

Inhaler technique for people with asthma or COPD

Information for health professionals

Key points

Most patients with asthma or COPD do not use their inhalers properly, and most have not had their technique checked or corrected by a health professional.

Incorrect inhaler technique with inhaled corticosteroid-containing treatment increases the risk of severe exacerbations and hospitalisation for people with asthma.

Poor asthma symptom control is often due to incorrect inhaler technique.

Incorrect inhaler technique with inhaled corticosteroids increases the risk of side effects like dysphonia and oral thrush.

The steps for using an inhaler correctly differ between types of inhaler device.

Checking and correcting inhaler technique can improve asthma outcomes.

Recommendations

Make sure the inhaler is appropriate for the patient's age, developmental stage, cognitive status and dexterity.

Assess inhaler technique at every opportunity, even for patients who have been using the inhaler for many years.

Repeat assessment and training regularly.

Community pharmacists should reinforce correct technique by reassessing technique and repeating the training when dispensing inhalers.

Provide all patients with individualised, hands-on training in correct inhaler use: explain and then demonstrate.

To assess technique, ask the person to show you how they use their inhaler, and check against the correct checklist for that type of inhaler. Provide the checklist as a reminder, and write down or highlight any steps that were done incorrectly (e.g. on a sticker attached to their inhaler).

Inhaler technique should always be checked before considering stepping up medication.

Most patients use inhalers incorrectly

Incorrect technique when using inhaled medicines is very common among patients with asthma or chronic obstructive pulmonary disease (COPD).¹⁻³ Australian research studies have reported that only approximately 10% of patients use correct technique.^{4,5}

High rates of incorrect inhaler use have been reported among children and adults,^{1,6-10} including experienced inhaler users.³ Groups most likely to make errors in inhaler technique include young children,^{6,7} older adults,¹¹⁻¹³ people with severe airflow limitation,^{12,14} and people using more than one type of inhaler device.¹⁵

Inhaler designs vary widely (Table 1). High rates of incorrect inhaler technique have been reported with pressurised metered-dose inhalers, soft mist inhalers, and dry powder inhalers.^{1,2,7}

Switching between inhalers, or the use of two different inhaler types, can lead to incorrect use due to confusion between the different techniques needed.¹ Always demonstrate inhaler technique when switching inhalers.

Regardless of the type of inhaler device prescribed, patients of any age are unlikely to use inhalers correctly unless they are given clear instruction, including a physical demonstration, and have their inhaler technique checked regularly.

See the National Asthma Council 'How-to' video library for [technique demonstrations](https://www.nationalasthma.org.au/health-professionals/how-to-videos) for all common inhaler types: [nationalasthma.org.au/health-professionals/how-to-videos](https://www.nationalasthma.org.au/health-professionals/how-to-videos)



Table 1. Types of inhalers for asthma and COPD medicines

Inhaler type	Brand name (active ingredient)	Pharmacological class	
Pressurised metered-dose inhaler	<i>Airomir Inhaler</i> (salbutamol)	SABA	
	<i>Asmol CFC-free Inhaler</i> (salbutamol)		
	<i>Ventolin CFC-Free Inhaler</i> (salbutamol)		
	<i>Zempreon CFC-Free Inhaler</i> (salbutamol)		
	<i>Atrovent Metered Aerosol Inhaler</i> (ipratropium)	SAMA	
	<i>Alvesco Inhaler</i> (ciclesonide)	ICS	
	<i>Axotide Junior Inhaler</i> (fluticasone propionate)		
	<i>Axotide Inhaler</i> (fluticasone propionate)		
	<i>Flixotide CFC-Free Junior Inhaler</i> (fluticasone propionate)		
	<i>Flixotide CFC-Free Inhaler</i> (fluticasone propionate)		
	<i>Fluticasone Cipla Inhaler</i> (fluticasone propionate)		
	<i>Qvar Inhaler</i> (beclometasone)		
	<i>Evocair MDI</i> (fluticasone propionate-salmeterol)		ICS-LABA
	<i>Fluticasone + Salmeterol Cipla</i> (fluticasone propionate-salmeterol)		
	<i>Flutiform Inhaler</i> (fluticasone propionate-formoterol)		
	<i>Fostair Inhaler</i> (beclometasone-formoterol)		
	<i>Pavtide Inhaler</i> (fluticasone propionate-salmeterol)		
	<i>Rilast Rapihaler</i> (budesonide-formoterol)		
	<i>SalplusF Inhaler</i> (fluticasone propionate-salmeterol)		
	<i>Seretide MDI</i> (fluticasone propionate-salmeterol)		
<i>Symbicort Rapihaler</i> (budesonide-formoterol)	ICS-LABA-LAMA		
<i>Breztri Aerosphere</i> (budesonide-formoterol-glycopyrronium)			
Breath-actuated pressurised metered-dose inhaler	<i>Airomir Autohaler</i> (salbutamol)	SABA	
	<i>Qvar Autohaler</i> (beclometasone)	ICS	
Dry powder inhaler (multidose reservoir)	<i>Bricanyl Turbuhaler</i> (terbutaline sulfate)	SABA	
	<i>Oxis Turbuhaler</i> (formoterol)	LABA	
	<i>Bretaris Genuair</i> (aclidinium)	LAMA	
	<i>Brimica Genuair</i> (aclidinium-formoterol)	LAMA-LABA	
	<i>Arnuity Ellipta</i> (fluticasone furoate)	ICS	
	<i>Pulmicort Turbuhaler</i> (budesonide)		
	<i>Bufomix Easyhaler</i> (budesonide-formoterol)	ICS-LABA	
	<i>DuoResp Spiromax</i> (budesonide-formoterol)		
	<i>Rilast Turbuhaler</i> (budesonide-formoterol)		
	<i>Salflumix Easyhaler</i> (fluticasone propionate-salmeterol)		
	<i>Symbicort Turbuhaler</i> (budesonide-formoterol)		

Table 1. Types of inhalers for asthma and COPD medicines (cont.)

Inhaler type	Brand name (active ingredient)	Pharmacological class
Dry powder inhaler (multi-blisters)	<i>Serevent Accuhaler</i> (salmeterol)	LABA
	<i>Incruse Ellipta</i> (umeclidinium)	LAMA
	<i>Anoro Ellipta</i> (umeclidinium-vilanterol)	LAMA-LABA
	<i>Arnuity Ellipta</i> (fluticasone furoate)	ICS
	<i>Axotide Junior Accuhaler</i> (fluticasone propionate)	
	<i>Axotide Accuhaler</i> (fluticasone propionate)	
	<i>Flixotide Junior Accuhaler</i> (fluticasone propionate)	
	<i>Flixotide Accuhaler</i> (fluticasone propionate)	
	<i>Breo Ellipta</i> (fluticasone furoate-vilanterol)	
	<i>Fluticasone Salmeterol Ciphalex</i> (fluticasone propionate-salmeterol)	
	<i>Pavtide Accuhaler</i> (fluticasone propionate-salmeterol)	
	<i>Seretide Accuhaler</i> (fluticasone propionate-salmeterol)	
	<i>Trelegy Ellipta</i> (fluticasone furoate-vilanterol-umeclidinium bromide)	ICS-LABA-LAMA
Dry powder inhaler (capsule)	<i>Onbrez Breezhaler</i> (indacaterol)	LABA
	<i>Braltus Zonda</i> (tiotropium)	LAMA
	<i>Seebri Breezhaler</i> (glycopyrronium)	
	<i>Spiriva Handihaler</i> (tiotropium)	
	<i>Tiotropium Lupin LupinHaler</i> (tiotropium)	
	<i>Ultibro Breezhaler</i> (glycopyrronium-indacaterol)	LAMA-LABA
	<i>Ateectura Breezhaler</i> (mometasone-indacaterol)	ICS-LABA
	<i>Enerzair Breezhaler</i> (mometasone-indacaterol-glycopyrronium)	ICS-LABA-LAMA
Soft mist inhaler	<i>Spiriva Respimat</i> (tiotropium)	LAMA
	<i>Spiolto Respimat</i> (tiotropium-olodaterol)	LAMA-LABA

ICS: inhaled corticosteroid; LABA: long-acting beta₂ agonist; LAMA: long-acting muscarinic antagonist; SABA: short-acting beta₂ agonist; SAMA: short-acting muscarinic antagonist

Visit the National Asthma Council website for the latest Asthma and COPD Medications chart: nationalasthma.org.au

Visit the Australian Asthma Handbook for information about choosing the best type of device for individual patients: astmahandbook.org.au

Inhaler choice

Choosing an appropriate inhaler for an individual involves consideration of several factors including dexterity, hand strength, inspiratory flow rate and volume, cognition, cost, and environmental impact.

Inhaler device polypharmacy should be minimised by use of single-inhaler dual and triple therapy. If multiple inhalers are indicated, where possible they should be the same type of device, to avoid the patient having to remember and master the different steps for multiple inhaler types. Changing devices or using multiple inhalers may lead to confusion and poorer disease control. Patients prescribed inhaler devices requiring a similar inhalation technique show better outcomes than those prescribed multiple devices requiring different techniques.¹⁶

Concurrent use of multiple device types

Ideally, each patient should be prescribed only a single inhaler type, because this may reduce errors and improve adherence.^{15,17-19}

If this is not possible, patients need clear instructions to avoid confusion. For example:

- One inhaler may need to be shaken (e.g. a pressurised metered-dose inhaler) while another should not be shaken (e.g. a dry powder inhaler).
- A pressurised metered-dose inhaler requires slow, steady and deep inhalation, while a dry powder inhaler requires more forceful inhalation.
- One inhaler may need washing while another must never come into contact with moisture.

Poor inhaler technique results in poor control and exacerbations

When inhalers are used incorrectly, the full dose may fail to reach the target area in the lung:²⁰

- When using a reliever, this could mean the patient fails to achieve good symptom relief, or maximal bronchodilation and improvement in lung function.²⁰
- When using an inhaled corticosteroid preventer, this could mean that the medicine does not reach sites of inflammation, including in the small airways,²⁰ and it increases the risk of local side effects such as dysphonia and oral thrush.

Certain critical errors could result in no medicine being inhaled at all. These include breathing out when actuating a pressurised metered-dose inhaler, loading a *Turbuhaler* when it is horizontal, failing to slide the lever on an *Accuhaler*, or not piercing the capsule in a single-dose dry powder inhaler).

Incorrect inhaler technique can lead to poor asthma symptom control and overuse of relievers and maintenance treatments.^{1-3,15,20,21} 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.³ Among people with COPD, those who make critical errors are twice as likely to experience severe exacerbations than those who do not.²²

Correcting patients' inhaler technique can improve asthma control, asthma-related quality of life and lung function.^{23,24}

Among patients with poorly controlled asthma referred to specialised asthma clinics^{25,26} or assessed in community pharmacies,²⁷ a high proportion are found to have poor inhaler technique.

When good asthma symptom control has not been achieved or a patient continues to have exacerbations despite appropriate treatment, both inhaler technique and adherence should always be checked before considering increasing the dose or changing the treatment regimen. The Pharmaceutical Benefits Schedule (PBS) requires adherence to current treatment and device (inhaler) technique to be reviewed at each clinical visit and before stepping up a patient's medication regimen. Inhaler technique must be checked and documented for patients with severe asthma when monoclonal antibody therapy (e.g. benralizumab, dupilumab, mepolizumab, omalizumab or tezepelumab) is being considered.

Visit the Australian Asthma Handbook for information about adjusting medicines to control asthma in children or adults: astmahandbook.org.au

How to train patients and carers in correct inhaler technique

Correct technique is specific to the inhaler type, so patients, parents and carers need to understand the right steps for their own inhaler. Healthcare professionals need to be proficient in the use of inhalers so that they can train others to use them properly. Training by health professionals can improve adults' and children's inhaler technique for a range of inhaler types.^{1,7,10}

There are 7 basic steps to using an inhaler device, relevant to all devices. Errors in any step may lead to inadequate drug delivery to the lungs.

1. Prepare inhaler device, check dose counter, shake the inhaler if applicable.
2. Prepare or load dose.
3. Breathe out, fully and gently, away from mouthpiece.
4. Put mouthpiece between teeth (without biting) and close lips to form a good seal.
5. Breathe in.

For pressurised metered-dose inhalers and soft mist inhalers: slow and steady.

For dry powder inhalers: quick and deep.

6. Remove inhaler from mouth and hold breath for 5 to 10 seconds.
7. Close inhaler or replace cap, and repeat steps 1 to 7 as necessary.

Watch, don't just ask

Ask the person to show you how they use their inhaler and check their technique against the checklist for that type of inhaler. Use the checklists for inhaler technique (from page 10).

Don't rely on patients' own assessment of their inhaler technique, even for experienced inhaler users. In an Australian study, 75% patients using an inhaler for an average of 2 to 3 years reported they were using their inhaler correctly but, on objective checking, only 10% showed the correct technique.⁴

Show, don't just tell

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), that involves both verbal instruction and physical demonstration.^{1,28-30} Patients do not learn to use their inhalers properly just by reading the manufacturer's leaflet.²⁸ Australian randomised controlled trials have shown that adults with asthma are more likely to use their inhaler correctly after a health professional demonstrated the correct technique using a placebo inhaler as well as explaining and providing written instructions, than after receiving only written and verbal instructions⁵ or after written instructions only.⁹

An effective method is to assess the individual's technique by comparing each step to a checklist specific to the type of inhaler, and then provide written instructions highlighting the steps that were incorrect (e.g. a sticker attached to the device).^{4,24} This helps patients maintain correct technique longer.³¹

Repeat, don't just prescribe or dispense

Even after achieving correct technique through training, patients can lose these skills within 2 to 3 months.^{5,23} Inhaler technique must be rechecked and training must be repeated regularly to help children and adults maintain correct technique.^{1,6}

Community pharmacists can reinforce correct technique by reassessing technique and repeating the training each time they dispense a device.⁴

Basic principles and common errors

Beta₂ agonist bronchodilators, which act on beta₂ receptors in the airway smooth muscle, may be more effective when particles are deposited in larger airways.²⁰ For inhaled corticosteroids, the goal is distribution throughout the airways, but this is not guaranteed because particle size and the speed of the patient's inhalation determines where the medicine is deposited.²⁰

Each type of inhaler device requires a specific technique to ensure that the medicine is delivered to the target region of the airways and to minimise deposition in the oropharynx (see checklists for inhaler technique from page 10). The inhaler checklists have been harmonised, where possible, to minimise confusion for patients.³²

Pressurised metered-dose inhalers

Shaking the inhaler before use is recommended for most pressurised metered-dose inhalers, to ensure a consistent delivered dose, because the contents are in suspension. It is important to actuate a dose as soon as possible after the shaking the device, to reduce the possibility of variation in delivered drug dose.³³

A few inhalers are formulated as a solution containing ethanol and do not require shaking. These include beclometasone-formoterol (*Fostair*), fluticasone propionate-formoterol (*Flutiform*), beclometasone (*Qvar Inhaler* and *Autohaler*), salbutamol (*Airomir Autohaler*) and ipratropium (*Atrovent*). The amount of alcohol per actuation is small; however, cultural or religious beliefs should be considered.

Pressurised metered-dose inhalers require slow, deep inhalation over 3 to 5 seconds, coordinated with actuation.^{2,20,25} It is essential for the dose to be released at the same time or very soon after the patient starts inhaling – not before.^{1,20} Among patients with asthma using metered-dose inhalers for regular inhaled corticosteroid–long-acting beta₂ agonist combination therapy, actuation before inhalation was a very common error associated with poorly controlled asthma symptoms in a large multicentre cross-sectional study.³⁴

If the person breathes in too rapidly, the medicine is more likely to be deposited in the oropharynx and fail to penetrate the airways.^{1,20}

Breath-holding for at least 5 seconds after inhalation is recommended because it may increase deposition of the inhaled drug in the airways.¹⁵

Common errors with pressurised metered-dose inhalers include:^{1,3,8,9,34}

- failing to shake the inhaler before actuating (if required)
- holding inhaler in wrong position (e.g. not upright)
- failing to exhale fully before actuating the inhaler
- exhaling into 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)¹
- failing to hold breath long enough after inhaling
- multiple actuations without shaking between doses (if required)
- using the inhaler when empty.

The use of a spacer with a pressurised metered-dose inhaler can help reduce problems with timing of inhalation and actuation, and reduce deposition of medicine in the mouth.

The Therapeutic Goods Administration requires both the metered and delivered doses to be included on labelling of inhalers.

Metered dose refers to the dose within the device that is available to be delivered with each actuation.

Delivered dose refers to the dose that actually exits the mouthpiece and can be inhaled into the lungs.

Methods for using a pressurised metered-dose inhaler and spacer: There are two methods (see checklists). The preferred method is to take a single slow deep breath over 3 to 5 seconds after actuation, then hold the breath for 5 seconds. The second method, using multiple breaths (tidal breathing), is used for those who cannot coordinate actuation with inhalation (e.g. young children), or during acute exacerbations. Inhaler technique should be checked after an emergency department presentation, as patients may only have experienced the tidal breathing technique.

Empty inhalers: Patients using pressurised metered-dose inhaler often fail to notice their inhaler is empty or nearly empty, or has passed the expiry date. For inhalers without a dose counter, there is no reliable way to tell when the inhaler is empty, so patients need to keep a count of doses used and keep a spare inhaler. Placing the canister in water to check if it floats was sometimes used in the past when CFC propellants were used, but this technique is no longer recommended because it is inaccurate and could damage the inhaler.¹⁵

Use the checklists for manually actuated pressurised metered-dose inhalers with and without spacers, single-breath method and multiple-breath method.

Visit the National Asthma Council Australia website for videos on how to use a pressurised metered-dose inhaler: nationalasthma.org.au/health-professionals/how-to-videos.

Dry powder inhalers

Some dry powder inhalers contain multiple doses, and others require a capsule to be inserted for each separate dose (Table 1).

Dry powder inhalers require forceful and deep inhalation over 2 to 3 seconds.^{1,2,20,25,35} It is essential that the person inhales strongly right from the start and continues for as long as possible,¹ so they should be instructed to breathe out fully before inhaling from the device. Strong flow is necessary to create the turbulence needed to transform the powder formulation into particles that can be deposited in the lung.^{1,2,20} The optimal rate of inhalation differs between inhaler designs because some have higher internal resistance than others. Among patients with asthma using dry powder inhalers for regular inhaled corticosteroid–long-acting beta₂ agonist combination therapy, insufficient inspiratory effort was a common error associated with poorly controlled asthma symptoms and increased frequency of exacerbations in a large multicentre cross-sectional study.³⁴

Among people with asthma using a *Turbuhaler*, shaking or tipping the inhaler while loading the dose has also been associated with poor asthma control and with exacerbations,³⁴ due to reduced availability of medicine for inhalation.

If the patient does not inhale fast enough or long enough, part of the dose may not be emitted from the inhaler, or the particles generated may be too big to enter the lungs – resulting in insufficient lung deposition and increased oropharyngeal deposition.^{7,20} Correct technique can be difficult or impossible during an acute asthma exacerbation, or for young children or people with COPD at any time.^{1,36} Most primary school-aged children (5–11 years) can use dry powder inhalers with adequate training, support and practice.³⁷

Moisture prevents the medicine dispersing properly when the inhaler is actuated.¹⁵ Patients must avoid exhaling into the device, to prevent moisture contamination of the powder and to avoid blowing the powder away.

An *Easyhaler* must be shaken 3 to 5 times before loading a dose. Shaking is necessary to aid the dose being deposited into the dosing cup and provide consistent dosing. Shaking ensures that the dosing cup is full, and not to mix the powder.

Common errors for dry powder inhalers include:^{3,7-9,34}

- tilting the device while loading the dose instead of keeping it in the correct position (horizontal for *Accuhaler* and *Genuair* or vertical for *Turbuhaler* and *Easyhaler*)
- shaking the device (except *Easyhaler*)
- 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.

Soft mist inhalers

Soft mist inhalers were designed to enhance drug delivery to the lungs, reduce the requirements for patient coordination and inspiratory effort, and improve patients' experience and ease of use.³⁸ Lung deposition is high and oropharyngeal deposition is low with soft mist inhalers.³⁸

Soft mist inhalers do not contain propellants. *Respimat* soft mist inhaler generates an aerosol independently of the patient's inhalation effort, with a slow velocity (0.8 m/sec) and prolonged duration (1.5 seconds), which facilitates the coordination of actuation and inhalation.³⁸

Soft mist inhalers can be used by patients with lower inspiratory flow rates.³⁹ Soft mist inhalers require hand-breath coordination and breath-holding. Use of spacer with *Respimat* is not recommended.

Common errors with *Respimat* include:⁴⁰

- errors in dose preparation and loading
- failing to exhale fully before inhaling
- inhaling too quickly
- no breath-holding after inhalation.

Other practice points

Breath-hold: Holding the breath increases lung deposition through the process of sedimentation. While the breath-holding capacity of patients with COPD may be limited, it is important that patients are advised to hold their breath for 5 seconds or as long as possible after inhalation.⁴¹

Mouthpiece or mask: Sealing the lips firmly around the mouthpiece is essential for all devices (including spacers). The mouthpiece should be placed between the teeth, without biting it. With pressurised metered-dose inhalers, a tightly fitting face mask can be used with a spacer for people who cannot form a close seal around the spacer mouthpiece (e.g. preschool children or people with cognitive impairment). Nasal breathing is more effective than mouth breathing in preschool children while using a mask.¹

Infants: Infants are unlikely to inhale enough medicine while crying.¹ The use of a spacer and face mask for a crying infant may require patience and skill: the child can be comforted (e.g. held by a parent, in own pram, or sitting on the floor) while the mask is kept on, and the actuation carefully timed just before the next intake of breath. Most infants will tolerate the spacer and mask eventually. The child may be more likely to accept the spacer and mask if allowed to handle them first (and at other times), if are personalised (e.g. with stickers or if demonstrated with a doll or teddy bear), or if the mask has a scent associated with the mother (e.g. lip gloss). The use of a spacer with a visible coloured valve allows parents to see the valve move as the child breathes in and out.

Dexterity problems: Some people may have difficulty manipulating devices due to problems with dexterity (e.g. osteoarthritis, stroke, muscle weakness). The Australian Asthma Handbook (astmahandbook.org.au) contains information about choosing the appropriate type of device for individual patients.

Rinsing and spitting: People taking inhaled corticosteroids are advised to rinse their mouth with water and spit out after each maintenance dose to reduce the amount of medicine deposited in the oropharynx.¹⁵ This may reduce the risk of oropharyngeal candidiasis ('thrush'). In children taking beta₂ agonists, mouth rinsing might reduce the risk of dental caries.¹⁵

Reliever before preventer: There is no need to take a short-acting beta₂ agonist reliever routinely before taking a preventer. Relievers should only be used for treating symptoms, or before exercise if required.

Considering patient preferences: Patients, especially adolescents, may be more likely to use a device that they prefer.

Expiry date and in-use shelf-life: All inhalers have an expiry date, usually under specified storage conditions. Inhalers should not be used after their expiry date. Expiry dates for inhalers are printed on the outer cardboard box and on the canister and/or plastic device. Some inhaler devices will also be packaged in a foil laminate or plastic pouch. Once these inhalers are opened, they must be used within a specified period to avoid reduction in stability and efficacy. Pharmacists should discuss storage and expiry after opening (in-use shelf life) with patients.

Care and maintenance of inhalers and spacers

Inhalers

Patients should follow the manufacturer's instructions on caring for devices.

Key points:

- **ICS-containing pressurised metered-dose inhalers** must never be washed (mouthpiece should be wiped with a dry tissue).
- **Multi-dose dry powder inhalers** must never be washed (can be wiped with a dry tissue).
- **Handihaler** must be washed at least monthly.

Ideally, the mouthpiece of bronchodilator pressurised metered-dose inhalers should be washed every week and dried before re-use.⁴²

Spacers

Before first use

Plastic spacers (e.g. *Volumatic*) must be washed before first use to reduce electrostatic charge (see Hygiene and maintenance, below). If this is not done, particles will be attracted to the surface and part of the dose will be lost.

Washing to reduce electrostatic charge is not necessary for metal spacers, disposable cardboard spacers (e.g. *Breath-A-Tech* cardboard spacer, *DispozABLE*, *e-chamber eco*, *LiteAire*), or antistatic polymer spacers (e.g. *Able A2A*, *Able Antibacterial*, *AeroChamber Plus*, *Breath-A-Tech*, *e-chamber La Grande*, *e-chamber La Petite*).

Hygiene and maintenance

Plastic or polyurethane spacers should be cleaned each month and after a respiratory tract infection. Spacers should be checked every 6 to 12 months for cracks and faulty valves.

How to clean a spacer:

- Disassemble by following the manufacturer's instructions (if relevant).
- Wash parts in warm water with liquid dishwashing detergent. Do not rinse.
- Allow to air-dry without wiping.
- When completely dry, reassemble carefully.

Environmental impact

Inhalers contribute significantly to greenhouse gas emissions, primarily due to the potent global warming potential of hydrofluorocarbon propellants in pressurised metered-dose inhalers.

Dry powder inhalers and soft mist inhalers are propellant-free and have a carbon footprint up to 200 times lower than that of pressurised metered-dose inhalers. For further information view the Reducing the environmental impact of asthma treatment information paper at nationalasthma.org.au/living-with-asthma/resources/health-professionals/information-paper.

Checklists for inhaler technique

The following checklists are intended for health professionals to use when assessing patients' inhaler technique. The checklists have been harmonised where possible, to minimise confusion for patients.³²

Instructions for patients and demonstration videos for all common inhaler types are available at nationalasthma.org.au/health-professionals/how-to-videos.

Checklist for manually actuated pressurised metered-dose inhaler (pMDI)

1. Remove cap. (Some must be squeezed at the sides to release).
2. Check dose counter (if device has one).
3. Hold inhaler **upright** and shake well.*
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form good seal.
6. Start to breathe in slowly through mouth and, at the same time, press down firmly on canister.
7. Continue to breathe in slowly and deeply for 3 to 5 seconds.
8. Hold breath for about 5 to 10 seconds, or as long as comfortable.
9. While holding breath, remove inhaler from mouth.
10. Breathe out gently (away from inhaler).
11. If more than one dose is needed, repeat all steps starting from step 3.
12. Replace cap.

Notes

Prime inhaler before first use or if unused for one week or more. The number of actuations varies according to manufacturer's instructions.

*Not all pressurised metered-dose inhalers need to be shaken, so check the manufacturer's instructions.

The patient should keep their chin up so the inhaler stays upright (not aimed at roof of mouth or tongue).

Problems coordinating inhalation and actuation with a pressurised metered-dose inhaler (step 6) can often be overcome by using a spacer.

A spacer should be used when taking an inhaled corticosteroid, whenever possible (see checklists for manually actuated pressurised metered-dose inhaler plus spacer).

The correct rate of inhalation (step 7) may be easier to learn by watching a demonstration.⁵

If a patient has trouble actuating the device, suggest they use both hands. People with weak hands or osteoarthritis may benefit from the use of a *Haleraid* device (available from pharmacies in two sizes, but will not fit all inhalers).

Checklist for manually actuated pressurised metered-dose inhaler (pMDI) plus spacer – single breath method

1. Assemble spacer (if necessary).
2. Remove inhaler cap (some must be squeezed at the sides to release).
3. Check dose counter (if device has one).
4. Hold inhaler **upright** and shake well.
5. Insert inhaler upright into spacer.
6. Put mouthpiece between teeth (without biting) and close lips to form good seal.
7. Breathe out gently, into the spacer.
8. Keep spacer horizontal and press down firmly on inhaler canister once.
9. Breathe in slowly and deeply for 3 to 5 seconds.
10. Hold breath for about 5 to 10 seconds, or as long as comfortable.
11. While holding breath, remove spacer from mouth.
12. Breathe out gently.
13. If more than one dose is needed, repeat all steps starting from step 4.
14. Remove inhaler from spacer.
15. Replace inhaler cap.



Notes

Only one puff should be actuated into the spacer and inhaled from the spacer at a time.

Patients should avoid a delay between pressing canister down and breathing in (steps 8 and 9). After the inhaler device is actuated into the spacer, the medicine only remains suspended and available for inhaling for a short time.

If the person cannot manage a single breath followed by breath holding (steps 9 and 10), use the multiple-breaths (tidal breathing) method.

Make sure the person also knows how to use their inhaler correctly without a spacer.

Checklist for manually actuated pressurised metered-dose inhaler (pMDI) plus spacer – multiple-breath (tidal breathing) method

1. Assemble spacer (if necessary).
2. Remove inhaler cap.
3. Check dose counter (if device has one).
4. Hold inhaler upright and shake well.
5. Insert inhaler upright into spacer.
6. Put mouthpiece between teeth (without biting) and close lips to form good seal.
7. Breathe out gently, into the spacer.
8. Keep spacer horizontal and press down firmly on inhaler canister once.
9. Breathe in and out normally for 4 breaths.
10. Remove spacer from mouth.
11. Breathe out gently.
12. Remove inhaler from spacer.
13. If more than one dose is needed, repeat all steps starting from step 3.
14. Replace inhaler cap.

Notes

The multiple-breath (tidal breathing) method can be used for young children or during acute exacerbations.

A tightly fitting face mask can be used with a spacer for people who cannot form a close seal around the spacer mouthpiece (e.g. preschool children or people with cognitive impairment). Nasal breathing is more effective than mouth breathing in preschool children while using a mask.¹

Only one puff should be actuated into the spacer and inhaled from the spacer at a time.



Checklist for Accuhaler

1. Check dose counter.
2. Open cover (use thumb grip).
3. Load dose: keep device **horizontal** while sliding lever until it clicks (do not shake).
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form a good seal (keep inhaler **horizontal**).
6. Breathe in quickly and deeply for 2 to 3 seconds.
7. Hold breath for about 5 to 10 seconds, or as long as comfortable.
8. While holding breath, remove inhaler from mouth.
9. Breathe out gently (away from inhaler).
10. If more than one dose is prescribed,* repeat all steps starting from step 3.
11. Close cover to click shut.

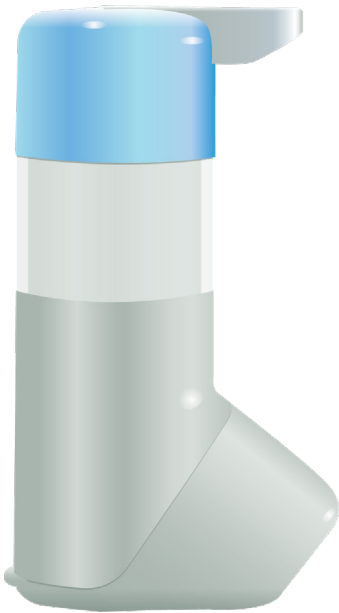
Notes

The inhaler should not be shaken after the dose is loaded.

The inhaler should not be held with the mouthpiece pointing downwards during or after loading the dose, because the medicine could dislodge.

Common errors include failing to exhale before inhaling, exhaling into the device mouthpiece, failing to inhale fully, inhaling too weakly, failing to hold breath after inhaling, and keeping device in a humid place.

*Not usually appropriate for medicines delivered by *Accuhaler*.



Checklist for *Autohaler*

1. Remove cap.
2. Hold inhaler **upright** and shake well.
3. Push lever up until it clicks.
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form good seal.
6. Breathe in slowly and deeply for 3 to 5 seconds. Keep breathing in after click is heard.
7. Hold breath for about 5 to 10 seconds, or as long as comfortable.
8. While holding breath, remove inhaler from mouth.
9. Breathe out gently (away from inhaler).
10. Push lever down.
11. If more than one dose is needed, repeat all steps starting from step 2.
12. Replace cap.

Notes

Prime inhaler by releasing two actuations into the air by loading a dose and then pushing dose release slide (on the bottom of the *Autohaler* unit) in the direction of the arrow before first use or if unused for two weeks or more.

The patient should slightly tilt their chin up so the inhaler stays upright (not aimed at roof of mouth or tongue).

There is no dose counter on the *Autohaler*. To check if empty, shake well and load the *Autohaler* by holding it upright and lifting the grey lever. Push the dose release slide (on the bottom of the *Autohaler* unit) in the direction of the arrow. If the inhaler does not fire a puff of medicine, it is empty.

Common errors when using *Autohaler* include failing to raise the lever, stopping inhaling immediately after hearing the click, exhaling into the device, and covering the air vent on the base of the inhaler.



Checklist for *Breezhaler*

1. Remove cap.
2. Tilt open mouthpiece.
3. Remove capsule from blister and place in chamber.
4. Close mouthpiece until it clicks.
5. Hold the inhaler **upright** and press both side piercing buttons in once and release.
6. Breathe out gently (away from inhaler).
7. Put mouthpiece between teeth (without biting) and close lips to form good seal.
8. Breathe in quickly and deeply for 2 to 3 seconds, so capsule vibrates.
9. Hold breath for about 5 to 10 seconds, or as long as comfortable.
10. While holding breath, remove inhaler from mouth.
11. Breathe out gently (away from inhaler).
12. Repeats steps 6 to 11, to empty capsule completely.
13. Open mouthpiece and remove used capsule.
14. If more than one dose is needed,* repeat all steps starting from step 3.
15. Close mouthpiece and cap.



Notes

Peel away the protective backing from the blister containing the capsule. Do not push the capsule through the foil.

The inhaler should not be shaken after the dose is loaded.

Do not wash the inhaler in water. Wipe the mouthpiece with a clean, dry tissue.

Common errors include failing to pierce the capsule, piercing it more than once, failure to use a new capsule for each dose, and failing to breathe in forcefully enough.

*Not usually appropriate for medicines delivered by *Breezhaler*.



Checklist for *Ciphaler*

1. Check dose counter.
2. Open cover (use thumb grip).
3. Load dose: keep device **horizontal** while sliding lever until it clicks (do not shake).
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form a good seal (keep inhaler **horizontal**).
6. Breathe in quickly and deeply for 2 to 3 seconds.
7. Hold breath for about 5 to 10 seconds, or as long as comfortable.
8. While holding breath, remove inhaler from mouth.
9. Breathe out gently (away from inhaler).
10. If more than one dose is prescribed,* repeat all steps starting from step 3.
11. Close cover to click shut.

Notes

The inhaler should not be shaken after the dose is loaded.

The inhaler should not be held with the mouthpiece pointing downwards during or after loading the dose, because the medicine could dislodge.

Common errors include failing to exhale before inhaling, exhaling into the device mouthpiece, failing to inhale fully, inhaling too weakly, failing to hold breath after inhaling, and keeping device in a humid place.

*Not usually appropriate for medicines delivered by *Ciphaler*.



Checklist for *Ellipta*

1. Check dose counter.
2. Slide cover down until a click is heard.
3. Breathe out gently (away from inhaler).
4. Put mouthpiece between teeth (without biting) and close lips to form a good seal (do not block air vent with fingers).
5. Breathe in quickly and deeply for 2 to 3 seconds.
6. Hold breath for 5 to 10 seconds, or as long as comfortable.
7. While holding breath, remove inhaler from mouth.
8. Breathe out gently (away from inhaler).
9. Slide the cover upwards as far as it will go, to cover the mouthpiece.
10. If more than one dose is needed,* repeat all steps starting from step 2.



Notes

The inhaler must not be shaken at any time.

Before first use, the inhaler must be removed from the foil package. The inhaler must be discarded and replaced with a new inhaler one month after opening the foil package.

The mouthpiece cover should not be opened until the patient is ready to inhale the dose (if the mouthpiece cover is re-closed, the dose is lost).

Common errors include shaking the inhaler, opening the mouthpiece cover without inhaling a dose, leaving the mouthpiece open, covering vent with the hand, exhaling into or near the mouthpiece, and failing to close the cover after inhaling.

*Not usually appropriate for medicines delivered by *Ellipta*.



Checklist for *Genuair*

1. Check dose counter.
2. Remove cap by squeezing arrows on each side and pulling outwards.
3. Hold inhaler **horizontally** with large, coloured button facing straight up. Without tilting inhaler, press and release the button.
4. Check that control window has changed to green.
5. Breathe out gently (away from inhaler).
6. Put mouthpiece between teeth (without biting) and close lips to form a good seal (keep inhaler **horizontal**).
7. Breathe in quickly and deeply for 2 to 3 seconds. Keep breathing in after click is heard.
8. Hold breath for about 5 to 10 seconds, or as long as comfortable.
9. While holding breath, remove inhaler from mouth.
10. Breathe out gently (away from inhaler).
11. Check that control window has changed to red.
12. Replace cap.
13. If more than one dose is needed,* repeat all steps starting from step 2.

Notes

The inhaler must not be shaken at any time.

The inhaler must be discarded and replaced with a new inhaler 60 days after opening the pouch.

Common errors include failure to exhale before inhaling, trying to inhale with cap on, exhaling into the device mouthpiece after loading the dose, inhaling before control window is green, holding coloured button down while inhaling, failure to inhale strongly enough, stopping inhalation too early, failure to hold breath long enough after inhalation.

*Not usually appropriate for medicines delivered by *Genuair*.



Checklist for *Handihaler*

1. Open cap.
2. Open mouthpiece.
3. Peel back foil, remove capsule and put capsule in chamber.
4. Close mouthpiece until it clicks.
5. Press green piercing button in once and release (do not shake).
6. Breathe out gently (away from inhaler).
7. Put mouthpiece between teeth (without biting) and close lips to form a good seal.
8. Breathe in quickly and deeply for 2 to 3 seconds, so capsule vibrates.
9. Hold breath for about 5 to 10 seconds, or as long as comfortable.
10. While holding breath, remove inhaler from mouth.
11. Breathe out gently (away from inhaler).
12. Repeat steps 6 to 11, to empty the capsule completely.
13. Open mouthpiece and remove used capsule.
14. Close mouthpiece.
15. Close cap.

Notes

The inhaler should not be shaken after the capsule has been pierced.

Clean the *Handihaler* once a month. Open the cap and mouthpiece. Then open the base by lifting the piercing button. Rinse the complete inhaler with warm water to remove any powder. Dry the *Handihaler* thoroughly by tipping excess of water out on a paper towel and air-dry afterwards, leaving the cap, mouthpiece and base open.

The *Handihaler* should be replaced every 12 months.

Common errors include failing to pierce the capsule, piercing it more than once, failing to inhale the second time to take the whole dose, failing to replace spent capsule after taking the full dose, and failing to breathe in deeply enough.



Checklist for *LupinHaler*

1. Open the cover by pressing the green piercing button.
2. Open the mouthpiece by pulling it upwards.
3. Take one capsule from the blister and place into the chamber.
4. Close the mouthpiece until it clicks. Leave the cover open.
5. Press piercing button in once, and release (do not shake).
6. Hold the inhaler horizontally but don't tip it upside-down.
7. Breathe out gently (away from inhaler).
8. Put mouthpiece between teeth (without biting) and close lips to form a good seal.
9. Breathe in quickly and deeply for 2 to 3 seconds. You should hear the capsule vibrating inside the inhaler.
10. Remove inhaler from mouth and hold breath for 5 to 10 seconds, or as long as comfortable.
11. Breathe out gently (away from inhaler).
12. Repeat steps 7 to 11 to empty the capsule completely.
13. Open the mouthpiece and tip used capsule into the bin.
14. Wipe the mouthpiece with a dry tissue.
15. Close the mouthpiece and cover.

Notes

The *LupinHaler* inhaler should only be used with the blister strip of capsules provided. Do not reuse the inhaler for another bottle of capsules. Do not store the capsule in the inhaler. Do not place a capsule directly into the mouthpiece.

The inhaler should not be shaken after the dose is loaded.

Clean the *LupinHaler* once per month. Open the cover and mouthpiece, then open the base by lifting the piercing button. Rinse all components of the *LupinHaler* completely with warm water to remove any powder. Dry the *LupinHaler* thoroughly by tipping any excess water out on a paper towel and allowing the *LupinHaler* to air dry afterwards, leaving the cover, mouthpiece and base open.

Common errors include piercing the capsule several times or not piercing the capsule at all, not breathing in strongly enough, not taking a second inhalation to receive the full dose from the capsule, swallowing the capsule instead of inhaling it through the *LupinHaler* inhaler, and not using a new capsule for each dose.



Checklist for *Respimat* (loading before first use)

1. Keep the cap closed.
2. Remove clear base: press safety catch while firmly pulling off base with other hand.
3. Insert the narrow end of the cartridge into the inhaler.
4. Place the inhaler on a firm surface and push down firmly until it clicks into place.
5. Put the clear base back into place until it clicks.
6. Turn the clear base in the direction of the arrows on the label until it clicks (half a turn).
7. Open the cap until it snaps fully open.
8. Point the inhaler toward the ground. Then press the dose-release button.
9. Close the cap.
10. Repeat steps 6 to 9 until you see a cloud coming out when you press the dose-release button.
11. Repeat steps 6 to 9 three more times.



Notes

Suggest that patients ask their pharmacist to load and prime the cartridge each month.

Respimat is supplied as a reusable inhaler and cartridge, and the cartridge only with repeat dispensing. Recommended use per reusable inhaler is 6 cartridges. Mark the checkbox on inhaler's label to track the number of cartridges.



Checklist for *Respimat* (daily after loaded and primed)

1. Hold inhaler **upright** with the cap closed.
2. Turn base in direction of arrows on label until it clicks (half a turn).
3. Open the cap until it snaps fully open.
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form a good seal.
6. Start to breathe in slowly and deeply through mouth and, at the same time, press down on the dose button.
7. Continue to breathe in slowly and deeply for 3 to 5 seconds.
8. Hold breath for 5 to 10 seconds, or as long as comfortable.
9. While holding breath, remove inhaler from mouth.
10. Breathe out gently (away from inhaler).
11. Close cover to click shut.
12. Repeat from step 1 for a total of two inhalations.



Notes

See separate instructions for loading the cartridge and priming the device.

Two inhalations is the usual dose for medicines used with *Respimat*.

Common errors include exhaling into the device mouthpiece, and not replacing the mouthpiece cover after inhaling.



Checklist for Spiromax

1. Check dose counter.
2. Hold **upright** with red mouthpiece cover at the bottom.
3. Open cover downwards until it clicks.
4. Breathe out gently (away from inhaler).
5. Put mouthpiece between teeth (without biting) and close lips to form a good seal (do not cover air vents).
6. Breathe in quickly and deeply for 2 to 3 seconds.
7. Remove inhaler from mouth (without breathing out).
8. Hold breath for 5 to 10 seconds, or as long as comfortable.
9. While holding breath, remove inhaler from mouth.
10. Breathe out gently (away from inhaler).
11. Close mouthpiece cover.
12. If more than one dose is needed, repeat all steps starting from step 2.

Notes

The inhaler must not be shaken at any time.

The mouthpiece should not be opened and closed unless a dose is being taken, because each time the mouthpiece is closed, the dose indicator counts down.

The inhaler looks similar to a pressurised metered-dose inhaler – patients need to understand it is actually a different type, and the important steps are different.

Common errors include not holding the inhaler in the upright position, not inhaling as fast and deep as possible from the beginning, and covering the air vent during inhalation.



Checklist for *Turbuhaler*

1. Unscrew and remove cover.
2. Check dose counter.
3. Keep inhaler **upright** while twisting grip at the base: twist around and then back until click is heard (do not shake).
4. Breathe out gently (away from inhaler).
5. With chin slightly raised, put mouthpiece between teeth (without biting) and close lips to form good seal (do not cover the air vents).
6. Breathe in quickly and deeply for 2 to 3 seconds.
7. Hold breath for about 5 to 10 seconds or as long as comfortable.
8. Remove inhaler from mouth.
9. Breathe out gently (away from inhaler).
10. If more than one dose is needed, repeat all steps starting from step 3.
11. Replace cover.



Notes

The inhaler must not be shaken at any time.

Prime inhaler by turning base fully in both directions twice before first use.

Patients need to inhale forcefully to release the particles. A strong airflow right from the start of inhalation is necessary to break up particles so they can reach the airways. This may be difficult for older people and those with severe airflow limitation⁷ (not recommended for young children).

The chin should be slightly raised during inhalation. The inhaler only needs to be kept upright while a dose is being loaded (by twisting the base around and then back).

Common errors include failure to exhale before inhaling, failure to turn the grip fully in both directions, failure to keep the device upright while loading, failure to inhale strongly enough, and allowing excess moisture into the device by exhaling into the mouthpiece or leaving cap off when not in use.





Checklist for *Zonda*

1. Open the cover.
2. Open the mouthpiece.
3. Take one capsule from the bottle and place into the chamber.
4. Close the mouthpiece until it clicks. Leave the cover open.
5. Press piercing button in once, and release.
6. Hold the inhaler **horizontally** but don't tip it upside down.
7. Breathe out gently (away from inhaler).
8. Put mouthpiece between teeth (without biting) and close lips to form a good seal.
9. Breathe in quickly and deeply. You should hear the capsule vibrating inside the inhaler.
10. Remove inhaler from mouth and hold breath for 5 to 10 seconds, or as long as comfortable.
11. Breathe out gently (away from inhaler).
12. Repeat steps 7 to 11 to empty the capsule completely.
13. Open the mouthpiece and tip used capsule into the bin.
14. Wipe the mouthpiece with a dry tissue.
15. Close the mouthpiece and cover.

Notes

The *Zonda* inhaler should only be used with the bottle of capsules provided. Do not reuse the inhaler for another bottle of capsules. Do not store the capsule in the inhaler. Do not place a capsule directly into the mouthpiece.

The inhaler should not be shaken after the dose is loaded.

Discard *Zonda* device after 30 uses. Do not reuse the inhaler for another bottle of capsules.

Common errors include piercing the capsule several times or not piercing the capsule at all, not breathing in strongly enough, not taking a second inhalation to receive the full dose from the capsule, swallowing the capsule instead of inhaling it through the *Zonda* inhaler, and not using a new capsule for each dose.

References

1. The Inhaler Error Steering Committee, Price D, Bosnic-Anticevich S, et al. Inhaler competence in asthma: common errors, barriers to use and recommended solutions. *Respir Med* 2013; 107: 37-46.
2. Bjermer L. The importance of continuity in inhaler device choice for asthma and chronic obstructive pulmonary disease. *Respiration* 2014; 88: 346-352.
3. Melani AS, Bonavia M, Cilenti V, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med* 2011; 105: 930-938.
4. Bsheti IA, Armour CL, Bosnic-Anticevich SZ, et al. Evaluation of a novel educational strategy, including inhaler-based reminder labels, to improve asthma inhaler technique. *Patient Educ Couns* 2008; 72: 26-33.
5. Bosnic-Anticevich SZ, Sinha H, So S, et al. Metered-dose inhaler technique: the effect of two educational interventions delivered in community pharmacy over time. *J Asthma* 2010; 47: 251-256.
6. Capanoglu M, Dibek Misirlioglu E, Toyran M, et al. Evaluation of inhaler technique, adherence to therapy and their effect on disease control among children with asthma using metered dose or dry powder inhalers. *J Asthma* 2015; 52: 838-845.
7. Lavorini F, Magnan A, Dubus JC, et al. Effect of incorrect use of dry powder inhalers on management of patients with asthma and COPD. *Respir Med* 2008; 102: 593-604.
8. Federman AD, Wolf MS, Sofianou A, et al. Self-management behaviors in older adults with asthma: associations with health literacy. *J Am Geriatr Soc* 2014; 62: 872-879.
9. Crane MA, Jenkins CR, Goeman DP, et al. Inhaler device technique can be improved in older adults through tailored education: findings from a randomised controlled trial. *NPJ Prim Care Respir Med* 2014; 24: 14034.
10. Gillette C, Rockich-Winston N, Kuhn JA, et al. Inhaler technique in children with asthma: a systematic review. *Acad Pediatr* 2016; 16: 605-615.
11. Choroa P, Pereira AM, Fonseca JA. Inhaler devices in asthma and COPD – an assessment of inhaler technique and patient preferences. *Respir Med* 2014; 108: 968-975.
12. Wieshammer S, Dreyhaupt J. Dry powder inhalers: which factors determine the frequency of handling errors? *Respiration* 2008; 75: 18-25.
13. Sestini P, Cappiello V, Aliani M, et al. Prescription bias and factors associated with improper use of inhalers. *J Aerosol Med* 2006; 19: 127-136.
14. Broeders ME, Molema J, Hop WC, et al. Inhalation profiles in asthmatics and COPD patients: reproducibility and effect of instruction. *J Aerosol Med* 2003; 16: 131-141.
15. Levy ML, Dekhuijzen PN, Barnes PJ, et al. Inhaler technique: facts and fantasies. A view from the Aerosol Drug Management Improvement Team (ADMIT). *NPJ Prim Care Respir Med* 2016; 26: 16017.
16. Rigby D. Inhaler device selection for people with asthma or chronic obstructive pulmonary disease. *Aust Prescr* 2024; 47: 140-147.
17. Braidio F, Lavorini F, Blasi F, et al. Switching treatments in COPD: implications for costs and treatment adherence. *Int J Chron Obstruct Pulmon Dis* 2015; 10: 2601-2608.
18. Bosnic-Anticevich S, Callan C, Chrystyn H, et al. Inhaler technique mastery and maintenance in healthcare professionals trained on different devices. *J Asthma* 2018; 55: 79-88.
19. Doyle S, Lloyd A, Williams A, et al. What happens to patients who have their asthma device switched without their consent? *Prim Care Respir J* 2010; 19: 131-139.
20. Haughney J, Price D, Barnes NC, et al. Choosing inhaler devices for people with asthma: current knowledge and outstanding research needs. *Respir Med* 2010; 104: 1237-1245.
21. Giraud V, Roche N. Misuse of corticosteroid metered-dose inhaler is associated with decreased asthma stability. *Eur Respir J* 2002; 19: 246-251.
22. Molimard M, Raheison C, Lignot S, et al. Chronic obstructive pulmonary disease exacerbation and inhaler device handling: real-life assessment of 2935 patients. *Eur Respir J* 2017; 49: 1601794.
23. Bsheti IA, Reddel HK, Armour CL, et al. Improved asthma outcomes with a simple inhaler technique intervention by community pharmacists. *J Allergy Clin Immunol* 2007; 119: 1537-1538.
24. Giraud V, Allaert FA, Roche N. Inhaler technique and asthma: feasibility and acceptability of training by pharmacists. *Respir Med* 2011; 105: 1815-1822.
25. Harnett CM, Hunt EB, Bowen BR, et al. A study to assess inhaler technique and its potential impact on asthma control in patients attending an asthma clinic. *J Asthma* 2014; 51: 440-445.
26. Hardwell A, Barber V, Hargadon T, et al. Technique training does not improve the ability of most patients to use pressurised metered-dose inhalers (pMDIs). *Prim Care Respir J* 2011; 20: 92-96.
27. Armour CL, Lemay K, Saini B, et al. Using the community pharmacy to identify patients at risk of poor asthma control and factors which contribute to this poor control. *J Asthma* 2011; 48: 914-922.
28. Lavorini F. Inhaled drug delivery in the hands of the patient. *J Aerosol Med Pulm Drug Deliv* 2014; 27: 414-418.
29. Newman S. Improving inhaler technique, adherence to therapy and the precision of dosing: major challenges for pulmonary drug delivery. *Expert Opin Drug Deliv* 2014; 11: 365-378.
30. Hesso I, Gebara SN, Kayyali R. Impact of community pharmacists in COPD management: Inhalation technique and medication adherence. *Respir Med* 2016; 118: 22-30.
31. Bsheti IA, Obeidat NM, Reddel HK. Effect of novel inhaler technique reminder labels on the retention of inhaler technique skills in asthma: a single-blind randomized controlled trial. *NPJ Prim Care Respir Med* 2017; 27: 9.
32. Bsheti IA, Bosnic-Anticevich SZ, Armour CL, et al. Checklists for dry powder inhaler technique: a review and recommendations. *Respir Care* 2013; 59: 1140-1154.
33. Hatley RH, Parker J, Pritchard JN, et al. Variability in delivered dose from pressurized metered-dose inhaler formulations due to a delay between shake and fire. *J Aerosol Med Pulm Drug Deliv* 2017; 30: 71-79.
34. Price DB, Roman-Rodriguez M, McQueen RB, et al. Inhaler errors in the CRITIKAL study: type, frequency, and association with asthma outcomes. *J Allergy Clin Immunol Pract* 2017; 5: 1071-1081.e1079.
35. Chrystyn H, Price D. Not all asthma inhalers are the same: factors to consider when prescribing an inhaler. *Prim Care Respir J* 2009; 18: 243-249.
36. Broeders ME, Sanchis J, Levy ML, et al. The ADMIT series – issues in inhalation therapy. 2. Improving technique and clinical effectiveness. *Prim Care Respir J* 2009; 18: 76-82.
37. Kuek SL, Wong NX, Dalziel S, et al. Dry-powder inhaler use in primary school-aged children with asthma: a systematic review. *ERJ Open Res* 2024; 10: 00455-02024.
38. Iwanaga T, Tohda Y, Nakamura S, et al. The RespiMat[®] soft mist inhaler: implications of drug delivery characteristics for patients. *Clin Drug Investig* 2019; 39: 1021-1030.
39. García-Río F, Soler-Cataluña JJ, Alcazar B, et al. Requirements, strengths and weaknesses of inhaler devices for COPD patients from the expert prescribers' point of view: results of the EPOCA Delphi Consensus. *COPD* 2017; 14: 573-580.
40. Sulku J, Bröms K, Högman M, et al. Critical inhaler technique errors in Swedish patients with COPD: a cross-sectional study analysing video-recorded demonstrations. *NPJ Prim Care Respir Med* 2021; 31: 5.
41. Horváth A, Balásházy I, Tomisa G, et al. Significance of breath-hold time in dry powder aerosol drug therapy of COPD patients. *Eur J Pharm Sci* 2017; 104: 145-149.
42. Chew NY, Reddel HK, Bosnic-Anticevich SZ, et al. Effect of mouthpiece washing on aerosol performance of CFC-free Ventolin. *J Asthma* 2004; 41: 721-727.



More information

National Asthma Council Australia provides resources and training:

Inhaler technique demonstration videos: nationalasthma.org.au/health-professionals/how-to-videos

Device and spacer charts: nationalasthma.org.au/living-with-asthma/resources/health-professionals/charts

Patient fact sheets: nationalasthma.org.au/living-with-asthma/resources/patients-carers/factsheets

Asthma education and training workshops: nationalasthma.org.au/health-professionals/education-training

Acknowledgements

2026 update

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Recommended citation

National Asthma Council Australia. (2026) Inhaler technique in people with asthma or COPD. National Asthma Council Australia, Melbourne.



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