasone dose recommendations from outdated or overseas guidelines based on older formulations containing CFC propellant – doses are different.

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Sources
Asset ID: 22

References


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<table>
<thead>
<tr>
<th>Usual treatment</th>
<th>Options for adjustments when asthma worsening</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Any treatment (applies to all regimens)</strong></td>
<td>Option 1: Increase reliever as needed in response to symptoms</td>
</tr>
<tr>
<td></td>
<td>Option 2: N/A</td>
</tr>
<tr>
<td><strong>Short-acting beta&lt;sub&gt;2&lt;/sub&gt;-agonist reliever only (no preventer)</strong></td>
<td>Option 1: If symptoms continue to worsen, start short course prednisone (e.g. 37.5–50 mg each morning for 5–10 days)</td>
</tr>
<tr>
<td></td>
<td>Option 2: Start regular ICS-containing preventer treatment, and continue for at least 2–4 weeks. Ensure patient knows how to use the inhaler correctly</td>
</tr>
<tr>
<td><strong>ICS-only preventer</strong></td>
<td>Option 1: Increase dose early (e.g. multiply dose by 4) for 7–14 days §</td>
</tr>
<tr>
<td></td>
<td>Option 2: Start short course prednisone (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual dose of ICS</td>
</tr>
<tr>
<td><strong>ICS/LABA combination</strong></td>
<td>Option 1: Budesonide/formoterol (Symbicort) maintenance-and-reliever regimen</td>
</tr>
<tr>
<td></td>
<td>Take extra doses of budesonide/formoterol as needed to relieve symptoms, up to a maximum of 72 mcg formoterol per day (12 actuations of 100/6 mcg or 200/6 mcg via dry-powder inhaler or 24 actuations of 50/3 mcg or 100/3 mcg via pressurised metered-dose inhaler per day) No more than 6 actuations at one time</td>
</tr>
<tr>
<td></td>
<td>Option 2: Start short course prednisone (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual budesonide/formoterol regimen</td>
</tr>
<tr>
<td><strong>Budesonide/formoterol (Symbicort) conventional maintenance regimen</strong></td>
<td>Option 1: Increase dose of budesonide/formoterol up to a maximum of 72 mcg formoterol daily for 7–14 days</td>
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<td></td>
<td>Option 2: Start short course prednisone (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual dose of budesonide/formoterol</td>
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<tr>
<td><strong>Fluticasone furoate/vilanterol (Breo)</strong></td>
<td>Option 1: If using medium dose (100/25 mcg): Replace with highest strength formulation of</td>
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<td>Option 2: Start short course prednisone (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual</td>
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</table>
### Usual treatment

<table>
<thead>
<tr>
<th>Usual treatment</th>
<th>Options for adjustments when asthma worsening</th>
</tr>
</thead>
</table>
| **Fluticasone propionate/formoterol** (Flutiform)                                | **Option 1** | **Option 2** *  
| same medicine (fluticasone furoate/vilanterol 200/25 mcg one inhalation once daily) for 7–14 days | dose of fluticasone furoate/vilanterol                                                                                                                                  |
| If using 50/5 mcg: Replace with highest strength formulation of same medicine (fluticasone propionate/formoterol 250/10 mcg) for 7–14 days | **Start short course prednisone** (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual dose of fluticasone propionate/formoterol |
| If using 125/5 mcg: Increase dose (e.g. multiply dose by 2) to achieve equivalent of highest strength formulation of same medicine (fluticasone propionate/formoterol 250/10 mcg) for 7–14 days | **Increase ICS dose (e.g. multiply ICS dose by 4) by adding a separate fluticasone propionate inhaler for 7–14 days** § |
| If using 250/10 mcg: Increase ICS dose (e.g. multiply ICS dose by 4) by adding a separate fluticasone propionate inhaler for 7–14 days | **Increase ICS dose (e.g. multiply ICS dose by 4) by adding a separate fluticasone propionate inhaler for 7–14 days** § |
| Increase fluticasone propionate/salmeterol if necessary to achieve total daily dose of salmeterol 100 mcg | **Start short course prednisone** (e.g. 37.5–50 mg each morning for 5–10 days) in addition to usual dose of fluticasone propionate/salmeterol |

* Second-line options for clinicians to consider when writing instructions for patients. The individual’s written asthma action plan should contain only one clear action for each situation.

† Increase only the fluticasone propionate dose (e.g. by prescribing a separate fluticasone propionate inhaler for 7–14 days in addition to the combination inhaler). The salmeterol dose should not be increased above 100 mcg/day.

§ This option may be preferred over oral corticosteroids for patients who experience significant mood effects or other significant side-effects (e.g. hyperglycaemia) with oral corticosteroids. It is unsuitable for patients who cannot tolerate increased risk of dysphonia (e.g. singers, actors, teachers) or who cannot afford an additional inhaler. For fluticasone furoate (Arnuity), the dose increase should take into account the fact that available formulations are medium and high doses, and that the inhaler must be discarded one month after opening.

**Notes**

The table provides options for adjustments the patient can make when asthma is getting worse (needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities, or when the use of...
reliever is not achieving rapid relief from symptoms). After choosing the most suitable strategies for the individual, the clinician should translate these into clear, easy-to-follow instructions in the person’s written asthma action plan.

For some preventer formulations, the suggested option may result in doses above those recommended in TGA-approved product information. If high doses are needed, they should be continued for only 7–14 days then reduced.

Templates for written asthma action plans (including templates designed for people using various preventer regimens) are available from the National Asthma Council Australia.

**Sources**


**Note:** PBS status as at October 2016: Fluticasone furoate is not subsidised by the PBS, except in combination with vilanterol.

*Back to top*

Asset ID: 42
Planning and conducting asthma review in adults

In this section

<table>
<thead>
<tr>
<th>Planning reviews</th>
<th>Planning asthma review and follow-up for adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunistic review</td>
<td>Reviewing asthma opportunistically in adults</td>
</tr>
<tr>
<td>Respiratory symptom visits</td>
<td>Reviewing asthma in adults during visits for respiratory symptoms</td>
</tr>
<tr>
<td>Scheduled asthma visits</td>
<td>Conducting asthma review in adults at scheduled asthma visits</td>
</tr>
<tr>
<td>Lung function testing</td>
<td>Spirometry and other lung function tests in asthma review for adults</td>
</tr>
</tbody>
</table>
Planning asthma review and follow-up

Recommendations

Set up a system to help identify patients with asthma and to schedule asthma reviews.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

Assess recent asthma symptom control at all the following times:

- when the person presents with uncontrolled asthma symptoms
- at follow-up after an asthma flare-up
- at follow-up 1–3 months after beginning preventer treatment or adjusting the dose
- at scheduled asthma review visits
- opportunistically at non-asthma visits
- every 4–6 weeks during pregnancy.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

Validated checklists or questionnaires can be used at each visit to assess recent asthma symptom control or to screen for poor asthma control, e.g:

- **Asthma Score (Asthma Control Test)**
- Primary care Asthma Control Screening
- **Asthma Control Questionnaire (ACQ)**

*Table. Primary care Asthma Control Screening tool (PACS)*

<table>
<thead>
<tr>
<th>Have you experienced any of the following more than once a week in the last month?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms of asthma, cough, wheeze, shortness of breath</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Waking at night because of asthma</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chest tightness on waking</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Difficulty in performing vigorous activity like running, lifting heavy objects, exercise</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Have you experienced any of the following more than once a week in the last month? Yes No

| Difficulty in performing moderate activities like vacuuming, climbing flights of stairs | • | • |

Interpretation: 'Yes' to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.


Asset ID: 87

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Plan regular review of risk factors for flare-ups, accelerated decline in lung function, or treatment-related adverse effects.

**Table. Risk factors for adverse asthma outcomes in adults and adolescents**

Please view and print this figure separately: [https://www.asthmahandbook.org.au/table/show/40](https://www.asthmahandbook.org.au/table/show/40)

**Table. Management of risk factors for adverse asthma outcomes in adults**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any risk factor for flare-ups</td>
<td>Check patient has an appropriate action plan</td>
</tr>
<tr>
<td></td>
<td>Carefully check inhaler technique and adherence, and identify any barriers to good adherence</td>
</tr>
<tr>
<td></td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months</td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td>History of intubation or intensive care unit admission for asthma</td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
</tr>
<tr>
<td></td>
<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
</tr>
<tr>
<td>High SABA use (&gt;2 canisters per month)</td>
<td>Check lung function</td>
</tr>
<tr>
<td></td>
<td>If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA</td>
</tr>
<tr>
<td>Risk factor</td>
<td>Clinical action †</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Long-term high-dose ICS</strong></td>
<td>Consider gradual reduction of ICS dose if symptoms stable Monitor regularly (e.g. assessment of bone density, regular eye examinations) For local side-effects, ensure inhaler technique is appropriate</td>
</tr>
<tr>
<td><strong>Poor lung function (even if few symptoms)</strong></td>
<td>Consider 3-month trial of higher ICS dose, then recheck lung function Consider referral for detailed specialist investigation</td>
</tr>
<tr>
<td><strong>Sensitivity to unavoidable allergens (e.g. Alternaria species of common moulds)</strong></td>
<td>Refer for further investigation and management</td>
</tr>
<tr>
<td><strong>Exposure to cigarette smoke (smoking or environmental exposure)</strong></td>
<td>Emphasise the importance of avoiding smoke Provide quitting strategies Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma) Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td><strong>Difficulty perceiving airflow limitation or the severity of exacerbations</strong></td>
<td>Regular PEF monitoring Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td><strong>No current written asthma action plan</strong></td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

Asset ID: 41

How this recommendation was developed
Adapted from existing guidance
Based on reliable clinical practice guideline(s) or position statement(s):
- Global Initiative for Asthma, 2012

Review each patient’s written asthma action plan at least once a year.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

When altering the medication or dose, flag the patient’s medical record with a reminder to ask at next visit:
- whether they thought the treatment change was helpful
- whether they are still taking that dose.
For patients who need long-term high-dose inhaled corticosteroids to maintain good asthma control or need frequent courses of oral corticosteroids, arrange monitoring of bone mineral density and glucose metabolism status.

Advise patients to:

- have regular eye examinations
- do regular weight-bearing physical activity
- have adequate dietary calcium intake
- maintain adequate vitamin D levels.

### Table. Definitions of ICS dose levels in adults

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Beclometasone dipropionate †</strong></td>
<td>100–200</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td>200–400</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td>80–160</td>
</tr>
<tr>
<td><strong>Fluticasone furoate</strong></td>
<td>–</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for Qvar (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

### Sources


Asset ID: 22
When dispensing asthma medicines in pharmacies, routinely ask when was the person’s last asthma review. Encourage them to visit their GP for comprehensive review as soon as possible if any of the following apply:

- Last review was 6 months ago or earlier.
- The person has recently experienced poor asthma control or worsening asthma.
- The person does not have a current written asthma action plan.
- The person is experiencing acute asthma.

“How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Inhaled corticosteroids for adults: adverse effects

Local adverse effects
Hoarseness (dysphonia) and candidiasis are the most common local adverse effects of inhaled corticosteroids with both pressurised metered-dose inhalers and dry-powder inhalers.

- The rate of dysphonia among patients taking inhaled corticosteroids has been estimated at 5–20%. However, higher rates of up to 58% have been reported in some studies. The risk varies with the device used.
- The rate of oropharyngeal candidiasis among adults using inhaled corticosteroids has been estimated at 5–7%, with positive mouth culture for *Candida albicans* in approximately 25% of patients. However, higher rates of up to 70% have been reported in some studies. The risk depends on the formulation, dose and dose frequency.

When taking inhaled corticosteroids via pressurised metered-dose inhalers, the use of a spacer reduces the risk of dysphonia and candidiasis. Spacers improve delivery of the medicine to the airways. Rinsing the mouth with water after inhaling reduces the risk of oropharyngeal candidiasis. Quick mouth rinsing immediately after inhaling effectively removes a high proportion of remaining medicine.

The incidence of dysphonia and candidiasis is significantly lower with ciclesonide than with equivalent doses of fluticasone propionate. This may an important consideration for patients who experience dysphonia, particularly for those for whom voice quality is important (e.g. singers, actors, teachers). With ciclesonide, the rate of adverse effects may not differ when taken with or without a spacer.

Systemic adverse effects
Cross-sectional population studies have reported lower bone mineral density with long-term use of high doses of inhaled corticosteroid, but the effect on fracture risk in patients with asthma is unclear.

A meta-analysis of randomised controlled trials in adults older than 40 years with COPD (in which osteoporosis is more common) or asthma found no association between the use of inhaled corticosteroid and fracture risk overall, but found a slight increase in fracture risk among those using high doses.

Cross-sectional studies show a dose–response relationship between inhaled corticosteroid use for asthma or COPD, and risk of cataracts in adults.

Long-term inhaled corticosteroid use for asthma or COPD is associated with a small increase in the risk of developing diabetes, and in the risk of diabetes progression. These risks are greatest at higher doses (equivalent to fluticasone propionate 1000 mcg/day or higher).

The incidence of osteoporosis, cataracts and diabetes increases with age, and these conditions are also more common in smokers and in patients with COPD. Few studies have assessed risk specifically in patients with asthma.

Patients at risk of osteoporosis should be referred for bone density screening, screened for vitamin D and/or calcium deficiency, and provided with advice about maintaining bone health.
Patient concerns about adverse effects

The prevalence of side effects that patients consider troubling increases with increasing dose of inhaled corticosteroids. Mid and high doses are consistently associated with a higher intensity and a higher prevalence of reported adverse effects, after controlling for other factors.

A high proportion of people with asthma may have misunderstandings and fears about using inhaled corticosteroids, such as fears about weight gain, unwanted muscle development, bone fractures, susceptibility to infections and reduction of efficacy of the medicine over time. Most people do not discuss their concerns about inhaled corticosteroid treatment with health professionals. Safety concerns are a major reason for poor adherence, particularly general concerns about corticosteroids rather than concerns about specific adverse effects.

Ongoing monitoring of asthma in adults

Asthma monitoring includes both self-monitoring by patients and periodic assessments by the clinician.

Asthma management in primary care should include periodic reassessment of (both):  

- recent asthma symptom control based on symptoms over the previous 4 weeks, with or without lung function testing. In many patients in primary care, symptoms, reliever use and lung function are useful surrogate measures of the degree to which the underlying disease process is controlled.
- risk factors that predict poor asthma outcomes (e.g. flare-ups, accelerated decline in lung function, or treatment-related adverse effects) independent of the person’s level of recent asthma symptom control.

Planned asthma check-ups should be made at intervals determined by both the individual’s level of recent asthma symptom control and risk factors. The following is a guide:

- 1–3 months after each adjustment to medications
- yearly for a person with no flare-up in the past 12 months and good symptom control for at least a year
- every 6 months for a person who has had a flare-up within the past 12 months or who has other risk factors for flare-ups or life-threatening asthma (e.g. smoking, previous recording of poor lung function on spirometry, history of admission to an intensive care unit for asthma)
- at least every 3 months for a person with severe asthma, work-exacerbated asthma, poor perception of airflow limitation, frequent rhinosinusitis symptoms, or other comorbid conditions that affect asthma control
- every 4–6 weeks for pregnant women.

Note: For patients with occupational asthma, management and follow-up by a specialist with experience in occupational asthma is recommended.

Assessing recent asthma control in adults: symptoms

Questionnaires

Questionnaire-based tools can be used to standardise review of asthma symptoms, e.g.:

- Primary care Asthma Control Screening tool (also known as Pharmacy Asthma Control Screening tool) a quick screening test to detect poor asthma control, developed and validated for use with Australian patients attending primary care
- UK Royal College of Physicians ‘3 Questions’
- Asthma Score (also known as Asthma Control Test).
- Asthma Control Questionnaire (ACQ)

The questionnaires can be completed on paper in the waiting room and scored by the practice nurse. They have also been administered via an application on hand-held personal electronic devices, or by telephone.

Note: Clinicians and researchers should only use the versions of the ACQ and Asthma Score that have been validated for use in the Australian population. The wording and layout of questionnaires must not be changed.
### Table. Primary care Asthma Control Screening tool (PACS)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you experienced any of the following more than once a week in the last month?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptoms of asthma, cough, wheeze, shortness of breath</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Waking at night because of asthma</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Chest tightness on waking</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Difficulty in performing vigorous activity like running, lifting heavy objects, exercise</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Difficulty in performing moderate activities like vacuuming, climbing flights of stairs</td>
<td>• •</td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:** 'Yes' to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.


Asset ID: 87

### Table. UK Royal College of Physicians ‘3 Questions’ screening tool

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the last month:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you had difficulty sleeping because of your asthma symptoms (including cough)?</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Have you had your usual asthma symptoms during the day (cough, wheeze, chest tightness or breathlessness)?</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Has your asthma interfered with your usual activities (e.g. housework, work/school etc)?</td>
<td>• •</td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation:**

- No to all three questions indicates good control.
- Yes to 2 or 3 questions indicates poor control.
- Yes to 1 question indicates that more detailed questioning is needed to assess level of asthma control (using another validated questionnaire or by asking about frequency of daytime symptoms, reliever requirement, limitation of activities and symptoms at night or on waking during the previous month).
**Note:** This test provides a quick and easy way of confirming someone's asthma control is good, or identifying those who need more assessments.

**Sources**


Asset ID: 37

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**Symptom-guided management**

Data from one UK study suggest that, for the majority of patients attending primary care, asthma symptoms are concordant with eosinophilic airway inflammation, and that symptoms can therefore be used as a guide to changing anti-inflammatory treatment.24 However, if symptoms do not improve as expected after a change in treatment, or if the person continues to experience flare-ups, it is necessary to measure lung function and consider other possible causes:

- Respiratory symptoms in a person with asthma may be due to non-asthma factors (e.g. cough due to post-nasal drip, shortness of breath due to obesity). Increasing the preventer treatment in such patients could result in unnecessarily high doses. A careful history (with lung function measurement in some patients) is necessary to confirm that symptoms are due to asthma, before deciding to change a person’s treatment.

- Patients vary in their ability to perceive airflow limitation, so symptoms may be an unreliable measure of asthma control in some patients. Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV1 increases or decreases by 15%).

**See:** [Asthma Score](#)

**Assessing asthma control in adults: spirometry**

Spirometry is necessary when making the diagnosis of asthma and when establishing the patient’s baseline and personal best status.

In ongoing asthma management, spirometry is useful in the following clinical situations:

- During a flare-up, spirometry provides objective evidence about the severity of bronchoconstriction.
- After a dose adjustment (either an increase or a decrease), change in lung function measured by spirometry provides additional information about the response to treatment.
- Spirometry can help identify if the person’s symptoms may be due to non-asthma conditions (e.g. for a patient with frequent respiratory symptoms, FEV1 above 80–90% predicted should prompt consideration of an alternative cause).
- Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV1 increases or decreases by 15%).
- Repeating spirometry over time may identify lung function decline that is more rapid than expected decline due to ageing alone, so the person can be referred for specialist review. (Spirometry should be repeated approximately every 1–2 years in most patients but more frequently as indicated by individual needs.)

There are limits to the amount of information that can be gained from spirometry alone:

- For an individual, spirometry readings are not closely reproducible between visits, so only a change in FEV1 of greater than 0.2 L and 12% from baseline can be considered clinically meaningful in adults.25
- Older people with long-standing asthma may develop fixed (irreversible or incompletely reversible) airflow limitation. Reliance solely on lung function expressed as percentage predicted value as a guide to adjusting preventer treatment would risk dose-escalation and over-treatment in these patients.
- At the population level, spirometry correlates poorly with symptom-based measures of asthma control,26 so in individual patients it is not possible to predict lung function from symptoms or vice versa.

To obtain reliable, good-quality readings, the spirometer must be well maintained and correctly calibrated, and the operator must be adequately trained and experienced.

**See:** [Diagnosing asthma in adults](#)
Self-monitoring in adults using peak expiratory flow

Peak flow monitoring is no longer routinely used in Australia, but is recommended for patients with severe asthma, a history of frequent flare-ups, or poor perception of airflow limitation.

Peak expiratory flow can be monitored at home using a mechanical or electronic peak flow meter, either regularly every day or when symptoms are worse. For patients who are willing to measure peak flow regularly, morning and evening readings can be plotted on a graph or recorded in a diary.

When peak flow monitoring results are recorded on a graph, the same chart should be used consistently so that patterns can be recognised. Flare-ups are easier to detect when the chart or image has a low ratio of width to height (aspect ratio), i.e. is compressed horizontally.27

When a person’s written asthma action plan is based on peak expiratory flow, instructions should be based on personal best, rather than predicted values. Personal best can be determined as the highest reading over the previous 2 weeks. When a person begins high-dose inhaled corticosteroid treatment, personal best peak expiratory flow reaches a plateau within a few weeks with twice daily monitoring.28

Assessing risk factors for adverse asthma outcomes in adults

Predicting poor asthma outcomes

As well as assessing recent asthma symptom control, it is necessary to assess each patient’s risk of future asthma events or adverse treatment effects. (Recent asthma symptom control and risk of adverse events are both components of overall asthma control.)

Table. Risk factors for adverse asthma outcomes in adults and adolescents Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

<table>
<thead>
<tr>
<th>Factors associated with increased risk of flare-ups</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor asthma control</td>
<td>Poor lung function (even if few symptoms)</td>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
<td></td>
</tr>
<tr>
<td>Any asthma flare-up during the previous 12 months</td>
<td>Difficulty perceiving airflow limitation or the severity of flare-ups</td>
<td>Socioeconomic disadvantage</td>
<td></td>
</tr>
<tr>
<td>Other concurrent chronic lung disease</td>
<td>Eosinophilic airway inflammation§</td>
<td>Use of illegal substances</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors associated with increased risk of life-threatening asthma</th>
<th>Intubation or admission to intensive care unit due to asthma (ever)</th>
<th>Sensitivity to an unavoidable allergen (e.g. Alternaria species of common moulds)</th>
<th>Inadequate treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
<td>Sensitivity to an unavoidable allergen (e.g. Alternaria species of common moulds)</td>
<td>Inadequate treatment</td>
<td>Experience of side-effects of OCS use (may contribute to undertreatment or delayed</td>
</tr>
</tbody>
</table>

Go to: National Asthma Council Australia’s Spirometry Resources

Go to: The National Asthma Council Australia and Woolcock Institute Peak Flow Chart

Table. Risk factors for adverse asthma outcomes in adults and adolescents

Risk factors for adverse asthma outcomes in adults and adolescents

Go to: National Asthma Council Australia’s Spirometry Resources

Go to: The National Asthma Council Australia and Woolcock Institute Peak Flow Chart
<table>
<thead>
<tr>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 or more hospitalisations for asthma in past year</td>
<td>Poor lung function</td>
<td>presentation to hospital during flare-ups)</td>
</tr>
<tr>
<td>3 or more ED visits for asthma in the past year</td>
<td>Eosinophilic airway inflammation&lt;sup&gt;§&lt;/sup&gt;</td>
<td>Lack of written asthma action plan</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td></td>
<td>Socioeconomic disadvantage</td>
</tr>
<tr>
<td>High short-acting beta&lt;sub&gt;2&lt;/sub&gt; agonist use (&gt;2 canisters per month)</td>
<td></td>
<td>Living alone</td>
</tr>
<tr>
<td>History of delayed presentation to hospital during flare-ups</td>
<td></td>
<td>Mental illness</td>
</tr>
<tr>
<td>History of sudden-onset acute asthma</td>
<td></td>
<td>Use of alcohol or illegal substances</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td></td>
<td>Poor access to health care (e.g. rural/remote region)</td>
</tr>
</tbody>
</table>

### Factors associated with accelerated decline in lung function
- Chronic mucus hypersecretion
- Severe asthma flare-up in a patient not taking ICS
- Poor lung function
- Exposure to cigarette smoke (smoking or environmental exposure)
- Occupational asthma

### Factors associated with treatment-related adverse events
- Long-term high-dose ICS
- Frequent use of OCS
- Anxiety disorder (due to increased sensitivity to asthma symptoms and reluctance to reduce ICS dose when asthma well controlled)
- Euphoria with OCS use

<sup>§</sup> White cell differential count on a peripheral blood sample is not routinely recommended in the investigation and management of asthma, except for patients with severe refractory asthma. In research studies, peripheral blood eosinophilia suggests the presence of eosinophilic airway inflammation.

### Sources


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**Table. Management of risk factors for adverse asthma outcomes in adults**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
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</thead>
<tbody>
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<td><strong>Any risk factor for flare-ups</strong></td>
<td>Check patient has an appropriate action plan</td>
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<tr>
<td></td>
<td>Carefully check inhaler technique and adherence, and identify any barriers to good adherence</td>
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<tr>
<td></td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td><strong>Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months</strong></td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td><strong>History of intubation or intensive care unit admission for asthma</strong></td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
</tr>
<tr>
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<td><strong>Long-term high-dose ICS</strong></td>
<td>Consider gradual reduction of ICS dose if symptoms stable</td>
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<td>Consider referral for detailed specialist investigation</td>
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<tr>
<td><strong>Sensitivity to unavoidable allergens (e.g. Alternaria species of common moulds)</strong></td>
<td>Refer for further investigation and management</td>
</tr>
<tr>
<td></td>
<td>Emphasise the importance of avoiding smoke</td>
</tr>
<tr>
<td>Risk factor</td>
<td>Clinical action †</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
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<tr>
<td><strong>Exposure to cigarette smoke</strong> <em>(smoking or environmental exposure)</em></td>
<td>Provide quitting strategies&lt;br&gt;Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)&lt;br&gt; Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td><strong>Difficulty perceiving airflow limitation or the severity of exacerbations</strong></td>
<td>Regular PEF monitoring&lt;br&gt; Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td><strong>No current written asthma action plan</strong></td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

Poor clinical control, as indicated by frequent asthma symptoms and frequent reliever use, is a very strong predictor of the risk of flare-ups in the future. Any asthma flare-up during the previous 12 months indicates higher risk of flare-up over the next 12 months. A history of artificial ventilation due to acute asthma, and admission to an intensive care unit due to acute asthma have been associated with increased risk of near-fatal asthma, but there is not enough evidence to indicate how long this risk may persist over a person's lifetime. Other risk factors indicate increased probability of future flare-ups or accelerated decline in lung function, independent of the person's level of recent asthma symptom control.

Other factors may increase a person's risk of treatment-associated adverse effects. The most important of these are prescription of high dose treatment and frequent courses of oral steroids.

People with risk factors need more frequent asthma review, a carefully tailored written asthma action plan, and close attention to adherence and correct inhaler technique.

**Inflammatory markers**

Inflammatory markers, such as sputum eosinophil percentage or exhaled nitric oxide, are used in research and for managing severe asthma in patients attending secondary or tertiary care. Elevated sputum eosinophil levels and, to a lesser extent, elevated exhaled nitric oxide, are associated with increased risk of flare-ups. At present, treatment based on inflammatory markers is not recommended for routine use in primary care.

The value of inflammatory markers is being evaluated:

- Adjusting asthma treatment by monitoring exhaled nitric oxide does not reduce the rate of flare-ups or improve asthma control in adults and children, compared with adjusting treatment according to clinical symptoms or spirometry, based on a meta-analysis of randomised controlled clinical trials. However, many of the studies were not optimally designed to answer this question, and some comparator regimens did not match current recommended treatment options.
- In some studies, asthma treatment algorithms based on monitoring sputum eosinophil counts reduced flare-ups, compared with control-based management. However, most studies assessing treatment guided by sputum eosinophilia have been conducted in selected populations in a few research centres, and therefore may not apply to the general community population. Assessment of sputum inflammatory cells is not generally available at present even in secondary care.
- Limited evidence suggests that patients whose symptoms do not match their degree of eosinophilic inflammation may benefit more from treatment monitoring using sputum eosinophil count than other patients.
- Monitoring inflammatory markers might enable safer down-titration of maintenance inhaled corticosteroid doses.

**Health system initiatives that support asthma care**

**Chronic Disease Management Medicare items**

Patients with asthma are eligible for Chronic Disease Management Medicare items. These include:
• Preparation of a GP Management Plan (Item 721)
• Review of a GP Management Plan (Item 732)
• Coordination of Team Care Arrangements (Item 723) for patients who need ongoing care from a multidisciplinary team of at least three health or care providers
• Coordination of a Review of Team Care Arrangements (Item 732)
• Contribution to a multidisciplinary care plan being prepared by another health or care provider (Item 729)
• Contribution to a multidisciplinary care plan being prepared for a resident of an aged care facility (Item 731).

GPAs can be assisted by practice nurses, Aboriginal and Torres Strait Islander health practitioners, Aboriginal health workers and other health professionals.24

Asthma cycle of care

The Asthma cycle of care is an Australian Government initiative to support primary care health professionals (GPs, other medical practitioners and trainees) to provide asthma care. It is implemented through the Practice Incentives Program (PIP) Asthma Incentive and applies to the clinical care of people with moderate-to-severe asthma, generally defined as people with (any of):35

• symptoms on most days
• use of preventative medication
• bronchodilator use at least three times per week
• hospital attendance or admission following an acute asthma flare-up.

The Asthma cycle of care involves at least two asthma-related consultations within 12 months for a patient with moderate-to-severe asthma, of which at least one visit is a planned asthma review. Each consultation includes:

• documenting the diagnosis, assessing asthma severity and assessing level of recent asthma symptom control
• reviewing the patient’s use of and access to asthma medicines and inhaler devices
• providing a written asthma action plan (or documented alternative, if the patient is unable to use a written action plan)
• providing asthma self-management education
• reviewing the written or documented asthma action plan.

The Personally Controlled eHealth Record System

The eHealth record is an electronic record for a patient that contains a summary of their health information. Patients can choose to register for an eHealth record. Authorised healthcare professionals can access a patient’s record and upload information to the record if their healthcare organisation has registered for the eHealth record system.

Health system initiatives for Aboriginal and Torres Strait Islander people

Health system initiatives to support the care of Aboriginal and Torres Strait Islander people include:

• Health Assessment Medicare items
• The Indigenous Chronic Disease Package
• The Asthma Spacer Ordering System.

References


Reviewing asthma opportunistically

Recommendations

At requests for repeat asthma scripts and whenever otherwise appropriate, consider screening for poor asthma control using the Primary care Asthma Control Screening.

**Table. Primary care Asthma Control Screening tool (PACS)**

<table>
<thead>
<tr>
<th>Have you experienced any of the following more than once a week in the last month?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms of asthma, cough, wheeze, shortness of breath</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Waking at night because of asthma</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chest tightness on waking</td>
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<td>Difficulty in performing vigorous activity like running, lifting heavy objects, exercise</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Difficulty in performing moderate activities like vacuuming, climbing flights of stairs</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Interpretation: ‘Yes’ to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.


Asset ID: 87

If the patient answers ‘yes’ to any question, further assessment is needed.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

At requests for repeat asthma scripts, always ask the person which asthma medicines they are using, using a non-judgemental and empathic manner (ask about both reliever and preventer use.)

If the person is not using prescribed preventer, use non-judgemental questions to find out why.

**Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment**
1. Many people don’t take their medication as prescribed. In the last four weeks:
   ◦ how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).
   ◦ how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)
   ◦ each time, how many puffs would you take? One? Two? (etc).

2. Do you find it easier to remember your medication in the morning, or the evening?


Asset ID: 38

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Adherence to preventer treatment: adults and adolescents

Most patients do not take their preventer medication as often as prescribed, particularly when symptoms improve, or are mild or infrequent. Whenever asthma control is poor despite apparently adequate treatment, poor adherence, as well as poor inhaler technique, are probable reasons to consider.

Poor adherence may be intentional and/or unintentional. Intentional poor adherence may be due to the person’s belief that the medicine is not necessary, or to perceived or actual adverse effects. Unintentional poor adherence may be due to forgetting or cost barriers.

Common barriers to the correct use of preventers include:

- being unable to afford the cost of medicines or consultations to adjust the regimen
- concerns about side effects
- interference of the regimen with the person’s lifestyle
- forgetting to take medicines
- lack of understanding of the reason for taking the medicines
- inability to use the inhaler device correctly due to physical or cognitive factors
- health beliefs that are in conflict with the belief that the prescribed medicines are effective, necessary or safe (e.g. a belief that the prescribed preventer dose is ‘too strong’ or only for flare-ups, a belief that asthma can be overcome by psychological effort, a belief that complementary and alternative therapies are more effective or appropriate than prescribed medicines, mistrust of the health professional).

Adherence to preventers is significantly improved when patients are given the opportunity to negotiate the treatment regimen based on their goals and preferences.1

Assessment of adherence requires an open, non-judgemental approach.

Accredited pharmacists who undertake Home Medicines Reviews can assess adherence while conducting a review.

Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment

1. Many people don’t take their medication as prescribed. In the last four weeks:
   ◦ how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).
2. Do you find it easier to remember your medication in the morning, or the evening?


Health system initiatives that support asthma care

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Health system initiatives for Aboriginal and Torres Strait Islander people

Health system initiatives to support the care of Aboriginal and Torres Strait Islander people include:

- Health Assessment Medicare items
- The Indigenous Chronic Disease Package
- The Asthma Spacer Ordering System.

See: *Asthma in Aboriginal and Torres Strait Islander peoples*

References


Reviewing asthma during visits for respiratory symptoms

Recommendations

When a person presents with respiratory symptoms, assess the cause, considering causes other than asthma.

️ How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

If current symptoms are probably due to asthma, assess:

- level of recent asthma symptom control including symptoms and reliever use
- flare-ups during the previous 12 months
- lung function (if possible)
- other risk factors (e.g. smoking, exposure to other triggers) or comorbid conditions
- current treatment, including adherence to preventer if prescribed. Do not assume the person is taking the dose most recently prescribed. Ask which asthma medicines the person is using, in a non-judgmental, empathic manner.
- inhaler technique. Watch the person use their inhaler.
- whether the person has a written asthma action plan. If so, ask if they have followed it and whether it has helped.

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>- Daytime symptoms ≤2 days per week</td>
<td>- Daytime symptoms &gt;2 days per week</td>
<td></td>
</tr>
<tr>
<td>- Need for reliever ≤2 days per week†</td>
<td>- Need for reliever &gt;2 days per week†</td>
<td></td>
</tr>
<tr>
<td>- No limitation of activities</td>
<td>- Any limitation of activities</td>
<td></td>
</tr>
<tr>
<td>- No symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
<td></td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Adapted from:
Asset ID: 33

Table. Risk factors for adverse asthma outcomes in adults and adolescents

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
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<tbody>
<tr>
<td><strong>Any risk factor for flare-ups</strong></td>
<td>Check patient has an appropriate action plan</td>
</tr>
<tr>
<td></td>
<td>Carefully check inhaler technique and adherence, and identify any barriers to good adherence</td>
</tr>
<tr>
<td></td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td><strong>Hospitalisation or ED visit for asthma or any asthma flare-up during the</strong></td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td><strong>previous 12 months</strong></td>
<td></td>
</tr>
<tr>
<td><strong>History of intubation or intensive care unit admission for asthma</strong></td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
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<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
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<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
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<td>Refer for assessment of asthma–COPD overlap</td>
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Risk factor | Clinical action †
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**Difficulty perceiving airflow limitation or the severity of exacerbations** | Regular PEF monitoring
| Action plan should recommend early review and measurement of lung function

**No current written asthma action plan** | Provide and explain written asthma action plan

† In addition to actions applicable to all risk factors

Asset ID: 41

**Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment**

1. **Many people don’t take their medication as prescribed. In the last four weeks:**
   - how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).
   - how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)
   - each time, how many puffs would you take? One? Two? (etc).

2. **Do you find it easier to remember your medication in the morning, or the evening?**


Asset ID: 38

![How this recommendation was developed](https://www.ncbi.nlm.nih.gov/pubmed/21627747)

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

**More information**

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**Ongoing monitoring of asthma in adults**

Asthma monitoring includes both self-monitoring by patients and periodic assessments by the clinician.

Asthma management in primary care should include periodic reassessment of (both): ¹

- **recent asthma symptom control** based on symptoms over the previous 4 weeks, with or without lung function testing. In many patients in primary care, symptoms, reliever use and lung function are useful surrogate measures of the degree to which the underlying disease process is controlled.
- **risk factors** that predict poor asthma outcomes (e.g. flare-ups, accelerated decline in lung function, or treatment-related adverse effects) independent of the person’s level of recent asthma symptom control.

Planned asthma check-ups should be made at intervals determined by both the individual’s level of recent asthma symptom control and risk factors. The following is a guide:

- 1–3 months after each adjustment to medications
- yearly for a person with no flare-up in the past 12 months and good symptom control for at least a year
• every 6 months for a person who has had a flare-up within the past 12 months or who has other risk factors for flare-ups or life-threatening asthma (e.g. smoking, previous recording of poor lung function on spirometry, history of admission to an intensive care unit for asthma)
• at least every 3 months for a person with severe asthma, work-exacerbated asthma, poor perception of airflow limitation, frequent rhinosinusitis symptoms, or other comorbid conditions that affect asthma control
• every 4–6 weeks for pregnant women.

Note: For patients with occupational asthma, management and follow-up by a specialist with experience in occupational asthma is recommended.

Assessing recent asthma control in adults: symptoms

Questionnaires

Questionnaire-based tools can be used to standardise review of asthma symptoms, e.g.: 

• Primary care Asthma Control Screening tool (also known as Pharmacy Asthma Control Screening tool) – a quick screening test to detect poor asthma control, developed and validated for use with Australian patients attending primary care
• UK Royal College of Physicians ’3 Questions’
• Asthma Score (also known as Asthma Control Test). 
• Asthma Control Questionnaire (ACQ)

The questionnaires can be completed on paper in the waiting room and scored by the practice nurse. They have also been administered via an application on hand-held personal electronic devices, or by telephone.

Note: Clinicians and researchers should only use the versions of the ACQ and Asthma Score that have been validated for use in the Australian population. The wording and layout of questionnaires must not be changed.

Table. Primary care Asthma Control Screening tool (PACS)

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<th>Yes</th>
<th>No</th>
</tr>
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<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

Interpretation: ‘Yes’ to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.
Table. UK Royal College of Physicians ‘3 Questions’ screening tool

<table>
<thead>
<tr>
<th>In the last month:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you had difficulty sleeping because of your asthma symptoms (including cough)?</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Have you had your usual asthma symptoms during the day (cough, wheeze, chest tightness or breathlessness)?</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Has your asthma interfered with your usual activities (e.g. housework, work/school etc)?</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

Interpretation:
No to all three questions indicates good control.
Yes to 2 or 3 questions indicates poor control.
Yes to 1 question indicates that more detailed questioning is needed to assess level of asthma control (using another validated questionnaire or by asking about frequency of daytime symptoms, reliever requirement, limitation of activities and symptoms at night or on waking during the previous month).

Note: This test provides a quick and easy way of confirming someone’s asthma control is good, or identifying those who need more assessments.

Sources


Symptom-guided management
Data from one UK study suggest that, for the majority of patients attending primary care, asthma symptoms are concordant with eosinophilic airway inflammation, and that symptoms can therefore be used as a guide to changing anti-inflammatory treatment. However, if symptoms do not improve as expected after a change in treatment, or if the person continues to experience flare-ups, it is necessary to measure lung function and consider other possible causes:

- Respiratory symptoms in a person with asthma may be due to non-asthma factors (e.g. cough due to post-nasal drip, shortness of breath due to obesity). Increasing the preventer treatment in such patients could result in unnecessarily high doses. A careful history (with lung function measurement in some patients) is necessary to confirm that symptoms are due to asthma, before deciding to change a person’s treatment.

- Patients vary in their ability to perceive airflow limitation, so symptoms may be an unreliable measure of asthma control in some patients. Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV₁ increases or decreases by 15%).

See: Asthma Score
**Assessing asthma control in adults: spirometry**

Spirometry is necessary when making the diagnosis of asthma and when establishing the patient’s baseline and personal best status.

In ongoing asthma management, spirometry is useful in the following clinical situations:

- During a flare-up, spirometry provides objective evidence about the severity of bronchoconstriction.
- After a dose adjustment (either an increase or a decrease), change in lung function measured by spirometry provides additional information about the response to treatment.
- Spirometry can help identify if the person’s symptoms may be due to non-asthma conditions (e.g. for a patient with frequent respiratory symptoms, FEV\(_1\) above 80–90% predicted should prompt consideration of an alternative cause).
- Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV\(_1\) increases or decreases by 15%).
- Repeating spirometry over time may identify lung function decline that is more rapid than expected decline due to ageing alone, so the person can be referred for specialist review. (Spirometry should be repeated approximately every 1–2 years in most patients but more frequently as indicated by individual needs.)

There are limits to the amount of information that can be gained from spirometry alone:

- For an individual, spirometry readings are not closely reproducible between visits, so only a change in FEV\(_1\) of greater than 0.2 L and 12% from baseline can be considered clinically meaningful in adults.\(^9\)
- Older people with long-standing asthma may develop fixed (irreversible or incompletely reversible) airflow limitation. Reliance solely on lung function expressed as percentage predicted value as a guide to adjusting preventer treatment would risk dose-escalation and over-treatment in these patients.
- At the population level, spirometry correlates poorly with symptom-based measures of asthma control,\(^10\) so in individual patients it is not possible to predict lung function from symptoms or vice versa.

To obtain reliable, good-quality readings, the spirometer must be well maintained and correctly calibrated, and the operator must be adequately trained and experienced.

[Go to: National Asthma Council Australia’s Spirometry Resources](https://www.asthmahandbook.org.au/spirometry-resources)

**Assessing risk factors for adverse asthma outcomes in adults**

**Predicting poor asthma outcomes**

As well as assessing recent asthma symptom control, it is necessary to assess each patient’s risk of future asthma events or adverse treatment effects. (Recent asthma symptom control and risk of adverse events are both components of overall asthma control.)

Table. **Risk factors for adverse asthma outcomes in adults and adolescents**

Please view and print this figure separately: [https://www.asthmahandbook.org.au/table/show/40](https://www.asthmahandbook.org.au/table/show/40)

**Table. Risk factors for adverse asthma outcomes in adults and adolescents**

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<thead>
<tr>
<th>Factors associated with increased risk of flare-ups</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor asthma control</td>
<td>Poor lung function (even if few symptoms)</td>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
<td></td>
</tr>
<tr>
<td>Any asthma flare-up during the previous 12 months</td>
<td>Difficulty perceiving airflow limitation or the severity of flare-ups</td>
<td>Socioeconomic disadvantage</td>
<td></td>
</tr>
<tr>
<td>Other concurrent chronic lung disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factors associated with increased risk of life-threatening asthma</td>
<td>Medical history</td>
<td>Investigation findings</td>
<td>Other factors</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
<td>Eosinophilic airway inflammation‡</td>
<td>Use of illegal substances, Major psychosocial problems, Mental illness</td>
<td></td>
</tr>
<tr>
<td>2 or more hospitalisations for asthma in past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or more ED visits for asthma in the past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High short-acting beta₂ agonist use (&gt;2 canisters per month)</td>
<td>Sensitivity to an unavoidable allergen (e.g. Alternaria species of common moulds)</td>
<td>Inadequate treatment, Experience of side-effects of OCS use (may contribute to under-treatment or delayed presentation to hospital during flare-ups), Lack of written asthma action plan, Socioeconomic disadvantage, Living alone, Mental illness, Use of alcohol or illegal substances, Poor access to health care (e.g. rural/remote region)</td>
<td></td>
</tr>
<tr>
<td>History of delayed presentation to hospital during flare-ups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of sudden-onset acute asthma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors associated with accelerated decline in lung function</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic mucus hypersecretion</td>
<td>Poor lung function Eosinophilic airway inflammation‡</td>
<td>Exposure to cigarette smoke (smoking or environmental exposure), Occupational asthma</td>
<td></td>
</tr>
<tr>
<td>Severe asthma flare-up in a patient not taking ICS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors associated with treatment-related adverse events</th>
<th>Medical history</th>
<th>Investigation findings</th>
<th>Other factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term high-dose ICS</td>
<td></td>
<td>Anxiety disorder (due to increased sensitivity to asthma symptoms and reluctance to reduce ICS dose when asthma well controlled), Euphoria with OCS use</td>
<td></td>
</tr>
<tr>
<td>Frequent use of OCS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
White cell differential count on a peripheral blood sample is not routinely recommended in the investigation and management of asthma, except for patients with severe refractory asthma. In research studies, peripheral blood eosinophilia suggests the presence of eosinophilic airway inflammation.

Sources


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**Table. Management of risk factors for adverse asthma outcomes in adults**

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
</table>
| **Any risk factor for flare-ups** | Check patient has an appropriate action plan  
Carefully check inhaler technique and adherence, and identify any barriers to good adherence  
Review frequently (e.g. every 3 months) |
| **Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months** | Ask about triggers for flare-ups, and lead time |
| **History of intubation or intensive care unit admission for asthma** | Ensure action plan recommends early medical review when asthma worsens |
| **Hospitalisation or ED visit for asthma in the past month** | Emphasise importance of maintaining regular ICS use after symptoms improve  
Confirm that patient has resumed using SABA only when needed for symptoms |
| **High SABA use (>2 canisters per month)** | Check lung function  
If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA |
| **Long-term high-dose ICS** | Consider gradual reduction of ICS dose if symptoms stable  
Monitor regularly (e.g. assessment of bone density, regular eye examinations) |
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td>For local side-effects, ensure inhaler technique is appropriate</td>
<td></td>
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<td>Poor lung function (even if few symptoms)</td>
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<td></td>
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<td>Emphasise the importance of avoiding smoke</td>
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<tr>
<td></td>
<td>Provide quitting strategies</td>
</tr>
<tr>
<td></td>
<td>Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)</td>
</tr>
<tr>
<td></td>
<td>Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of exacerbations</td>
<td>Regular PEF monitoring</td>
</tr>
<tr>
<td></td>
<td>Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td>No current written asthma action plan</td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

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Poor clinical control, as indicated by frequent asthma symptoms and frequent reliever use, is a very strong predictor of the risk of flare-ups in the future. Any asthma flare-up during the previous 12 months indicates higher risk of flare-up over the next 12 months. A history of artificial ventilation due to acute asthma, and admission to an intensive care unit due to acute asthma have been associated with increased risk of near-fatal asthma, but there is not enough evidence to indicate how long this risk may persist over a person’s lifetime. Other risk factors indicate increased probability of future flare-ups or accelerated decline in lung function, independent of the person’s level of recent asthma symptom control. Other factors may increase a person’s risk of treatment-associated adverse effects. The most important of these are prescription of high dose treatment and frequent courses of oral steroids.

People with risk factors need more frequent asthma review, a carefully tailored written asthma action plan, and close attention to adherence and correct inhaler technique.

**Inflammatory markers**

Inflammatory markers, such as sputum eosinophil percentage or exhaled nitric oxide, are used in research and for managing severe asthma in patients attending secondary or tertiary care. Elevated sputum eosinophil levels and, to a lesser extent, elevated exhaled nitric oxide, are associated with increased risk of flare-ups. At present, treatment based on inflammatory markers is not recommended for routine use in primary care.

The value of inflammatory markers is being evaluated:

- Adjusting asthma treatment by monitoring exhaled nitric oxide does not reduce the rate of flare-ups or improve asthma control in adults and children, compared with adjusting treatment according to clinical symptoms or spirometry, based on a meta-analysis of randomised controlled clinical trials. However, many of the studies were not optimally designed to answer this question, and some comparator regimens did not match current recommended treatment options.
In some studies, asthma treatment algorithms based on monitoring sputum eosinophil counts reduced flare-ups, compared with control-based management. However, most studies assessing treatment guided by sputum eosinophilia have been conducted in selected populations in a few research centres, and therefore may not apply to the general community population. Assessment of sputum inflammatory cells is not generally available at present even in secondary care.

Limited evidence suggests that patients whose symptoms do not match their degree of eosinophilic inflammation may benefit more from treatment monitoring using sputum eosinophil count than other patients.

Monitoring inflammatory markers might enable safer down-titration of maintenance inhaled corticosteroid doses.

Correct use of inhaler devices

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique. High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported, even among regular users. Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers. In patients with asthma or COPD, incorrect technique is associated with a 50% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.

Correcting patients' inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.

Common errors and problems with inhaler technique

Common errors with manually actuated pressurised metered dose inhalers include:

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

How to improve patients' inhaler technique

Patients' inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique. The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal
Patients do not learn to use their inhalers properly just by reading the manufacturer’s leaflet. An effective method is to assess the individual’s technique by comparing with a checklist specific to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device). The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD. Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.

Written asthma action plans for adults

Every person with asthma should have their own written asthma action plan. When provided with appropriate self-management education, self-monitoring and medical review, individualised written action plans consistently improve asthma health outcomes if they include two to four action points, and provide instructions for use of both inhaled corticosteroid and oral corticosteroids for treatment of flare-ups. Written asthma action plans are effective if based on symptoms or personal best peak expiratory flow (not on percentage predicted).

**How to develop and review a written asthma action plan**

A written asthma action plan should include all the following:

- a list of the person’s usual medicines (names of medicines, doses, when to take each dose) – including treatment for related conditions such as allergic rhinitis
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids) in all the following situations:
  - when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities)
  - when asthma symptoms get substantially worse (e.g. when needing reliever again within 3 hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
  - when peak flow falls below an agreed rate (for those monitoring peak flow each day)
  - during an asthma emergency.
- instructions on when and how to get medical care (including contact telephone numbers)
- the name of the person writing the action plan, and the date it was issued.

**Table. Options for adjusting medicines in a written asthma action plan for adults**

Please view and print this figure separately: [https://www.asthmahandbook.org.au/table/show/42](https://www.asthmahandbook.org.au/table/show/42)

**Table. Checklist for reviewing a written asthma action plan**

- Ask if the person (or parent) knows where their written asthma action plan is.
- Ask if they have used their written asthma action plan because of worsening asthma.
- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether they find it suitable and effective.
- Check that the medication recommendations are appropriate to the person’s current treatment.
- Check that all action points are appropriate to the person’s level of recent asthma symptom control.
- Check that the person (or parent) understands and is satisfied with the action points.
- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person’s usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.
- Check that the contact details for medical care and acute care are up to date.

Asset ID: 43
Templates for written asthma action plans

Templates are available from National Asthma Council Australia:

- National Asthma Council Australia colour-coded plan, available as a printed handout that folds to wallet size and as the Asthma Buddy smartphone application
- Asthma Cycle of Care asthma action plan
- A plan designed for patients using budesonide/formoterol combination as maintenance and reliever therapy
- Remote Indigenous Australian Asthma Action Plan
- Every Day Asthma Action Plan (designed for remote Indigenous Australians who do not use written English – may also be useful for others for whom written English is inappropriate).

Some written asthma action plans are available in community languages.

Software for developing electronic pictorial asthma action plans is available online.

► Go to: National Asthma Council Australia’s Asthma Action Plan Library
Download: Imperial College London's Electronic Asthma Action Plan (ZIP/9.9 MB)

Health system initiatives that support asthma care

Chronic Disease Management Medicare items

Patients with asthma are eligible for Chronic Disease Management Medicare items. These include:

- Preparation of a GP Management Plan (Item 721)
- Review of a GP Management Plan (Item 732)
- Coordination of Team Care Arrangements (Item 723) for patients who need ongoing care from a multidisciplinary team of at least three health or care providers
- Coordination of a Review of Team Care Arrangements (Item 732)
- Contribution to a multidisciplinary care plan being prepared by another health or care provider (Item 729)
- Contribution to a multidisciplinary care plan being prepared for a resident of an aged care facility (Item 731).

GPs can be assisted by practice nurses, Aboriginal and Torres Strait Islander health practitioners, Aboriginal health workers and other health professionals.

► Go to: Australian Government Department of Health's Chronic Disease Management (CDM) Medicare Items webpage

Asthma cycle of care

The Asthma cycle of care is an Australian Government initiative to support primary care health professionals (GPs, other medical practitioners and trainees) to provide asthma care. It is implemented through the Practice Incentives Program (PIP) Asthma Incentive and applies to the clinical care of people with moderate-to-severe asthma, generally defined as people with (any of): 39

- symptoms on most days
- use of preventative medication
- bronchodilator use at least three times per week
- hospital attendance or admission following an acute asthma flare-up.

The Asthma cycle of care involves at least two asthma-related consultations within 12 months for a patient with moderate-to-severe asthma, of which at least one visit is a planned asthma review. Each consultation includes:

- documenting the diagnosis, assessing asthma severity and assessing level of recent asthma symptom control
- reviewing the patient’s use of and access to asthma medicines and inhaler devices
- providing a written asthma action plan (or documented alternative, if the patient is unable to use a written action plan)
- providing asthma self-management education
- reviewing the written or documented asthma action plan.

► Go to: Australian Government Department of Health’s Asthma cycle of care
Go to: Medicare’s Practice Incentive Program (PIP)

The Personally Controlled eHealth Record System

The eHealth record is an electronic record for a patient that contains a summary of their health information. Patients can choose to register for an eHealth record. Authorised healthcare professionals can access a patient’s record and upload information to the record if their healthcare organisation has registered for the eHealth record system.
Health system initiatives for Aboriginal and Torres Strait Islander people

Health system initiatives to support the care of Aboriginal and Torres Strait Islander people include:

- Health Assessment Medicare items
- The Indigenous Chronic Disease Package
- The Asthma Spacer Ordering System.

See: Asthma in Aboriginal and Torres Strait Islander peoples

References


Conducting asthma review at scheduled asthma visits

Recommendations

Validated checklists or questionnaires can be used at each visit to assess recent asthma symptom control or to screen for poor asthma control, e.g:

- **Asthma Score (Asthma Control Test)**
- Primary care Asthma Control Screening
- **Asthma Control Questionnaire (ACQ)**

**Table. Primary care Asthma Control Screening tool (PACS)**

<table>
<thead>
<tr>
<th>Have you experienced any of the following more than once a week in the last month?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms of asthma, cough, wheeze, shortness of breath</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Waking at night because of asthma</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Chest tightness on waking</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Difficulty in performing vigorous activity like running, lifting heavy objects, exercise</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Difficulty in performing moderate activities like vacuuming, climbing flights of stairs</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Interpretation: 'Yes' to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.


Asset ID: 87

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

At scheduled asthma visits, assess (all of):

- any problems or issues the person is having with their asthma
• current level of control based on symptoms and reliever use during the previous 4 weeks
• flare-ups during the previous 12 months
• lung function (every 1–2 years for most people; more often when good asthma control has been lost or not achieved, or when the person has a known risk factor for accelerated loss of lung function)
• other risk factors (e.g. smoking, exposure to other triggers) or comorbid conditions
• current treatment, including adherence to preventer if prescribed. Do not assume the person is taking the dose most recently prescribed. Ask which asthma medicines the person is using, in a non-judgmental, empathic manner.
• inhaler technique
• whether the person has a written asthma action plan and knows how to use it, and whether it is up to date.

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>• Daytime symptoms ≤2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week</td>
<td>• Daytime symptoms &gt;2 days per week†</td>
</tr>
<tr>
<td>• Need for reliever ≤2 days per week†</td>
<td>• Need for reliever &gt;2 days per week†</td>
<td>• Need for reliever &gt;2 days per week†</td>
</tr>
<tr>
<td>• No limitation of activities</td>
<td>• Any limitation of activities</td>
<td>• Any limitation of activities</td>
</tr>
<tr>
<td>• No symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
<td>• Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

† Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Adapted from:
Asset ID: 33

Table. Risk factors for adverse asthma outcomes in adults and adolescents
Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Table. Management of risk factors for adverse asthma outcomes in adults

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
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</table>
| Any risk factor for flare-ups | Check patient has an appropriate action plan
| | Carefully check inhaler technique and adherence, and identify any barriers to good adherence
<p>| | Review frequently (e.g. every 3 months) |
| Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months | Ask about triggers for flare-ups, and lead time |</p>
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of intubation or intensive care unit admission for asthma</td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
</tr>
<tr>
<td></td>
<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
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<tr>
<td>High SABA use (&gt;2 canisters per month)</td>
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<td></td>
<td>If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA</td>
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<td>Refer for further investigation and management</td>
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<td>Emphasise the importance of avoiding smoke</td>
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<td>Regular PEF monitoring</td>
</tr>
<tr>
<td></td>
<td>Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td>No current written asthma action plan</td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

Asset ID: 41

Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment
1. **Many people don’t take their medication as prescribed. In the last four weeks:**
   - how many days a week would you have taken your preventer medication? None at all? One? Two? (etc).
   - how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other)
   - each time, how many puffs would you take? One? Two? (etc).

2. **Do you find it easier to remember your medication in the morning, or the evening?**


Asset ID: 38

*How this recommendation was developed*

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

**More information**

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**Ongoing monitoring of asthma in adults**

Asthma monitoring includes both self-monitoring by patients and periodic assessments by the clinician.

Asthma management in primary care should include periodic reassessment of (both):

- **recent asthma symptom control** based on symptoms over the previous 4 weeks, with or without lung function testing. In many patients in primary care, symptoms, reliever use and lung function are useful surrogate measures of the degree to which the underlying disease process is controlled.
- **risk factors** that predict poor asthma outcomes (e.g. flare-ups, accelerated decline in lung function, or treatment-related adverse effects) independent of the person’s level of recent asthma symptom control.

Planned asthma check-ups should be made at intervals determined by both the individual’s level of recent asthma symptom control and risk factors. The following is a guide:

- 1–3 months after each adjustment to medications
- yearly for a person with no flare-up in the past 12 months and good symptom control for at least a year
- every 6 months for a person who has had a flare-up within the past 12 months or who has other risk factors for flare-ups or life-threatening asthma (e.g. smoking, previous recording of poor lung function on spirometry, history of admission to an intensive care unit for asthma)
- at least every 3 months for a person with severe asthma, work-exacerbated asthma, poor perception of airflow limitation, frequent rhinosinusitis symptoms, or other comorbid conditions that affect asthma control
- every 4–6 weeks for pregnant women.

**Note:** For patients with occupational asthma, management and follow-up by a specialist with experience in occupational asthma is recommended.

▸ See: Managing asthma during pregnancy
See: Work-related asthma

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**Assessing recent asthma control in adults: symptoms**

**Questionnaires**

Questionnaire-based tools can be used to standardise review of asthma symptoms, e.g.:
• Primary care Asthma Control Screening tool (also known as Pharmacy Asthma Control Screening tool)\(^2\) - a quick screening test to detect poor asthma control, developed and validated for use with Australian patients attending primary care

• UK Royal College of Physicians ‘3 Questions’\(^3\)

• Asthma Score (also known as Asthma Control Test).\(^4\)

• Asthma Control Questionnaire (ACQ)

The questionnaires can be completed on paper in the waiting room and scored by the practice nurse. They have also been administered via an application on hand-held personal electronic devices,\(^5,6\) or by telephone.\(^7\)

**Note:** Clinicians and researchers should only use the versions of the ACQ and Asthma Score that have been validated for use in the Australian population. The wording and layout of questionnaires must not be changed.

### Table. Primary care Asthma Control Screening tool (PACS)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
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<tbody>
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<td>Symptoms of asthma, cough, wheeze, shortness of breath</td>
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<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

**Interpretation:** ‘Yes’ to any question indicates that the person may have poorly controlled asthma, so more detailed assessment is needed.


Asset ID: 87

### Table. UK Royal College of Physicians ‘3 Questions’ screening tool

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you had difficulty sleeping because of your asthma symptoms (including cough)?</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Have you had your usual asthma symptoms during the day (cough, wheeze, chest tightness or breathlessness)?</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>
In the last month:

| Has your asthma interfered with your usual activities (e.g. housework, work/school etc)? |
|---|---|
| Yes | No |

**Interpretation:**

- No to all three questions indicates good control.
- Yes to 2 or 3 questions indicates poor control.
- Yes to 1 question indicates that more detailed questioning is needed to assess level of asthma control (using another validated questionnaire or by asking about frequency of daytime symptoms, reliever requirement, limitation of activities and symptoms at night or on waking during the previous month).

**Note:** This test provides a quick and easy way of confirming someone’s asthma control is good, or identifying those who need more assessments.

**Sources**


Asset ID: 37

**Symptom-guided management**

Data from one UK study suggest that, for the majority of patients attending primary care, asthma symptoms are concordant with eosinophilic airway inflammation, and that symptoms can therefore be used as a guide to changing anti-inflammatory treatment. However, if symptoms do not improve as expected after a change in treatment, or if the person continues to experience flare-ups, it is necessary to measure lung function and consider other possible causes:

- Respiratory symptoms in a person with asthma may be due to non-asthma factors (e.g. cough due to post-nasal drip, shortness of breath due to obesity). Increasing the preventer treatment in such patients could result in unnecessarily high doses. A careful history (with lung function measurement in some patients) is necessary to confirm that symptoms are due to asthma, before deciding to change a person’s treatment.

- Patients vary in their ability to perceive airflow limitation, so symptoms may be an unreliable measure of asthma control in some patients. Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV1 increases or decreases by 15%).

**Assessing asthma control in adults: spirometry**

Spirometry is necessary when making the diagnosis of asthma and when establishing the patient’s baseline and personal best status.

In ongoing asthma management, spirometry is useful in the following clinical situations:

- During a flare-up, spirometry provides objective evidence about the severity of bronchoconstriction.
- After a dose adjustment (either an increase or a decrease), change in lung function measured by spirometry provides additional information about the response to treatment.
- Spirometry can help identify if the person’s symptoms may be due to non-asthma conditions (e.g. for a patient with frequent respiratory symptoms, FEV1 above 80–90% predicted should prompt consideration of an alternative cause).
- Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV1 increases or decreases by 15%).

See: [Spirometry](#)
• Repeating spirometry over time may identify lung function decline that is more rapid than expected decline due to ageing alone, so the person can be referred for specialist review. (Spirometry should be repeated approximately every 1–2 years in most patients but more frequently as indicated by individual needs.)

There are limits to the amount of information that can be gained from spirometry alone:

• For an individual, spirometry readings are not closely reproducible between visits, so only a change in FEV₁ of greater than 0.2 L and 12% from baseline can be considered clinically meaningful in adults.⁹
• Older people with long-standing asthma may develop fixed (irreversible or incompletely reversible) airflow limitation. Reliance solely on lung function expressed as percentage predicted value as a guide to adjusting preventer treatment would risk dose-escalation and over-treatment in these patients.
• At the population level, spirometry correlates poorly with symptom-based measures of asthma control,¹⁰ so in individual patients it is not possible to predict lung function from symptoms or vice versa.

To obtain reliable, good-quality readings, the spirometer must be well maintained and correctly calibrated, and the operator must be adequately trained and experienced.

Go to: National Asthma Council Australia’s Spirometry Resources

Assessing risk factors for adverse asthma outcomes in adults

Predicting poor asthma outcomes
As well as assessing recent asthma symptom control, it is necessary to assess each patient’s risk of future asthma events or adverse treatment effects. (Recent asthma symptom control and risk of adverse events are both components of overall asthma control.)

Table. Risk factors for adverse asthma outcomes in adults and adolescents Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Table. Risk factors for adverse asthma outcomes in adults and adolescents

<table>
<thead>
<tr>
<th>Risk factors for adverse asthma outcomes in adults and adolescents</th>
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<tr>
<td>Medical history</td>
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<tr>
<td>Factors associated with increased risk of flare-ups</td>
</tr>
<tr>
<td>Poor asthma control</td>
</tr>
<tr>
<td>Any asthma flare-up during the previous 12 months</td>
</tr>
<tr>
<td>Other concurrent chronic lung disease</td>
</tr>
<tr>
<td>Poor lung function (even if few symptoms)</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of flare-ups</td>
</tr>
<tr>
<td>Eosinophilic airway inflammation</td>
</tr>
<tr>
<td>Exposure to cigarette smoke (smoking or environmental exposure)</td>
</tr>
<tr>
<td>Socioeconomic disadvantage</td>
</tr>
<tr>
<td>Use of illegal substances</td>
</tr>
<tr>
<td>Major psychosocial problems</td>
</tr>
<tr>
<td>Mental illness</td>
</tr>
<tr>
<td>Factors associated with increased risk of life-threatening asthma</td>
</tr>
<tr>
<td>Intubation or admission to intensive care unit due to asthma (ever)</td>
</tr>
<tr>
<td>2 or more hospitalisations for asthma in past year</td>
</tr>
<tr>
<td>Sensitivity to an unavoidable allergen (e.g. Alternaria species of common moulds)</td>
</tr>
<tr>
<td>Inadequate treatment</td>
</tr>
<tr>
<td>Experience of side-effects of OCS use (may contribute to under-treatment or delayed</td>
</tr>
<tr>
<td>Medical history</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>3 or more ED visits for asthma in the past year</td>
</tr>
<tr>
<td>Hospitalisation or ED visit for asthma in the past month</td>
</tr>
<tr>
<td>High short-acting beta&lt;sub&gt;2&lt;/sub&gt; agonist use (&gt;2 canisters per month)</td>
</tr>
<tr>
<td>History of delayed presentation to hospital during flare-ups</td>
</tr>
<tr>
<td>History of sudden-onset acute asthma</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Factors associated with accelerated decline in lung function**

- Chronic mucus hypersecretion
- Severe asthma flare-up in a patient not taking ICS
- Poor lung function
- Eosinophilic airway inflammation<sup>§</sup>
- Exposure to cigarette smoke (smoking or environmental exposure)
- Occupational asthma

**Factors associated with treatment-related adverse events**

- Long-term high-dose ICS
- Frequent use of OCS
- Anxiety disorder (due to increased sensitivity to asthma symptoms and reluctance to reduce ICS dose when asthma well controlled)
- Euphoria with OCS use

<sup>§</sup> White cell differential count on a peripheral blood sample is not routinely recommended in the investigation and management of asthma, except for patients with severe refractory asthma. In research studies, peripheral blood eosinophilia suggests the presence of eosinophilic airway inflammation.

**Sources**


<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Any risk factor for flare-ups</strong></td>
<td>Check patient has an appropriate action plan</td>
</tr>
<tr>
<td></td>
<td>Carefully check inhaler technique and adherence, and identify any barriers to good adherence</td>
</tr>
<tr>
<td></td>
<td>Review frequently (e.g. every 3 months)</td>
</tr>
<tr>
<td><strong>Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months</strong></td>
<td>Ask about triggers for flare-ups, and lead time</td>
</tr>
<tr>
<td><strong>History of intubation or intensive care unit admission for asthma</strong></td>
<td>Ensure action plan recommends early medical review when asthma worsens</td>
</tr>
<tr>
<td><strong>Hospitalisation or ED visit for asthma in the past month</strong></td>
<td>Emphasise importance of maintaining regular ICS use after symptoms improve</td>
</tr>
<tr>
<td></td>
<td>Confirm that patient has resumed using SABA only when needed for symptoms</td>
</tr>
<tr>
<td><strong>High SABA use (&gt;2 canisters per month)</strong></td>
<td>Check lung function</td>
</tr>
<tr>
<td></td>
<td>If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA</td>
</tr>
<tr>
<td><strong>Long-term high-dose ICS</strong></td>
<td>Consider gradual reduction of ICS dose if symptoms stable</td>
</tr>
<tr>
<td></td>
<td>Monitor regularly (e.g. assessment of bone density, regular eye examinations)</td>
</tr>
<tr>
<td></td>
<td>For local side-effects, ensure inhaler technique is appropriate</td>
</tr>
<tr>
<td><strong>Poor lung function (even if few symptoms)</strong></td>
<td>Consider 3-month trial of higher ICS dose, then recheck lung function</td>
</tr>
<tr>
<td></td>
<td>Consider referral for detailed specialist investigation</td>
</tr>
<tr>
<td><strong>Sensitivity to unavoidable allergens (e.g. Alternaria species of common moulds)</strong></td>
<td>Refer for further investigation and management</td>
</tr>
<tr>
<td><strong>Exposure to cigarette smoke (smoking or environmental exposure)</strong></td>
<td>Emphasise the importance of avoiding smoke</td>
</tr>
<tr>
<td></td>
<td>Provide quitting strategies</td>
</tr>
<tr>
<td>Risk factor</td>
<td>Clinical action †</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)</td>
<td>Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of exacerbations</td>
<td>Regular PEF monitoring</td>
</tr>
<tr>
<td></td>
<td>Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td>No current written asthma action plan</td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

Poor clinical control, as indicated by frequent asthma symptoms and frequent reliever use, is a very strong predictor of the risk of flare-ups in the future. Any asthma flare-up during the previous 12 months indicates higher risk of flare-up over the next 12 months. A history of artificial ventilation due to acute asthma, and admission to an intensive care unit due to acute asthma have been associated with increased risk of near-fatal asthma, but there is not enough evidence to indicate how long this risk may persist over a person’s lifetime. Other risk factors indicate increased probability of future flare-ups or accelerated decline in lung function, independent of the person’s level of recent asthma symptom control.

Other factors may increase a person’s risk of treatment-associated adverse effects. The most important of these are prescription of high dose treatment and frequent courses of oral steroids.

People with risk factors need more frequent asthma review, a carefully tailored written asthma action plan, and close attention to adherence and correct inhaler technique.

**Inflammatory markers**

Inflammatory markers, such as sputum eosinophil percentage or exhaled nitric oxide, are used in research and for managing severe asthma in patients attending secondary or tertiary care. Elevated sputum eosinophil levels and, to a lesser extent, elevated exhaled nitric oxide, are associated with increased risk of flare-ups. At present, treatment based on inflammatory markers is not recommended for routine use in primary care.

The value of inflammatory markers is being evaluated:

- Adjusting asthma treatment by monitoring exhaled nitric oxide does not reduce the rate of flare-ups or improve asthma control in adults and children, compared with adjusting treatment according to clinical symptoms or spirometry, based on a meta-analysis of randomised controlled clinical trials. However, many of the studies were not optimally designed to answer this question, and some comparator regimens did not match current recommended treatment options.
- In some studies, asthma treatment algorithms based on monitoring sputum eosinophil counts reduced flare-ups, compared with control-based management. However, most studies assessing treatment guided by sputum eosinophilia have been conducted in selected populations in a few research centres, and therefore may not apply to the general community population. Assessment of sputum inflammatory cells is not generally available at present even in secondary care.
- Limited evidence suggests that patients whose symptoms do not match their degree of eosinophilic inflammation may benefit more from treatment monitoring using sputum eosinophil count than other patients.
- Monitoring inflammatory markers might enable safer down-titration of maintenance inhaled corticosteroid doses.

**Correct use of inhaler devices**

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique.
High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported, even among regular users. Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.

Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers. In patients with asthma or COPD, incorrect technique is associated with a 50% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.

Correcting patients’ inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.

Common errors and problems with inhaler technique

Common errors with manually actuated pressurised metered dose inhalers include:

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

How to improve patients’ inhaler technique

Patients’ inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or other person trained in correct technique. The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration. Patients do not learn to use their inhalers properly just by reading the manufacturer’s leaflet. An effective method is to assess the individual’s technique by comparing with a checklist specific to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device).

The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD.

Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.

Go to: National Asthma Council Australia’s Using your inhaler webpage for information, patient resources and videos on inhaler technique
Go to: National Asthma Council Australia’s information paper for health professionals on Inhaler technique for people with asthma or COPD
Go to: NPS MedicineWise information on Inhaler devices for respiratory medicines
**Written asthma action plans for adults**

Every person with asthma should have their own written asthma action plan. When provided with appropriate self-management education, self-monitoring and medical review, individualised written action plans consistently improve asthma health outcomes if they include two to four action points, and provide instructions for use of both inhaled corticosteroid and oral corticosteroids for treatment of flare-ups. Written asthma action plans are effective if based on symptoms or personal best peak expiratory flow (not on percentage predicted).

**How to develop and review a written asthma action plan**

A written asthma action plan should include all the following:

- a list of the person’s usual medicines (names of medicines, doses, when to take each dose) – including treatment for related conditions such as allergic rhinitis
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids) in all the following situations:
  - when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities)
  - when asthma symptoms get substantially worse (e.g. when needing reliever again within 3 hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
  - when peak flow falls below an agreed rate (for those monitoring peak flow each day)
  - during an asthma emergency.
- instructions on when and how to get medical care (including contact telephone numbers)
- the name of the person writing the action plan, and the date it was issued.

| Table. Options for adjusting medicines in a written asthma action plan for adults |
| Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42 |

| Table. Checklist for reviewing a written asthma action plan |

- Ask if the person (or parent) knows where their written asthma action plan is.
- Ask if they have used their written asthma action plan because of worsening asthma.
- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether it is suitable and effective.
- Check that the medication recommendations are appropriate to the person’s current treatment.
- Check that all action points are appropriate to the person’s level of recent asthma symptom control.
- Check that the person (or parent) understands and is satisfied with the action points.
- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person’s usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.
- Check that the contact details for medical care and acute care are up to date.

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**Templates for written asthma action plans**

Templates are available from National Asthma Council Australia:

- National Asthma Council Australia colour-coded plan, available as a printed handout that folds to wallet size and as the Asthma Buddy smartphone application
- Asthma Cycle of Care asthma action plan
- A plan designed for patients using budesonide/formoterol combination as maintenance and reliever therapy
- Remote Indigenous Australian Asthma Action Plan
- Every Day Asthma Action Plan (designed for remote Indigenous Australians who do not use written English – may also be useful for others for whom written English is inappropriate).

Some written asthma action plans are available in community languages.

Software for developing electronic pictorial asthma action plans is available online.

Go to: National Asthma Council Australia’s Asthma Action Plan Library
Health system initiatives that support asthma care

Chronic Disease Management Medicare items

Patients with asthma are eligible for Chronic Disease Management Medicare items. These include:

- Preparation of a GP Management Plan (Item 721)
- Review of a GP Management Plan (Item 732)
- Coordination of Team Care Arrangements (Item 723) for patients who need ongoing care from a multidisciplinary team of at least three health or care providers
- Coordination of a Review of Team Care Arrangements (Item 732)
- Contribution to a multidisciplinary care plan being prepared by another health or care provider (Item 729)
- Contribution to a multidisciplinary care plan being prepared for a resident of an aged care facility (Item 731).

GPs can be assisted by practice nurses, Aboriginal and Torres Strait Islander health practitioners, Aboriginal health workers and other health professionals.

Asthma cycle of care

The Asthma cycle of care is an Australian Government initiative to support primary care health professionals (GPs, other medical practitioners and trainees) to provide asthma care. It is implemented through the Practice Incentives Program (PIP) Asthma Incentive and applies to the clinical care of people with moderate-to-severe asthma, generally defined as people with (any of):

- symptoms on most days
- use of preventative medication
- bronchodilator use at least three times per week
- hospital attendance or admission following an acute asthma flare-up.

The Asthma cycle of care involves at least two asthma-related consultations within 12 months for a patient with moderate-to-severe asthma, of which at least one visit is a planned asthma review. Each consultation includes:

- documenting the diagnosis, assessing asthma severity and assessing level of recent asthma symptom control
- reviewing the patient’s use of and access to asthma medicines and inhaler devices
- providing a written asthma action plan (or documented alternative, if the patient is unable to use a written action plan)
- providing asthma self-management education
- reviewing the written or documented asthma action plan.

The Personally Controlled eHealth Record System

The eHealth record is an electronic record for a patient that contains a summary of their health information. Patients can choose to register for an eHealth record. Authorised healthcare professionals can access a patient’s record and upload information to the record if their healthcare organisation has registered for the eHealth record system.

Health system initiatives for Aboriginal and Torres Strait Islander people

Health system initiatives to support the care of Aboriginal and Torres Strait Islander people include:

- Health Assessment Medicare items
- The Indigenous Chronic Disease Package
- The Asthma Spacer Ordering System.

See: Asthma in Aboriginal and Torres Strait Islander peoples

References


## Spirometry and other lung function tests in asthma review for adults

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<th><strong>Other lung function tests</strong></th>
<th>Roles of other lung function tests in asthma review in adults</th>
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</table>
Performing spirometry in asthma review in adults

Recommendations

Perform or arrange spirometry at baseline and after symptoms stabilise (3–6 months) to establish the person’s personal best as the basis for future comparison.

Note: If reliable equipment and appropriately trained staff are available, spirometry can be performed in primary care. If not, refer to an appropriate provider such as an accredited respiratory function laboratory.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Perform spirometry before and after bronchodilator. Ask patients to use their own reliever inhaler and take the opportunity to check inhaler technique.

Note: Spirometry is reimbursed by MBS only if pre- and post-bronchodilator readings are taken and a permanently recorded tracing is retained.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Do not advise patients to skip their preventer before a spirometry visit, but document whether the person has taken a combination preventer that contains a long-acting beta$_2$ agonist on the day of spirometry.

Note: Patients referred to a respiratory function laboratory may be asked to skip certain medicines before a spirometry visit.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Measure lung function using spirometry when:

- making or confirming the diagnosis
- assessing future risk
- person has been experiencing worsening asthma control or a flare-up
- monitoring response after dose adjustment
- periodically reviewing asthma (every 1–2 years for most patients).

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Record spirometry at every asthma visit for:

- patients with severe asthma
- patients who are known to have poor perception of airflow limitation (e.g. those who do not feel any different with a 15% decrease or increase in FEV$_1$).
When spirometry findings are markedly discordant with symptoms (e.g. normal spirometry in a patient with frequent symptoms, or FEV\textsubscript{1} <70% predicted in a patient with no symptoms), consider the possibility of an alternative diagnosis and consider referral for specialist assessment.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

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### Assessing asthma control in adults: spirometry

Spirometry is necessary when making the diagnosis of asthma and when establishing the patient’s baseline and personal best status.

In ongoing asthma management, spirometry is useful in the following clinical situations:

- During a flare-up, spirometry provides objective evidence about the severity of bronchoconstriction.
- After a dose adjustment (either an increase or a decrease), change in lung function measured by spirometry provides additional information about the response to treatment.
- Spirometry can help identify if the person’s symptoms may be due to non-asthma conditions (e.g. for a patient with frequent respiratory symptoms, FEV\textsubscript{1} above 80–90% predicted should prompt consideration of an alternative cause).
- Spirometry can help identify if the person is a poor perceiver of airflow limitation (e.g. person is unable to feel the difference when FEV\textsubscript{1} increases or decreases by 15%).
- Repeating spirometry over time may identify lung function decline that is more rapid than expected decline due to ageing alone, so the person can be referred for specialist review. (Spirometry should be repeated approximately every 1–2 years in most patients but more frequently as indicated by individual needs.)

There are limits to the amount of information that can be gained from spirometry alone:

- For an individual, spirometry readings are not closely reproducible between visits, so only a change in FEV\textsubscript{1} of greater than 0.2 L and 12% from baseline can be considered clinically meaningful in adults.\(^1\)
- Older people with long-standing asthma may develop fixed (irreversible or incompletely reversible) airflow limitation. Reliance solely on lung function expressed as percentage predicted value as a guide to adjusting preventer treatment would risk dose-escalation and over-treatment in these patients.
- At the population level, spirometry correlates poorly with symptom-based measures of asthma control,\(^2\) so in individual patients it is not possible to predict lung function from symptoms or vice versa.

To obtain reliable, good-quality readings, the spirometer must be well maintained and correctly calibrated, and the operator must be adequately trained and experienced.

**Go to:** National Asthma Council Australia’s [Spirometry Resources](#)

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**Spirometry in diagnosis and monitoring**

Spirometry is the best lung function test for diagnosing asthma and for measuring lung function when assessing asthma control. Spirometry can:

- detect airflow limitation
- measure the degree of airflow limitation compared with predicted normal airflow (or with personal best)
- demonstrate whether airflow limitation is reversible.

It should be performed by well-trained operators with well-maintained and calibrated equipment.\(^3\),\(^4\)
Before performing spirometry, check if the person has any contraindications (e.g. myocardial infarction, angina, aneurysm, recent surgery, suspected pulmonary embolism, suspected pneumothorax, fractured ribs). Advise them to stop if they become dizzy.

Clearly explain and physically demonstrate correct spirometry technique:

- Sit upright with legs uncrossed and feet flat on the floor and do not lean forward.
- Breathe in rapidly until lungs feel absolutely full. (Coaching is essential to do this properly.)
- Do not pause for more than 1 second.
- Place mouthpiece in mouth and close lips to form a tight seal.
- Blast air out as hard and fast as possible and for as long as possible, until the lungs are completely empty or you are unable to blow out any longer.
- Remove mouthpiece.

Repeat the test until you obtain three acceptable tests and these meet repeatability criteria.

Acceptability of test

A test is acceptable if all the following apply:

- forced expiration started immediately after full inspiration
- expiration started rapidly
- maximal expiratory effort was maintained throughout the test, with no stops
- the patient did not cough during the test
- the patient did not stop early (before 6 seconds for adults and children over 10 years, or before 3 seconds for children under 10 years).

Record the highest FEV\textsubscript{1} and FVC result from the three acceptable tests, even if they come from separate blows.

Repeatability criteria

Repeatability criteria for a set of acceptable tests are met if both of the following apply:

- the difference between the highest and second-highest values for FEV\textsubscript{1} is less than 150 mL
- the difference between the highest and second-highest values for FVC is less than 150 mL.

For most people, it is not practical to make more than eight attempts to meet acceptability and repeatability criteria.

Testing bronchodilator response (reversibility of airflow limitation)

Repeat spirometry 10-15 minutes after giving 4 separate puffs of salbutamol (100 mcg/actuation) via a pressurised metered-dose inhaler and spacer. (For patients who have reported unacceptable side-effects with 400 mcg, 2 puffs can be used.)

For adults and adolescents, record a clinically important bronchodilator response if FEV\textsubscript{1} increases by ≥ 200 mL and ≥ 12%.

For children, record a clinically important bronchodilator response if FEV\textsubscript{1} increases by ≥ 12%.

Go to: National Asthma Council Australia’s Spirometry Resources

References

Using other lung function tests in asthma review in adults

Recommendations

When reviewing asthma, do not use occasional office readings from a peak flow meter in place of spirometry to assess lung function.

 élèves

Consider asking patients to carry out 2–8 weeks of peak flow monitoring in these situations:

• to help confirm the diagnosis of asthma
• to help identify a trigger (e.g. in the diagnosis of work-related asthma)
• to document improvement after starting treatment (where the benefit would outweigh the burden of monitoring)
• to monitor safety after a planned dose reduction (especially in an anxious patient).

Notes

For patients with suspected work-related asthma, consider offering referral for specialist assessment as soon as possible.

Patients should record peak flow results on a chart in preference to a diary. Patients' ability to recognise flare-ups depends on the proportions of the chart, so use the standardised National Asthma Council Australia and Woolcock Institute Peak Flow Chart.

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

Consider long-term peak flow monitoring for patients with:

• severe asthma
• frequent or sudden flare-ups
• poor perception of airflow limitation.

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

If the person uses a peak flow meter to monitor asthma at home, ask them to bring their peak flow meter and their peak flow chart or diary to the review. Record any clinically important variation in lung function. Ask about the circumstances around the time of any apparent flare-ups. Regularly check the person's peak flow measurement technique.

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).
When reviewing asthma, do not use occasional office readings from a hand-held lung function-measuring device (portable device that measures FEV\textsubscript{1} and/or FEV\textsubscript{6}, but not FVC) to assess lung function in place of spirometry.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Self-monitoring in adults using peak expiratory flow

Peak flow monitoring is no longer routinely used in Australia, but is recommended for patients with severe asthma, a history of frequent flare-ups, or poor perception of airflow limitation.

Peak expiratory flow can be monitored at home using a mechanical or electronic peak flow meter, either regularly every day or when symptoms are worse. For patients who are willing to measure peak flow regularly, morning and evening readings can be plotted on a graph or recorded in a diary.

When peak flow monitoring results are recorded on a graph, the same chart should be used consistently so that patterns can be recognised. Flare-ups are easier to detect when the chart or image has a low ratio of width to height (aspect ratio), i.e. is compressed horizontally.\textsuperscript{1}

When a person’s written asthma action plan is based on peak expiratory flow, instructions should be based on personal best, rather than predicted values. Personal best can be determined as the highest reading over the previous 2 weeks. When a person begins high-dose inhaled corticosteroid treatment, personal best peak expiratory flow reaches a plateau within a few weeks with twice daily monitoring.\textsuperscript{2}

References


Managing flare-ups in adults

Recommendations

Advise patients that if they experience a flare-up (e.g. worsening symptoms over hours or days, or needing reliever again within a few hours), they should increase their reliever use to control symptoms. Include these instructions in the patient’s written asthma action plan.

Table. Severity classification for flare-ups (exacerbations)

<table>
<thead>
<tr>
<th>Severity</th>
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<tr>
<td><strong>Mild</strong></td>
<td>Worsening of asthma control that is only just outside the normal range of variation for the individual (documented when patient is well)</td>
<td>More symptoms than usual, needing reliever more than usual (e.g. &gt;3 times within a week for a person who normally needs their reliever less often), waking up with asthma, asthma is interfering with usual activities A gradual reduction in PEF† over several days</td>
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</table>
| **Moderate** | Events that are (all of):  
• troublesome or distressing to the patient  
• require a change in treatment  
• not life-threatening  
• do not require hospitalisation. | More symptoms than usual, increasing difficulty breathing, waking often at night with asthma symptoms |
| **Severe** | Events that require urgent action by the patient (or carers) and health professionals to prevent a serious outcome such as hospitalisation or death from asthma | Needing reliever again within 3 hours, difficulty with normal activity |

† Applies to patients who monitor their asthma using a peak expiratory flow meter (single PEF measurements in clinic not recommended for assessing severity of flare-ups).

Note: the ATS/ERS Task Force recommended that severe exacerbations should be defined in clinical trials as the use of oral corticosteroids for 3 or more days. However, this definition is not applicable to clinical practice.


Asset ID: 35
### Table. Options for adjusting medicines in a written asthma action plan for adults

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42

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Advise patients to keep taking regular preventer during a flare-up (even if they need oral corticosteroids).

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For patients using a pressurised metered-dose inhaler reliever, advise (and state in a written asthma action plan) to use a spacer during a flare-up to increase the amount of medicine deposited within the airways.

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<tr>
<td>• Hall et al. 2011¹</td>
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<tr>
<td>• Lipworth and Clark, 1998²</td>
</tr>
</tbody>
</table>

Prescribe an increase in preventer and/or a course of oral corticosteroids for patients with (any of):

- acute asthma symptoms that recur within 3 hours of taking a rapid-onset beta₂ agonist reliever
- increasing difficulty breathing over one or more days
- night-time asthma symptoms that interfere with sleep over more than one night in a row
- peak flow below a pre-defined level (for those monitoring peak flow each day; level determined based on individual’s personal best and history of peak flow levels before and during flare-ups).

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When prescribing oral corticosteroids, the recommended daily dose is oral prednisone or prednisolone 37.5–50 mg for 5–10 days. It is usually not necessary to taper the dose for courses of less than 14 days.

**Notes**

Dose tapering may be necessary for patients who experience adverse effects.

If a patient needs to take prednisolone for more than 2 weeks, the dose should be tapered before ceasing.

Pregnancy is not a contraindication for oral corticosteroids. Oral prednisone or prednisolone is rated Category A for pregnancy.

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<tr>
<td>• Cydulka and Emerman, 1998³</td>
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<tr>
<td>• Hasegawa et al. 2000⁴</td>
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<tr>
<td>• Jones et al. 2002⁵</td>
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</tbody>
</table>
To increase the preventer dose during a flare-up in patients taking regular maintenance inhaled corticosteroid or combination inhaled corticosteroid/long-acting beta₂ agonist, consider advising them to quadruple the dose of inhaled corticosteroid by giving an extra inhaler at the onset of a flare-up (e.g. use an extra high-dose inhaled corticosteroid inhaler, in addition to usual dose with usual inhaler, for 2 weeks).

- Taking short-term high doses of inhaled corticosteroid may not be appropriate for some people, e.g. people who cannot risk dysphonia (e.g. singers, actors, teachers) and people who cannot afford the extra medicine.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- FitzGerald et al. 2000
- Levy et al. 1996
- Oborne et al. 2009
- Quon et al. 2010
- Reddel and Barnes, 2006
- Rodrigo, 2006

In patients taking maintenance combination fluticasone propionate/salmeterol, ensure that the total daily dose of salmeterol is 100 mcg/day during a flare-up.

Note: For example, if a patient is currently taking fluticasone propionate/salmeterol 250/25 mcg via pressurised metered-dose inhaler at a dose of 1 puff twice daily, they should increase this to 2 puffs twice daily during worsening asthma. An extra fluticasone propionate inhaler may also be prescribed for 1-2 weeks so that the inhaled corticosteroid component can be increased while the salmeterol dose remains at 100 mcg/day.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

To increase the preventer dose during a flare-up in patients taking budesonide/formoterol as maintenance-and-reliever regimen using a dry-powder inhaler, advise the person to:

- take one extra inhalation of their budesonide/formoterol combination inhaler when they need relief from asthma symptoms (up to a maximum of 12 inhalations per day in total, including maintenance doses)
- take action (e.g. contact GP or start a course of oral corticosteroids) if they need more than 6 reliever inhalations of their budesonide/formoterol combination inhaler per day for more than 2-3 days (or as instructed in their written asthma action plan)
- go to the emergency department or GP if they need more than 12 reliever inhalations of their budesonide/formoterol combination inhaler in one day (keep taking as needed while waiting).

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- AstraZeneca Pty Ltd 2010
To increase the preventer dose during a flare-up in patients taking budesonide/formoterol as maintenance-and-reliever regimen using a pressurised metered-dose inhaler, advise the person to:

- take two extra inhalations of their budesonide/formoterol combination inhaler when they need relief from asthma symptoms (up to a maximum of 24 inhalations per day in total, including maintenance doses)
- take action (e.g. contact GP or start a course of oral corticosteroids) if they need more than 12 reliever inhalations of their budesonide/formoterol combination inhaler per day for more than 2–3 days (or as instructed in their written asthma action plan)
- go to the emergency department or GP if they need more than 24 reliever inhalations of their budesonide/formoterol combination inhaler in one day (keep taking as needed while waiting).

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- AstraZeneca Pty Ltd 2012

Advise patients when to reduce their preventer medication back to normal (e.g. after 2 weeks), and to reduce reliever use once symptoms have improved.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

Make the decision to prescribe antibiotics or not during respiratory tract infections in people with asthma according to the same considerations for people without asthma.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

**More information**

**Definition and recognition of flare-ups (exacerbations)**

An asthma flare-up is a worsening (exacerbation) of asthma symptoms and lung function, compared with the person’s previous status (i.e. outside the patient’s usual range of day-to-day variation). The onset of asthma flare-ups varies widely. Flare-ups are usually progressive (over days or weeks), but in some adults acute asthma can occur suddenly over a few hours. The patient’s experience of symptoms may be a more sensitive indicator of the onset of a flare-up than peak expiratory flow monitoring, because symptoms usually increase before deterioration in lung function is detected. However, some people perceive symptoms poorly and may have a clinically significant decline in lung function without a marked change in symptoms.

Patients need clear instructions in their written asthma action plan about how to monitor symptoms and how to recognise a flare-up (e.g. worsening symptoms and increasing reliever use). For most patients, a daily diary is not needed to monitor asthma, but current status (including symptom frequency, frequency of reliever use, limitation of activity) should be documented at every doctor visit so that the clinician can recognise any change.

**Table. Severity classification for flare-ups (exacerbations)**

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<sup>†</sup> Applies to patients who monitor their asthma using a peak expiratory flow meter (single PEF measurements in clinic not recommended for assessing severity of flare-ups).

**Note:** the ATS/ERS Task Force recommended that severe exacerbations should be defined in clinical trials as the use of oral corticosteroids for 3 or more days. However, this definition is not applicable to clinical practice.


**Managing flare-ups in adults: self-management**

Moderate flare-ups (e.g. nocturnal wakening, increased need for reliever, PEF reduction <20% from best) can usually be managed without a hospital visit.¹⁷

Patients should be able to manage most flare-ups using their written asthma action plan. Asthma action plans that include instructions both for increasing the dose of inhaled corticosteroid and for starting oral corticosteroids (in addition to reliever as needed) during flare-ups are effective in reducing the risk of needing Emergency Department visits or hospital admissions.²¹

Written asthma action plans based on symptoms and those based on peak expiratory flow are equally effective.²¹

**Managing flare-ups in adults: oral corticosteroids**

The use of oral corticosteroids is accepted as part of the management of severe asthma flare-ups, including in most asthma clinical trials.
Most clinical trials that have specifically evaluated the use of oral corticosteroids to manage flare-ups have been conducted in patients attending emergency departments. Oral corticosteroids courses of 5–10 days are effective in regaining control of asthma after an acute flare-up. A 5-day course of prednisolone 40 mg per day may be as effective as a 10-day course in adults. 

Abruptly ceasing oral prednisolone after a short course appears to be equally effective as tapering over a longer period. Tapering the dose does not reduce the risk of suppression of adrenal function. The dose should be tapered if oral corticosteroids have been taken for more than 2 weeks.

Action plans for worsening asthma that include instructions for the use of oral corticosteroids as well as instructions to increase the dose of inhaled corticosteroid, are effective in improving lung function and reducing hospital admissions.

**Managing flare-ups in adults: adjusting inhaled corticosteroid dose**

Several randomised clinical trials have assessed whether increasing the inhaled corticosteroid dose is an effective strategy in avoiding the need for oral corticosteroids or acute medical care during flare-ups in adults with asthma taking daily maintenance inhaled corticosteroid or daily maintenance inhaled corticosteroid/long-acting beta; agonist combination treatment.

There is some evidence that quadrupling the maintenance dose of inhaled corticosteroids, or treating with a high dose of inhaled corticosteroids, reduces the severity of asthma flare-ups. For patients taking inhaled corticosteroid/long-acting beta; agonist combinations, this can be achieved by adding a separate high-dose inhaled corticosteroid inhaler to the patient’s usual maintenance treatment for 7–14 days. This strategy may be useful for patients who experience clinically important side-effects with oral corticosteroids, but may not be suitable for patients who cannot afford the extra medicine or who experience hoarseness with high dose inhaled corticosteroid.

However, overall evidence from randomised clinical trials does not support the use of inhaled corticosteroids as a substitute for oral corticosteroids during most flare-ups in adults:

- A self-initiated increase (e.g. increasing the dose by a factor of two to five) after asthma worsened did not reduce the overall risk of flare-ups requiring rescue oral corticosteroids in a meta-analysis of randomised controlled clinical trials mainly in adults.
- Doubling the dose in response to specific criteria for worsening lung function (with or without worsening asthma symptoms) did not reduce the proportion of people who needed oral corticosteroids. However, in two of the three clinical trials that evaluated the efficacy of doubling the dose, patients did not begin taking the higher dose (active or placebo) until approximately one week after asthma began to worsen. Therefore, there is insufficient evidence to judge the effectiveness of doubling the dose of inhaled corticosteroid at the first sign of worsening symptoms.
- In another clinical trial, patients taking a range of inhaled corticosteroid-based regimens at baseline were randomised to one of two treatment strategies when any of the following occurred: when peak expiratory flow rate fell (by 15% or more on 2 consecutive days, or by 30% or more on 1 day), when they believed their asthma was worsening, or they developed a cold. Treatment strategies were (1) increasing the dose of inhaled corticosteroid to four times higher than the maintenance dose, regardless of baseline regimen, or (2) continuing usual dose. Overall, the group randomised to the increased dose strategy did not have a reduced risk of flare-ups that required oral corticosteroid treatment. However, fewer than one quarter of patients started the study inhaler. Among those patients who did begin taking the high-dose (or placebo) inhaler due to perceived worsening asthma, quadrupling the dose was associated with a significant (almost halving) reduction in the rate of severe flare-up.

**Managing flare-ups in adults: adjusting budesonide/formoterol maintenance-and-reliever treatment**

When asthma symptoms worsen, patients taking budesonide/formoterol 100/6 mcg or 200/6 mcg as maintenance-and-reliever treatment can increase as-needed inhalations:

- for budesonide/formoterol 100/6 mcg or 200/6 mcg via dry-powder inhaler, up to a maximum of 12 actuations per day (total of maintenance and reliever inhalations).
- for budesonide/formoterol 50/3 mcg or 100/3 mcg via pressurised metered-dose inhaler, up to a maximum of 24 actuations per day (total of maintenance and reliever inhalations).

A written asthma action plan template developed by Australian clinicians for adults using budesonide/formoterol maintenance and reliever regimen suggests that the patient should commence oral corticosteroids and/or see a doctor after 2–3 days if asthma is worsening, or symptoms are not improving, despite taking 6 reliever inhalations of budesonide/formoterol per day in addition to maintenance doses.

Go to: National Asthma Council Australia’s written asthma action plan for adults using budesonide/formoterol maintenance and reliever regimen in the Asthma Action Plan Library.
Self-monitoring in adults using peak expiratory flow

Peak flow monitoring is no longer routinely used in Australia, but is recommended for patients with severe asthma, a history of frequent flare-ups, or poor perception of airflow limitation.

Peak expiratory flow can be monitored at home using a mechanical or electronic peak flow meter, either regularly every day or when symptoms are worse. For patients who are willing to measure peak flow regularly, morning and evening readings can be plotted on a graph or recorded in a diary.

When peak flow monitoring results are recorded on a graph, the same chart should be used consistently so that patterns can be recognised. Flare-ups are easier to detect when the chart or image has a low ratio of width to height (aspect ratio), i.e. is compressed horizontally.\footnote{22}

When a person’s written asthma action plan is based on peak expiratory flow, instructions should be based on personal best, rather than predicted values. Personal best can be determined as the highest reading over the previous 2 weeks. When a person begins high-dose inhaled corticosteroid treatment, personal best peak expiratory flow reaches a plateau within a few weeks with twice daily monitoring.\footnote{23}

Acute respiratory tract infections

Although people with asthma are no more likely to experience viral upper respiratory tract infection than people without asthma, they are more likely to experience symptoms of lower respiratory tract infection.\footnote{24}

In patients with asthma, respiratory tract infections often lead to asthma flare-ups.

During viral infections, inhaled short-acting \beta_2\ agonists may have reduced effectiveness and there may be a reduced bronchodilator response in lung function.\footnote{25}

Worsening asthma may be misdiagnosed as a respiratory tract infection, and respiratory tract infections may be misdiagnosed as asthma, because acute bronchitis in patients with no evidence of asthma may be associated with a short-term reduction in lung function.

- If spirometry during a respiratory tract infection shows reduced FEV1 and lack of acute response to bronchodilator in a person with suspected asthma, spirometry should be repeated after the person recovers. Apparent non-reversible airflow limitation may be due to viral infection.

Antibiotics and asthma management

Most respiratory tract infections are due to viruses rather than bacteria. The decision about whether or not to use antibiotics for treatment of respiratory tract infections in people with asthma should be made on the same basis as in people without asthma.

Long-term therapy with macrolides may have an anti-inflammatory effect, but there is not enough evidence to recommend this routinely for managing asthma.\footnote{26, 27, 28}

References


Providing self-management support for adults

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<tr>
<th>Education</th>
<th>Provide adults and adolescents with information, skills and tools for asthma self-management</th>
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<th>Action plans</th>
<th>Prepare and review written asthma action plans for adults</th>
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</table>
Providing information, skills and tools for asthma self-management for adults

Recommendations

Provide or arrange education in asthma self-management, including (all of):

- self-monitoring of asthma control based on symptoms (and peak expiratory flow monitoring, if used)
- inhaler technique
- a written asthma action plan
- the importance of regular medical review.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Gibson et al. 2002
- Gibson et al. 2002
- Gibson and Powell, 2004
- National Asthma Council Australia, 2008
- Powell and Gibson, 2002

Check the person’s inhaler technique at each encounter:

- Have the patient demonstrate their inhaler technique, while checking against a checklist of steps for the specific device.
- Demonstrate correct technique using a placebo device and correct any specific errors identified.
- Have the patient repeat the demonstration to check they can now use the device correctly. If necessary, repeat instruction until the patient has all steps correct.

Notes:

Watch the person use their inhaler – don’t just ask if they think they know how to use it properly.

Checklists of steps, and videos demonstrating correct technique, for various types of inhalers are available on National Asthma Council Australia’s website.

Go to: National Asthma Council Australia’s Using your inhaler webpage for information, patient resources and videos on inhaler technique
Go to: National Asthma Council Australia’s information paper for health professionals on Inhaler technique for people with asthma or COPD
Go to: NPS MedicineWise’s Asthma: inhaler device checklist

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Basheti et al. 2013
- National Asthma Council Australia, 2008
Advise patients to seek emergency medical care immediately if they experience any of these danger signs:

- severe breathing problems
- symptoms get worse very quickly
- reliever has little or no effect
- difficulty saying sentences
- blue lips
- drowsiness.

The person and their family should know that they must call an ambulance and give asthma first aid if they see any of these danger signs.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

More information

Asthma self-management for adults
Effective self-management requires:

- adherence to the agreed treatment regimen
- correct use of inhaler devices for asthma medicines
- monitoring asthma control (symptoms, with addition of peak expiratory flow for some patients)
- having an up-to-date written asthma action plan and following it when asthma worsens
- management of triggers or avoidance (if appropriate)
- regular medical review.

Self-monitoring of asthma
Self-monitoring by the patient, based on symptoms and/or peak expiratory flow, is an important component of effective asthma self-management.¹

For most patients, a daily diary is not necessary. Patients should be trained to take note if their symptoms worsen or their reliever use increases, so they can implement their written asthma action plan and/or get medical care as appropriate.

Internet-based self-management algorithms in which patients adjust their treatment monthly on the basis of control scores have been reported to be more effective than usual care.⁷ In patients with partly and uncontrolled asthma, weekly self-monitoring and monthly treatment adjustment may improve asthma control.⁸

Asthma self-management education
Patients need careful asthma education to enable them to manage their asthma effectively.

Education in asthma self-management that involves self-monitoring (by either peak expiratory flow or symptoms), regular medical review and a written action plan improves health outcomes for adults with asthma.¹ Training programs that enable people to adjust their medication using a written action plan appear to be more effective than other forms of asthma self-management.¹

Information alone does not appear to improve health outcomes in adults with asthma, although perceived symptoms may improve.²

Structured group asthma education programs are available in some regions. Contact Asthma Australia in your state or territory for information about available asthma education programs.

Adherence to preventer treatment: adults and adolescents
Most patients do not take their preventer medication as often as prescribed, particularly when symptoms improve, or are mild or infrequent. Whenever asthma control is poor despite apparently adequate treatment, poor adherence, as well as poor inhaler technique, are probable reasons to consider.

Poor adherence may be intentional and/or unintentional. Intentional poor adherence may be due to the person’s belief that the medicine is not necessary, or to perceived or actual adverse effects. Unintentional poor adherence may be due to forgetting or cost barriers.

Common barriers to the correct use of preventers include:

- being unable to afford the cost of medicines or consultations to adjust the regimen
- concerns about side effects
- interference of the regimen with the person’s lifestyle
- forgetting to take medicines
- lack of understanding of the reason for taking the medicines
- inability to use the inhaler device correctly due to physical or cognitive factors
- health beliefs that are in conflict with the belief that the prescribed medicines are effective, necessary or safe (e.g. a belief that the prescribed preventer dose is ‘too strong’ or only for flare-ups, a belief that asthma can be overcome by psychological effort, a belief that complementary and alternative therapies are more effective or appropriate than prescribed medicines, mistrust of the health professional).

Adherence to preventers is significantly improved when patients are given the opportunity to negotiate the treatment regimen based on their goals and preferences.⁹

Assessment of adherence requires an open, non-judgemental approach.

Accredited pharmacists who undertake Home Medicines Reviews can assess adherence while conducting a review.

Table. Suggested questions to ask adults and older adolescents when assessing adherence to treatment

| 1. Many people don’t take their medication as prescribed. In the last four weeks: |
| ◦ how many days a week would you have taken your preventer medication? None at all? One? Two? (etc). |
| ◦ how many times a day would you take it? Morning only? Evening only? Morning and evening? (or other) |
| ◦ each time, how many puffs would you take? One? Two? (etc). |

| 2. Do you find it easier to remember your medication in the morning, or the evening? |


Asset ID: 38

Go to: Medicare’s Home Medicines Review (HMR)

Written asthma action plans for adults

Every person with asthma should have their own written asthma action plan.

When provided with appropriate self-management education, self-monitoring and medical review, individualised written action plans consistently improve asthma health outcomes if they include two to four action points, and provide instructions for use of both inhaled corticosteroid and oral corticosteroids for treatment of flare-ups.³ Written asthma action plans are effective if based on symptoms⁵ or personal best peak expiratory flow (not on percentage predicted).³

How to develop and review a written asthma action plan

A written asthma action plan should include all the following:
- a list of the person’s usual medicines (names of medicines, doses, when to take each dose) – including treatment for related conditions such as allergic rhinitis
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids) in all the following situations:
  - when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities)
  - when asthma symptoms get substantially worse (e.g. when needing reliever again within 3 hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
  - when peak flow falls below an agreed rate (for those monitoring peak flow each day)
  - during an asthma emergency.
- instructions on when and how to get medical care (including contact telephone numbers)
- the name of the person writing the action plan, and the date it was issued.

**Table. Options for adjusting medicines in a written asthma action plan for adults**

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42

**Table. Checklist for reviewing a written asthma action plan**

- Ask if the person (or parent) knows where their written asthma action plan is.
- Ask if they have used their written asthma action plan because of worsening asthma.
- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether they find it suitable and effective.
- Check that the medication recommendations are appropriate to the person’s current treatment.
- Check that all action points are appropriate to the person’s level of recent asthma symptom control.
- Check that the person (or parent) understands and is satisfied with the action points.
- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person’s usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.
- Check that the contact details for medical care and acute care are up to date.

**Templates for written asthma action plans**

Templates are available from National Asthma Council Australia:

- National Asthma Council Australia colour-coded plan, available as a printed handout that folds to wallet size and as the Asthma Buddy smartphone application
- Asthma Cycle of Care asthma action plan
- A plan designed for patients using budesonide/formoterol combination as maintenance and reliever therapy
- Remote Indigenous Australian Asthma Action Plan
- Every Day Asthma Action Plan (designed for remote Indigenous Australians who do not use written English – may also be useful for others for whom written English is inappropriate).

Some written asthma action plans are available in community languages.

Software for developing electronic pictorial asthma action plans is available online.

Go to: National Asthma Council Australia’s Asthma Action Plan Library
Download: Imperial College London’s Electronic Asthma Action Plan (ZIP/9.9 MB)

**Correct use of inhaler devices**

The majority of patients do not use inhaler devices correctly. Australian research studies have reported that only approximately 10% of patients use correct technique.  

High rates of incorrect inhaler use among children with asthma and adults with asthma or COPD have been reported, even among regular users.  Regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.
Poor inhaler technique has been associated with worse outcomes in asthma and COPD. It can lead to poor asthma symptom control and overuse of relievers and preventers.\textsuperscript{14, 21, 19, 22, 23} In patients with asthma or COPD, incorrect technique is associated with a 50\% increased risk of hospitalisation, increased emergency department visits and increased use of oral corticosteroids due to flare-ups.\textsuperscript{19}

Correcting patients' inhaler technique has been shown to improve asthma control, asthma-related quality of life and lung function.\textsuperscript{24, 25}

**Common errors and problems with inhaler technique**

Common errors with manually actuated pressurised metered dose inhalers include:\textsuperscript{20}

- failing to shake the inhaler before actuating
- holding the inhaler in wrong position
- failing to exhale fully before actuating the inhaler
- actuating the inhaler too early or during exhalation (the medicine may be seen escaping from the top of the inhaler)
- actuating the inhaler too late while inhaling
- actuating more than once while inhaling
- inhaling too rapidly (this can be especially difficult for children to overcome)
- multiple actuations without shaking between doses.

Common errors for dry powder inhalers include:\textsuperscript{20}

- not keeping the device in the correct position while loading the dose (horizontal for Accuhaler and vertical for Turbuhaler)
- failing to exhale fully before inhaling
- failing to inhale completely
- inhaling too slowly and weakly
- exhaling into the device mouthpiece before or after inhaling
- failing to close the inhaler after use
- using past the expiry date or when empty.

Other common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to seal the lips firmly around the mouthpiece of an inhaler or spacer
- inability to generate adequate inspiratory flow for the inhaler type
- failure to use a spacer when appropriate
- use of incorrect size mask
- inappropriate use of a mask with a spacer in older children.

**How to improve patients' inhaler technique**

Patients' inhaler technique can be improved by brief education, including a physical demonstration, from a health professional or person trained in correct technique.\textsuperscript{20} The best way to train patients to use their inhalers correctly is one-to-one training by a healthcare professional (e.g. nurse, pharmacist, GP, specialist), that involves both verbal instruction and physical demonstration.\textsuperscript{16, 14, 28} Patients do not learn to use their inhalers properly just by reading the manufacturer's leaflet.\textsuperscript{27} An effective method is to assess the individual's technique by comparing with a checklist specific to the type of inhaler, and then, after training in correct technique, to provide written instructions about errors (e.g. a sticker attached to the device).\textsuperscript{12, 25}

The National Asthma Council information paper on inhaler technique includes checklists for correct technique with all common inhaler types used in asthma or COPD.

Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.\textsuperscript{24, 14, 15}

Go to: National Asthma Council Australia's [Using your inhaler webpage](https://www.nationalasthma.org.au/inhaler) for information, patient resources and videos on inhaler technique

Go to: National Asthma Council Australia's information paper for health professionals on [Inhaler technique for people with asthma or COPD](https://www.nationalasthma.org.au/inhaler/technique)

Go to: NPS MedicineWise information on [Inhaler devices for respiratory medicines](https://www.nps.org.au/healthprofessional/inhaler-devices)
Peak flow monitoring is no longer routinely used in Australia, but is recommended for patients with severe asthma, a history of frequent flare-ups, or poor perception of airflow limitation.

Peak expiratory flow can be monitored at home using a mechanical or electronic peak flow meter, either regularly every day or when symptoms are worse. For patients who are willing to measure peak flow regularly, morning and evening readings can be plotted on a graph or recorded in a diary.

When peak flow monitoring results are recorded on a graph, the same chart should be used consistently so that patterns can be recognised. Flare-ups are easier to detect when the chart or image has a low ratio of width to height (aspect ratio), i.e. is compressed horizontally.

When a person’s written asthma action plan is based on peak expiratory flow, instructions should be based on personal best, rather than predicted values. Personal best can be determined as the highest reading over the previous 2 weeks. When a person begins high-dose inhaled corticosteroid treatment, personal best peak expiratory flow reaches a plateau within a few weeks with twice daily monitoring.

When 'wheeze-detecting' devices

Some hand-held devices and smart phone applications are marketed for detecting and measuring wheeze by audio recording and analysis.

There is not enough evidence to recommend these devices and apps for use in monitoring asthma symptoms or asthma control in adults or children, or in distinguishing wheeze from other airway sounds in children.

- Over-reliance on these devices could result in over- or under-treatment.

Psychosocial factors affecting asthma self-management

Psychosocial factors can affect asthma symptoms and outcomes in children and adults. These can include biological, individual, family and community-level factors, which can have synergistic effects in an individual with asthma. Mechanisms may include effects of stress on the immune system and effects of life circumstances on patients’ and families’ ability to manage asthma.

Relationships between psychosocial and cultural factors

Important influences on asthma outcomes include the person’s asthma knowledge and beliefs, confidence in ability to self-manage, perceived barriers to healthcare, socioeconomic status, and healthcare system navigation skills, and by the quality of interaction and communication between patient and healthcare provider. There is a complex interrelationship between:

- patient factors (e.g. health literacy, health beliefs, ethnicity, educational level, social support, cultural beliefs, comorbidities, mental health)
- healthcare provider factors (e.g. communication skills, teaching abilities, available time, educational resources and skills in working with people from different backgrounds)
- healthcare system factors (e.g. the complexity of the system, the healthcare delivery model, the degree to which the system is oriented towards chronic disease management or acute care, and the degree to which the system is sensitive to sociocultural needs).

Health literacy

‘Health literacy’ refers to the individual’s capacity to obtain, process, and understand basic health information and services they need to make appropriate health decisions. A person’s level of health literacy is influenced by various factors including skills in reading, writing, numeracy, speaking, listening, cultural and conceptual knowledge.

Inadequate health literacy is recognised as a risk factor for poorer health outcomes and less effective use of health care services. Poor health literacy has been associated with poor asthma control, and incorrect inhaler technique. Aspects of health literacy that have been associated with poorer asthma outcomes in adults include reading skills, listening skills, numeracy skills, and combinations of these. Studies assessing the association between parents’ health literacy and children’s asthma have reported inconsistent findings. Overall, there is not enough evidence to prove that low health literacy causes poor asthma control or inadequate self-management.

Australian research suggests that there are probably many Australians with limited health literacy. It may be possible to identify some groups of patients more likely to have inadequate health literacy, such as people living in regions with low
socioeconomic status, and those with low English literacy (e.g. people with limited education, members of some ethnic minorities, immigrants, and the elderly). However, even well-educated patients might have trouble with basic health literacy skills.

Attempting to assess every patient’s health literacy is impractical and may be embarrassing for the person and time-consuming for the health professional. Instead, it may be more effective for health professionals simply to assume that all patients have limited health literacy. Accordingly, all self-management skills need to be explained carefully, simply and repeatedly, and all written material should be clear and easy to read. Special consideration is needed for patients from culturally and linguistically diverse communities, including Aboriginal and Torres Strait Islander people.

**Psychosocial support and improving health literacy**

Psychosocial interventions that include asthma education may improve health-related quality of life for children and adolescents with asthma and their families. However, simply providing education might not improve a person’s health literacy, since it also depends on other factors like socioeconomic status, social support, and is influence by the provider and the healthcare system.

Asthma Australia provides personal support and information for people with asthma and parents of children with asthma through the Asthma Australia Information line by telephone on 1800 Asthma (1800 278 462) or online.

Go to: Asthma Australia

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**References**


Preparing written asthma action plans for adults

Recommendations

For every person with asthma, develop an individualised written asthma action plan that is appropriate for their treatment regimen, asthma severity, culture, language, literacy level, and ability to self-manage.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

A written asthma action plan should include all of the following:

- the person’s usual asthma and allergy medicines
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids)
- when and how to get medical care, including during an emergency
- name of the person preparing the plan
- the date.

Note: A range of templates is available from National Asthma Council Australia’s Asthma Action Plan Library.

Table. Options for adjusting medicines in a written asthma action plan for adults

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

Ensure the person has a prescription for any medicines they may need to follow their action plan (e.g. prednisolone).

Explain which medicines they should have available at all times, or when to fill prescriptions to have medicines available (e.g. before travel).

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

Review the written asthma action plan every year, and whenever there is a significant change in treatment or asthma status.

How this recommendation was developed
Consensus
Based on clinical experience and expert opinion (informed by evidence, where available).

When reviewing a written asthma action plan, consider the following:

- Does the person know where their written asthma action plan is?
- Have they used it? If so, any problems?
• Are listed medicines and instruction for actions current and appropriate?
• Are contact details for medical care and acute care up to date?

**Table. Checklist for reviewing a written asthma action plan**

- Ask if the person (or parent) knows where their written asthma action plan is.
- Ask if they have used their written asthma action plan because of worsening asthma.
- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether they find it suitable and effective.
- Check that the medication recommendations are appropriate to the person’s current treatment.
- Check that all action points are appropriate to the person’s level of recent asthma symptom control.
- Check that the person (or parent) understands and is satisfied with the action points.
- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person’s usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.
- Check that the contact details for medical care and acute care are up to date.

Asset ID: 43

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

For people who are unable to read a written asthma action plan easily due to poor eyesight or when written English is inappropriate, consider a pictorial action plan.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

For every person with a history of anaphylaxis (or risk factors), also provide a written anaphylaxis plan.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available).

**More information**

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**Written asthma action plans for adults**

Every person with asthma should have their own written asthma action plan.

When provided with appropriate self-management education, self-monitoring and medical review, individualised written action plans consistently improve asthma health outcomes if they include two to four action points, and provide instructions for use of both inhaled corticosteroid and oral corticosteroids for treatment of flare-ups.\(^1\) Written asthma action plans are effective if based on symptoms\(^2\) or personal best peak expiratory flow (not on percentage predicted).\(^1\)

**How to develop and review a written asthma action plan**

A written asthma action plan should include all the following:

- a list of the person’s usual medicines (names of medicines, doses, when to take each dose) – including treatment for related conditions such as allergic rhinitis
- clear instructions on how to change medication (including when and how to start a course of oral corticosteroids) in all the following situations:
- when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma, more symptoms than usual, asthma is interfering with usual activities)
- when asthma symptoms get substantially worse (e.g. when needing reliever again within 3 hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
- when peak flow falls below an agreed rate (for those monitoring peak flow each day)
- during an asthma emergency.

- instructions on when and how to get medical care (including contact telephone numbers)
- the name of the person writing the action plan, and the date it was issued.

Table. Options for adjusting medicines in a written asthma action plan for adults

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/42

Table. Checklist for reviewing a written asthma action plan

- Ask if the person (or parent) knows where their written asthma action plan is.
- Ask if they have used their written asthma action plan because of worsening asthma.
- Ask if the person (or parent) has had any problems using their written asthma action plan, or has any comments about whether they find it suitable and effective.
- Check that the medication recommendations are appropriate to the person’s current treatment.
- Check that all action points are appropriate to the person’s level of recent asthma symptom control.
- Check that the person (or parent) understands and is satisfied with the action points.
- If the written asthma action plan has been used because of worsening asthma more than once in the past 12 months: review the person’s usual asthma treatment, adherence, inhaler technique, and exposure to avoidable trigger factors.
- Check that the contact details for medical care and acute care are up to date.

Asset ID: 43

Templates for written asthma action plans

Templates are available from National Asthma Council Australia:

- National Asthma Council Australia colour-coded plan, available as a printed handout that folds to wallet size and as the Asthma Buddy smartphone application
- Asthma Cycle of Care asthma action plan
- A plan designed for patients using budesonide/formoterol combination as maintenance and reliever therapy
- Remote Indigenous Australian Asthma Action Plan
- Every Day Asthma Action Plan (designed for remote Indigenous Australians who do not use written English – may also be useful for others for whom written English is inappropriate).

Some written asthma action plans are available in community languages.

Software for developing electronic pictorial asthma action plans is available online.

Go to: National Asthma Council Australia’s Asthma Action Plan Library
Download: Imperial College London’s Electronic Asthma Action Plan (ZIP/9.9 MB)

References

Managing severe, high-risk and difficult-to-control asthma in adults

Recommendations

Consider referral to a specialist respiratory physician with an interest in asthma for people with severe, high-risk or difficult-to-control asthma, including those with any of the following:

- persistent asthma symptoms despite adequate treatment taken correctly. (For most people, good asthma symptom control can be achieved by following the stepped approach to adjusting medication.)
- a requirement for high-dose inhaled corticosteroids to maintain asthma control (after checking and correcting inhaler technique and confirming adherence)
- flare-ups or chest infections more than once a year
- a history of life-threatening asthma (including any previous admission to intensive care for asthma)
- a previous presentation to an emergency department for acute asthma
- systemic or severe treatment-related adverse effects
- persistent sputum production
- persistent poor adherence to preventer treatment or psychosocial factors that prevent effective treatment
- clinical features that could suggest an alternative diagnosis (e.g. atypical symptoms, normal spirometry during symptoms)
- significantly discordant symptoms and spirometry (e.g. frequent symptoms but normal lung function, or few interval symptoms but frequent or sudden flare-ups or FEV<sub>1</sub> < 70% predicted when well)
- troublesome comorbidities such as marked obesity or frequent rhinosinusitis
- other risk factors for adverse outcomes.

Table. Definition of levels of recent asthma symptom control in adults and adolescents (regardless of current treatment regimen)

<table>
<thead>
<tr>
<th>Good control</th>
<th>Partial control</th>
<th>Poor control</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of:</td>
<td>One or two of:</td>
<td>Three or more of:</td>
</tr>
<tr>
<td>- Daytime symptoms ≤ 2 days per week</td>
<td>- Daytime symptoms &gt; 2 days per week</td>
<td>- Daytime symptoms &gt; 2 days per week</td>
</tr>
<tr>
<td>- Need for reliever ≤ 2 days per week↑</td>
<td>- Need for reliever &gt; 2 days per week↑</td>
<td>- Need for reliever &gt; 2 days per week↑</td>
</tr>
<tr>
<td>- No limitation of activities</td>
<td>- Any limitation of activities</td>
<td>- Any limitation of activities</td>
</tr>
<tr>
<td>- No symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
<td>- Any symptoms during night or on waking</td>
</tr>
</tbody>
</table>

↑ Not including SABA taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks.

Adapted from:


Asset ID: 33
Table. Risk factors for adverse asthma outcomes in adults and adolescents

Please view and print this figure separately: https://www.asthmahandbook.org.au/table/show/40

Table. Management of risk factors for adverse asthma outcomes in adults

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
</table>
| Any risk factor for flare-ups | Check patient has an appropriate action plan  
Carefully check inhaler technique and adherence, and identify any barriers to good adherence  
Review frequently (e.g. every 3 months) |
| Hospitalisation or ED visit for asthma or any asthma flare-up during the previous 12 months | Ask about triggers for flare-ups, and lead time |
| History of intubation or intensive care unit admission for asthma | Ensure action plan recommends early medical review when asthma worsens |
| Hospitalisation or ED visit for asthma in the past month | Emphasise importance of maintaining regular ICS use after symptoms improve  
Confirm that patient has resumed using SABA only when needed for symptoms |
| High SABA use (>2 canisters per month) | Check lung function  
If SABA use appears to be habitual, investigate causes and consider alternative strategies, e.g. short-term substitution of ipratropium for SABA |
| Long-term high-dose ICS | Consider gradual reduction of ICS dose if symptoms stable  
Monitor regularly (e.g. assessment of bone density, regular eye examinations)  
For local side-effects, ensure inhaler technique is appropriate |
| Poor lung function (even if few symptoms) | Consider 3-month trial of higher ICS dose, then recheck lung function  
Consider referral for detailed specialist investigation |
| Sensitivity to unavoidable allergens (e.g. Alternaria species of common moulds) | Refer for further investigation and management |
| Exposure to cigarette smoke (smoking or environmental exposure) | Emphasise the importance of avoiding smoke  
Provide quitting strategies |
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Clinical action †</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider increasing ICS dose (higher dose of ICS likely to be necessary to control asthma)</td>
<td>Refer for assessment of asthma–COPD overlap</td>
</tr>
<tr>
<td>Difficulty perceiving airflow limitation or the severity of exacerbations</td>
<td>Regular PEF monitoring</td>
</tr>
<tr>
<td></td>
<td>Action plan should recommend early review and measurement of lung function</td>
</tr>
<tr>
<td>No current written asthma action plan</td>
<td>Provide and explain written asthma action plan</td>
</tr>
</tbody>
</table>

† In addition to actions applicable to all risk factors

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*Figure. Stepped approach to adjusting asthma medication in adults*

Please view and print this figure separately: https://www.asthmahandbook.org.au/figure/show/31

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Chung et al. 2014

**Montelukast can be considered as an add-on option in patients with difficult-to-treat asthma who are already taking other preventers.**

Note: PBS status as at October 2016: Montelukast treatment is not subsidised by the PBS for people aged 15 years or over. Special Authority is available for DVA gold card holders, or white card holders with approval for asthma treatments.

**How this recommendation was developed**

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Ducharme, 2004

**Tiotropium can be considered as an add-on option in adults who have had a severe asthma flare-up despite maintenance treatment with high-dose inhaled corticosteroid in combination with a long-acting beta₂ agonist.**

**Table. Definitions of ICS dose levels in adults**

<table>
<thead>
<tr>
<th>Inhaled corticosteroid</th>
<th>Daily dose (mcg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Beclometasone dipropionate †</td>
<td>100–200</td>
</tr>
<tr>
<td>Inhaled corticosteroid</td>
<td>Daily dose (mcg)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td><strong>Budesonide</strong></td>
<td>200–400</td>
</tr>
<tr>
<td><strong>Ciclesonide</strong></td>
<td>80–160</td>
</tr>
<tr>
<td><strong>Fluticasone furoate</strong></td>
<td>—</td>
</tr>
<tr>
<td><strong>Fluticasone propionate</strong></td>
<td>100–200</td>
</tr>
</tbody>
</table>

† Dose equivalents for **Qvar** (TGA-registered CFC-free formulation of beclometasone dipropionate).

*Fluticasone furoate is not available as a low dose. TGA-registered formulations of fluticasone furoate contain a medium or high dose of fluticasone furoate and should only be prescribed as one inhalation once daily.

Note: The potency of generic formulations may differ from that of original formulations. Check TGA-approved product information for details.

Sources


Asset ID: 22

Note: PBS status as at October 2016: Tiotropium is not subsidised by the PBS for the treatment of asthma.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Anderson et al. 2015
- Kew et al. 2016
- Rodrigo et al. 2015

Consider a trial of treatment with a small-particle inhaled corticosteroid (e.g. beclometasone [**Qvar**], ciclesonide) for patients with difficult-to-treat asthma, those with persistently low lung function despite regular treatment with inhaled corticosteroids, or those who experience significant oral/laryngeal adverse effects while taking other inhaled corticosteroids.

**How this recommendation was developed**

**Consensus**

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Leach et al. 2009

Omalizumab treatment can be considered for adults and adolescents aged 12 years and over, with moderate-to-severe allergic asthma despite inhaled corticosteroid treatment, and raised IgE levels.
Note: For adults and adolescents with severe allergic asthma who may be eligible for PBS subsidy, whose asthma is not well-controlled despite optimal inhaled therapy, refer immediately for specialist assessment, because patients only become eligible for PBS subsidisation for omalizumab after at least 12 months’ care by a specialist experienced in the management of severe asthma. After treatment is established, ongoing treatment with omalizumab may be administered by a GP, with 6-monthly review of ongoing eligibility at the specialist clinic.

How this recommendation was developed

Adapted from existing guidance

Based on reliable clinical practice guideline(s) or position statement(s):

- Katelaris et al. 2009
- Chung et al. 2014

Mepolizumab can be considered as an add-on treatment for patients aged 12 years and over with severe refractory eosinophilic asthma.

Note: PBS status as at October 2016: Mepolizumab is not subsidised by the PBS.

How this recommendation was developed

Consensus

Based on clinical experience and expert opinion (informed by evidence, where available), with particular reference to the following source(s):

- Menzella et al. 2016
- Powell et al. 2015

More information

Definitions of severe and difficult-to-treat asthma

Although most people’s asthma can be effectively treated with currently available medicines, a substantial subset of people have uncontrolled asthma (as indicated by persisting symptoms, low lung function and/or flare-ups) despite treatment. These patients are described as having difficult-to-treat asthma.

Some patients with difficult-to-treat asthma have severe asthma. Asthma severity is classified retrospectively according to the level of treatment needed to achieve or maintain good asthma control, rather than by the intensity or frequency of symptoms. International guidelines have been published for the assessment and management of patients with severe asthma. ‘Severe asthma’ (also called severe refractory asthma or ‘severe treatment-resistant asthma’) is defined as asthma for which good control is not achieved despite the highest level of recommended treatment, or asthma for which control can be maintained only with the highest level of recommended treatment. It is estimated that 5-10% of patients with asthma have severe asthma.

Not all patients with difficult-to-treat asthma have severe asthma. ‘Difficult-to-treat asthma’ includes asthma that is uncontrolled due to adherence issues, inappropriate or incorrect use of medicines, environmental triggers or comorbidities. Patients whose asthma control improves rapidly with correction of such problems are not considered to have severe asthma.

Treatment-resistant asthma or severe refractory asthma can only be diagnosed after confirming the diagnosis, confirming good adherence to high-dose inhaled corticosteroid and correct inhaler technique, excluding alternative or overlapping diagnoses, identifying and minimising exposure to preventable triggers including allergens, irritants and medicines that cause bronchoconstriction, managing comorbidities, and closely monitoring for at least 6 months.

Omalizumab is a treatment option for some adults, adolescents and children with severe asthma.

The definition of severe asthma proposed by the World Health Organization (WHO) Consultation on Severe Asthma for global use is ‘uncontrolled asthma which can result in risk of frequent severe exacerbations (or death) and/or adverse reactions to medications and/or chronic morbidity (including impaired lung function or reduced lung growth in children). The WHO definition of severe asthma includes a category called ‘severe untreated asthma’, a term recommended only for use in countries that lack access to standard asthma medications such as inhaled corticosteroids.
Patients with severe symptoms due to untreated asthma may be found, after starting regular treatment, to have mild asthma (i.e. asthma that is easily controlled with low-dose inhaled corticosteroids).

**Inhaled corticosteroids for adults: adverse effects**

**Local adverse effects**

Hoarseness (dysphonia) and candidiasis are the most common local adverse effects of inhaled corticosteroids with both pressurised metered-dose inhalers and dry-powder inhalers:

- The rate of dysphonia among patients taking inhaled corticosteroids has been estimated at 5–20%. However, higher rates of up to 58% have been reported in some studies. The risk varies with the device used.
- The rate of oropharyngeal candidiasis among adults using inhaled corticosteroids has been estimated at 5–7%, with positive mouth culture for *Candida albicans* in approximately 25% of patients. However, higher rates of up to 70% have been reported in some studies. The risk depends on the formulation, dose and dose frequency.

When taking inhaled corticosteroids via pressurised metered-dose inhalers, the use of a spacer reduces the risk of dysphonia and candidiasis. Spacers improve delivery of the medicine to the airways.

Rinsing the mouth with water after inhaling reduces the risk of oropharyngeal candidiasis. Quick mouth rinsing immediately after inhaling effectively removes a high proportion of remaining medicine.

The incidence of dysphonia and candidiasis is significantly lower with ciclesonide than with equivalent doses of fluticasone propionate. This may an important consideration for patients who experience dysphonia, particularly for those for whom voice quality is important (e.g. singers, actors, teachers). With ciclesonide, the rate of adverse effects may not differ when taken with or without a spacer.

**Systemic adverse effects**

Cross-sectional population studies have reported lower bone mineral density with long-term use of high doses of inhaled corticosteroid, but the effect on fracture risk in patients with asthma is unclear.

A meta-analysis of randomised controlled trials in adults older than 40 years with COPD (in which osteoporosis is more common) or asthma found no association between the use of inhaled corticosteroid and fracture risk overall, but found a slight increase in fracture risk among those using high doses.

Cross-sectional studies show a dose–response relationship between inhaled corticosteroid use for asthma or COPD, and risk of cataracts in adults.

Long-term inhaled corticosteroid use for asthma or COPD is associated with a small increase in the risk of developing diabetes, and in the risk of diabetes progression. These risks are greatest at higher doses (equivalent to fluticasone propionate 1000 mcg/day or higher).

The incidence of osteoporosis, cataracts and diabetes increases with age, and these conditions are also more common in smokers and in patients with COPD. Few studies have assessed risk specifically in patients with asthma.

Patients at risk of osteoporosis should be referred for bone density screening, screened for vitamin D and/or calcium deficiency, and provided with advice about maintaining bone health.

**Patient concerns about adverse effects**

The prevalence of side effects that patients consider troubling increases with increasing dose of inhaled corticosteroids. Mid and high doses are consistently associated with a higher intensity and a higher prevalence of reported adverse effects, after controlling for other factors.

A high proportion of people with asthma may have misunderstandings and fears about using inhaled corticosteroids, such as fears about weight gain, unwanted muscle development, bone fractures, susceptibility to infections and reduction of efficacy of the medicine over time. Most people do not discuss their concerns about inhaled corticosteroid treatment with health professionals. Safety concerns are a major reason for poor adherence, particularly general concerns about corticosteroids rather than concerns about specific adverse effects.
**Inhaled corticosteroids for adults and adolescents: particle size**

Medicines with small particle size (CFC-free beclometasone [Qvar] and ciclesonide) achieve a greater proportion of medicine deposited in the lungs, and are potentially distributed more widely in the large, intermediate, and small airways. However, the clinical implications have not been established.

Randomised controlled trials comparing ciclesonide with fluticasone propionate in adults and adolescents have observed lower rates of patient-reported side-effects, and confirmed dysphonia and oral candidiasis, among patients using ciclesonide than among those using fluticasone propionate.

**Montelukast for adults: efficacy**

In adults and adolescents with asthma that is not controlled by low-dose inhaled corticosteroid, the addition of a leukotriene receptor antagonist is less effective than the addition of a long-acting β2 agonist in reducing the rate of asthma flare-ups that require treatment with oral corticosteroids. The addition of a leukotriene receptor antagonist is also associated with lesser improvement in lung function and quality of life than the addition of a long-acting β2 agonist.

Montelukast taken 1 hour before exercise can be used to manage exercise-induced bronchoconstriction, but it is less effective than short-acting β2 agonists.

Retrospective analysis of clinical trial data suggests that some people with asthma who smoke, or are obese, may achieve better asthma control with montelukast than with an inhaled corticosteroid. However, prospective studies would be needed to confirm this.

Some individuals may also achieve better asthma control with montelukast than with an inhaled corticosteroid for reasons that are unknown and cannot be predicted from currently available data.

Although montelukast was previously thought to have particular benefits for people with aspirin-intolerant asthma, this has not been consistently demonstrated in clinical trials.

Within specialised severe asthma clinics, montelukast is sometimes prescribed as add-on treatment for adults.

**Montelukast for adults and adolescents: psychiatric effects**

Post-marketing surveillance reports led to concerns about a possible association between leukotriene receptor antagonist use and suicide risk. A recent case-control study reported a statistically significant association between the use of leukotriene receptor antagonists and suicide attempts in people aged 19–24 years. However, this association was no longer statistically significant after adjusting for potential confounding factors, including previous exposure to other asthma medicines and previous exposure to other medicines associated with suicide.

**Omalizumab**

Omalizumab is a treatment option for some adults and children aged 6 years and over with difficult-to-treat asthma. It is approved by the Therapeutic Goods Administration for use in:

- adults and adolescents aged 12 years and over with moderate-to-severe allergic asthma that is not controlled while taking inhaled corticosteroid and who have raised IgE levels.
- children aged 6 to 11 years with severe allergic asthma who have documented exacerbations despite daily high-dose inhaled corticosteroids and who have raised IgE levels.

When given in addition to inhaled corticosteroids, omalizumab is effective in helping control asthma in patients with severe asthma, particularly those with asthma that is not controlled despite regular treatment with inhaled corticosteroid at medium-to-high dose plus long-acting β2 agonist, with or without other add-on treatments. Clinical trials have shown that omalizumab reduces the rate of asthma flare-ups, enables a reduction in inhaled corticosteroid dose, improves symptoms, reduces short-acting β2 agonist reliever requirement, improves quality of life and achieves a small increase in FEV1.
Omalizumab treatment is generally well tolerated, but is associated with injection site reactions. It has been associated with anaphylactoid reactions, which can occur more than 2 hours after injection, so patients must carry adrenaline for self-administration (e.g. EpiPen) at all times. Early reports suggested that omalizumab may be associated with an increased risk of malignancy. However, subsequent pooled results indicate that a causal relationship between omalizumab therapy and malignancy is unlikely.

Note: Omalizumab treatment in adults and adolescents is subsidised through the PBS for use in patients with severe allergic asthma who meet certain criteria, including monitoring for at least 12 months by a specialist (respiratory physician, clinical immunologist, allergist or general physician) experienced in the management of patients with severe asthma. PBS criteria for continuation of treatment include demonstration of a therapeutic response by recording asthma symptom control, at baseline and after 6 months of treatment, using the 5-item Asthma Control Questionnaire (ACQ-5).

As at October 2016, omalizumab treatment is not subsidised by the PBS for children aged 6 to 11 years.

Mepolizumab

Mepolizumab is a biological humanised anti-interleukin-5 (IL-5) monoclonal antibody (human IgG1) which reduces the number of eosinophils in sputum and blood. It is indicated for add-on treatment of severe refractory eosinophilic asthma in patients aged 12 years or over and is administered by subcutaneous injection once every 4 weeks.

In people with severe eosinophilic asthma, mepolizumab treatment has been shown to improve health-related quality of life, reduce the rate of asthma flare-ups and reduce the need to systemic corticosteroids.

Adverse effects include hypersensitivity reactions such as urticaria, angioedema, rash, bronchospasm, hypotension. These generally occur within hours of administration, but reactions up to days after administration have been recorded. No cases of anaphylaxis were recorded in a 52-week open-label study of subcutaneous mepolizumab, conducted among patients who had participated in two randomised controlled trials.

Note: PBS status as at October 2016: Mepolizumab is not subsidised by the PBS.

Tiotropium for adults

A meta-analysis of 13 randomised placebo-controlled clinical trials in patients with asthma found that tiotropium as an add-on in patients taking inhaled corticosteroids improved lung function, reduced the rate of flare-ups, and improved asthma symptom control. In patients with poorly controlled asthma despite treatment with medium-to-high doses of inhaled corticosteroids, tiotropium was not inferior to salmeterol.

In patients taking a combination of an inhaled corticosteroid and salmeterol, the addition of tiotropium increased lung function, reduced the rate of flare-ups, and improved asthma symptom control.

Tiotropium was well tolerated.

A Cochrane review that included five double-blind, double-dummy trials found that the addition of tiotropium to inhaled corticosteroid therapy reduced the risk of flare-ups requiring systemic corticosteroids and improved lung function, compared with the same dose of inhaled corticosteroid, in adults not taking a long-acting beta2 agonist.

Another Cochrane review concluded that tiotropium in addition to the combination of an inhaled corticosteroid and a long-acting beta2 agonist may have additional benefits over inhaled corticosteroid/long-acting beta2 agonist alone in reducing the need for rescue oral corticosteroids in adults with severe asthma.

Bronchial thermoplasty in adults

The bronchial thermoplasty procedure uses thermal energy to ablate smooth muscle within the bronchus. It is currently being investigated as a treatment for patients with asthma that is not well controlled with medical management.

There is limited evidence from which to assess its efficacy. Preliminary findings suggest that it is well tolerated and may reduce the rate of severe flare-ups and emergency department visits.

This procedure is not widely available in Australia, and its application to patients with asthma using primary care services has not been defined.
References


