Information paper for health professionals

NATIONAL ASTHMA COUNCIL AUSTRALIA

Leading the attack against Asthma

Inhaler technique in adults with asthma or COPD

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Incorrect technique when taking inhaled medications frequently prevents patients with asthma or chronic obstructive pulmonary disease (COPD) from receiving the maximal benefit from their medications. Recent studies confirm that:

- **regardless of the type of inhaler device prescribed, patients are unlikely to use inhalers correctly unless they receive clear instruction, including a physical demonstration**
- **the risk of misusing inhalers is particularly high in older and more debilitated patients**
- **brief verbal instruction on correct technique, with a physical demonstration, is effective when repeated over time and can improve clinical outcomes.**

Incorrect inhaler technique is common

A large proportion of patients prescribed inhaled medications do not use their inhalers correctly. Overall, up to 90% of patients show incorrect technique in clinical studies with either standard pressurised metered dose inhalers (pMDIs)[1,2] or dry-powder inhalers (DPIs) such as *Accuhaler*, *Aerolizer*, *HandiHaler* and *Turbuhaler*.[3] Although these newer inhalers were designed to improve ease of use, significant rates of incorrect use among patients with asthma or COPD have been reported for all currently used inhaler designs (Table 1),[3–9] even among regular adult users.[4,9]

With all inhaler types, error rates increase with age and the severity of airflow obstruction.[9–11] Even after training is provided, some patients will continue to have difficulties using inhalers properly.[12,13]

Inhaler technique has important clinical consequences

Incorrect use of inhalers is associated with poorer asthma control.[14,15] With short-acting beta$_2$ agonists (relievers), poor inhaler technique results in loss of bronchodilator effect.[16] Among patients using standard pMDIs without a spacer, failure to coordinate inspiration with actuation has been shown to result in reduced lung deposition of medication.[17]

Incorrect use of pMDIs for inhaled corticosteroids (ICS) has been associated with increased reliever use, increased use of emergency medical services, worsening asthma and higher rates of asthma instability as assessed by a general practitioner. These outcomes are most pronounced among patients with poor inspiration–actuation coordination.[14] Inefficient technique with DPIs may also lead to insufficient drug delivery and therefore insufficient lung deposition.[3]

What was already known on this topic?

- Incorrect inhaler technique is common among patients with asthma or COPD. In asthma, this could result in suboptimal disease control, raising the risk of absences from work or school, unnecessary increases in medication dosage, exacerbations requiring oral corticosteroid treatment, and potential side-effects.
- Patients' inhaler technique can be significantly improved by brief instruction given by a health professional or assistant trained in correct inhaler technique.

What is new in this topic?

- New high-quality evidence has confirmed that asthma control can be improved by brief verbal instruction and physical demonstration of correct inhaler technique, taking only a few minutes and repeated regularly (Figure 1).
- Checklist-based assessment and correction of step-by-step technique is an effective strategy for improving inhaler technique.
- Pharmacists can do this effectively when dispensing inhaled medications.

Table 1. Common inhaler types used in Australia

Design type	Common medications
Standard pMDI (used alone or with a spacer)	
Standard inhaler	*Airomir* (salbutamol) *Alvesco* (ciclesonide) *Asmol* (salbutamol) *Atrovent* (ipratropium bromide) *Combivent* (ipratropium and salbutamol) *Epaq* (salbutamol) *Flixotide* (fluticasone) *Intal* (sodium cromoglycate) *Intal Forte* (sodium cromoglycate) *Qvar* (beclomethasone) *Seretide* (salmeterol plus fluticasone) *Serevent* (salmeterol)* *Tilade* (nedocromil sodium) *Ventolin* (salbutamol)
Breath-activated pMDI	
Autohaler	*Airomir* (salbutamol) *Qvar* (beclomethasone)
Dry powder inhaler	
Accuhaler	*Flixotide* (fluticasone) *Seretide* (salmeterol plus fluticasone) *Serevent* (salmeterol)
Aerolizer	*Foradile* (eformoterol)
HandiHaler	*Spiriva* (tiotropium)
Turbuhaler	*Bricanyl* (terbutaline sulfate) *Oxis* (eformoterol) *Pulmicort* (budesonide) *Symbicort* (budesonide plus eformoterol)

pMDI, pressurised metered dose inhaler. *Discontinued December 2007.

Figure 1. Physical demonstration of correct technique.

Among patients taking ICS, failure to maintain meticulous oral hygiene (rinse, gargle and spit) after each dose increases the risk of oropharyngeal candidiasis ('thrush') and hoarseness, caused by medication deposited in the mouth and pharynx. For those using a pMDI, the risk of these local side-effects can also be reduced by using a valved spacer.[18]

Common problems

Correct technique depends on the inhaler type, so patients need to understand the right steps for their own inhaler. Common errors for several inhaler types are shown in Tables 2–7 along with a suggested checklist of steps for each inhaler.

Patients using a pMDI are much more likely to have poor technique when using their device without a spacer.[4,11] The use of spacers helps overcome the problem of coordinating inspiration with actuation. However, the medication stays suspended for a short time only, so if patients fail to take each dose without delay immediately after loading the spacer, a proportion of the dose is deposited onto the inner surface of the spacer and therefore lost.

Even when patients are able to demonstrate correct technique during consultation with a health professional, they may not maintain this standard at other times.[11,13] Those instructed to use a spacer may subsequently revert to using their pMDI alone.[11]

Patients frequently fail to detect when the inhaler is empty or nearly empty, particularly when using reliever pMDIs. This problem can result in patients continuing to use the inhaler when it may no longer be delivering the required dose. Built-in dose counters may not overcome this problem for patients with poor eyesight.

Poor maintenance of inhalers or spacers, or failure to replace an inhaler or spacer when necessary, can also result in suboptimal drug delivery.

Spacer care and hygiene[18]

Spacers should be cleaned before first use and then monthly by washing in warm water with kitchen detergent and allowing to air dry without rinsing. Drying with a cloth or paper towel can result in electrostatic charge ('static') on the inside of the spacer, which can reduce availability of dose. The mouthpiece should be wiped clean of detergent before use.

Where spacers are for the use of more than one individual, infection control guidelines should be followed.

Spacers should be reviewed every 6–12 months to check the structure is intact (e.g. no cracks) and the valve is functioning.

Special groups

Older patients

A substantial body of evidence has shown that incorrect inhaler technique is particularly common among older people with asthma or COPD, whether using a pMDI or a DPI.[9,19,20] When prescribing inhaled medication, doctors should check that the individual is capable of using the relevant inhaler correctly.

Some older patients with advanced COPD may benefit from the use of a spacer with a pMDI.[9] However, many will also have difficulties connecting the inhaler to the spacer.[21] A breath-activated inhaler (e.g. *Autohaler*) may be easier to use for some older patients.[21]

Patients with osteoarthritis may be unable to activate a pMDI easily,[10] and may benefit from the use of a *Haleraid* or a breath-activated inhaler. Mechanical difficulties can usually be overcome by checking each individual's technique and helping the person identify which inhaler they can use best.

Patients with COPD

Most patients with COPD are unable to use a pMDI correctly. Common errors include inadequate coordination of inspiration and actuation and inability to achieve a high enough inspiratory flow rate.[22] Even with training, some will be unable to overcome these problems[22] and may do better with a pMDI plus spacer.

A study using *Accuhalers* and *Turbuhalers* showed that patients with severe COPD were less likely to achieve a high enough inspiratory rate to activate the inhaler, even after instruction.[22] These patients might achieve better technique using a breath-activated inhaler, where possible.[22] Adequate lung doses of ICS may be achieved with a breath-activated inhaler, despite poor technique.[23]

Patients with cognitive impairment

Inability to achieve a firm seal around the mouthpiece can be a problem for older patients with cognitive impairment when using inhalers alone or with a spacer. A spacer face mask can overcome this problem.[24] Those with cognitive impairment are likely to have problems retaining skills after instruction in the use of an inhaler.[25]

Other factors

Lower education levels have been associated with an increased rate of incorrect technique.[20] Poor inhaler technique might be more common among patients with poor English language skills, due to difficulties understanding the instructions.[26]

The concurrent use of multiple inhaler types with different techniques can confuse patients.[19]

Education can improve inhaler technique and clinical outcomes

A large body of evidence from randomised clinical trials has shown that patients' inhaler technique can be improved by education from a health professional[8,12,27–32] or other person trained in correct technique.[33] The amount of instruction on inhaler technique given by health care professionals influences patients' likelihood of correct technique.[20]

However, published studies from around the world suggest that as many as 25% of patients with asthma or COPD have never received verbal inhaler technique instruction. When given, instruction is often rushed, poor quality and not reinforced.[3] Only an estimated 11% of patients receive follow-up assessment and education on their inhaler technique.[6]

Several studies have demonstrated that community pharmacists can provide effective training in correct inhaler technique.[6–8,34] In patients with asthma, interventions to correct inhaler technique have been shown to improve measures of asthma control such as patient-reported perceived asthma control,[7] scores for asthma-related quality-of-life questionnaires,[7,35] asthma severity classification,[8] and lung function measures such as peak expiratory flow (PEF)[36] or PEF variability.[7] In patients with asthma who showed poor timing and rapid inhalation when using a salmeterol pMDI, the use of a spacer achieved a greater increase in expiratory flow after bronchodilator and this benefit persisted for 6 hours.[37]

Practice tips

- Knowing the steps in inhaler technique and common errors for each type of inhaler can help you check patients' technique and provide effective instruction.
- Contact the National Asthma Council Australia, your local Asthma Foundation or your division of general practice/general practice network about asthma training workshops available in your region.
- Inhaler demonstration videos are available via the National Asthma Council Australia and Asthma Foundation NSW websites and from the Lung Health Promotion Centre at the Alfred.
- The use of personalised reminders on inhalers, to direct the patient's attention to individual errors in technique, is a feasible and effective way to improve technique.[6]
- Ask "Can you show me how you use your inhaler?" rather than "Can you use your inhaler?" to avoid merely checking patient confidence.
- For those instructed to use a spacer with a pMDI, ask in a non-judgemental manner whether they sometimes or often use the inhaler alone. Emphasise that using the spacer is an important part of correct technique for best results.
- Keep your advice and explanations relevant to the person's age, cultural background and education.

How can health professionals help patients use inhalers correctly?

1. Make sure your own knowledge of correct technique is up to date

Don't assume your own technique is correct. A high proportion (31–85%) of health professionals show incorrect technique when tested objectively, and these rates are similar between doctors, nurses and community pharmacists.[8]

Learn to use each inhaler type correctly, including new inhalers, so you can confidently demonstrate their use to patients. Learn the rationale for each step of the instructions, so you can clearly explain its importance to patients.[11] Become aware of common errors with different types (Tables 2–7).

2. Ensure the inhaler is appropriate for the patient

Become aware of common errors for special groups. In patients with asthma or COPD who show poor inhaler technique with a pMDI, the addition of a large-volume spacer and education from a health professional (rather than simply changing inhalers) might be the best initial strategy for improving inhaler technique.[4]

Patients with pMDIs should use a spacer:

- whenever ICS medications are used
- if they have poor inspiration–activation coordination
- when taking a reliever during acute asthma episodes (if available).

Where possible, avoid prescribing multiple inhaler types. The use of multiple inhaler types may lead to confusion and errors,[38] and has been identified as a cause of poor technique.[39]

3. Ask patients to show you how they use their inhaler

Actively check the patient's technique against the appropriate checklist for the specific inhaler type. Don't rely on the patient's assurance that they know how to use their inhaler. Patients are unlikely to ask for advice because most are unaware that their inhaler technique is faulty.[8]

4. Give patients verbal instruction, not just a leaflet

The manufacturer's instruction sheet alone is ineffective in achieving correct technique.[4,12,13,30] Patients with asthma or COPD using an inhaler for the first time are more likely to show correct technique after receiving verbal instruction than after reading the manufacturer's leaflet.[30] Instruction provided in groups or by video can also be as effective as one-to-one instruction in improving technique.[40]

An Australian approach that has achieved significant improvements in asthma control among patients using long-term preventer and/or controller medications (*Accuhaler* and *Turbuhaler*) involves the following components delivered by community pharmacists:[8]

- Have the patient demonstrate their inhaler technique, while checking against a purpose-developed checklist of essential steps.
- Demonstrate correct technique and correct any specific errors identified.
- Have the patient repeat the demonstration to check they have understood. If necessary, repeat instruction until the patient has all steps correct.
- Give the patient a written record of any step(s) incorrectly performed at the initial demonstration, by highlighting these on a printed label attached to the patient's inhaler.
- At each subsequent visit, repeat assessment and education.

Patients with poorly controlled asthma may gain the most clinical benefit from purpose-designed asthma management education interventions. For others, basic instruction is as effective as intensive education programs in improving inhaler technique.[41]

5. Give a physical demonstration

Inhaler technique education is best delivered by verbal instructions and physical demonstration of the technique by a skilled educator, either face to face or by video.[6,8,29] Demonstrating the steps can also help overcome language barriers.

Check that the person is able to understand the instructions and perform them correctly.

6. Repeat instruction regularly

Inhaler technique must be rechecked and education must be reinforced regularly in order to maintain correct technique, as inhaler technique deteriorates again after education.[6–8, 31,42] Three months after training, loss of skills is associated with a deterioration in some asthma outcomes.[7] Older patients may be particularly prone to losing technical skills over time.[19]

Even with experienced inhaler users, don't rely on patients' judgement of their inhaler technique. In an Australian study, 75% patients using an inhaler for an average of 2–3 years reported they were using their inhaler correctly but, on objective checking, only 10% demonstrated correct technique.[8] Most patients will have received instruction only at the time of their first prescription.

Table 2. Pressurised metered dose inhaler suggested checklist and common errors

Suggested checklist of steps*	Problems and common errors	Tips
1. Remove cap 2. Hold inhaler upright and shake well 3. Breathe out gently 4. Put mouthpiece between teeth without biting and close lips to form good seal 5. Start to breathe in slowly through mouth and press down firmly on canister 6. Continue to breathe in slowly and deeply 7. Hold breath for about 10 seconds or as long as comfortable 8. While holding breath, remove inhaler from mouth 9. Breathe out gently away from mouthpiece 10. If an extra dose is needed, wait 1 minute and then repeat steps 2 to 9 11. Replace cap	• Inability to coordinate activation with inhalation[14,38] • Failure to hold breath for a sufficient time[14,38] • Multiple actuations without waiting or shaking in between doses • Incorrect position of inhaler • Difficult for people with osteoarthritis affecting hands • May be unsuitable for patients with severe COPD with poor inspiratory flow rate[22]	• All patients using a pMDI for an inhaled corticosteroid medication should use a spacer • Patients with weak hands or osteoarthritis who have difficulty using a pMDI may benefit from a *Haleraid* device • Keep chin up and inhaler upright (not aimed at roof of mouth or tongue)

*Check the package insert for any specific instructions relating to an individual prescribed inhaler. COPD, chronic obstructive pulmonary disease; pMDI, pressurised metered dose inhaler.

Figure 2. Metered dose inhaler showing correct position of inhaler and good seal with lips around mouthpiece.

Figure 3. Metered dose inhaler plus spacer showing good seal with lips around mouthpiece.

Table 3. Pressurised metered dose inhaler plus spacer suggested checklist and common errors

Suggested checklist of steps	Problems and common errors	Tips
1. Assemble spacer 2. Remove inhaler cap 3. Hold inhaler upright and shake well 4. Insert inhaler upright into spacer 5. Put mouthpiece between teeth without biting and close lips to form good seal 6. Breathe out gently 7. Hold spacer level and press down firmly on canister once 8. Breathe in slowly and deeply then hold breath for about 10 seconds or as long as comfortable *OR* Breathe in and out normally for 4 breaths* 9. Remove spacer from mouth 10. Breathe out gently 11. Remove inhaler from spacer 12. If an extra dose is needed, wait 1 minute and then repeat steps 3 to 11 13. Replace cap and disassemble spacer	• Compromised drug delivery to lungs due to build up of electrostatic charge, damaged or sticky valves, or by multiple actuations[38] • Multiple actuations without waiting or shaking in between doses • Delay between actuation and inhalation leading to no medication being inhaled • Patients with cognitive impairment may be unable to form adequate lip seal	• Overcomes errors with pMDI alone for many patients • Good spacer care and hygiene can improve efficacy • Use a facemask for infants and patients unable to form a good lip seal

*Multiple breaths (tidal breathing) is used for young children and during acute exacerbations where a single deep breath cannot be managed. pMDI, pressurised metered dose inhaler.

Table 4. *Autohaler* suggested checklist and common errors

Suggested checklist of steps*	Problems and common errors	Tips
1. Remove cap 2. Hold inhaler upright and shake well* 3. Push lever up 4. Breathe out gently away from mouthpiece 5. Put mouthpiece between teeth without biting and close lips to form good seal 6. Breathe in slowly and deeply. Keep breathing in after click is heard 7. Hold breath for about 10 seconds or as long as comfortable 8. While holding breath, remove inhaler from mouth 9. Breathe out gently away from mouthpiece 10. Push lever down 11. If an extra dose is needed, repeat steps 2 to 10 12. Replace cap	• Incorrect position of inhaler • Multiple actuations without shaking in between doses* • Stopping breathing in when the click is heard • Excess moisture from humidity or breathing into device[38]	• Keep chin up and inhaler upright (not aimed at roof of mouth or tongue) • Always lift the lever before using the inhaler • Always put the cover back on the inhaler after use

**Qvar Autohaler* does not need to be shaken before use.

Figure 4. *Autohaler* showing correct position of inhaler and good seal with lips around mouthpiece.

Figure 5. *Accuhaler* showing correct position of inhaler and good seal with lips around mouthpiece.

Table 5. *Accuhaler* suggested checklist and common errors

Suggested checklist of steps	Problems and common errors	Tips
1. Check dose counter 2. Open using thumb grip 3. Holding horizontally, load dose by sliding lever until it clicks 4. Breathe out gently away from mouthpiece 5. Place mouthpiece in mouth and seal lips 6. Breathe in steadily and deeply 7. Hold breath for about 10 seconds or as long as comfortable 8. While holding breath, remove inhaler from mouth 9. Breathe out gently away from mouthpiece 10. If an extra dose is needed, repeat steps 3 to 9 11. Close cover to click shut	• Not loading dose before inhaling • Failure to breathe in deeply and with enough force to deliver medication[3] • Failure to hold breath for a sufficient time after inhalation[3] • Excess moisture from humidity or breathing into device[38]	• Never hold the inhaler with the mouthpiece pointing downwards during or after loading a dose, as the medication can dislodge. Always keep it horizontal. • A fine weave, dark coloured cloth or handkerchief held over the mouthpiece can be used to assess whether the patient has inhaled strongly enough to draw the medication out of the device • Always close the inhaler after use

Table 6. *HandiHaler* suggested checklist and common errors

Suggested checklist of steps	Problems and common errors	Tips
1. Open cap 2. Open mouthpiece 3. Remove capsule from blister and place in chamber 4. Close mouthpiece until it clicks 5. Press green piercing button in once and release 6. Breathe out gently away from mouthpiece 7. Put mouthpiece between teeth without biting and close lips to form good seal 8. Breathe in slowly and deeply, so capsule vibrates 9. Continue to breathe in as long as comfortable 10. While holding breath, remove inhaler from mouth 11. Breathe out gently away from mouthpiece 12. Put mouthpiece back between teeth without biting and close lips to form good seal 13. Breathe in slowly and deeply, so capsule vibrates 14. Continue to breathe in as long as comfortable 15. While holding breath, remove inhaler from mouth 16. Breathe out gently away from mouthpiece 17. Open mouthpiece and remove used capsule 18. If an extra dose is needed, repeat steps 3 to 17 19. Close mouthpiece and cap	• Not piercing capsule or, conversely, piercing capsule multiple times • Not using a new capsule for each dose • Failure to breathe in deeply and with enough force to deliver medication • Not taking second breath to receive full dose from capsule • Swallowing capsule instead of inhaling it through the *HandiHaler*	• When dispensing a new device to a patient with weak hands, work the cover back and forth several times to loosen up (may not be an issue with the latest model) • Always close the inhaler after use

Figure 6. *HandiHaler* showing new capsule being loaded.

Figure 7. *Turbuhaler* showing good seal with lips around mouthpiece and adequate inhalation.

Table 7. *Turbuhaler* suggested checklist and common errors

Suggested checklist of steps	Problems and common errors	Tips
1. Unscrew and remove cover 2. Check dose counter 3. Keep inhaler upright while twisting grip around and then back until click is heard 4. Breathe out gently away from mouthpiece 5. Place mouthpiece between teeth without biting and close lips to form a good seal 6. Breathe in strongly and deeply 7. Remove inhaler from mouth 8. Breathe out gently away from mouthpiece 9. If an extra dose is needed, repeat steps 3 to 9 10. Replace cover	• Incorrect positioning of inhaler during loading of a dose[3] • Failing to complete both steps of loading manoeuvre (around and then back)[3] • Failure to breathe in deeply and with enough force to deliver medication[3] • Excess moisture from humidity or breathing into device[38]	• Place inhaler on a flat surface (e.g. table) for loading dose to ensure it remains upright • A fine weave, dark coloured cloth or handkerchief held over the mouthpiece can be used to assess whether the patient has inhaled strongly enough to draw the medication out of the device • Read the dose counter in the middle of the window • Always put the cover back on the inhaler after use

Other resources

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