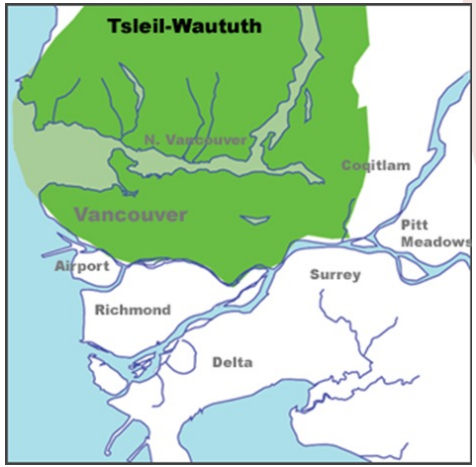
We would like to acknowledge that we are gathered today on the traditional territories of the Musqueam, Squamish and Tsleil-Waututh peoples.

Source: www.johomaps.net/na/canada/bc/vancouver/firstnations/firstnations.html



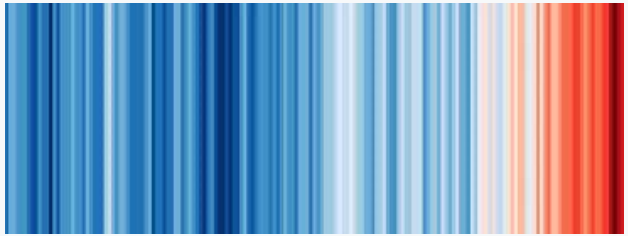
Environmental impact of inhalers: turning low-carbon care into high-quality care

VCH Family & Community Practice Rounds

Kevin Liang, MD, CCFP
Sustainable Inhaler Initiative—Lead
November 15th, 2023

Disclosures

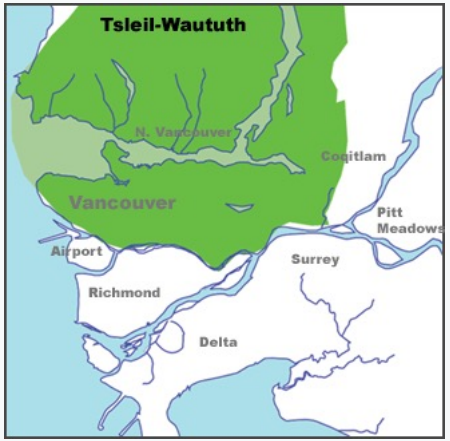
No industry-related financial disclosures



Mitigating Potential Bias

Only published trial data is presented
All recommendations are consistent with published up-to-date guidelines

Land Acknowledgement



I acknowledge that the land on which I gather is the unceded territory of the Coast Salish Peoples, including the territories of the xʷməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and Səl̓ílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations.

Objectives & Outline

1. Review the environmental impact of pressurized metered-dose inhaler (pMDIs)

2. Review alternatives to pMDIs, including opportunities to change patients to dry powered inhalers (DPIs) or soft mist inhalers (SMIs)

3. Discuss current asthma and COPD guidelines and how recommendations fit with inhaler device

4. Review tools available in BC and the costs of inhaler switches


gsk
Store below 30°C
Avoid storage in
direct sunlight or

CBC | MENU

NEWS Top Stories Local Climate World Canada

Science

Swap your inhaler, skip the laughing gas: How patients can help curb health-care emissions

CNN health Life, But Better Fitness Food Sleep Mindfulness Relationships

Asthma patients could slash their carbon footprint by switching to 'greener' inhalers

Home · News

A 139-km car trip: Fraser Health working to reduce climate impact of inhalers

B.C. doctor wants to educate people about switching to HFA-free inhalers

Lauren Collins
May 6, 2023 5:12 PM

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NEWS

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Health

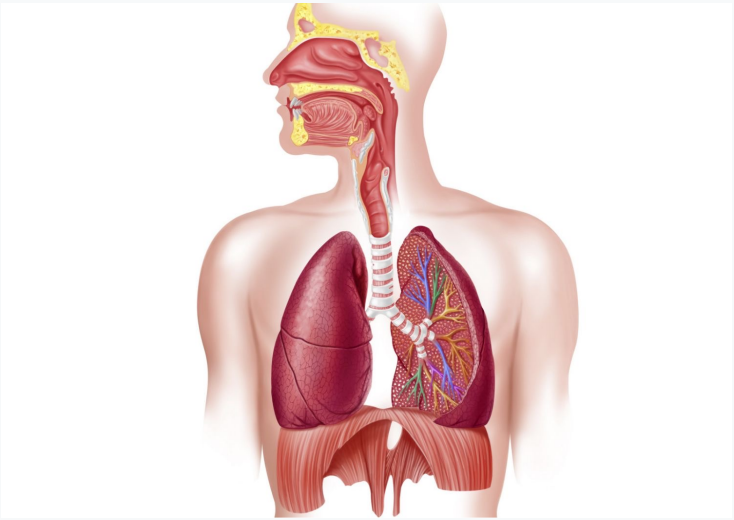
Why switching asthma inhaler could be better for you and the planet

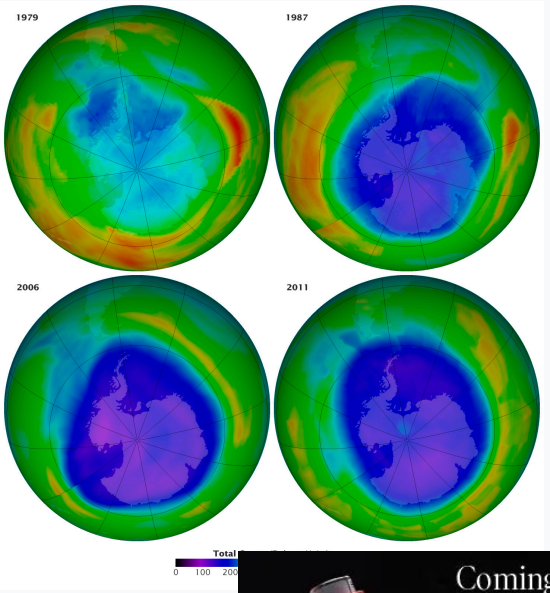
Nelson doctors working to reduce metered dose inhaler usage for planetary health

Doctors want patients to consider switching to dry powder inhalers

BLACK PRESS SUBMITTED / Mar. 22, 2023 11:30 a.m. / COMMUNITY

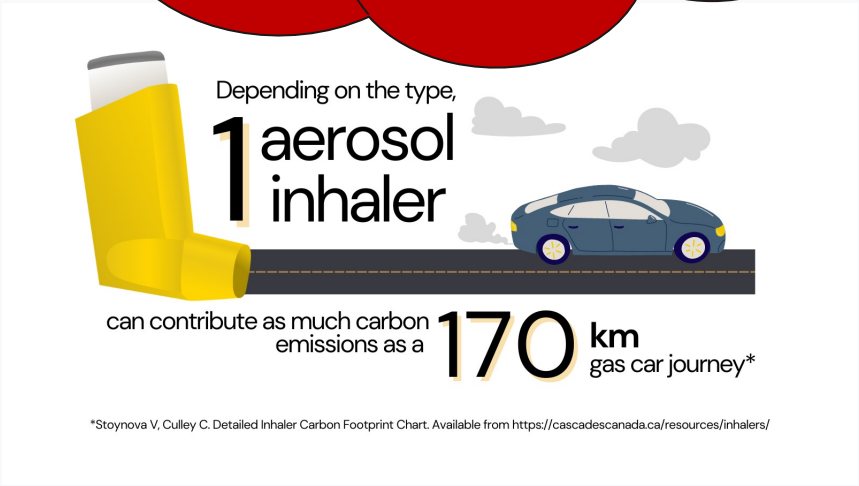

gsk
Store below 30°C
Avoid storage in
direct sunlight or





- Prior propellant CFC (chlorofluorocarbons) contributed to breakdown of ozone layer.
- Signing of the Montréal Protocol in 1987 mandated elimination of CFC propellants. This prompted switch to HFA (hydrofluoroalkane).
- The global ban on CFC’s put in place to help the ozone layer restore itself

Propellants in pMDIs are up to to 3800 times more polluting than carbon dioxide



pMDI

DPI

Diskus

Turbuhaler

Ellipta

Breezhaler

Handihaler

Respiclick

Twisthaler

Inhub

Genuair

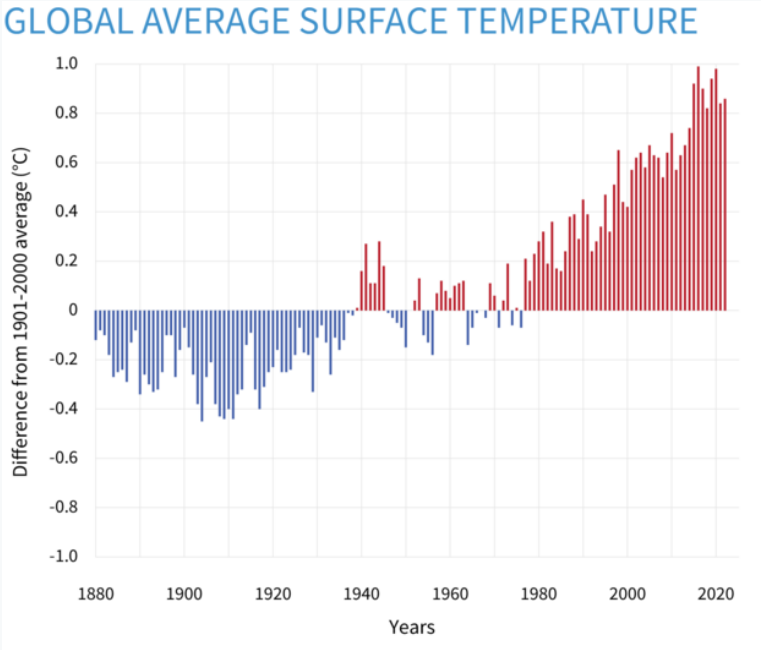
SMI

“**CLIMATE CHANGE** is the biggest global health threat of the 21st century”[1]

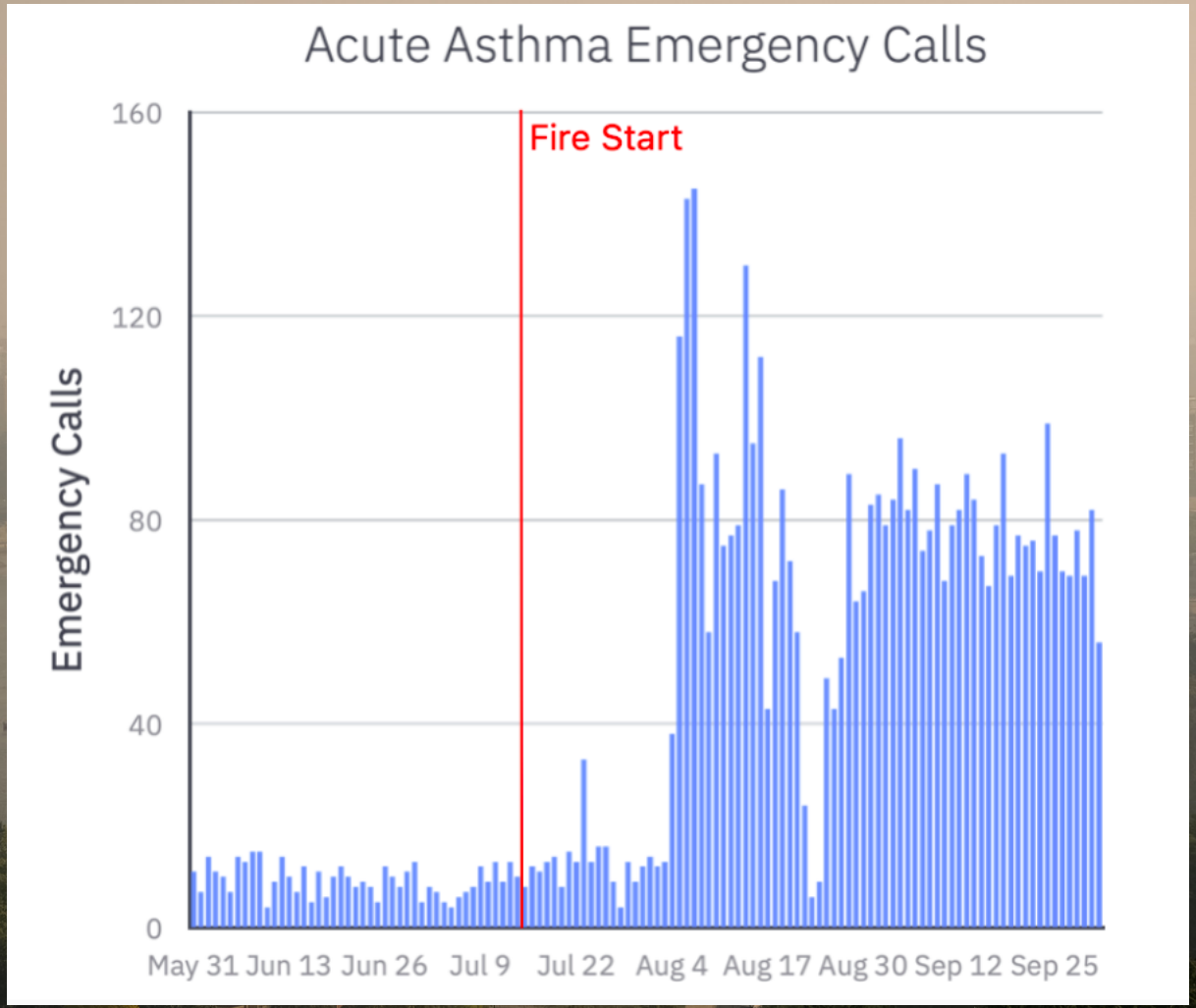
We have experienced a global mean temperature rise of 1.2 C above pre-industrial levels[1]

In Canada, climate change is leading to more extreme weather events, including:

- Heat waves
- Floods
- Droughts
- Wildfire



1. Wight J, Middleton J. Climate change: the greatest public health threat of the century. BMJ. 2019 Jun 3;365.
2. Watts N, Amann M, Arnell N, Ayeb-Karlsson S, Beagley J, Belesova K, Boykoff M, Byass P, Cai W, Campbell-Lendrum D, Capstick S. The 2020 report of the Lancet Countdown on health and climate change: responding to converging crises. The Lancet. 2021 Jan 9;397(10269):129-70.


Acute Asthma Emergency Calls
Fire Start
Emergency Calls
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120
80
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Jun 13
Jun 26
Jul 9
Jul 22
Aug 4
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Aug 30
Sep 12
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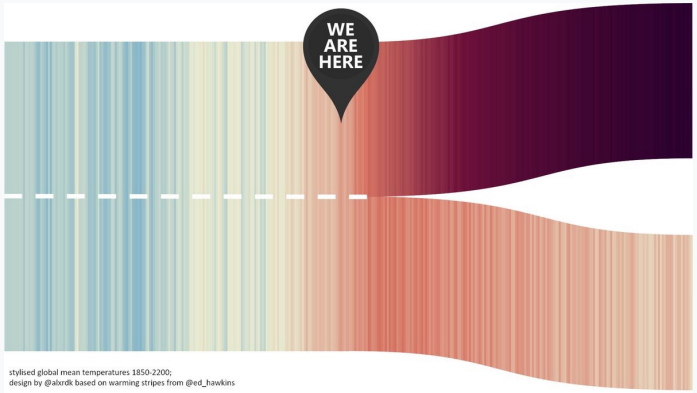
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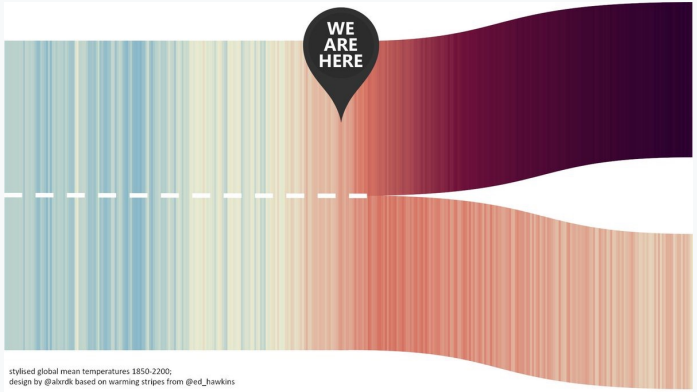
stylised global mean temperatures 1850-2200;
design by @alxrdk based on warming stripes from @ed_hawkins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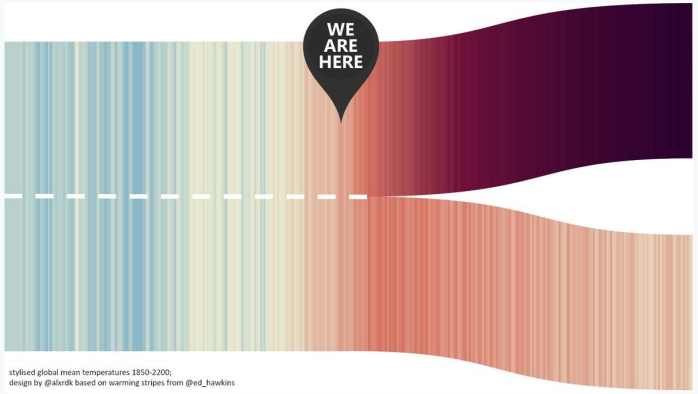
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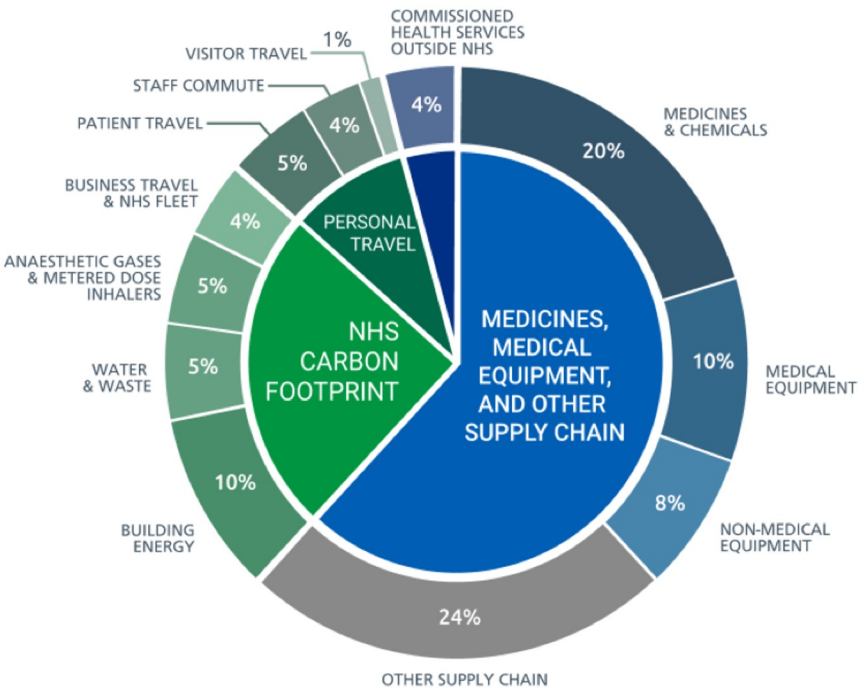


3.5% of NHS carbon footprint comes exclusively from Metered Dose Inhalers (Tennison et al, 2021)

CLINICAL

Kevin E. Liang, MD, CCFP, Jiayun Angela Yao, PhD, Philip Hui, MD, FRCPC, Darryl Quantz, MFPH, MPH, MSc

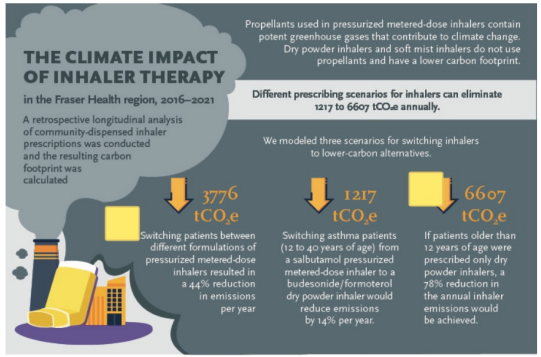
Climate impact of inhaler therapy in the Fraser Health region, 2016–2021

Switching away from pressurized metered-dose inhalers with high carbon footprints, when appropriate, would reduce the health care sector's greenhouse gas emissions.

ABSTRACT

Background: Inhaler therapy is a cornerstone treatment for asthma and chronic obstructive pulmonary disease. Propellants used in pressurized metered-dose inhalers contain potent greenhouse gases that contribute to climate change. Dry powder inhalers and soft mist inhalers do not use propellants and have a lower carbon footprint.

Methods: We conducted a retrospective longitudinal analysis of community-dispensed inhaler prescriptions in the Fraser Health region in British Columbia from 2016 to 2021 and calculated the resulting carbon footprint. We modeled three scenarios for switching inhalers to lower-carbon alternatives.



BCMJ
BC Medical Journal

Why low-carbon respiratory care is high-quality care

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease pollution

- Some inhalers contain powerful pollution that contribute to global climate change
- Inhalers are a source of pollution we have direct control over as clinicians

Ways to provide low-carbon respiratory care

01

Develop suitable prescribing practices around all inhalers

02

Encourage pMDI alternatives when appropriate

03

Ensure appropriate pMDI use & disposal when prescribed

Ways to provide low-carbon respiratory care

01

Right Diagnosis

02

Right Inhalers

03

Right Use & Right Disposal

Ways to provide low-carbon respiratory care

01

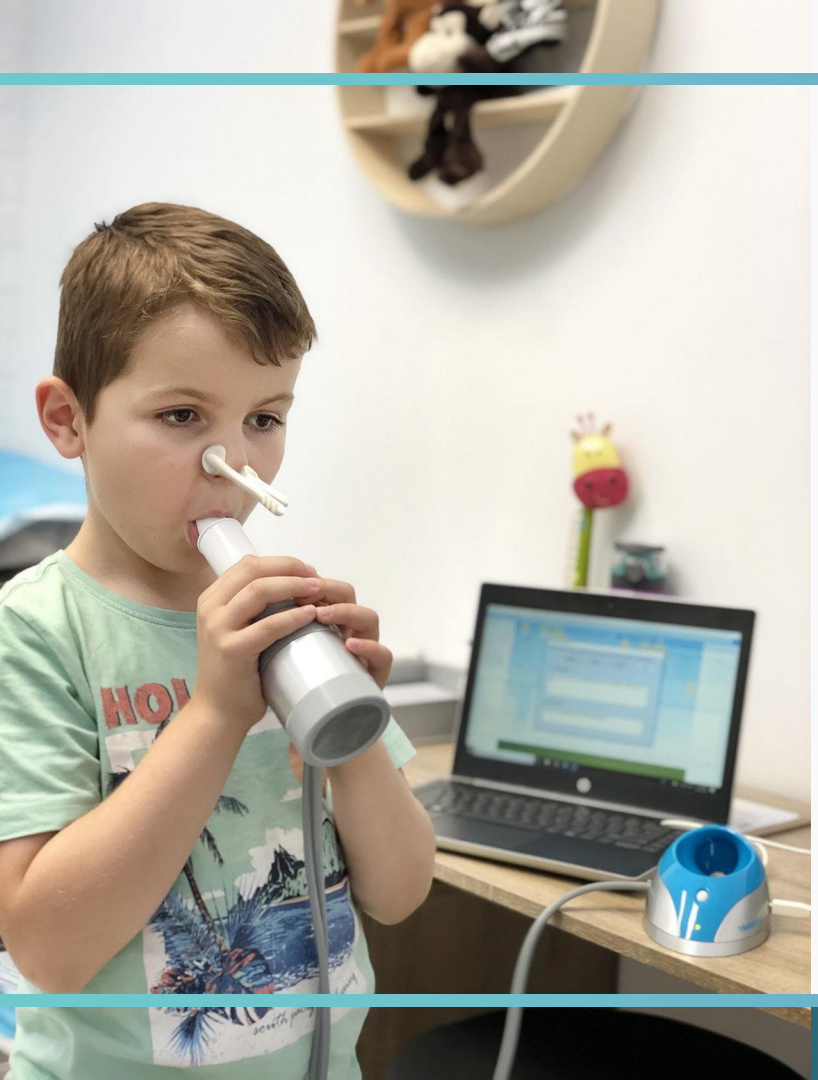
Right Diagnosis

02

Right Inhalers

03

Right Use & Right Disposal



Right Diagnosis: Asthma

- 1/3 patients labelled with asthma do not have asthma on objective testing [1,2]
- 80% of those with negative test results were on medication for asthma [1]
- Patients with spirometry-confirmed asthma have better respiratory outcomes[2]

1. Aaron et.al. JAMA. 2017; 317(3): 269-279. Re-evaluation of Diagnosis in Adults With Physician-Diagnosed Asthma
2. Global Initiative for Asthma (GINA) Guidelines 2020, page 26. Available at https://ginasthma.org/wp-content/uploads/2020/06/GINA-2020-report_20_06_04-1-wms.pdf

Right Diagnosis: COPD

- Up to 44% of patients who received a clinical diagnosis of COPD did not actually have the condition when tested objectively[1]
- When COPD is diagnosed without spirometry, providers underestimate the severity of the condition[2]
- Patients with COPD have both lower hospital admission rates and lower mortality when the diagnosis is confirmed by spirometry, as opposed to clinically[1,2]

1.. Gershon AS, Hwee J, Chapman KR, Aaron SD, O'Donnell DE, Stanbrook MB, et al. Factors associated with undiagnosed and overdiagnosed COPD. European Respiratory Journal. 2016;48(2):561-4.
2. Hill K, Goldstein RS, Guyatt GH, Blouin M, Tan WC, Davis LL, et al. Prevalence and underdiagnosis of chronic obstructive pulmonary disease among patients at risk in primary care. Cmaj. 2010;182(7):673-8.

Choosing Wisely Canada™

Don't initiate medications for **asthma** in patients ≥ 6 years old who have not had confirmation of reversible airflow limitation with spirometry

Don't initiate long-term maintenance inhalers in stable patients with suspected **COPD** if they have not had confirmation of post-bronchodilator airflow obstruction with spirometry

Gupta S, Thériault G. Do not diagnose or routinely treat asthma or chronic obstructive pulmonary disease without pulmonary function testing. bmj. 2023 Mar 20;380.

What about patients ≤ 5 years old?

Objective documentation
of signs of airflow
obstruction

What about patients ≤ 5 years old?

Objective documentation of signs of airflow obstruction

Absence of clinical factors suggestive of an alternative diagnosis

What about patients ≤ 5 years old?

Objective documentation of signs of airflow obstruction

Absence of clinical factors suggestive of an alternative diagnosis

Reversibility of airflow obstruction

Inappropriate use of inhalers:
1. Bronchiolitis

- Bronchiolitis is a common viral illness caused by RSV and occurs during the late fall and winter months
- The diagnosis is typically made for a first episode of wheezing in children less than 12-24 months of age in winter months
- Supportive care is the cornerstone of treatment

Canadian Paediatric Society

"The pathophysiology of bronchiolitis is such that the airways are obstructed rather than constricted. Infants appear to have inadequate β-agonist lung receptor sites. When the diagnosis of bronchiolitis is clear, a trial of salbutamol is not recommended."

Other inappropriate uses of inhalers:
2. Viral & Post-Viral cough

Observed typical duration of cough = **18 days**

VERSUS

Patient expectation for duration of cough = **5-9 days**


Tools for Practice

Bronchodilators or inhaled corticosteroids for postinfectious cough

Samantha S. Moe PharmD ACPR Emélie Braschi MD PhD CCFP G. Michael Allan MD CCFP FCFP

"most patients (>80%, regardless of treatment) will have cough resolution by day 20"[3]

Insel K, Lyon C. Q: Are inhaled steroids effective for a postviral cough?. Journal of Family Practice. 2015 Mar 1;64(3):189-90.

Ebell MH, Lundgren J, Youngpairoj S. How long does a cough last? Comparing patients' expectations with data from a systematic review of the literature. Ann Fam Med. 2013 Jan-Feb;11(1):5-13. doi: 10.1370/afm.1430. PMID: 23319500; PMCID: PMC3596033.https://pubmed-ncbi-nlm-nih-gov.myaccess.library.utoronto.ca/23319500/

Moe SS, Braschi E, Allan GM. Bronchodilators or inhaled corticosteroids for postinfectious cough. Canadian Family Physician. 2023 Mar 1;69(3):180-.

Why low-carbon respiratory care is high-quality care

Why low-carbon respiratory care is high-quality care

Reason #2 Avoid harms from inappropriate inhaler use

- Mismanagement of COPD or asthma — unnecessary treatment or undertreatment
- Missing or delaying recognition and treatment of the actual diagnosis
- Financial cost to patient/PharmaCare
- May affect patient's quality of life
- Medication side effects (including tremor, electrolyte disturbance, anticholinergic symptoms)
- Inhaler/drug shortage during respiratory season/wildfire season

Ways to provide low-carbon respiratory care

01

Right Diagnosis

Confirmed asthma or COPD

02

Right Inhalers

03

Right Use of pMDI

pMDI

DPI

Diskus

Turbuhaler

Ellipta

Breezhaler

Handihaler

Respiclick

Twisthaler

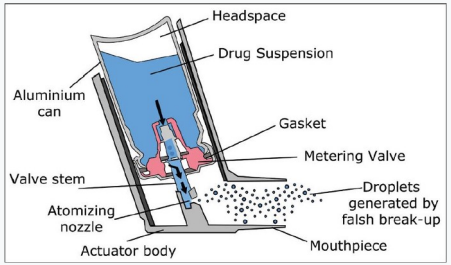
Inhub

Genuair

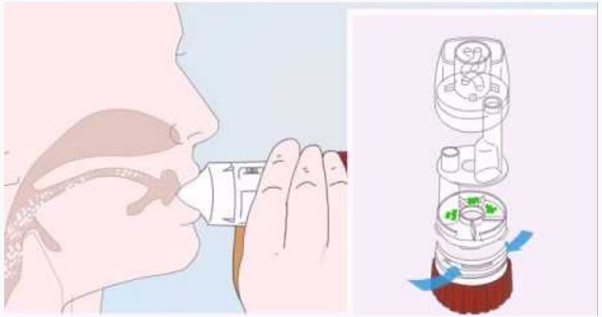
SMI

Comparing Inhalers

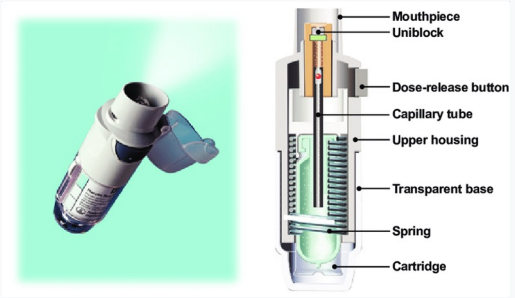
Metered Dose Inhalers (MDIs)



Dry Powder Inhalers (DPIs)



Soft Mist Inhalers (SMIs)



Factors to consider: pollution

Metered Dose Inhalers (MDIs)

~10-28 kg CO_2e per inhaler

11.9 litres of gasoline

Dry Powder Inhalers (DPIs)

~0.5-1 kg CO_2e per inhaler

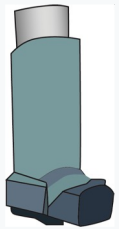
Soft Mist Inhalers (SMIs)

~0.8 kg CO_2e per inhaler

Factors to consider: dose counter

Metered Dose Inhalers (MDIs)

Most devices do not have a dose counter

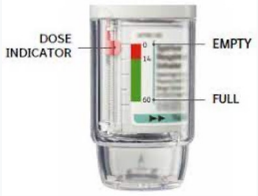


Dry Powder Inhalers (DPIs)

All available devices have a dose counter

Soft Mist Inhalers (SMIs)

All available devices have a dose counter



Factors to consider: technique

Metered Dose Inhalers (MDIs)

- Slow, steady inhalation (4-5 sec)
- Need to sync breathing with release of medication
- Preferred for those with poor inspiratory flow, those with dementia

Dry Powder Inhalers (DPIs)

- Quick, deep inhalation (2-3 sec)
- No need to sync breathing
- Generally easier to use[1]
- **Preferred for school aged children and above (≥ 6 years)**

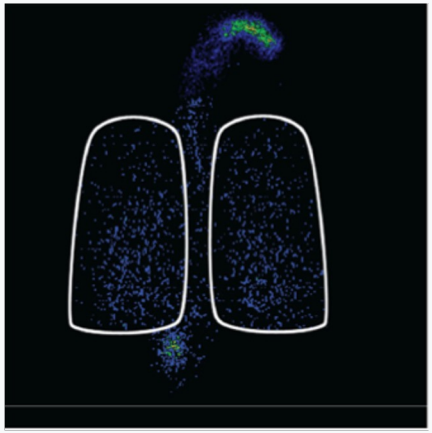
Soft Mist Inhalers (SMIs)

- Slow steady inhalation (4-5 sec)
- Aerosol generated has lower velocity and longer duration than pMDI

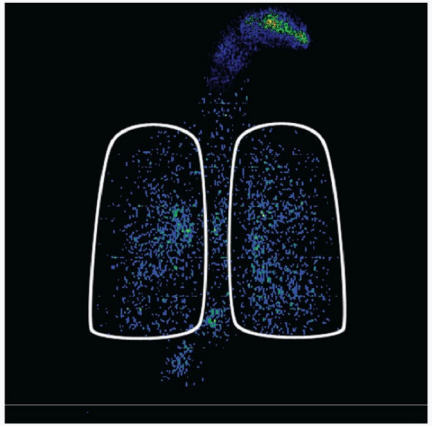
1. Ramadan WH, Sarkis AT. Patterns of use of dry powder inhalers versus pressurized metered-dose inhalers devices in adult patients with chronic obstructive pulmonary disease or asthma: an observational comparative study. Chronic respiratory disease. 2017 Aug;14(3):309-20.

Factors to consider: medication deposition

Metered Dose Inhalers (MDIs) —without spacer



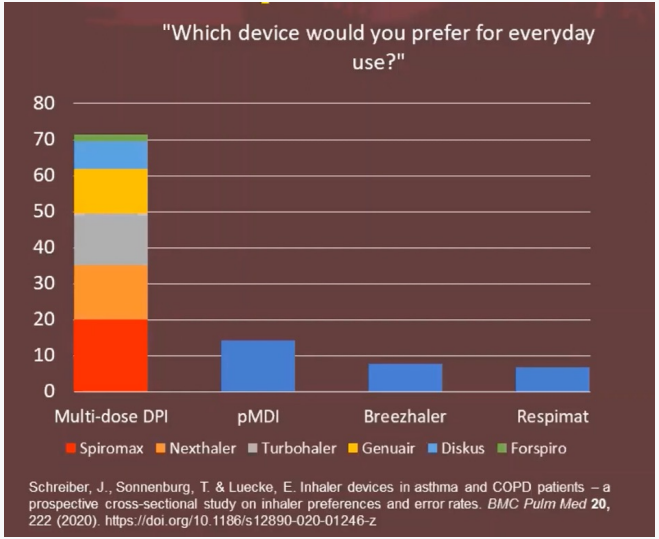
Dry Powder Inhalers (DPIs)



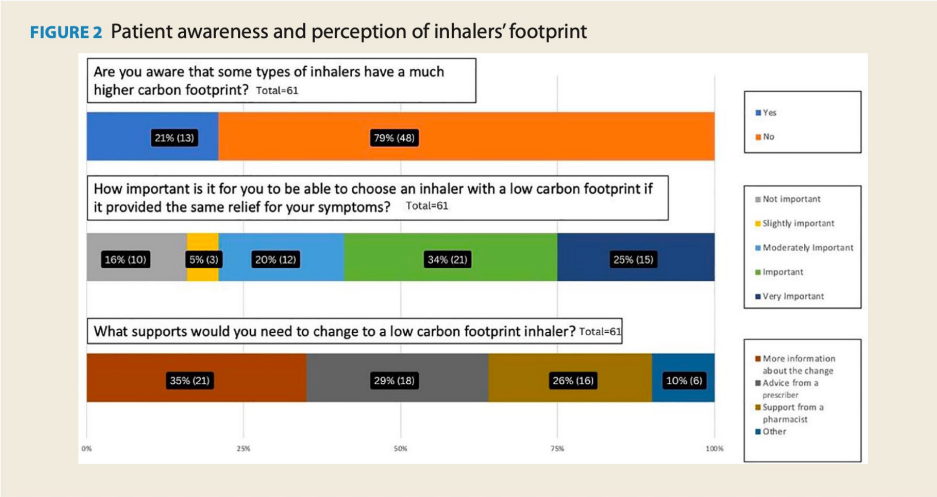
Soft Mist Inhalers (SMIs)

Ciciliani AM, Denny M, Langguth P, Voshaar T, Wachtel H. Lung deposition using the Respimat® Soft Mist™ inhaler mono and fixed-dose combination therapies: an in vitro/in silico analysis. COPD: Journal of Chronic Obstructive Pulmonary Disease. 2020 Nov 23;18(1):91-100.

Factors to consider: Patient Preference



Schreiber, J., Sonnenburg, T. & Luecke, E. Inhaler devices in asthma and COPD patients – a prospective cross-sectional study on inhaler preferences and error rates. *BMC Pulm Med* **20,** 222 (2020). https://doi.org/10.1186/s12890-020-01246-z



Quantz D, Wong GY, Liang K. Patient perspectives on the environmental impact of inhalers: A survey in British Columbia. Canadian Pharmacists Journal/Revue des Pharmaciens du Canada. 2023 Oct 11:17151635231202980.

Why low-carbon respiratory care is high-quality care

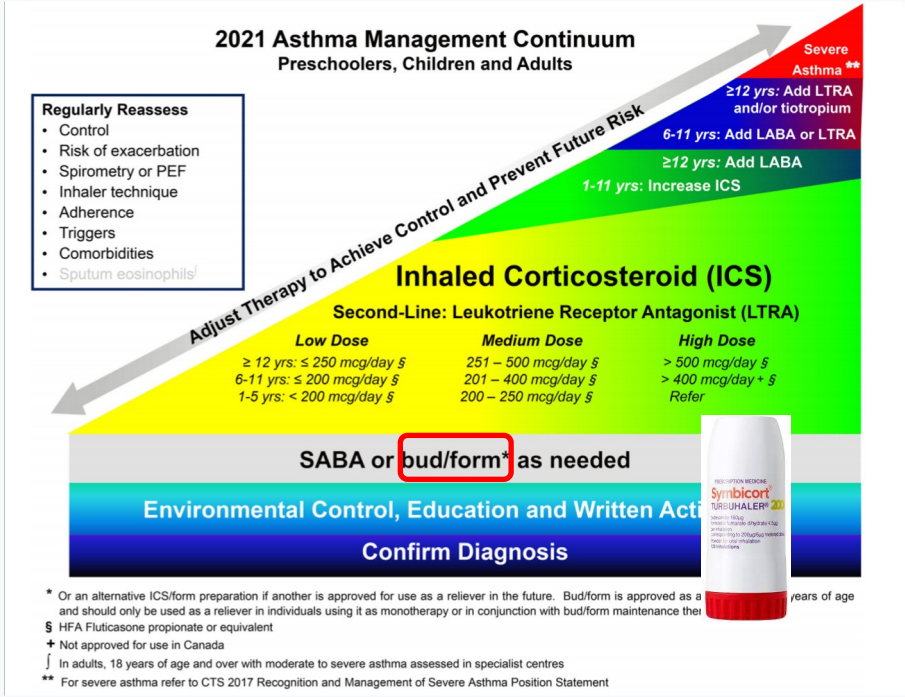
Why low-carbon respiratory care is high-quality care

Reason #3 Clinical benefits of DPIs and SMIs

- Presence of a dose counter:
  -preventing the use of an an empty inhaler
  -throwing away doses remaining in inhalers
- No need for a spacer with each use
- Perhaps better deposition of medication depending on technique*
- Patient preference

Asthma and COPD guidelines & low-carbon Respiratory Care

Asthma Guidelines



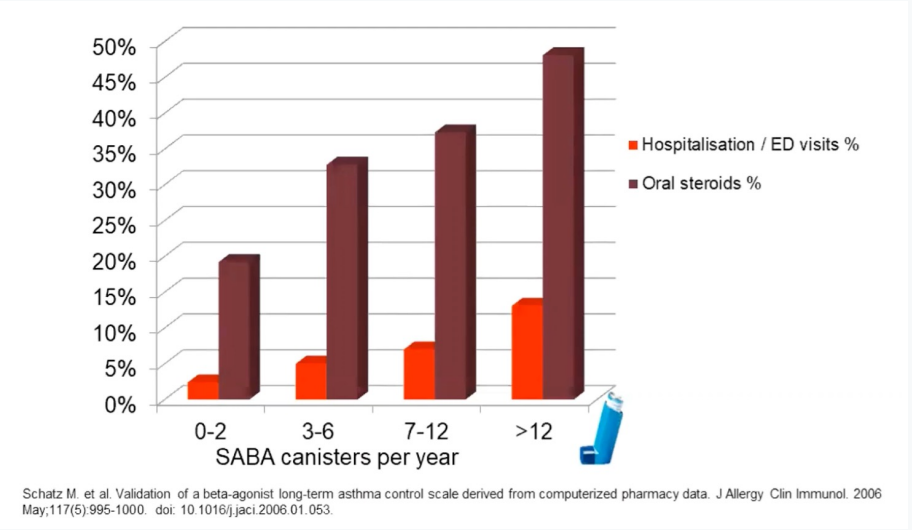
https://cts-sct.ca/wp-content/uploads/2021/02/FINAL-CTS_Very-Mild-and-Mild-Asthma-CPG.pdf

Asthma Guidelines — SABA overuse

Table 3. Well-controlled asthma criteria.

Characteristic	Frequency or value
Daytime symptoms	≤2 days/week
Nighttime symptoms	<1 night/week and mild
Physical activity	Normal
Exacerbations	Mild and infrequent*
Absence from work or school due to asthma	None
Need for a reliever (SABA or bud/form)†	≤2 doses per week
FEV_1 or PEF	≥90% of personal best
PEF diurnal variation	<10–15%#
Sputum eosinophils	<2–3%●

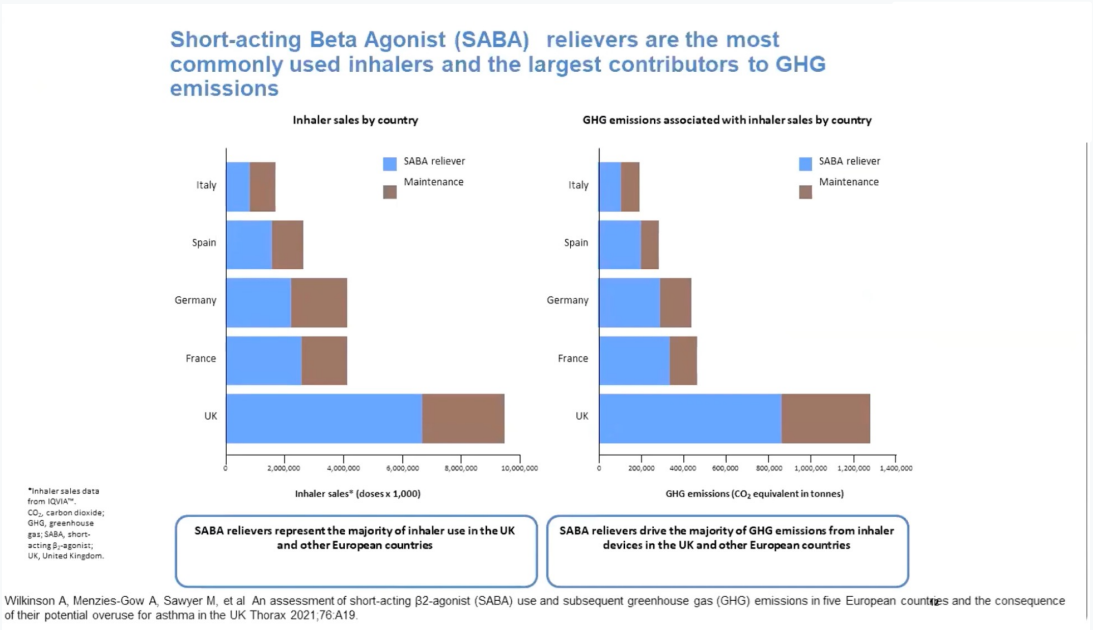
A patient who meets all of the above criteria would be considered to have well-controlled asthma.



Schatz M. et al. Validation of a beta-agonist long-term asthma control scale derived from computerized pharmacy data. J Allergy Clin Immunol. 2006 May;117(5):995-1000. doi: 10.1016/j.jaci.2006.01.053.

Noorduyn SG, Qian C, Johnston KM, Soliman M, Talukdar M, Walker BL, Hernandez P, Penz E. SABA use as an indicator for asthma exacerbation risk: an observational cohort study (SABINA Canada). ERJ Open Research. 2022 Jul 1;8(3).

Asthma Guidelines



Wilkinson A, Menzies-Gow A, Sawyer M, et al An assessment of short-acting β2-agonist (SABA) use and subsequent greenhouse gas (GHG) emissions in five European countries and the consequence of their potential overuse for asthma in the UK Thorax 2021;76:A19.

Over-reliance on reliever therapy reflects poor asthma control and results in large amounts of pollution

COPD Guidelines

CANADIAN JOURNAL OF RESPIRATORY, CRITICAL CARE, AND SLEEP MEDICINE
https://doi.org/10.1080/24745332.2023.2231451

Taylor & Francis
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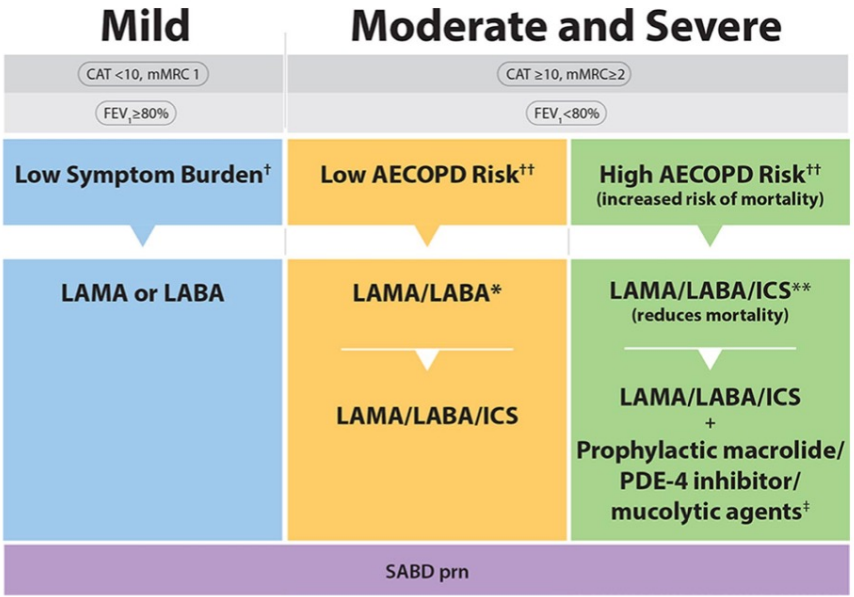
CTS GUIDELINES AND POSITION PAPERS

Check for updates

2023 Canadian Thoracic Society Guideline on Pharmacotherapy in Patients with Stable COPD



"In individuals with stable COPD, at low risk of exacerbations , with low symptom burden and health status impairment and only mildly impaired lung function (FEV1≥80% predicted), we recommend starting initial monotherapy with either LAMA or LABA."

Bourbeau J, Bhutani M, Hernandez P, Aaron SD, Beauchesne MF, Kermelly SB, D'Urzo A, Lal A, Maltais F, Marciniuk JD, Mulpuru S. 2023 Canadian Thoracic Society Guideline on Pharmacotherapy in Patients With Stable COPD. Chest. 2023 Sep 9.

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www.lungsask.ca

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20 mcg/dose

Duration: 4-6h
Company: BI
*nebules also available

Company Key
AZ – AstraZeneca Canada Inc.
BI – Boehringer Ingelheim Canada Ltd.
Covis – Covis Pharma Canada Ltd.
GSK – GlaxoSmithKline Inc.
Novartis – Novartis Pharmaceuticals Canada Inc.
Valeant – Valeant Canada
Viatris – Viatris

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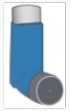
SABA
(Short-Acting Beta2-Agonist)
USE REGULARLY or PRN



Airomir™ MDI
(salbutamol sulphate)
100 mcg/dose

Duration: 4-6h
Company: Valeant

Bricanyl® Turbuhaler®
(terbutaline sulphate)
0.5 mg/dose

Duration: 4-6h
Company: AZ

Ventolin® Diskus®
(salbutamol sulphate)
200 mcg/dose

Duration: 4-6h
Company: GSK

Ventolin® MDI
(salbutamol sulphate)
100 mcg/dose

Duration: 4-6h
Company: GSK
*nebules and generic brands available

Long-Acting Bronchodilators

LAMA
(Long-Acting Muscarinic Antagonist)
USE REGULARLY

Incruse™ Ellipta®
(umeclidinium bromide)
62.5 mcg/dose

Duration: 24h
Company: GSK

Seebri® Breezhaler®
(glycopyrronium bromide)
50 mcg/dose

Duration: 24h
Company: Covis

Spiriva® Handihaler®
(tiotropium bromide monohydrate)
18 mcg/dose

Duration: 24h
Company: BI

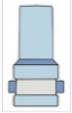
Spiriva® Respimat®
(tiotropium bromide monohydrate)
2.5 mcg/dose

Duration: 24h
Company: BI

Tudorza® Genuair®
(aclidinium bromide)
400 mcg/dose

Duration: 12h
Company: AZ

LABA
(Long-Acting Beta2-Agonist)
USE REGULARLY



Foradil® Aerolizer®
(formoterol fumarate)
12 mcg/dose

Duration: 12h
Company: Novartis

Serevent® Diskus®
(salmeterol xinafoate)
50 mcg/dose

Duration: 12h
Company: GSK

Striverdi® Respimat®
(olodaterol hydrochloride)
2.5 mcg/dose

Duration: 24h
Company: BI
*Approved by Health Canada but may not be available yet

ICS/LAMA/LABA
USE REGULARLY

Breztri™ Aerosphere®
(budesonide/glycopyrronium/formoterol fumarate)
182/8.2/5.8 mcg/dose

Duration: 12h
Company: AZ

Combination Inhalers

ICS/LABA
(Inhaled Corticosteroid/Long-Acting Beta2-Agonist)
USE REGULARLY

*only the Advair® Diskus® has been approved for COPD use.

Advair® Diskus®
(fluticasone propionate/salmeterol xinafoate
100/50; 250/50; 500/50 mcg doses

Duration: 12h
Company: GSK

Breo™ Ellipta®
(fluticasone furoate/vilanterol trifenatate)
100/25 mcg/dose

Duration: 24h
Company: GSK

Symbicort® Turbuhaler®
(budesonide/formoterol fumarate)
100/6; 200/6; 400/12 FORTE mcg doses

Duration: 12h
Company: AZ

Wixela® Inhub®
(fluticasone propionate/salmeterol xinafoate)
100/50; 250/50; 500/50 mcg doses

Duration: 12h
Company: Viatris

Trelegy™ Ellipta®
(fluticasone furoate/umeclidinium bromide/vilanterol trifenatate)
100/62.5/25 mcg/dose

Duration: 24h
Company: GSK

SAMA and SABA
USE REGULARLY

Combivent® Respimat®
(ipratropium bromide/salbutamol sulphate)
20/100 mcg/dose

Duration: 4-6h
Company: BI
*nebules also available

LAMA and LABA
USE REGULARLY

Anoro™ Ellipta®
(umeclidinium bromide/vilanterol trifenatate)
62.5/25 mcg/dose

Duration: 24h
Company: GSK

Duaklir® Genuair®
(aclidinium bromide/formoterol fumarate dehydrate)
400/12 mcg/dose

Duration:12h
Company: AZ

Inspiolto® Respimat®
(tiotropium bromide monohydrate/olodaterol hydrochloride)
2.5/2.5 mcg dose

Duration: 24h
Company: BI

Ultibro® Breezhaler®
(glycopyrronium bromide/indacaterol maleate)
50/110 mcg/dose

Duration: 24h
Company: Covis

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www.lungsask.ca

Short-Acting Bronchodilators

SAMA
(Short-Acting Muscarinic Antagonist)
USE REGULARLY or PRN

Atrovent® MDI
(ipratropium bromide)
20 mcg/dose

Duration: 4-6h
Company: BI
*nebules also available

Company Key

AZ – AstraZeneca Canada Inc.
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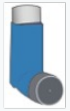
SABA
(Short-Acting Beta2-Agonist)
USE REGULARLY or PRN



Airomir™ MDI
(salbutamol sulphate)
100 mcg/dose

Duration: 4-6h
Company: Valeant

Ventolin® MDI
(salbutamol sulphate)
100 mcg/dose

Duration: 4-6h
Company: GSK
*nebules and generic brands available

Long-Acting Bronchodilators

LAMA
(Long-Acting Muscarinic Antagonist)
USE REGULARLY

LABA
(Long-Acting Beta2-Agonist)
USE REGULARLY

ICS/LAMA/LABA
USE REGULARLY

Breztri™ Aerosphere®
(budesonide/glycopyrronium/formoterol fumarate)
182/8.2/5.8 mcg/dose

Duration: 12h
Company: AZ

Combination Inhalers

ICS/LABA
(Inhaled Corticosteroid/Long-Acting Beta2-Agonist)
USE REGULARLY

SAMA and SABA
USE REGULARLY

LAMA and LABA
USE REGULARLY

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www.lungsask.ca

Short-Acting Bronchodilators

SAMA
(Short-Acting Muscarinic Antagonist)
USE REGULARLY or PRN

SABA
(Short-Acting Beta2-Agonist)
USE REGULARLY or PRN

Bricanyl® Turbuhaler®
(terbutaline sulphate)
0.5 mg/dose

Duration: 4-6h
Company: AZ

Ventolin® Diskus®
(salbutamol sulphate)
200 mcg/dose

Duration: 4-6h
Company: GSK

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Long-Acting Bronchodilators

LAMA
(Long-Acting Muscarinic Antagonist)
USE REGULARLY

Incruse™ Ellipta®
(umeclidinium bromide)
62.5 mcg/dose

Duration: 24h
Company: GSK

Seebri® Breezhaler®
(glycopyrronium bromide)
50 mcg/dose

Duration: 24h
Company: Covis

Spiriva® Handihaler®
(tiotropium bromide monohydrate)
18 mcg/dose

Duration: 24h
Company: BI

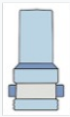
Spiriva® Respimat®
(tiotropium bromide monohydrate)
2.5 mcg/dose

Duration: 24h
Company: BI

Tudorza® Genuair®
(aclidinium bromide)
400 mcg/dose

Duration: 12h
Company: AZ

LABA
(Long-Acting Beta2-Agonist)
USE REGULARLY



Foradil® Aerolizer®
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12 mcg/dose

Duration: 12h
Company: Novartis

Serevent® Diskus®
(salmeterol xinafoate)
50 mcg/dose

Duration: 12h
Company: GSK

Striverdi® Respimat®
(olodaterol hydrochloride)
2.5 mcg/dose

Duration: 24h
Company: BI
*Approved by Health Canada but may not be available yet

ICS/LAMA/LABA
USE REGULARLY

Trelegy™ Ellipta®
(fluticasone furoate/ umeclidinium bromide/ vilanterol trifenatate)
100/62.5/25 mcg/dose

Duration: 24h
Company: GSK

Combination Inhalers

ICS/LABA
(Inhaled Corticosteroid/Long-Acting Beta2-Agonist)
USE REGULARLY

*only the Advair® Diskus® has been approved for COPD use.

Advair® Diskus®
(fluticasone propionate/ salmeterol xinafoate)
100/50; 250/50; 500/50 mcg doses

Duration: 12h
Company: GSK

Breo™ Ellipta®
(fluticasone furoate/ vilanterol trifenatate)
100/25 mcg/dose

Duration: 24h
Company: GSK

Symbicort® Turbuhaler®
(budesonide/formoterol fumarate)
100/6; 200/6; 400/12 FORTE mcg doses

Duration: 12h
Company: AZ

Wixela® Inhub®
(fluticasone propionate/ salmeterol xinafoate)
100/50; 250/50; 500/50 mcg doses

Duration: 12h
Company: Viatris

SAMA and SABA
USE REGULARLY

Combivent® Respimat®
(ipratropium bromide/ salbutamol sulphate)
20/100 mcg/dose

Duration: 4-6h
Company: BI
*nebules also available

LAMA and LABA
USE REGULARLY

Anoro™ Ellipta®
(umeclidinium bromide/ vilanterol trifenatate)
62.5/25 mcg/dose

Duration: 24h
Company: GSK

Duaklir® Genuair®
(aclidinium bromide/ formoterol fumarate dehydrate)
400/12 mcg/dose

Duration:12h
Company: AZ

Inspiolto® Respimat®
(tiotropium bromide monohydrate/olodaterol hydrochloride)
2.5/2.5 mcg dose

Duration: 24h
Company: BI

Ultibro® Breezhaler®
(glycopyrronium bromide/ indacaterol maleate)
50/110 mcg/dose

Duration: 24h
Company: Covis

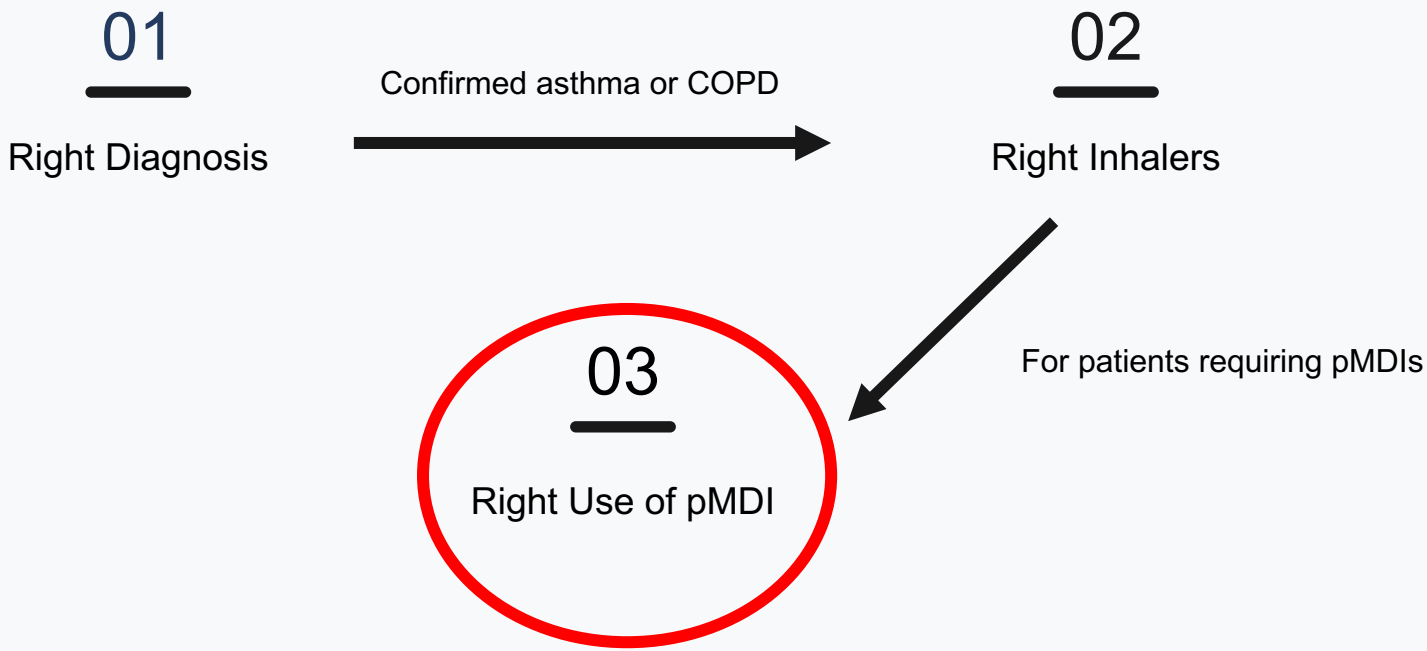
Why low-carbon respiratory care is high-quality care

Why low-carbon respiratory care is high-quality care

Reason #4: Following asthma & COPD guidelines = low-carbon care

- For patients with asthma: minimal use of salbutamol/rescue inhalers means good asthma control + low-carbon care
- For patients with COPD: switching to maintenance therapy means good COPD control + low-carbon care

Ways to provide low-carbon respiratory care

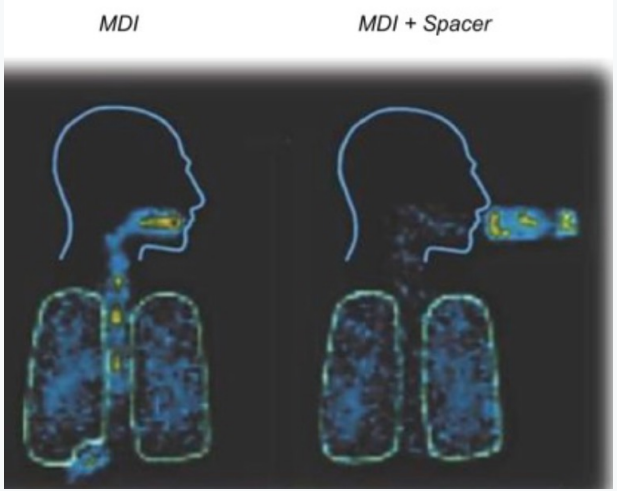


Inhalers are hard to use

- Inhaler technique studies show that 12-71% of the time, they are not used correctly[1]
- MDI administration misuse is common in older adults (79% conducting critical errors) and children (97% misuse)[1]

Duarte-de-Araújo A, Teixeira P, Hespanhol V, Correia-de-Sousa J. **COPD: misuse of inhaler devices in clinical practice.** Int J Chron Obstruct Pulmon Dis. 2019;14:1209-1217. doi:10.2147/COPD.S178040
Melani AS, Zanchetta D, Barbato N, et al. **Inhalation technique and variables associated with misuse of conventional metered-dose inhalers and newer dry powder inhalers in experienced adults.** Annals of Allergy, Asthma & Immunology. 2004;93(5):439-446. doi:10.1016/S1081- 1206(10)61410-X

pMDI Deposition



Asthma Canada recommends that anyone, of any age, who is using a pMDI should use a spacer.

Compared with a pMDI alone, spacers minimis:
- coordination difficulties
- reduce oropharyngeal deposition

and increase lung deposition

Ciciliani AM, Denny M, Langguth P, Voshaar T, Wachtel H. Lung deposition using the Respimat® Soft Mist™ inhaler mono and fixed-dose combination therapies: an in vitro/in silico analysis. COPD: Journal of Chronic Obstructive Pulmonary Disease. 2020 Nov 23;18(1):91-100.

Why low-carbon respiratory care is high-quality care

Why low-carbon respiratory care is high-quality care

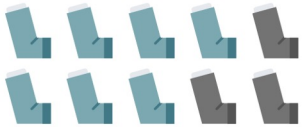
Reason #5: Improved pMDI technique = less pollution

Good MDI technique is associated with:

- Decreased hospitalization and E.D. visits
- Decreased need for oral steroids and antimicrobials
- Better disease control
- Improved quality of life

Every inhaler needs to be disposed by the pharmacist

7 out of 10

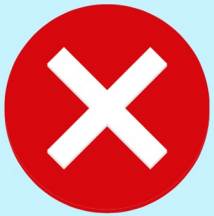


inhalers are thrown away *before* being empty.[1]

When thrown into the garbage for landfill, inhalers release harmful greenhouse gases into the environment.[2]

Ensure that you are using your inhaler correctly and dispose of it when it is empty.

Ask your clinic or pharmacy to see if they have a recycling or disposal program.*



Do NOT throw them in your household garbage or recycling.

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease Pollution

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease Pollution

Reason #2: Avoid harms from inappropriate inhaler use

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease Pollution

Reason #2: Avoid harms from inappropriate inhaler use

Reason #3: Clinical benefits of DPIs and SMIs

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease Pollution

Reason #2: Avoid harms from inappropriate inhaler use

Reason #3: Clinical benefits of DPIs and SMIs

Reason #4: Following asthma & COPD guidelines = low-carbon care

Why low-carbon respiratory care is high-quality care

Reason #1: Decrease Pollution

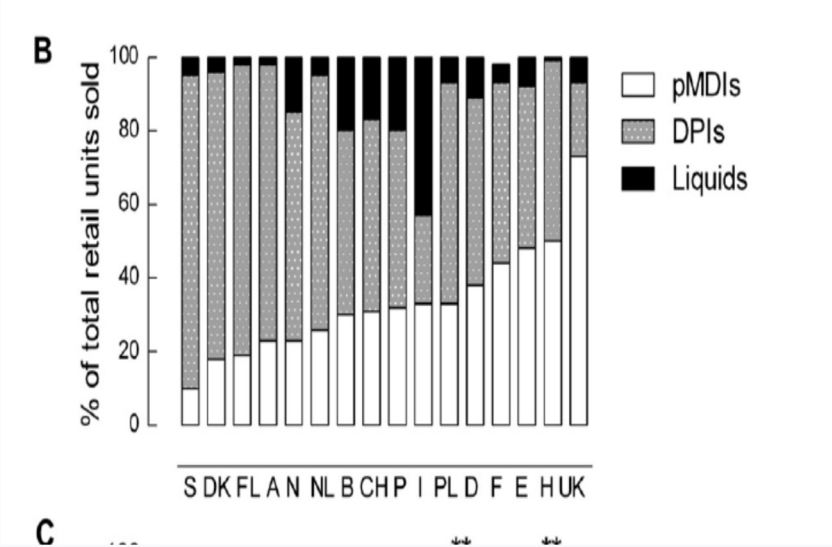
Reason #2: Avoid harms from inappropriate inhaler use

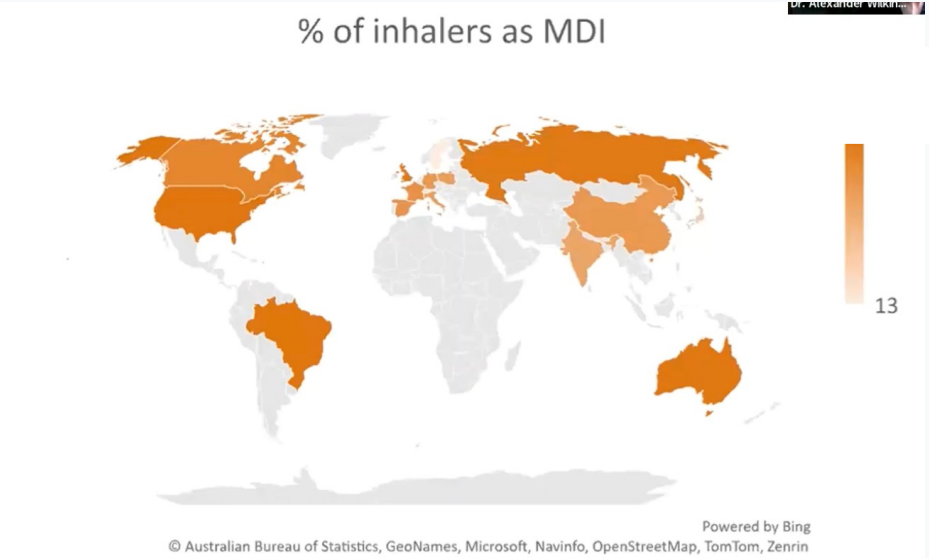
Reason #3: Clinical benefits of DPIs and SMIs

Reason #4: Following asthma & COPD guidelines = low-carbon care

Reason #5: Improved pMDI technique = less pollution + better disease control

What are other countries doing?





(Lavorini et al, 2011)

What about the cost of switching?

Example of moderate intensity ICS prescription	**Cost of inhaler***	**Number of actuations per device**	**Cost per dose****
Fluticasone MDI 125 mcg 1 inh BID	$66.63	120	**$0.56/dose**
Budesonide DPI 200 mcg 1 inh BID	$91.17	200	**$0.46/dose**
Example of moderate intensity ICS/LABA prescription	**Cost of inhaler*****	**Number of actuations per device**	**Cost per dose****
Fluticasone/Salmeterol MDI 125/25 mcg 1 inh BID	$140.82	120	**$1.17/dose**
Budesonide/Formoterol DPI 200/6 mcg 1 inh BID	$115.86	120	**$0.97/dose**
Example of SABA prescription	**Cost of inhaler***	**Number of actuations per device**	**Cost per dose****
Salbutamol MDI 100 mcg 2 inh QID PRN	$18.45	200	**$0.19/dose (2 inh)**
Terbutaline DPI 0.5 mg 1 inh QID PRN	$21.38	100	**$0.21/dose**

**includes standard pharmacy mark-up and dispensing fee*

***cost retrieved from drugsearch.ca*

****excludes dispensing fee, assumes no SA coverage*

"Regardless of drug class, DPIs are often the less expensive option for patients when considering the cost per dose."

Stoynova & Culley, 2022

Short-acting beta$_2$ agonist (SABA)

MDI			DPI		
Product	**Cost***	**Pharmacare**	**Product**	**Cost***	**Pharmacare**
Teva-Salbutamol (salbutamol)	**200 actuations** 100 mcg ~$18	✓	Ventolin® Diskus (salbutamol)	**60 blisters** 200 mcg ~$24	✗
Ventolin®, generics (salbutamol)	**200 actuations** 100 mcg Brand ~$19 Generic ~$18	✓	Bricanyl® Turbuhaler (terbutaline)	**100 doses** 500 mcg ~$21	✓

Inhaled Corticosteroid (ICS)

MDI			DPI		
Product	**Cost***	**Pharmacare**	**Product**	**Cost***	**Pharmacare**
Alvesco® (ciclesonide)	**120 actuations** 100 mcg ~$67 200 mcg ~$105	✓	Flovent® Diskus (fluticasone propionate)	**60 doses** 100 mcg ~$45 250 mcg ~$66 500 mcg ~$97	✓
Qvar® (beclomethasone)	**200 actuations** 50 mcg ~$55 100 mcg ~$96	✓	Arnuity® Ellipta (fluticasone furoate)	**30 doses** 100 mcg ~$62 200 mcg ~$108	✓
Flovent® (fluticasone propionate)	**120 actuations** 50 mcg ~$45 125 mcg ~$67 250 mcg ~$122	✓	Asmanex® Twisthaler (mometasone)	**30 doses (100, 400mcg) or 60 doses(200, 400mcg)** 200 mcg ~$56 400 mcg ~$96	200mcg ✓ 400mcg ✓
			Pulmicort® Turbuhaler (budesonide)	**200 doses** 100 mcg ~$52 200 mcg ~$91 400 mcg ~$128	✓

ICS/LABA

MDI			DPI		
Product	**Cost***	**Pharmacare**	**Product**	**Cost***	**Pharmacare**
Zenhale® (mometasone/ formoterol)	**120 actuations** 100/5 mcg ~$106 200/5 mcg ~$128	Special Authority	Advair® Diskus, generics (fluticasone propionate/salmeterol)	**60 blisters** 100/50 mcg ~$110, $57 250/50 mcg ~$130, $65 500/50 mcg ~$180, $89	Special Authority
Advair® (fluticasone propionate/ salmeterol)	**120 actuations** 125/25 mcg ~$129 250/25 mcg ~$180	Special Authority	Breo® Ellipta (fluticasone furoate/vilanterol)	**30 blisters** 100/25 mcg ~$107 200/25 mcg ~$160	Special Authority
			Symbicort® Turbuhaler (budesonide/formoterol)	**120 doses** 100/6 mcg ~$84 200/6 mcg ~$106	Special Authority

Special Authority: Diagnosis of Asthma + Inadequate response on optimal dose of inhaled corticosteroid

Case #1: Sammy Salbutamol

A 25-year-old patient with asthma who has a Ventolin and Flovent inhaler

You check his record and see that over the past year, he has received over 4 Ventolin inhalers

Poor Asthma Control

On SABA & ICS therapy

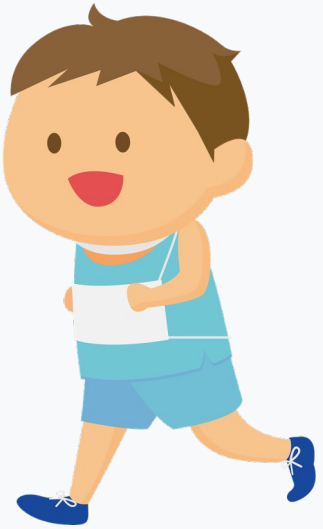
Consider switch to ICS-LABA combination:

Budesonide-Formoterol

- Tackles SABA monotherapy
- Dose counter
- Simplifies inhaler

*Special Authority Required

Case #2: "Mild”-Asthma Michael



50-year-old gentleman with life-long history of asthma. He had a spirometry test 5 years ago.

He says his asthma is very well-controlled and only uses one salbutamol inhaler every year.

He takes it when he exercises or during the wildfire seasons

Very Mild Asthma

On Salbutamol PRN

Switch SABA to SABA (+ICS): terbutaline (Bricanyl) + budesonide (Pulmicort)

- Covered by Pharmacare
- Dose Counter
- No spacer needed when exercising
- Regular ICS use reduces exercise-induced asthma

Case #3: Too-Many-Inhalers Tom

80-year-old patient with documented COPD

He needs his Ventolin and Atrovent inhalers refilled. He uses both inhalers regularly. In his bag of inhalers, he also has:

- Advair pMDI
- Sprivia Respimat
- Incruse Ellipta — a sample he received last year

Mild COPD

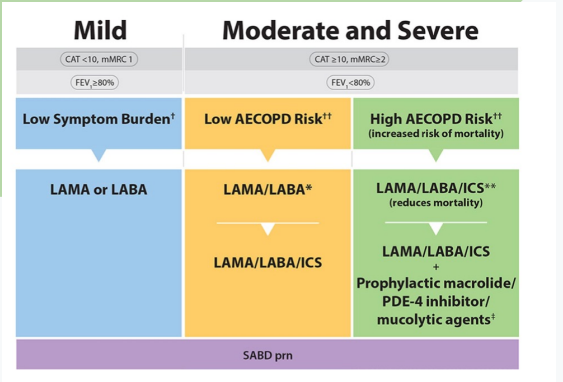
On Salbutamol (SABA) PRN

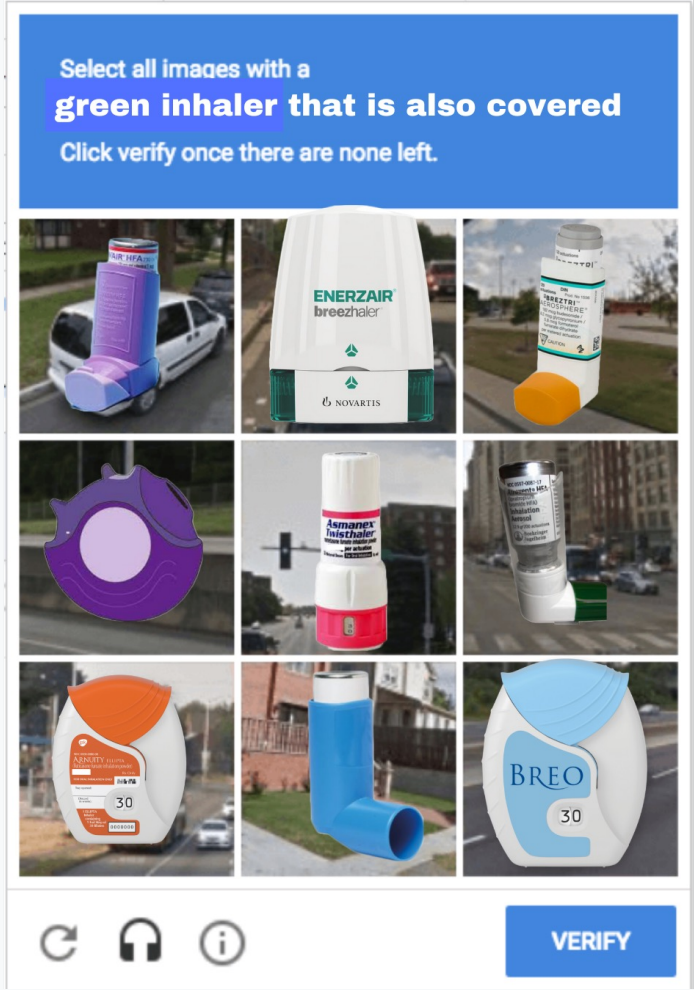
+ Atrovent (SAMA) PRN + Advair (ICS/LABA)

+ Spiriva (LAMA) + Incruse (LAMA)

Switch to Spiriva Respimat (Maintenance) + Bricanyl (Rescue)

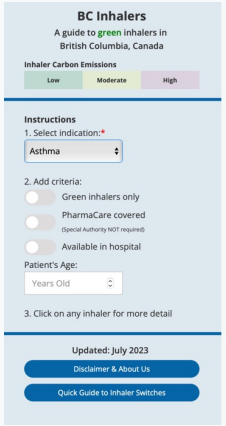
- Reduces Pill Burden
- Covered by Pharmacare
- No spacer required
- No special authority required



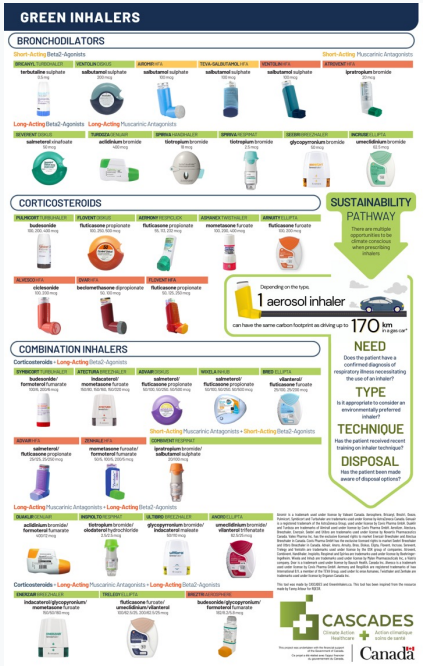

Select all images with a
green inhaler that is also covered
Click verify once there are none left.
ENERZAIR
breezhaler
NOVARTIS
Asmanex
Twisthaler
30
BREO
30
VERIFY

Clinical Tools

www.BCInhalers.ca



CASCADES



Reach Out for an Inhaler PSP project to provide high quality & green asthma care

kevin.liang@fraserhealth.ca

Aim 1

Improve outcomes for adult asthma patients through identification of SABA over-reliance and appropriate implementation of a MART based treatment strategy.

Objectives

- Reduce the proportion of inhaled asthma treatments prescribed that are a SABA inhaler by increasing appropriate use of ICS and reducing over-reliance on SABA
- Reduce the number of asthma exacerbations requiring treatment with oral corticosteroids
- Reduce asthma related emergency department attendance and hospitalisation

Aim 2

Reduce the environmental impact of adult asthma management through reduction in SABA over-reliance, reducing health care resource utilisation, and use of preventer dry powder inhalers (DPI) where appropriate.

Objectives

- Reduce the number of SABA inhalers prescribed
- Reduce health care resource utilisation through improved asthma control.
- Increase the proportion of preventer inhalers that are DPI where appropriate