SECTION 1.1
DIAGNOSING ASTHMA IN ADULTS

Clinical processes and considerations for diagnosing asthma in adults and adolescents, including initial investigations, differential diagnosis and further investigations

VERSION 1.1

Related topics

- Investigating asthma-like symptoms in adolescents and young adults
- Investigating exercise-induced bronchoconstriction
- Investigating suspected work-related asthma
- Investigating new asthma-like symptoms in older adults
- Diagnosing and assessing asthma in Aboriginal and Torres Strait Islander people
- Diagnosing asthma in children
- Diagnostic considerations when COPD is a possibility
- Warning patients about alternative diagnostic practices
ABOUT

This PDF is a complete and print-friendly reproduction of the content included in the Diagnosing asthma in adults section of the Australian Asthma Handbook at asthmahandbook.org.au

On the Australian Asthma Handbook website, you can access complete and print-friendly content for all other sections of the Handbook.

While this PDF has primarily been designed as a printable equivalent of the website, it is also optimised to be viewed and navigated on screens and tablets.

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- The Thoracic Society of Australia and New Zealand (TSANZ)

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## RECOMMENDATION TYPES

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<td>🧑‍⚕️</td>
<td>Evidence-based recommendation (with reference to named sources)</td>
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<td>🧑‍⚕️</td>
<td>Evidence-based recommendation following inconclusive literature search</td>
<td>Based on clinical experience and expert opinion after systematic literature review yielded insufficient evidence for an evidence-based recommendation</td>
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<td>🧑‍⚕️</td>
<td>Based on selected evidence</td>
<td>Based on a limited structured literature review or published systematic review</td>
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<td>Adapted from existing guidance</td>
<td>Based on reliable clinical practice guideline(s) or position statement(s)</td>
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## ABBREVIATIONS

- **CFC**: chlorofluorocarbon
- **COPD**: chronic obstructive pulmonary disease
- **ED**: emergency department
- **EIB**: exercise-induced bronchoconstriction
- **FEV<sub>1</sub>**: forced expiratory volume over one second
- **FVC**: forced vital capacity
- **ICS**: inhaled corticosteroid
- **ICU**: intensive care unit
- **IgE**: Immunoglobulin E
- **IV**: intravenous
- **LABA**: long-acting beta<sub>2</sub>-adrenergic receptor agonist
- **NSAIDs**: nonsteroidal anti-inflammatory drugs
- **OCS**: oral corticosteroids
- **PBS**: Pharmaceutical Benefits Scheme
- **PEF**: peak expiratory flow
- **pMDI**: pressurised metered-dose inhaler or 'puffer'
- **SABA**: short-acting beta<sub>2</sub>-adrenergic receptor agonist
- **TGA**: Therapeutic Goods Administration

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Overview

There is no single reliable test (‘gold standard’) and there are no standardised diagnostic criteria for asthma.

In some patients, observing a response to treatment may help confirm the diagnosis, but lack of response to bronchodilators or to inhaled corticosteroids does not rule out asthma.

The diagnosis of asthma in adults is based on:
- history
- physical examination
- considering other diagnoses
- documenting variable airflow limitation.

In some patients, observing a response to treatment may help confirm the diagnosis, but lack of response to bronchodilators or to inhaled corticosteroids does not rule out asthma.

Note: The guidance in this section generally also applies to older adolescents.

A clinical definition of asthma in adults
Asthma is defined clinically as the combination of variable respiratory symptoms (e.g. wheeze, shortness of breath, cough and chest tightness) and excessive variation in lung function.

See: Section 7.4: Definitions and commonly used terms

VARIABLE RESPIRATORY SYMPTOMS THAT SUGGEST ASTHMA

HISTORY AND PHYSICAL EXAMINATION

Table. Findings that increase or decrease the probability of asthma in adults

Supports asthma diagnosis?

NO

YES

SPIROMETRY

FEV₁ before and 10-15 mins after bronchodilator

Reversible airflow limitation? (FEV₁ increase ≥200 mL and ≥12% from baseline)

Expiratory airflow limitation? (FEV₁/FVC < lower limit of normal for age)

NO

YES

INVESTIGATIONS FOR SPECIFIC ALTERNATIVE DIAGNOSIS

Alternative diagnosis confirmed?

NO

YES

FURTHER INVESTIGATIONS

Tests as indicated

Consider bronchial provocation test

Supports asthma diagnosis?

NO

YES

CONSIDER REFERRAL

ASTHMA

Start asthma treatment and review response
**Recommendations**

**Investigating asthma-like symptoms in adults**

**Taking a history**

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| 📝  | Consider asthma in adults with (any of):  
- episodic breathlessness  
- wheezing  
- chest tightness  
- cough. |         |
| 📝  | Ask about:  
- current symptoms (both daytime and night-time)  
- pattern of symptoms (e.g. course over day, week or year)  
- precipitating or aggravating factors (e.g. exercise, viral infections, ingested substances, allergens)  
- relieving factors (e.g. medicines)  
- impact on work and lifestyle  
- home and work environment  
- smoking history (tobacco or cannabis, exposure to other people’s smoke)  
- past history of allergies including atopic dermatitis (eczema) or allergic rhinitis (‘hay fever’)  
- family history of asthma and allergies. |         |
| 📝  | When respiratory symptoms are not typical, do not rule out the possibility of asthma without doing spirometry, because symptoms of asthma vary widely from person to person. |         |

**Performing a physical examination**

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<td>📝</td>
<td>Perform a physical examination, including chest auscultation and inspection of upper respiratory tract for signs of allergic rhinitis.</td>
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<tr>
<td>📝</td>
<td>Do not rule out the possibility of asthma without doing spirometry, because physical examination may be normal when symptoms are absent and this does not exclude a diagnosis of asthma.</td>
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**Assessing lung function**

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| 📝  | Perform or arrange spirometry for every patient with suspected asthma.  
**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. |         |
<table>
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<td>📝</td>
<td>Measure bronchodilator reversibility by performing spirometry before and after administration of a rapid-onset beta_2_ agonist bronchodilator (e.g. 4 puffs of salbutamol 100 mcg/actuation via pressurised metered-dose inhaler and spacer).</td>
<td>1-3</td>
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<tr>
<td>Notes</td>
<td>Airflow limitation is defined as reversible (i.e. bronchodilator response is clinically important) if FEV_1_ increases by ≥200 mL and ≥12%. Failure to demonstrate reversible airflow limitation after bronchodilator ('bronchodilator reversibility') does not exclude asthma, and its presence does not prove asthma – the pattern of symptoms and other clinical features must also be considered.</td>
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<tr>
<td>Figure. Steps in the diagnosis of asthma in adults</td>
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<tr>
<td>📝</td>
<td>Record the ratio of FEV_1_ to FVC (FEV_1_/FVC). Before making the diagnosis of asthma, confirm that FEV_1_/FVC is reduced (less than the lower limit of normal for age) at a time when FEV_1_ is lower than predicted. Note: If the spirometer does not provide lower limit of normal for age, use the follow age-based cut-points to indicate expiratory airflow limitation in adults and older adolescents: - less than 0.85 (up to 19 years) - less than 0.80 (20–39 years) - less than 0.75 (40–59 years) - less than 0.70 (60 years and older).</td>
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<td>📝</td>
<td>If a patient shows some improvement in FEV_1_ after bronchodilator, but does not meet criteria for reversible airflow limitation, consider other investigations. If necessary, repeat spirometry after a treatment trial of 4–6 weeks with regular low-dose inhaled corticosteroid plus short-acting beta_2_ agonist as needed, to see if there is a significant improvement in symptoms and lung function. Note: Airflow limitation can be transient (e.g. when recorded during a severe acute infection of the respiratory tract) and does not necessarily mean that the person has chronic asthma. Ideally, airflow limitation should be confirmed when the patient does not have a respiratory tract infection.</td>
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<tr>
<td>📝</td>
<td>Hand-held lung function-measuring devices (designed to measure FEV_1_ and/or FEV_6_, but not FVC) can be used in COPD case-finding and may also be useful in asthma case-finding, but must not be relied on either for ruling out asthma or when making a definitive diagnosis of asthma, because there is not enough evidence and validated protocols have not been developed.</td>
<td></td>
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<tr>
<td>📝</td>
<td>Do not use peak flow meters in place of spirometry for diagnosing asthma.</td>
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For more information on Investigating asthma-like symptoms in adults, please see:

- Significance of findings on physical examination
- Spirometry in diagnosis and monitoring
- Roles of other lung function tests in diagnosing asthma in adults
- Definition of variable expiratory airflow limitation
Considering alternative diagnoses in adults

Consider other possible causes of respiratory symptoms, including:
- poor cardiopulmonary fitness
- other respiratory conditions (e.g. bronchiectasis, chronic obstructive pulmonary disease, hyperventilation/dysfunctional breathing, inhaled foreign body, large airway stenosis, pleural effusion, pulmonary fibrosis, rhinitis rhinosinusitis, upper airway dysfunction
- cardiovascular disease (e.g. chronic heart failure, pulmonary hypertension)
- comorbid conditions (e.g. obesity, gastro-oesophageal reflux
- lung cancer.

Consider the possibility of upper airway dysfunction when FEV₁/FVC ratio on spirometry is normal or when symptoms of breathlessness or wheeze do not improve after taking short acting beta₂ agonist.

Investigate cough thoroughly if there are findings that might indicate a serious alternative or comorbid diagnosis.

If airflow limitation is not completely reversible, consider the possibility of COPD (as an alternative diagnosis or a coexisting diagnosis), especially in smokers and ex-smokers over 35 years old and in people over 65 years old.

Consider the possibility of adult-onset asthma in people with dyspnoea, wheeze or cough, even if they have no previous diagnosis of asthma.

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**Table. Findings that increase or decrease the probability of asthma in adults**

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<tr>
<td>☑️</td>
<td>Consider other possible causes of respiratory symptoms, including:</td>
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<td>- poor cardiopulmonary fitness</td>
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<td>- other respiratory conditions (e.g. bronchiectasis, chronic obstructive pulmonary disease, hyperventilation/dysfunctional breathing, inhaled foreign body, large airway stenosis, pleural effusion, pulmonary fibrosis, rhinitis rhinosinusitis, upper airway dysfunction</td>
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<td>- cardiovascular disease (e.g. chronic heart failure, pulmonary hypertension)</td>
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<td>- lung cancer.</td>
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<td>☑️</td>
<td>Consider the possibility of upper airway dysfunction when FEV₁/FVC ratio on spirometry is normal or when symptoms of breathlessness or wheeze do not improve after taking short acting beta₂ agonist.</td>
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<td>☑️</td>
<td>Investigate cough thoroughly if there are findings that might indicate a serious alternative or comorbid diagnosis.</td>
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<td>☑️</td>
<td>If airflow limitation is not completely reversible, consider the possibility of COPD (as an alternative diagnosis or a coexisting diagnosis), especially in smokers and ex-smokers over 35 years old and in people over 65 years old.</td>
<td>10</td>
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<tr>
<td>☑️</td>
<td>Consider the possibility of adult-onset asthma in people with dyspnoea, wheeze or cough, even if they have no previous diagnosis of asthma.</td>
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For more information on **Considering alternative diagnosis in adults**, please see:

> Upper airway dysfunction
> Is it asthma, COPD or both?
> Cough and asthma in adults
> Spirometry in diagnosis and monitoring
Making a diagnosis of asthma in adults

Consider features that increase or decrease the probability of asthma.

<table>
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| ❓    | Make a diagnosis of asthma if all of the following apply:  
|      | - The person has a history of variable symptoms (especially cough, chest tightness, wheeze and shortness of breath).  
|      | - Expiratory airflow limitation has been demonstrated (FEV1/FVC less than lower limit of normal for age).  
|      | - Expiratory airflow limitation has been shown to be variable  
|      | - There are no findings that suggest an alternative diagnosis.  
|      | **Note:** If the spirometer does not provide lower limit of normal for age, use the following age-based cut-points to indicate expiratory airflow limitation in adults and older adolescents:  
|      | - less than 0.85 (up to 19 years)  
|      | - less than 0.80 (20–39 years)  
|      | - less than 0.75 (40–59 years)  
|      | - less than 0.70 (60 years and older). |

| Sources | 11,12 |

Table. Findings that increase or decrease the probability of asthma in adults

If a patient’s asthma has been diagnosed elsewhere (e.g. in a new patient reporting the diagnosis of asthma), try to confirm the diagnosis – whether or not the person has current symptoms, and whether or not the person is taking asthma medicines.

For more information on Making a diagnosis of asthma in adults, please see:  
- Definition of variable expiratory airflow limitation  
- Spirometry in diagnosis and monitoring  
- Making the clinical diagnosis of asthma in adults and adolescents
After making the diagnosis of asthma, begin treatment for 4–6 weeks with either of the following:

- short-acting β₂ agonist taken as needed
- regular treatment with an inhaled corticosteroid (plus short-acting β₂ agonist taken as needed).

Arrange to check response to treatment after 4–6 weeks. Depending on the severity of initial symptoms, consider also monitoring progress and clinical signs during the treatment trial.

Note: Although response to initial asthma treatment supports the diagnosis of asthma, respiratory symptoms and low lung function may improve spontaneously (e.g., if they were due to a respiratory infection). Conversely, lack of response to treatment does not necessarily rule out asthma.

Also consider a treatment trial if asthma is strongly suspected but spirometry before and after bronchodilator does not demonstrate clinically important reversible airflow limitation (change in FEV₁ of at least 200 mL and 12% from baseline) and other investigations have not confirmed variable airflow limitation.

If there is no clear response to initial treatment, after confirming correct inhaler technique and good adherence, consider further investigations or referral to confirm or exclude the diagnosis of asthma.

For more information on Starting treatment and reviewing response in adults, please see:

- Definition of variable expiratory airflow limitation
- Spirometry in diagnosis and monitoring
- Confirming the diagnosis of asthma in adults and adolescents
- Correct use of inhaler devices
### Considering further investigations in adults

#### General considerations

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<tr>
<td>🗣️</td>
<td>Consider arranging further investigations and referral to appropriate specialists if the diagnosis cannot be made with confidence from clinical features, spirometry and response to treatment.</td>
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<tr>
<td>🗣️</td>
<td>Consider investigation for conditions that may affect or mimic asthma symptoms (e.g. coronary heart disease, obstructive sleep apnoea, gastro-oesophageal reflux disease or aspirin-exacerbated respiratory disease).</td>
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| 🗣️ | Consider and investigate the possibility of work-related asthma if (any of):  
  - the timing of asthma symptoms is associated with work activities (especially if symptoms improve when the person is away from the workplace)  
  - the person is exposed to substances known to cause occupational asthma  
  - co-workers have respiratory symptoms.  
  **Note:** Do not rule out the possibility of work-related asthma if the person’s occupation is not among those commonly associated with asthma triggers (e.g. bakers, vehicle spray painters, electronics manufacturing workers who perform soldering, woodworkers, healthcare workers, laboratory animal workers, agriculture workers), because many substances and occupations have been associated with asthma and more are being identified continually. | 13-16 |
| 🗣️ | Consider referral in the following circumstances:  
  - if the diagnosis is uncertain (consider referral for diagnostic assessment and further investigation by a respiratory physician or general physician)  
  - if signs and symptoms do not respond to a treatment trial (consider further investigations or referral to an appropriate specialist)  
  - if work-related asthma is suspected (consider referral to a respiratory physician, occupational physician and/or allergist, or allergist with experience in work-related asthma, if possible. Investigation is complex and involves a very detailed history, detailed lung function testing, site visits and sometimes challenge testing). |  |

#### Airway hyperresponsiveness tests

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| 🗣️ | Consider arranging bronchial provocation (challenge) tests for airway hyperresponsiveness if asthma is suspected but initial spirometry does not demonstrate reversible airflow limitation.  
  **Notes**  
  If challenge testing is needed, consider referring to a respiratory physician for investigation, or discussing with a respiratory physician before selecting which test to order.  
  Don’t test during a respiratory infection, or initiate inhaled corticosteroid treatment in the few weeks before challenge testing, because these could invalidate the result. |  |
| 🗣️ | Bronchial provocation (challenge) tests should be performed only in accredited respiratory function laboratories.  
  **Note:** A list of accredited laboratories is available from the Australian and New Zealand Society of Respiratory Science: [http://anzsrs.rewarddesign.net/accreditedresp.html](http://anzsrs.rewarddesign.net/accreditedresp.html) |  |
## Allergy tests

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<td>Consider allergy testing as part of diagnostic investigations if you suspect allergic triggers, or to guide management.</td>
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<tr>
<td>![Exclamation mark]</td>
<td>To investigate allergies in a person with severe or unstable asthma, or a history of anaphylaxis, refer to a specialist allergist for investigation to minimise risk.</td>
<td>18</td>
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</table>
| ![Exclamation mark] | If allergy testing is needed, refer to an appropriate provider for skin prick testing for common aeroallergens. **Notes**  
- If staff are trained in the skin prick test procedure and its interpretation, skin prick testing can be performed in primary care. If not, refer to an appropriate provider.  
| ![Exclamation mark] | Blood test (immunoassay for allergen-specific immunoglobulin E) can be used if skin prick testing is (any of):  
  - unavailable  
  - impractical (e.g. a patient who is unable to cooperate with test procedure, a patient taking antihistamines when these cannot be withdrawn, or a patient taking tricyclic antidepressants or pizotifen)  
  - contraindicated (e.g. patients with severe dermatographism, extensive skin rash, or those at risk of anaphylaxis including patients with occupational asthma due to latex sensitivity). | 18      |

## Airway inflammation tests

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<td>![Exclamation mark]</td>
<td>Do not routinely order induced sputum eosinophil count for all patients with suspected asthma. It is not necessary to demonstrate airway inflammation if the patient shows clinical features of asthma and there is a low probability that these are due to another cause.</td>
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<tr>
<td>![Exclamation mark]</td>
<td>Measurement of exhaled nitric oxide is not recommended as a diagnostic test for asthma in routine clinical practice.</td>
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<tr>
<td>![Exclamation mark]</td>
<td>Do not routinely order tests for airway hyperresponsiveness (challenge tests) for all patients with suspected asthma. It is not necessary to demonstrate airway hyperresponsiveness if the patient shows clinical features of asthma and there is a high probability that these are not due to another cause.</td>
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## Sources

- Australian Asthma Handbook v1.1 – section 1.1: diagnosing asthma in ADULTS
### Imaging

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<td>📷</td>
<td>Consider arranging chest X-ray if there are respiratory symptoms that are not explained by asthma or as otherwise indicated to investigate the possibility of other conditions (e.g. pneumonia, cancer).</td>
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<tr>
<td>📷</td>
<td>Do not routinely order chest X-ray in all patients with suspected asthma, because it is not a diagnostic test for ruling asthma in or out.</td>
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**For more information on **Consideration further investigations in adults, please see:**
- Spirometry in diagnosis and monitoring
- Cough and asthma in adults
- Is it asthma, COPD or both?
- Other diagnostic tests in adults
Significance of findings on physical examination

Wheeze suggests asthma but does not prove the diagnosis. Widespread wheeze on auscultation of the chest during symptoms increases the probability that the patient has asthma, but this may also occur in patients with COPD, viral or bacterial respiratory infection, tracheomalacia or inhaled foreign body. Obese people who do not have asthma may also report wheezing.

High-pitched stridor is commonly mistaken for wheezing in people with upper airway dysfunction. However, careful auscultation will reveal that the sound is localised to the upper airway (not peripheral airway expiratory wheezing).

Crackles on chest auscultation indicate an alternate or concurrent diagnosis.

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.

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 FEV₁ 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 FEV₁ 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.)

Record a clinically important bronchodilator response if FEV₁ increases by ≥200 mL and ≥12%.

Roles of other lung function tests in diagnosing asthma in adults

Peak expiratory flow meters in asthma diagnosis

Occasional measurement of peak expiratory flow rate is not as reliable as spirometry in the diagnosis of asthma and should not be used as a substitute.

However, peak expiratory flow monitoring can be used to support the diagnosis of asthma in some patients (e.g. as one of several investigations in the assessment of suspected work-related asthma).
When using peak expiratory flow rate to measure lung function in diagnostic investigation, either of the following suggest a diagnosis of asthma:24

- improvement in peak expiratory flow rate of at least 60 mL/min (or at least 20%) after inhaling a short-acting beta2 agonist bronchodilator, compared with baseline measure
- diurnal variation in peak expiratory flow rate of more than 10% with twice-daily readings.

**Hand-held lung function measuring devices**

Small hand-held devices that measure FEV1 and/or FEV6 could be useful in primary care case-finding to detect patients who need full investigation for COPD.23 However, there is not enough evidence to recommend their use in asthma diagnosis at present.24

**Other lung function tests used in further investigation**

Tests of airway hyperresponsiveness, lung volume tests and diffusing capacity tests may have roles within further investigation of respiratory symptoms in some patients.

> See: Considering further investigations in adults

**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.25 Normal FEV1/FVC values derived from population studies vary,1,3 but are usually greater than:1

- 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.3

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
- a 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 (normal 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
- 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.24,25 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.26,27

> Go to: National Asthma Council Australia’s Spirometry Resources at http://www.nationalasthma.org.au/health-professionals/spirometry-resources

asthmahandbook.org.au/diagnosis/adults
Upper airway dysfunction

Upper airway dysfunction is intermittent, abnormal adduction of the vocal cords during respiration, resulting in variable upper airway obstruction. It often mimics asthma and is commonly misdiagnosed as asthma. It can cause severe acute episodes of dyspnoea that occur either unpredictably or due to exercise. Inspiratory stridor associated with vocal cord dysfunction is often described as ‘wheezing’, but symptoms do not respond to asthma treatment.

Upper airway dysfunction can coexist with asthma. People with asthma who also have upper airway dysfunction experience more symptoms than those with asthma alone and this can result in overtreatment if vocal cord dysfunction is not identified and managed appropriately.

Upper airway dysfunction probably has multiple causes. In some people it is probably due to hyperresponsiveness of the larynx in response to intrinsic and extrinsic triggers. Triggers can include exercise, psychological conditions, airborne irritants, rhinosinusitis, gastro-esophageal reflux disease, and medicines.

Upper airway dysfunction should be considered when spirometry shows normal FEV₁/FVC ratio in a patient with suspected asthma or symptoms do not respond to short-acting beta₂ agonist reliever. The shape of the maximal respiratory flow loop obtained by spirometry may suggest the diagnosis. Direct observation of the vocal cords is the best method to confirm the diagnosis of upper airway dysfunction.

Is it asthma, COPD or both?

The main symptoms of chronic obstructive pulmonary disease (COPD) are breathlessness, cough and sputum production. Chest tightness, wheezing and airway irritability are also common. Patients often attribute breathlessness to ageing or poor cardiopulmonary fitness.

The definitions of asthma and COPD overlap, and asthma and COPD frequently coexist in people aged 65 years and over. Comorbid COPD is often misdiagnosed as asthma in older people, and vice versa.

Table. Findings that increase or decrease the probability of asthma in adults

Although untreated asthma is usually characterised by airway hyperresponsiveness and airway inflammation (eosinophilic and/or neutrophilic), these features are not essential for making the diagnosis of asthma in clinical practice.

Making the clinical diagnosis of asthma

The clinical diagnosis of asthma is based on the probability that the symptoms are due to asthma rather than another cause, and on the magnitude of deviation from the level of lung function and the variation in lung function that is seen in a healthy population (i.e. demonstrating variable airflow limitation).

Cough and asthma in adults

When no other asthma symptoms are present, chronic cough (present for more than 8 weeks) is unlikely to indicate asthma.

Chronic cough may be due to asthma if:
- cough is episodic
- cough with exercise is associated with other symptoms that suggest airflow limitation (expiratory wheeze or breathlessness)
- spirometry confirms reversible airflow limitation.

If cough is due to asthma, it should respond to treatment with an inhaled corticosteroid preventer taken regularly and reliever as needed.

Findings that suggest a serious alternative or comorbid diagnosis that requires further investigation include:
- haemoptysis
- smoker with > 20 pack–year smoking history
- smoker aged over 45 years with a new cough, altered cough, or cough with voice disturbance
- prominent dyspnoea, especially at rest or at night
- substantial sputum production
- hoarseness
- fever
- weight loss
- complicated gastro-oesophageal reflux disease
- swallowing disorders with choking or vomiting
- recurrent pneumonia
- abnormal clinical respiratory examination.

limitation may develop over time. It is often difficult to confirm the diagnosis of asthma after a patient has been started on preventer treatment.

**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.\textsuperscript{30-33} 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.

**Correct use of inhaler devices**

The majority of patients do not use inhaler devices correctly. Significant rates of incorrect use among patients with asthma or COPD have been reported for all currently used inhaler designs, even among regular adult users.\textsuperscript{34, 35} 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{34}

**Common errors and problems with inhaler technique**

Common errors include:\textsuperscript{34}

- failing to load the device correctly
- multiple actuations without waiting or shaking in between doses
- inability to coordinate activation with inhalation
- failure to hold breath long enough after breathing in fully
- incorrect position of inhaler (e.g. chin down and inhaler aimed at roof of mouth or tongue – should be upright with chin up).

Common problems include:

- difficulty manipulating device due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness)
- inability to generate adequate inspiratory flow.

**Problems associated with incorrect use of inhaler devices**

Incorrect use of inhalers may lead to insufficient drug delivery to the airways, and is associated with worse asthma control,\textsuperscript{34} including increased reliever use, increased use of emergency medical services, worsening asthma and higher rates of asthma instability as assessed by a health professional.

For patients using pressurised metered-dose inhalers, the risk of poor outcomes is most pronounced among patients with poor inspiration–actuation coordination.\textsuperscript{34} Incorrect technique when using dry-powder inhalers can also lead to poor asthma outcomes.\textsuperscript{35}

With inhaled corticosteroids, poor inhaler technique is also associated with increased risk of local adverse effects such as dysphonia. Among patients taking inhaled corticosteroids, failure to rinse and spit after each dose increases the risk of oropharyngeal candidiasis (‘thrush’) caused by medicine deposited in the mouth and larynx.\textsuperscript{34}

**How to improve patients’ inhaler technique**

Patients’ inhaler technique can be improved by brief education from a health professional or other person trained in correct technique, provided this includes a physical demonstration and checking the patient’s technique again after training. Community pharmacists can provide effective brief training in correct inhaler technique.\textsuperscript{34}

Interventions to correct patients’ inhaler technique can improve measures of asthma control and lung function measures.\textsuperscript{34}

To maintain correct inhaler technique, patients’ technique needs to be checked repeatedly and training needs to be repeated. Even after training is provided, some patients will continue to have difficulties using inhalers properly.\textsuperscript{34} Patients who are able to demonstrate correct technique during consultation with a health professional may not maintain this standard at other times.\textsuperscript{34}


**Other diagnostic tests in adults**

For patients with incompletely reversible airflow limitation, a careful history will often clarify which investigation is most appropriate. Lung volume tests and diffusing capacity tests may be helpful to identify emphysema or pulmonary fibrosis. High-resolution computed tomography is useful if bronchiectasis is suspected.

asthmahandbook.org.au/diagnosis/adults
**Bronchial provocation (challenge) tests in adults and older adolescents**

The main roles of bronchial provocation tests of airway hyperresponsiveness (airway hyperreactivity) in adults are to exclude asthma as the cause of current symptoms, and to confirm the presence of exercise-induced bronchoconstriction.\(^3\)\(^6\)\(^8\)

Bronchial provocation tests for hyperresponsiveness are performed in accredited lung function testing laboratories. These tests involve repeated spirometry tests.

Bronchial provocation tests of airway hyperresponsiveness include:

- **direct challenge tests** (e.g. methacholine challenge test)\(^3\)\(^8\)
- **indirect challenge tests** (e.g. exercise challenge test, eucapnic voluntary hyperpnoea, hypertonic (4.5%) saline, mannitol challenge test)\(^9\)

**Challenge tests for exercise-induced bronchoconstriction**

**Role of challenge tests**

Self-reported symptoms are not sensitive enough to detect exercise-induced bronchoconstriction reliably or specific enough to rule out other conditions, particularly in elite athletes.\(^4\)\(^0\)\(^4\)\(^2\) Single office FEV\(_1\) readings or peak expiratory flow measurement are not adequate to demonstrate exercise-induced bronchoconstriction.\(^4\)\(^3\)

Standardised, objective bronchial provocation (challenge) tests using spirometry are necessary for the investigation of suspected exercise-induced bronchoconstriction in elite athletes. These tests involve serial spirometry measurements after challenge with exercise (or exercise surrogates e.g. dry powder mannitol, eucapnic voluntary hyperpnoea or hyperventilation, or hyperosmolar aerosols such as 4.5% saline).\(^4\)\(^0\)\(^4\)\(^3\)\(^5\) Severity of exercise-induced bronchoconstriction is assessed by percentage fall in FEV\(_1\) after challenge.\(^4\)\(^3\)

Challenge testing is mandated by sports governing bodies before the athlete is given permission to use some asthma medicines, and the required testing protocol varies between specific sports. The latest information is available from the Australian Sports Anti-Doping Authority (ASADA) and the World Anti-Doping Agency (WADA).

Challenge tests are also used in the investigation of exercise-related symptoms in recreational and non-athletes, when objective demonstration of exercise-induced bronchoconstriction is needed to guide management decisions.

**Choice of challenge test**

There is no single challenge test that will identify all individuals with exercise-induced bronchoconstriction.\(^4\)\(^0\) The most appropriate test or tests for an individual depend on clinical and individual factors:

- The eucapnic voluntary hyperpnoea test can provoke a severe response.\(^4\)\(^0\) For safety reasons, the eucapnic voluntary hyperpnoea test should only be used in adults who regularly exercise at high intensity (e.g. elite athletes).\(^4\)\(^0\) It should not be used in children.

- When an exercise challenge test is used, inhalation of dry air is recommended to diagnose or exclude exercise-induced bronchoconstriction because it increases the sensitivity of the test.\(^4\)\(^0\)

- Mannitol challenge can be used as an alternative to exercise provocation testing to investigate suspected exercise-induced bronchoconstriction,\(^4\)\(^0\)\(^4\)\(^6\)\(^7\) including in children.\(^4\)\(^8\)\(^9\)

For safety reasons, exercise challenge in dry air should be avoided in patients with FEV\(_1\) < 70% predicted.\(^5\)

**Referral**

If challenge testing is needed, consider referring to a respiratory physician for investigation, or discussing with a respiratory physician before selecting which test to order. Do not test during a respiratory infection, or initiate inhaled corticosteroid treatment in the few weeks before challenge testing, because these could invalidate the result.

A list of accredited respiratory function laboratories is available from the Australian and New Zealand Society of Respiratory Science (ANZRS).

- Go to: Australian and New Zealand Society of Respiratory Science (ANZRS) Accredited Respiratory Laboratories webpage at http://anzrs.rewarddesign.net/accreditedresp.html

**Induced sputum test for eosinophilia**

Patients with untreated asthma usually have airway inflammation (eosinophilic and/or neutrophilic), but testing for this is not essential for making the diagnosis of asthma in clinical practice. Some types of asthma are not associated with eosinophilic airway inflammation.

The induced sputum test is not a standard microbiology test. It is provided by specialised laboratories.

**Exhaled nitric oxide (NO) testing**

Measurement of the fraction of exhaled nitric oxide is not routinely used in Australian clinical practice, but is used in some hospitals and in some clinical trials.

In patients with symptoms that suggest asthma (e.g. wheeze, shortness of breath, variable cough), the finding of increased exhaled nitric oxide provides...
supportive evidence for an asthma diagnosis, but is not conclusive, because: 17

- some types of asthma (i.e. asthma without eosinophilic airway inflammation) are not associated with increased exhaled nitric oxide
- patients treated with inhaled corticosteroids may show a false negative test result.

In people with a clinical diagnosis of asthma, the exhaled nitric oxide test is useful for identifying those with asthma that is likely to respond well to inhaled corticosteroids. The exhaled nitric oxide test is easy for patients to do.

The predictive value of exhaled nitric oxide as a diagnostic test for asthma is higher than for peak expiratory flow and spirometry, and similar to that of bronchial challenge tests. 17

There are several inflammatory phenotypes in asthma: eosinophilic, neutrophilic, mixed, and asthma with sputum cell counts within normal range (‘paucigranulocytic’). The exhaled nitric oxide fraction is associated with eosinophilic airway inflammation, but not with neutrophilic or paucigranulocytic asthma. 17

**Impulse oscillometry**

Impulse oscillometry is a noninvasive and rapid technique for measuring pulmonary function. Unlike spirometry, the test is easy to do and requires only passive cooperation by the patient, so it is suitable for small children. It is not used routinely in clinical practice, but is currently available in some tertiary referral centres.

Low-frequency impulse oscillometry (resistance at 5 Hz) measurements taken before and after administration of a bronchodilator correlate with spirometry (FEV₁) in people with asthma and without asthma. 50 Impulse oscillometry may be useful in identifying patients with asthma, and might possibly identify obstruction in the peripheral airways. 51

This test is not used routinely in clinical practice because diagnostic cut-points are not well established yet. 51 Australian normal values for adults without asthma have been developed. 52

**Allergy tests in diagnostic investigation in adults and adolescents**

Not all asthma is allergic, so negative allergy tests cannot exclude asthma. The probability that respiratory symptoms are due to allergic asthma is increased if a person has a history of allergy, or a family history of allergic rhinitis or atopic dermatitis.

The Australasian Society of Clinical Immunology (ASCIA) recommends skin prick testing as the first-choice method for investigating allergies in a person with asthma. 18 ASCIA cautions that non-specialist practices should not perform skin prick testing in patients with persistent severe or unstable asthma due to potential adverse effects. 18


> See: Section 4.2: Allergies and asthma
### Table. Findings that increase or decrease the probability of asthma in adults

<table>
<thead>
<tr>
<th>Asthma is more likely to explain the symptoms if any of these apply</th>
<th>Asthma is less likely to explain the symptoms if any of these apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than one of these symptoms:</td>
<td>Dizziness, light-headedness, peripheral tingling</td>
</tr>
<tr>
<td>• wheeze</td>
<td></td>
</tr>
<tr>
<td>• breathlessness</td>
<td></td>
</tr>
<tr>
<td>• chest tightness</td>
<td></td>
</tr>
<tr>
<td>• cough</td>
<td></td>
</tr>
<tr>
<td>Symptoms recurrent or seasonal</td>
<td>Isolated cough with no other respiratory symptoms</td>
</tr>
<tr>
<td>Symptoms worse at night or in the early morning</td>
<td>Chronic sputum production</td>
</tr>
<tr>
<td>History of allergies (e.g. allergic rhinitis, atopic dermatitis)</td>
<td>No abnormalities on physical examination of chest when symptomatic (over several visits)</td>
</tr>
<tr>
<td>Symptoms obviously triggered by exercise, cold air, irritants, medicines (e.g. aspirin or beta blockers), allergies, viral infections, laughter</td>
<td>Change in voice</td>
</tr>
<tr>
<td>Family history of asthma or allergies</td>
<td>Symptoms only present during upper respiratory tract infections</td>
</tr>
<tr>
<td>Symptoms began in childhood</td>
<td>Heavy smoker (now or in past)</td>
</tr>
<tr>
<td>Widespread wheeze audible on chest auscultation</td>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>FEV₁ or PEF lower than predicted, without other explanation</td>
<td>Normal spirometry or PEF when symptomatic (despite repeated tests)</td>
</tr>
<tr>
<td>Eosinophilia or raised blood IgE level, without other explanation</td>
<td></td>
</tr>
<tr>
<td>Symptoms rapidly relieved by a SABA bronchodilator</td>
<td></td>
</tr>
</tbody>
</table>

*Table adapted from:*  
Australian Asthma Handbook v1.1 asset ID: 2
### 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.  
**Note:** If not available, test again (either of):  
- Repeat lung function test during and after symptoms  
- Withhold bronchodilator treatment (SABA 6 hours or LABA-containing preventer more than 12 hours) 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.  
If not available, consider back-titrating preventer by one step:  
- Reduce inhaled corticosteroid dose by 50%.  
- 2–3 weeks later reassess lung function by spirometry before and 10–15 minutes after salbutamol.  
- If still no evidence of variable airflow limitation, consider stopping preventer treatment (with close monitoring) and repeating spirometry another 2–3 weeks later.  
If preventer is ceased and symptoms do not return at 2–3 weeks, review within 6 months. |

Table applies to patients taking maintenance inhaled corticosteroid or combination inhaled corticosteroid/long-acting beta₂ agonist  
† For patients using inhaled corticosteroid/long-acting beta₂ agonist combinations, reduce the dose of inhaled corticosteroid component by 50%. For those already using the lowest possible dose of inhaled corticosteroid/long-acting beta₂ 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.  
*Australian Asthma Handbook v1.1 asset ID: 9*
### Table. Initial treatment choices (adults not already using a preventer)

<table>
<thead>
<tr>
<th>Clinical profile</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>
<tr>
<td>Symptoms twice per month or more</td>
<td>Regular ICS starting at a low dose (plus SABA as needed)</td>
<td>Montelukast‡</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cromones§</td>
</tr>
<tr>
<td>Waking due to asthma symptoms at least once during the past month</td>
<td>Regular ICS starting at a low dose (plus SABA as needed)</td>
<td>If patient also has frequent daytime symptoms consider either of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• medium- to high-dose ICS (plus SABA as needed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [private prescription] combination ICS/LABA#</td>
</tr>
<tr>
<td>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)</td>
<td>Regular ICS starting at a low dose (plus SABA as needed)</td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td>Regular ICS starting at a low dose (plus SABA as needed)</td>
<td>Monitor frequently</td>
</tr>
<tr>
<td>Patient not currently taking a preventer whose symptoms are severely uncontrolled or very troublesome</td>
<td>Regular ICS (plus SABA as needed) For very uncontrolled asthma at presentation (e.g. frequent night waking, low lung function), consider (either of):</td>
<td>Consider (private prescription) combination ICS/LABA#</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• high-dose ICS (then down-titrate when symptoms improve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• a short course of oral corticosteroids in addition to ICS</td>
</tr>
</tbody>
</table>

† 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 April 2015: 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 April 2015: 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.

**Australian Asthma Handbook v1.1 asset ID: 32**

### 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. 6–8 weeks).
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) in Section 7.2: Tools for primary care

**Australian Asthma Handbook v1.1 asset ID: 36**
### Table. Conditions that can be confused with asthma in adults and adolescents

<table>
<thead>
<tr>
<th>Conditions characterised by cough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pertussis (whooping cough)</td>
</tr>
<tr>
<td>Gastro-oesophageal reflux</td>
</tr>
<tr>
<td>Rhinosinusitis/upper airway cough syndrome</td>
</tr>
<tr>
<td>Adverse effect of medicines (e.g. ACE inhibitors)</td>
</tr>
<tr>
<td>Bronchiectasis</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
</tr>
<tr>
<td>Pulmonary fibrosis</td>
</tr>
<tr>
<td>Large airway stenosis</td>
</tr>
<tr>
<td>Habit-cough syndrome</td>
</tr>
<tr>
<td>Inhaled foreign body</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions characterised by wheezing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory infections</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease (COPD)</td>
</tr>
<tr>
<td>Upper airway dysfunction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions characterised by difficulty breathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathlessness on exertion due poor cardiopulmonary fitness</td>
</tr>
<tr>
<td>Hyperventilation</td>
</tr>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Chronic heart failure</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
</tr>
<tr>
<td>Lung cancer</td>
</tr>
</tbody>
</table>


Australian Asthma Handbook v1.1 asset ID: 83


