HANDLING OF INHALER DEVICES:
A PRACTICAL GUIDE FOR PHARMACISTS

PHARMACEUTICAL SERVICES DIVISION
MINISTRY OF HEALTH MALAYSIA
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<tr>
<td>BI Tube</td>
<td>Boehringer Ingelheim Tube</td>
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<tr>
<td>BP</td>
<td>British Pharmacopoeia</td>
</tr>
<tr>
<td>CFC</td>
<td>Chlorofluorocarbon</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic Pulmonary Airway Disease</td>
</tr>
<tr>
<td>LABA</td>
<td>Long-acting beta-2 agonist</td>
</tr>
<tr>
<td>mcg</td>
<td>Microgram</td>
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<tr>
<td>MDI</td>
<td>Metered Dose Inhaler</td>
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<tr>
<td>PEFR</td>
<td>Peak Expiratory Flow Rate</td>
</tr>
<tr>
<td>SABA</td>
<td>Short-acting beta-2 agonist</td>
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</tbody>
</table>
INTRODUCTION

Asthma and Chronic Obstructive Pulmonary Disease (COPD) can lead to chronic morbidity and mortality throughout the world and their prevalence has increased considerably over the past 20 years.

Asthma is a chronic inflammatory disorder of the airways. Chronically inflamed airways are hyperresponsive; they become obstructed and airflow is limited (by bronchoconstriction, mucus plugs and increased inflammation) when airways are exposed to various risk factors.

COPD consists of chronic bronchitis and emphysema, two commonly co-existing diseases of the lungs in which the airways become narrowed. This leads to a limitation of the flow of air to and from the lungs causing shortness of breath. In contrast to asthma, the limitation of airflow is poorly reversible and usually gets progressively worse over time.

An inhaler or puffer is a medical device used for delivering medication into the body via the lungs. It is mainly used in the treatment of asthma and COPD. Recent studies have shown that incorrect inhaler technique prevent patients from receiving maximal benefits from medications. Poor medication delivery leads to reduced quality of life, more frequent and longer hospital stay and poor control of the symptoms of asthma such as wheeze, cough and breathlessness.

“Handling of Inhaler Devices: A Practical Guide for Pharmacists” is a collaborative effort involving pharmacists within the Ministry of Health from all states. This guidebook aims to provide pharmacists, prescribers and other health care professionals with standard inhaler techniques to assist patients.
METERED DOSE INHALER (MDI)

1.1 INTRODUCTION

An inhaler is a medical device that administers medication to the lungs in an aerosolised form for the measurement of asthma, chronic obstructive pulmonary disease (COPD) and other respiratory conditions. The most commonly used type of inhaler is the metered dose inhaler (MDI). This type of inhaler consists of a small canister that holds the medicine. The medicine is administered in a metered dose, which saves the users from having to measure their dosage. MDIs are used to administer bronchodilators, anticholinergics and steroids.

A MDI consists of 2 major components: the canister and an actuator (or mouthpiece). The canister itself consists of a metering dose valve with an actuating stem. The formulation resides within the canister and is made up of the drug, a liquefied gas propellant and, in many cases, stabilising excipient. The actuator contains the mating discharge nozzle and generally includes a dust cap to prevent contamination.

![Picture 1: Cross Section of a Metered Dose Inhaler.](image-url)
1.2 DIRECTIONS FOR USE

STEP 1:
Remove the mouthpiece cover. Remain standing or seated upright to obtain the full dose of each actuation.

STEP 2:
Hold the inhaler in an upright position as shown in diagram.

Note:
May use both hands for patients with difficulty in handling the device.
Note:
Each shake constitute from top to bottom, back to top again.

STEP 3:
Shake the MDI 3 - 5 times in an up-down motion before each puff to mix the contents of the canister. If the device is being used for the first time, prime it by actuating the canister mid-air until an even spray is obtained.

STEP 4:
Exhale slowly and completely through your mouth before holding your breath. **DO NOT** exhale into the mouthpiece.
STEP 5:
Device should be held at an upright position. Insert into mouth with no obstruction to the mouthpiece with the head slightly tilted.

DO NOT bite the mouthpiece.
STEP 6:
Begin inhaling slowly through the mouth (NOT nose) (1) and simultaneously actuate the MDI ONCE (2). Continue inhalation for about 3-5 seconds until the lungs are full (3).

STEP 7:
Hold breath for 4-10 seconds.
It is recommended to leave the inhaler in the mouth while holding breath.

Note:
Ability to hold breath for less than 4 seconds, consider use of a spacer.
No extra benefit for holding breath more than 10 seconds.
STEP 8:
Remove inhaler (1) from mouth and exhale slowly (2).

STEP 9:
Wait 30 seconds to 1 minute before repeating step 3-8 if subsequent doses are required.

STEP 10:
Close cap and keep the inhaler in a dry place.

Note:
1. Patients should be advised to gargle with water after using certain types of MDIs e.g. Anticholinergics and Inhaled Corticosteroids (ICS).
2. If on two types of inhalers (steroid & bronchodilator), it is recommended to use the bronchodilator first and wait for 5 minutes before using the steroid.
1.3 **MAINTENANCE**

- It is important to keep the device clean to:
  - Prevent medication accumulation.
  - Prevent blockage over the nozzle.

- Clean the plastic mouthpiece only, **NOT** the metal canister.

- Clean at least **ONCE A WEEK**.

- For inhalers that are not used for more than 2 weeks, it should be primed before use.

**STEP 1:**

Remove the mouthpiece cover and canister from the actuation body.

**DO NOT** use detergent or soap.
STEP 2:
Wash the actuator from the top with running tap water for 30 seconds.
Repeat by running tap water through the mouthpiece of the actuator for 30 seconds.

STEP 3:
Let the actuator dry overnight after shaking off as much water as possible.

Note:
If the patient needs to use the MDI during exacerbation, shake the actuator dry and then actuate twice away from face to ensure no blockage. The inhaler is ready for use.
STEP 4:
When the actuator has dried, assemble the canister to the actuator body. Ensure a tight fit.

Shake the device well and actuate twice away from face to ensure no blockage.

Replace the cap and store the device safely before the next use.

1.4 DETERMINING CONTENTS OF AN MDI CANISTER
- It is hard to determine the remaining contents of the MDI.
- The floating/immersion technique is no longer endorsed by a panel of experts.

Keep a spare one. The shaking method can be done to estimate the remaining contents of the MDI canister but it does not reflect the actual content of the canister.
### 1.5 SUMMARY OF METERED DOSE INHALERS

<table>
<thead>
<tr>
<th>INHALER/PROPELLANT/ PACKAGING</th>
<th>STRENGTH PER PUFF (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| SALBUTAMOL BP (ASTHALIN®)     | 100                      | Adult and children | 100 - 200 mcg | 2400 mcg | 1. Slight tremor (particularly in the hands)  
2. Headache  
3. Peripheral dilatation  
4. Palpitations  
5. Tachycardia  
6. Arrhythmias  
7. Disturbances of sleep and behavior in children  
8. Muscle cramps  
9. Hypersensitivity reactions including paradoxical bronchospasm, urticaria, angioedema, hypotension, pulmonary oedema, erythema multiforme | Short-acting beta-agonist (SABA) |
<p>| 400 doses                     | 200 mcg 15 minutes before exercise | Exercise induced bronchospasm | 400 mcg every 10 minutes | 2400 mcg | |</p>
<table>
<thead>
<tr>
<th>INHALER/PROPELLANT/PACKAGING</th>
<th>STRENGTH PER PUFF (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
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<tr>
<td></td>
<td></td>
<td>Children &lt; 6 years</td>
<td>60 mcg</td>
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<td>Anticholinergic and short acting beta-agonist (SABA)</td>
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<tr>
<td>INHALER/PROPellant/PACKAGING</td>
<td>STRENGTH PER PUFF (MCG)</td>
<td>GROUP</td>
<td>DAILY DOSE</td>
<td>MINIMUM</td>
<td>MAXIMUM</td>
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<td>BUDESONIDE/300 doses</td>
<td>200</td>
<td>Adult</td>
<td>200 mcg</td>
<td>200 mcg</td>
<td>1600 mcg</td>
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<td>C/children 2 - 7 years &gt; 7 years</td>
<td>200 mcg</td>
<td>200 mcg</td>
<td>400 mcg</td>
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<td>200 mcg</td>
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<td>800 mcg</td>
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<tr>
<td>BECLOMETHASONE DIPROPIONATE (BECLAZONE®)/200 doses</td>
<td>100</td>
<td>Adult</td>
<td>300 mcg</td>
<td>300 mcg</td>
<td>800 mcg</td>
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<td></td>
<td></td>
<td>Children &gt; 6 years</td>
<td>100 mcg</td>
<td></td>
<td>400 mcg</td>
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<tr>
<td>INHALER/PROPELLANT/PACKAGING</td>
<td>STRENGTH PER PUFF (MCG)</td>
<td>GROUP</td>
<td>DAILY DOSE</td>
<td>ADVERSE EFFECT</td>
<td>REMARK</td>
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<td>MINIMUM</td>
<td>MAXIMUM</td>
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<tr>
<td>CICLESONIDE (ALVESCO®)/60 doses</td>
<td>160</td>
<td>Adult</td>
<td>160 mcg</td>
<td>320 mcg</td>
<td>Side effects are similar with Budesonide PLUS:</td>
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<td></td>
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<td></td>
<td></td>
<td>1. Epistaxis</td>
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<td>2. Nasopharyngitis</td>
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<td>3. Bruising</td>
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<td>4. Cataracts</td>
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<td>5. Glaucoma</td>
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<tr>
<td>FLUTICASONE PROPIONATE (FLIXOTIDE®)/120 doses</td>
<td>125</td>
<td>Adult</td>
<td>100 mcg</td>
<td>2000 mcg</td>
<td>1. Mouth and throat candidiasis</td>
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<td></td>
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<td>2. Hoarseness (patients are advised to gargle after using the medication)</td>
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<td>3. Paradoxical bronchospasm</td>
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<td>4. Cutaneous hypersensitivity reactions</td>
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<td>5. Headache</td>
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<td>6. Giddiness or dizziness</td>
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<td>7. Sleep disorders</td>
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<td>8. Migraine</td>
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<td>9. Paralysis of cranial nerves</td>
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<td>10. Mood disorders</td>
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</table>

Remark: Glucocorticoid
<table>
<thead>
<tr>
<th>INHALER/PROPELLANT/ PACKAGING</th>
<th>STRENGTH PER PUFF (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
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</thead>
</table>
| **FLUTICASONE PROPIONATE** & **SALMETEROL XINAFOATE** *(SERETIDE® EVOHALER®)* | 25/50  
25/125  
25/250 | Adult and children Ø 4 years | 25 mcg (1 puff Salmeterol alone)  
50 mcg (2 puffs Salmeterol alone) | 1. Transient tremor  
2. Subjective palpitations and headache  
3. Cardiac arrhythmias (atrial fibrillation, supraventricular tachycardia and extrasystoles)  
4. Athralgia  
5. Hypersensitivity reactions such as rash, edema and angioedema  
6. Side effects for fluticasone are similar with *Flixotide®* | Glucocorticoid and long acting beta-agonist (LABA) |

**Notes:**
- Transient tremor
- Subjective palpitations and headache
- Cardiac arrhythmias (atrial fibrillation, supraventricular tachycardia and extrasystoles)
- Athralgia
- Hypersensitivity reactions such as rash, edema and angioedema
- Side effects for fluticasone are similar with *Flixotide®*
1.6 REFERENCES


2. TURBUHALER®

2.1 INTRODUCTION

Turbuhaler® is an easy-to-use, multiple-dose, inspiratory flow-driven dry powder inhaler. Currently there are 4 types of Turbuhaler® which are Budesonide (Pulmicort®), combination of Budesonide/Formoterol (Symbicort®), Formoterol (Oxis®) and Terbutaline (Bricanyl®).


2.2 DIRECTIONS FOR USE

A. Preparing a new Turbuhaler® (Priming):

**STEP 1:**
Unscrew and lift off the cover.

**STEP 2:**
Hold the Turbuhaler® upright with the grip facing downwards.

Turn the grip as far as it will go and then turn it back as far as it will go in the opposite direction until a “CLICK” sound is heard.

Perform this procedure TWICE.
B. Used Turbuhaler®

STEP 1:
Unscrew and lift off the cover.

STEP 2:
Hold the Turbuhaler® upright with the grip facing downwards.

*DO NOT* hold the mouthpiece when turning the grip.
STEP 3:
To load the Turbuhaler® with a dose, turn the grip as far as it will go in one direction as shown in the diagram.

STEP 4:
Then turn it back again as far as it will go in the opposite direction until a "CLICK" sound is heard.

The Turbuhaler® is now loaded with the desired dose and is ready for use.

Note:
If the turbuhaler is accidentally dropped, a new dose should be loaded and inhaled.
STEP 5:
Breathe out away from the mouthpiece.

STEP 6:
Place the mouthpiece gently between the lips.
Ensure a tight seal around it as in diagram.
**STEP 7:**
Breathe in forcefully and deeply through the mouth only.

**Note:**
Holding breath after inhalation is optional.

**STEP 8:**
Remove the Turbuhaler® from the mouth before breathing out again.

*DO NOT* breathe into the mouthpiece.
STEP 9:
Repeat step 2 - 8 if more than one dose is required.

STEP 10:
Replace the cover and store Turbuhaler® in a dry place.

Note:
1. Patients should be advised to gargle with water after using steroid containing Turbuhalers®.
2. If on two types of Turbuhalers® (steroid & bronchodilator), it is recommended to use the bronchodilator first and wait for 5 minutes before using the steroid.
2.3 **MAINTENANCE**

1. Clean the outside of the mouthpiece once a week with a dry cloth or tissue.
2. Never use water or any other fluid when cleaning the mouthpiece.

2.4 **HOW TO KNOW WHEN THE TURBUHALER® IS EMPTY?**

Turbuhaler® has a dose indicator that shows how many doses are left in the inhaler. It moves slowly when each time a dose is loaded.

For example, Budesonide/Formoterol (Symbicort®) Turbuhaler® dose indicator marks every 10th dose, and every 20th dose is displayed numerically. When the red colour first appears in dose indicator, it shows that there are only 20 doses left.

Picture 3: Shows how many doses are left (Adapted from: http://www.az-air.com/respiratory-products/turbuhaler/turbuhaler-the-basics/)
Terbutaline (*Bricanyl*®), Budesonide (*Pulmicort*®) and Formoterol (*Oxis*®) Turbuhaler® dose indicators are not displayed numerically. When the red colour first appears in dose indicator, it shows that there are only 20 doses left.

The Turbuhaler® can be safely disposed off when the dose indicator window has turned red completely. The sound heard when the device is shaken is produced by a drying agent, and not the medication. Turbuhaler® cannot be re-filled with drug and should be discarded.

### 2.5 DETERMINING THE FUNCTIONALITY OF THE DEVICE WHEN IN DOUBT

![Drug Dark cloth](image)

Picture 4: Determining the functionality of the device when in doubt (Adapted from: http://www.az-air.com/respiratory-products/turbuhaler/turbuhaler-function-and-use/)

Turbuhaler® makes no sound when the drug is released. Moreover, since the amount of drug delivered by Turbuhaler® is small, there is either no or only a faint taste in the mouth when the drug is delivered. This can, in some cases, lead to patients being uncertain as to whether they have received the required dose. The correct functionality of the Turbuhaler® can easily be checked by inhaling through a piece of dark cloth.
### 2.6 SUMMARY OF TURBUHALER®

<table>
<thead>
<tr>
<th>INHALER/PACKAGING</th>
<th>STRENGTH PER INHALATION (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>MINIMUM</td>
<td>MAXIMUM</td>
<td></td>
</tr>
</tbody>
</table>
| TERBUTALINE (BRICANYL®)/ 200 doses | 500       | Adult | 500 mcg | 6000 mcg | 1. Mouth & throat irritation  
2. Cardiac arrhythmias  
3. Headache  
4. Fine skeletal muscle tremor  
5. Paradoxical bronchospasm  
6. Potentially severe hypokalemia  
*Use with caution in patient with hyperthyroidism |
|                   |                               | Children 3 -12 years | 500 mcg | 4000 mcg | |
| FORMOTEROL (OXIS®)/ 4.5 mcg/60 doses 9 mcg/60 doses | 4.5       | Adult | 4.5 - 9 mcg | 54 mcg | *Monitor potassium level in acute severe asthma |
|                   |                               | Children > 6 years | 18 mcg | | |
|                   | 9                               | Adult | 9 mcg | 54 mcg | |
|                   |                                 | Children > 6 years | 18 mcg | | |

Short-acting beta-agonist (SABA)  
Long-acting beta-agonist (LABA)
<table>
<thead>
<tr>
<th>INHALER/PACKAGING</th>
<th>STRENGTH PER INHALATION (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>160/4.5 mcg/60 doses</td>
<td></td>
<td>Aldolescents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160/4.5mcg/120 doses</td>
<td></td>
<td>Reliever therapy: 1 inhalation as needed in response to symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max daily dose including reliever therapy: 12 inhalations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUDESONIDE (PULMICORT®)</td>
<td>100</td>
<td>Adult</td>
<td>200 - 1600 mcg</td>
<td>1600 mcg</td>
<td>Glucocorticoid</td>
</tr>
<tr>
<td>100mcg/200 doses &amp; 200 mcg/100 doses</td>
<td></td>
<td>Or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Children &gt; 7 years</td>
<td>200 - 800 mcg</td>
<td>800 mcg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 2 - 7 years</td>
<td>200 - 400 mcg</td>
<td>400 mcg</td>
<td></td>
</tr>
</tbody>
</table>
2.7 REFERENCES


3. EASYHALER®

3.1 INTRODUCTION

The Easyhaler® is a new generation, multidose dry powder inhaler preloaded with 200 doses of asthma medications. Easyhaler® has been designed to resemble a MDI in terms of the small size of the device, but importantly avoids the need to coordinate drug release and inhalation. The Easyhaler® product range currently includes four products; anti-inflammatory inhaled corticosteroids Budesonide (Giona®) Easyhaler® and Beclomethasone (Beclomet®) Easyhaler® as well as bronchodilators Formeterol Easyhaler® and Salbutamol (Buventol®) Easyhaler®. Salbutamol via Easyhaler® is at least as effective as salbutamol via Turbuhaler® in the treatment of histamine-induced bronchoconstriction (Zetterstrom et al. 2000). The efficacy via Easyhaler® is unaffected by low inspiratory flow.

Picture 1: Easyhaler®
Picture 2: Different types of Easyhaler® (Adapted from http://www.orion.fi/en/Products-and-services/Human-prescription-medicines/Proprietary-products-portfolio/Easyhaler/)
3.2 DIRECTIONS FOR USE

A. Preparing the powder inhaler for first use

**STEP 1:**
Remove the powder inhaler from the laminated pouch.

**STEP 2:**
Insert the powder inhaler into the protective cover.

The dust cap on the mouthpiece prevents accidental actuation of the inhaler when inserting it into the protective cover.
B. Delivering the medication

**STEP 1:**
Remove the dust cap.

**STEP 2:**
Shake the device prior to each dose
After shaking, hold the device in the upright position.
STEP 3:
Press the device only **ONCE** between the thumb and forefinger until a "**CLICK**" sound is heard.

Keep holding the device in the upright position.

**Note:**
If more than one dose is accidentally released, remove the dose from the mouthpiece by tapping it against the palm of the hand.

STEP 4:
Breathe out normally, away from the mouthpiece.
STEP 5:

Place the mouthpiece between lips and close tightly around the mouthpiece.

Breathe in forcefully and deeply through the mouth only.

STEP 6:

Remove the inhaler from mouth and hold breath for 5-10 seconds.
STEP 7:
Repeat step 2-6 if more than one dose is required.

STEP 8:
Put the dust cap back on the mouthpiece.
Store Easyhaler® in a dry place.

Note:
1. Patients should be advised to gargle with water after using steroid containing Easyhalers®.
2. If on two types of Easyhalers® (steroid & bronchodilator), it is recommended to use the bronchodilator first and wait for 5 minutes before using the steroid.
3.3 MAINTENANCE

1. The mouthpiece can be cleaned with a dry cloth or tissue.
2. Never use water or any other fluid when cleaning the mouthpiece.
3. Inhalation powder should not be exposed to humidity. If the powder becomes damp, it is not suitable for use and should be disposed of.

3.4 HOW DO YOU KNOW WHEN YOUR EASYHALER® IS EMPTY?

Easyhaler® has a dose counter which indicates the number of remaining doses. The counter turns after every five actuations. When the counter turns red there are 20 doses left. A clear window on the back of the inhaler allows viewing of the powder. The device must be replaced when the dose counter indicates zero.
### 3.5 SUMMARY OF EASYHALER®

<table>
<thead>
<tr>
<th>INHALER/PACKAGING</th>
<th>STRENGTH PER INHALATION (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALBUTAMOL (BUVENTOL®)/200 doses</td>
<td>200</td>
<td>Adult</td>
<td>200 - 400 mcg</td>
<td>2400 mcg</td>
<td>Common</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Tremor</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>2. Palpitation</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>3. Headache</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 6 - 12 years</td>
<td>200 mcg</td>
<td>1200 mcg</td>
<td>Infrequent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1. Hyperglycaemia (high dose)</td>
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<td>2. Tachycardia</td>
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<td>3. Muscle cramps</td>
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<td>4. Agitation</td>
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<td>5. Hyperactivity in children</td>
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<td>6. Insomnia</td>
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<td></td>
<td></td>
<td></td>
<td>Rare</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>1. Paradoxical bronchospasm</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>2. Allergic reactions including urticaria and angioedema</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Short-acting beta-agonist (SABA)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td>Use with caution in patient with hyperthyroidism</td>
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<td></td>
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<td></td>
<td>Monitor potassium level in acute severe asthma</td>
</tr>
<tr>
<td>INHALER/PACKAGING</td>
<td>STRENGTH PER INHALATION (MCG)</td>
<td>GROUP</td>
<td>DAILY DOSE</td>
<td>ADVERSE EFFECT</td>
<td>REMARK</td>
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<td>-------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>BUDESONIDE (GINA®)/200 doses</td>
<td>200</td>
<td>Adult</td>
<td>200 mcg</td>
<td>1600 mcg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 6 - 12 years</td>
<td>200 mcg</td>
<td>800 mcg</td>
<td></td>
</tr>
<tr>
<td>BECLOMETHASONE (BECLOMET®)/200 doses</td>
<td>200</td>
<td>Adult</td>
<td>200 mcg</td>
<td>1600 mcg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children 6 - 12 years</td>
<td>200 mcg</td>
<td>800 mcg</td>
<td></td>
</tr>
</tbody>
</table>

**Common**
1. Dysphonia
2. Oropharyngeal candidiasis
3. Bruising

**Rare**
1. Allergic reactions

**Others (if used in high doses)**
1. Adrenal impairment
2. Bone density loss
3. Glaucoma
4. Cataract
5. Skin thinning
6. Bruising
7. Impaired growth

Glucocorticoid
3.6 REFERENCES


4. ACCUHALER®

4.1 INTRODUCTION

The combination of Salmeterol and Fluticasone Propionate (Seretide®) Accuhaler® is a moulded plastic inhaler device containing a foil strip with 60 blisters. Each blister contains lactose as a carrier. The blisters protect the inhalation powder from the effects of the atmosphere.

Picture 1: Cross Section of Accuhaler®.
4.2 DIRECTIONS FOR USE

Check that the dose counter read 60, indicating the full number of doses.

STEP 1:

Hold the outer case in one hand and put the thumb of the other hand on the thumb grip to open the Seretide® Accuhaler®.

Push the thumb grip as far as it will go until a “CLICK” sound is heard.

STEP 2:

Hold the device horizontally with the mouthpiece towards the patient.

Slide the lever as far as it will go as in diagram until another “CLICK” sound is heard to load a dose in the device.

Note:

Never hold the inhaler with the mouthpiece pointing downwards during or after loading a dose, as the medication can be dislodged. Always keep it horizontal.
STEP 3:

Hold the Accuhaler® away from mouth and breathe out completely.

*DO NOT* breathe into the device.

STEP 4:

Put the mouthpiece into the mouth and ensure a good seal.

Breathe in forcefully and deeply through the mouth only.

STEP 5:

Remove the Accuhaler® from the mouth and hold breath for 10 seconds or as long as possible.

*DO NOT* breathe into the mouthpiece.
4.3 **MAINTENANCE**

1. Wipe the mouthpiece of the Seretide® Accuhaler® with a dry cloth or tissue to clean it.

2. The Accuhaler® is recommended to be cleaned at least **ONCE A WEEK**.

3. The content of the device is susceptible to moisture. For this reason keep it in a dry place away from humidity.

**Note:**

1. Patients should be advised to gargle with water after using the Seretide® Accuhaler®
2. Number 5 to 1 appear RED to warn that there are only a few doses left.
### 4.4 SUMMARY OF ACCUHALER®

<table>
<thead>
<tr>
<th>INHALER/PACKAGING</th>
<th>STRENGTH PER INHALATION (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALMETEROL &amp; FLUTICASONE PROPIONATE (SERETIDE®)/ 60 doses</td>
<td>50/100* 50/250 50/500</td>
<td>Adult and adolescents (&gt; 12 years)</td>
<td>1 inhalation (50/100) * OR 2 inhalations (50/250) OR 2 inhalations (50/500)</td>
<td>1. β2-agonist treatment side effects like tremor, palpitations, cardiac arrhythmias etc. 2. Arthralgia 3. Hypersensitive reactions like rash, oedema and angioedema 4. Hoarseness and candidiasis of the mouth 5. Possible systemic steroid effects like Cushing’s syndrome and adrenal suppression</td>
<td>Combination of glucocorticoid and long-acting beta-agonist (LABA) * Not available in MOH Drug Formulary (updated November 2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children &gt; 4 years</td>
<td>1 inhalation (50/100) *</td>
<td>2 inhalations (50/100) *</td>
<td></td>
</tr>
</tbody>
</table>
4.5 REFERENCES


5. HANDIHALER®

5.1 INTRODUCTION

HandiHaler® is a device to deliver Tiotropium bromide (Spiriva®) into the lung. Tiotropium bromide (Spiriva®) comes in light green, hard gelatine capsule-containing powder form and contains 18 mcg tiotropium blended with lactose monohydrate as a carrier. Spiriva® capsules should not be swallowed and must be used with HandiHaler® device only.

Spiriva® is not a rescue medicine and should not be used for acute exacerbation.

Picture 1: Spiriva® capsules.

Picture 2: HandiHaler®.
5.2 **DIRECTIONS FOR USE**

**STEP 1:**
Open the dust cap by pressing the green piercing button.

**Note:**
Some HandiHaler® devices may require the dust cap to be manually opened upwards.

**STEP 2:**
Pull the dust cap upwards to expose the mouthpiece.
STEP 3:
Open the mouthpiece by pulling it upwards.

STEP 4:
The blister cards are perforated in the middle.
Tear the card along the perforation.

Note:
1. Store Spiriva® capsules in a dry place.
2. Keep away from extreme heat or moisture.
STEP 5:
Carefully open the blister cavity by peeling back the aluminum foil until **ONE** capsule is fully visible.

**DO NOT** exceed the **STOP** line.

**Note:**
In case a second capsule is exposed to air accidently, it has to be discarded. The capsule should be removed from the blister pack just before using it.

STEP 6:
Remove the capsule from the blister pack.

**Note:**
**DO NOT** swallow the capsule.
STEP 7:
Place the capsule in the centre of the chamber.

STEP 8:
Close the mouthpiece firmly until a “CLICK” sound is heard.
STEP 9:

Hold the HandiHaler® device with the mouthpiece pointed upright.

Press the green piercing button completely as shown in diagram before releasing it.

This will make holes in the capsules to allow the medication to be delivered when inhaled.

STEP 10:

Breathe out completely.

DO NOT breathe into the mouthpiece.
STEP 11:

Place the HandiHaler® horizontally to the mouth and close the lips tightly around the mouthpiece.

Breathe in slowly and deeply at a rate sufficient to hear the **CAPSULE VIBRATE**.

STEP 12:

Remove device from the mouth and hold breath for 5-10 seconds or as long as possible.

Then resume normal breathing.

STEP 13:

To ensure that all the medicine is inhaled, repeat step 10-12.
STEP 14:
Open the mouthpiece and dispose the empty capsule into rubbish bin as in diagram.

STEP 15:
Close the mouthpiece and dust cap for storage.
5.3 MAINTENANCE

STEP 1:
Open the dust cap, mouthpiece and chamber as in diagram.

STEP 2:
Rinse all parts with warm water to remove any powder.

DO NOT use cleaning agents or detergents.
STEP 3:

Dry the HandiHaler® thoroughly by shaking off the excess water and air-drying it.

STEP 4:

It takes 24 hours to air dry, so clean it immediately after use.

Note:

It is recommended to clean the device EVERY MONTH.
## 5.4 SUMMARY OF HANDIHALER®

<table>
<thead>
<tr>
<th>INHALER/PACKAGING</th>
<th>STRENGTH PER INHALATION (MCG)</th>
<th>GROUP</th>
<th>DAILY DOSE</th>
<th>ADVERSE EFFECT</th>
<th>REMARK</th>
</tr>
</thead>
</table>
| TIOTROPIUM BROMIDE (SPIRIVA®)/30 capsules | 18                            | Adult                  | 18 mcg     | 1. Dryness of mouth or xerostomia  
2. Upper respiratory infections  
3. Sinusitis  
4. Rash  
5. Cataracts  
6. Angioedema  
7. Bitter or metallic taste  
8. Tachycardia  
9. Urinary retention  
10. Angina pectoris  
11. Hypercholesterolemia  
12. Hyperglycemia | Long acting anticholinergic   |
5.5 REFERENCES


6. SPACER DEVICES

6.1 INTRODUCTION

A spacer is a device attached to a metered-dose inhaler that aids delivery of inhaled medications and to increase the effectiveness of a metered dose inhaler (MDI). A spacer is usually used for children and elderly patients who have poor coordination to MDI technique.

The advantages of spacers are:

1. Eliminate the problem of hand-breath coordination.
2. Improve the delivery of medication and allows more medicine into the lungs.
3. Reduce throat irritation and/or fungal growth in the upper airways (e.g. candidiasis, hoarseness and bad taste).

Picture 1: The advantages using MDI with Spacer devices (Adapted from http://trudellmed.com/_Content/PDFs/AC+Fv_StudySummary.pdf)
There are 2 types of spacer device, namely the extension tube (i.e. BI tube) and holding chamber (i.e. Chamber with mouthpiece & Chamber with mask).

a) BI Tube

b) Chamber with Mouthpiece

(Aadapted from http://trudellmed.com/Consumers/cn_aerochamber_wfv.asp)

 c) Chamber with Mask
6.2 DIRECTIONS FOR USE

6.2.1 BI TUBE
STEP 1:
Remove the mouthpiece cover from the metered dose inhaler (MDI).

STEP 2:
Attach the large end of the BI tube to the mouthpiece of the MDI.

STEP 3:
Shake the MDI 5 times in an up-down motion (as shown in diagram) before use.
STEP 4:
Exhale slowly and completely through your mouth before holding your breath.

*DO NOT* exhale into the BI tube.

STEP 5:
Press the base of the canister (1) and inhale the nebulised aerosol (2).

STEP 6:
Hold breath for 5-10 seconds.

Note:
To prevent the spray from depositing on the tube, inhale immediately after pressing the canister.
STEP 7:

Wait 30 seconds to 1 minute before repeating step 3-6 if subsequent doses are required.

STEP 8:

After use, remove the BI Tube and replace the mouthpiece cover on the MDI.

Note:
The BI Tube may be left attached to the MDI.
6.2.2 CHAMBER WITH MASK

**STEP 1:**
Visually check for foreign objects before each use.

**STEP 2:**
Remove the mouthpiece cover from the MDI.
**STEP 3:**

Insert the MDI into the adaptor of the chamber.

**STEP 4:**

While holding the chamber with MDI firmly, shake the MDI for 5 times in an up-down motion (as in diagram).

**STEP 5:**

Apply mask to face and ensure that there is a good seal.
STEP 6:
Press MDI **ONCE** at beginning of normal breath.
Breathe normally between 5-10 breaths while holding the mask firmly to your face.

STEP 7:
Slow down inhalation if the **WHISTLE** sound is heard.

STEP 8:
Wait 30 seconds to 1 minute before repeating step 4-6 if subsequent doses are required.
6.2.3 CHAMBER WITH MOUTHPIECE

STEP 1:
Visually check for foreign objects before each use.

STEP 2:
Remove the cap from the MDI and the mouthpiece cover of the chamber.
STEP 3:

Insert the MDI into the adaptor of the mouthpiece (1).

While holding the mouthpiece with MDI firmly, shake the unit for 5 times in an up-down motion as shown in diagram (2).

STEP 4:

Put the mouthpiece in the mouth.
**STEP 5:**
Simultaneously press the MDI *ONCE* (1) at the beginning of a slow and deep inhalation (2).
Hold breath as long as possible, between to 4-10 seconds before breathing out through the nose.

**Note:**
1. Alternatively, the mouthpiece may be kept tightly in the mouth.
2. Inhale slowly through the mouth and exhale through the nose for 5 times after pressing the MDI.

**STEP 6:**
Slow down inhalation if a *WHISTLE* sound is heard.

**STEP 7:**
Wait 30 seconds to 1 minute before repeating step 3-6 if subsequent doses are required.
6.3  **MAINTENANCE**

6.3.1  **BI TUBE**

- Wash the BI tube at least *ONCE A MONTH* with tap water and air dry.
- It is not recommended to wipe the BI tube dry after washing.

6.3.2  **CHAMBER WITH MASK OR MOUTHPIECE**

- It is recommended to clean *ONCE A WEEK*.

1. Remove the backpiece only.

2. *DO NOT* remove the mask or valve assembly.

- Soak both parts for 15 minutes in a mild solution of liquid dish detergent and warm clean water.
- Agitate gently.
• **DO NOT** rinse the chamber as shown, as this may lead to static build up.

• If concern about potential for contact dermatitis, rinse only the mouthpiece/mask portion in water.

• Shake out excess water and allow to air dry in a vertical position.

• **DO NOT** rub dry.

• To reassemble, centre the alignment feature on the back piece as shown.

**Note:**
Cleaning of the product varies between the different variants of the AeroChamber®. Please refer to each individual product information leaflet.
6.4 REFERENCES


7. PEAK FLOW METER

7.1 INTRODUCTION

A peak flow meter is a small portable device with a measuring gauge. It measures the force and speed that air is blown out of the lungs. This measurement is referred to as the peak expiratory flow rate (PEFR).

a) “NORMAL” PEAK FLOW RATE

Normal peak flow rate is based on a person’s age, height, sex and race. A personal best normal may be obtained from measuring the patient’s own peak flow rate. Therefore, it is important that patients discuss with their health care provider on what is considered as “normal.”

Once patients have learned their usual and expected peak flow rate, changes or trends of their disease condition can easily be recognised.
b) MEASURING REVERSIBILITY OF AIRFLOW OBSTRUCTION

To measure the degree of reversibility (usually increased in asthma) of airflow obstruction, perform peak flow meter measurement before and approximately 15 minutes after administering a bronchodilator by metered dose inhaler or nebuliser. Short acting Beta-2 agonists (e.g. salbutamol, terbutaline) are generally considered the benchmark bronchodilator.

c) DETERMINE A “NORMAL” PEAK FLOW RATE

Three zones of measurement are commonly used to interpret peak flow rates. In general, a normal peak flow rate can vary as much as 20 percent.

**Green Zone** (80-100% of patients’ usual or "normal" peak flow rate): This zone signals that patients’ asthma is under reasonably good control. It is advisable to continue the prescribed program or management.

**Yellow Zone** (50-80% of patients’ usual or "normal" peak flow rate): This zone signals that more attention should be given to patients’ asthma program or management. Patients are advised to consult their healthcare provider to review their regimen.

**Red Zone** (<50% of patients’ usual or "normal" peak flow rate): This zone signals a medical alert. Immediate decisions and actions must be taken. Patients are advised to use their rescue medications right away and consult their healthcare provider immediately.

<table>
<thead>
<tr>
<th>Your Personal Best peak flow meter reading is:</th>
<th>You are in the Green Zone if your peak flow meter reading is:</th>
<th>You are in the Yellow Zone if your peak flow meter reading is between:</th>
<th>You are in the Red Zone if your peak flow meter reading is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 above 80</td>
<td>80 and 50</td>
<td>below 50</td>
<td></td>
</tr>
<tr>
<td>125 above 100</td>
<td>100 and 63</td>
<td>below 63</td>
<td></td>
</tr>
<tr>
<td>150 above 120</td>
<td>120 and 75</td>
<td>below 75</td>
<td></td>
</tr>
<tr>
<td>175 above 140</td>
<td>140 and 88</td>
<td>below 88</td>
<td></td>
</tr>
</tbody>
</table>

E.g.: Your personal best peak flow meter reading is: 175. You are in the red zone if your peak flow meter reading is below 88.
7.2 **DIRECTIONS FOR USE**

**STEP 1:**
Place the mouthpiece on the peak flow meter.

**Note:**
Alternatively, the originally supplied plastic mouthpiece may be detached and replaced with a disposable mouthpiece.

**STEP 2:**
Reset the marker to the bottom of the scale (zero or the lowest number on the scale).
STEP 3:
Hold the peak flow meter in the way that the scale and marker is not obstructed by the fingers of the patient (As shown in diagram).

STEP 4:
Stand in an upright position and breathe in as deep as possible.
STEP 5:
Place the peak flow meter in the mouth and maintain it horizontally, closing the lips around the mouthpiece.
Make sure the opening of the mouthpiece is not blocked by the tongue.

STEP 6:
Blow as hard and fast as possible.

*DO NOT* tilt the head forward while blowing.
7.3 MAINTENANCE

Most peak flow meters need to be cleaned. Follow the cleaning instructions which are available when the unit is purchased.
7.4 REFERENCES


4. Reddel HK, Marks GB, Jenkins CR. When can personal best peak flow be determined for asthma action plans?. *Thorax*. 2004 Nov; 59(11):922-4


PHARMACEUTICAL COMPANIES

AstraZeneca Sdn Bhd
Boehringer Ingelheim (M) Sdn Bhd
Cipla Ltd
GlaxoSmithKline Pharmaceutical Sdn Bhd
Nycomed Division Diethelm (M) Sdn Bhd
Orion Pharma
Pharmaniaga Logistics Sdn Bhd