

CONSIDERATIONS FOR PRESCRIBING

Accurate diagnosis of asthma and COPD requires confirmatory testing to avoid unnecessary inhaler prescribing.^{1,2}

- > Long-term inhalers are often prescribed for asthma and COPD without confirmation of diagnosis.¹
- > 44% of Canadians who receive a diagnostic label of asthma have never had spirometry testing. Up to 67% of Canadians with COPD, chronic bronchitis, and emphysema have had no spirometry.^{3,4}
- When the diagnosis is not confirmed, there is potential patient harm due to missed alternative diagnoses, unnecessary medication costs and side effects, and patients believing they have a chronic illness.⁵⁻⁹
- Not all wheezes are due to asthma: In a large Canadian study, 33% of patients who had received a diagnosis of asthma from their physician in the last 5 years did not have asthma when assessed objectively with lung function tests. However, 79% of these non-asthmatic patients were in fact using asthma medications.⁶
- > There is no evidence of benefit for SABA, ICS, or ICS/LABA in "post-viral cough" for adults.²⁹

Patients' expectations for duration of cough do not match the reality: the average duration of cough from a viral upper respiratory illness is 18 days, though patients only expect it to last 5 to 7 days.¹⁰

Diagnosing Asthma

- Guidelines uniformly recommend objective testing to establish asthma diagnosis. Cough, wheeze, or dyspnea can be caused by other conditions.¹¹⁻¹³
- > The best time to perform spirometry is when the patient is symptomatic. Spirometry can generally be performed in children 6+ years of age. ^{1,2,13,14}
- > "Don't initiate medications for asthma (e.g., inhalers, leukotriene receptor antagonists, or other) in patients ≥ 6 years old who have not had confirmation of reversible airflow limitation with spirometry, and in its absence, a positive methacholine or exercise challenge test, or sufficient peak expiratory flow variability." Choosing Wisely Canada Recommendation²
- Other lung function tests, such as plethysmography (i.e. lung volumes) and diffusion capacity testing are not required when asthma is suspected.¹

Diagnosing COPD

- Not all shortness of breath, chronic cough, and sputum are COPD. Guidelines uniformly recommend objective testing to establish a COPD diagnosis.^{1,2,15}
- > A diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough, and/or sputum production and an appropriate history of exposure to noxious stimuli. Spirometry demonstrating a postbronchodilator FEV1/FVC < 70% (or less than the lower limit of normal, if available) is required to make a definitive diagnosis." Choosing Wisely Canada Recommendation²

Questions to consider

- □ Under what initial circumstances was this inhaler was prescribed?
- Does my patient have a confirmed diagnosis? If not, can I refer my patient for objective testing?
- □ Is my patient's current medication working for them?
- □ Is my patient experiencing an acute airways exacerbation?

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CONSIDERATIONS FOR SWITCHING

Switching must occur with patient involvement.

- Shared decision-making can lead to improved medication adherence and health outcomes for the patient.^{52,53}
- > A forced non-medical switch in inhaler type can be associated with harm for the patient.⁵⁴

Considerations for prescribing DPIs¹⁶

- Larger than MDI, but more portable than using MDI with spacer
- Breath-actuated, quick, deep inhalation (2-3 sec), breath hold after
- Less coordination required, no need to sync breathing
- > Many DPIs have dose counters
- > Available for most treatments
- > Sufficient inspiratory flow required
- > Need proper dose preparation and loading to achieve optimal available dose for inhalation

Considerations for prescribing MDIs

Without Spacer

- > Slow, steady inhalation (4-5 sec), breath hold after
- > Need to sync breathing with release of medication

With Spacer

- > Slow, steady inhalation (4-5 sec) OR slow, steady breathing in & out the mouth, breath hold after
- > No need to sync breathing
- > Preferred for preschoolers

Studies evaluating the switch from MDIs to DPIs show that most patients remain on the DPI¹⁷ and have no loss of asthma control.¹⁸

When are MDI's necessary?

- > Severe COPD
- > Preschoolers
- Frailty or other causes of limited inspirational capacity
- > Financial/drug coverage issues
- > Patient preference

To minimize carbon impact if MDIs are necessary:

 Ensure proper MDI usage including a spacer, which improves drug delivery and can therefore reduce amount needed.^{19,20} If salbutamol is needed as reliever, consider prescribing Airomir (specific generic name) MDI as it has ~1/3 of the carbon footprint of other salbutamol MDIs.²¹ On these prescriptions, write "dispense as written" or "no substitutions" so it is not switched to generic salbutamol or Ventolin.

Asthma Treatment Update

- > Asthma treatment guidelines (> age 12) have recently changed.^{11,12} "There is new evidence in children ≥12 years of age and adults that PRN budesonide/formoterol (bud/form) decreases exacerbations in comparison to PRN SABA, with different levels of evidence in those with very mild versus mild asthma."²²
- "For safety, GINA no longer recommends treatment of asthma in adults and adolescents with Short-Acting Beta-2- Agonists (SABA) alone, without inhaled corticosteroids (ICS). There is strong evidence that SABA-only treatment, although providing short-term relief of asthma symptoms, does not protect patients from severe exacerbations, and that regular or frequent use of SABA increases the risk of exacerbations."¹¹
- According to 2020 SABINA studies, the use of more than 2 SABA inhalers per year (regardless of additional maintenance/controller medication [e.g. ICS]) is correlated with increased exacerbations, hospitalizations and mortality.^{23,24}
- > Risks associated with frequent SABA use:^{25,26}
 - Rebound hyperresponsiveness
 - Decreased broncho-protection
 - Decreased bronchodilator Response
 - o Increased allergic response
 - Increased eosinophilic inflammation
 - Increased E.D. presentations
 - Increased death rate from asthma
- > ICS use is 73% lower when patients only have 1 inhaler (e.g. combined ICS/LABA).²⁷ With better asthma control (including maintenance therapy), fewer relievers are necessary because fewer

Questions to consider

- \Box Is my patient able to use a DPI?
- □ Is my patient using a spacer with an MDI? If not, would they benefit from a more portable DPI?
- □ How often is my patient using their SABA?

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exacerbations occur.^{11,13,14,28}

CONSIDERATIONS FOR TEACHING

Inhaler Technique

- Inhaler technique studies show that 12-71% of the time, they are not used correctly.³⁰⁻³⁴
- MDI administration misuse is even more common in older adults (79% conducting critical errors) and children (97% misuse).^{35,36}
- Inhaler misuse is associated with:^{30,32,34,36-38}
 - Increased hospitalization and E.D. visits
 - Increased need for oral steroids and antimicrobials
 - o Poor disease control
 - Decreased quality of life

MDI Technique^{39,40}

- > Proper Technique
 - Shake inhaler before every actuation
 - o Breathe out
 - Slow inhale (4-5s) with lips on inhaler while actuating medication
 - o Hold breath for 10s (adults)
 - Wait >30s before next actuation
- > Common Errors
 - Lack of breath hold
 - Actuate 2x in a row
 - o Inhaling too quickly
 - Not using aero chamber/spacer device
- Many studies show that patients often use MDIs incorrectly,⁵⁰ with the most frequently committed critical error being failure to trigger the device and simultaneously breathe in.⁵¹

DPI Technique^{30,41,42}

- > Proper Technique:
 - o Deploy medication/load device
 - o Breathe out away from device
 - Quick & forceful inhaler (~2s) with mouth on device opening, inhaler must be upright
 - Hold breath for 10s (adults)
- > Common Errors
 - \circ Lack of breath hold
 - o Inhalation too slow/does not generate

Questions to consider

- □ Is my patient using their inhaler correctly?
- □ Are they comfortable using the device and can they 'teach' it back to me?
- Am I periodically checking my patient's inhaler technique?

enough force

Studies show DPIs are easier to use, tend to have fewer inhalation errors with use, and often contain dose counters.⁴³⁻⁴⁷

CONSIDERATIONS FOR DISPOSING

- Many patients cannot reliably identify when their MDI is empty. If the inhalers do not have the dose counter, the patients/carers should make note of when the inhaler is first initiated.⁴⁸
- Encourage patients to return their old inhalers to pharmacies for recycling and incineration.
 Compared to landfill disposal, this saves 4-18 kg
 CO (eq) per inhaler.⁴⁹ See <u>this link</u> for a list of pharmacies in BC, ON, MB, & PEI accepting inhalers.

References

- 1. Let's Clear the Air. Choosing Wisely Canada. https://choosingwiselycanada.org/airways/
- 2. Six tests, treatments to question in respiratory medicine. Choosing Wisely Canada. <u>https://choosingwiselycanada.org/recommendation/respiratory-medicine/</u>
- 3. Chapman, K. R., Boulet, L. P., Rea, R. M., & Franssen, E.

Questions to consider

- Does my patient know when their inhaler is empty?
- □ Do they know how and where to dispose of it when it is done?

(2008). Suboptimal asthma control: Prevalence, detection and consequences in general practice. European Respiratory Journal, 31(2), 320-325. doi.org/10.1183/09031936.00039707

- Evans, J., Chen, Y., Camp, P. G., Bowie, D. M., & McRae, L. (2014). Estimating the prevalence of COPD in Canada: Reported diagnosis versus measured airflow obstruction -ARCHIVED (No. 82-003-X; Health Reports). https://www150.statcan.gc.ca/n1/pub/82-003x/2014003/article/11908-eng.pdf
- Kavanagh J, Jackson DJ, Kent BD. (2019) Over- and under-diagnosis in asthma. Breathe, 15(1):e20-e27. doi:10.1183/20734735.0362-2018
- Aaron SD, Vandemheen KL, FitzGerald JM, et al. (2017) Reevaluation of Diagnosis in Adults With Physician Diagnosed Asthma. JAMA, 317(3):269-279. doi:10.1001/jama.2016.19627
- Pakhale S, Sumner A, Coyle D, Vandemheen K, Aaron S. (2011). (Correcting) misdiagnoses of asthma: a cost

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n Green Initiative, developed by Dr. Meghan Davis & Tatiana Gayowsky with . Reviewed by Dr. Kimberly Wintemute, Dr. Alan Kaplan and Dr. Samantha Green.

effectiveness analysis. BMC Pulmonary Medicine, 11(1):27. doi:10.1186/1471-2466-11-27.

- Aaron SD, Vandemheen KL, Boulet L-P, et al. (2008) Overdiagnosis of asthma in obese and nonobese adults. CMAJ, 179(11):1121-1131. doi:10.1503/cmaj.081332
- Diab, N., Gershon, A. S., Sin, D. D., Tan, W. C., Bourbeau, J., Boulet, L.-P., & Aaron, S. D. (2018). Underdiagnosis and Overdiagnosis of Chronic Obstructive Pulmonary Disease. American Journal of Respiratory and Critical Care Medicine, 198(9), 1130-1139. doi:10.1164/rccm.201804-0621Cl
- Ebell MH, Lundgren J, Youngpairoj S. (2013). How long does a cough last? Comparing patients' expectations with data from a systematic review of the literature. Ann Fam Med, 11(1):5-13. doi:10.1370/afm.1430
- 11. Global Strategy for Asthma Management and Prevention, Full Report. (2021). Global Initiative for Asthma.
- Reddel HK, FitzGerald JM, Bateman ED, et al. (2019). GINA 2019: a fundamental change in asthma management: Treatment of asthma with short-acting bronchodilators alone is no longer recommended for adults and adolescents. European Respiratory Journal, 53(6). doi:10.1183/13993003.01046-2019
- Lougheed MD, Lemiere C, Ducharme FM, et al. (2012) Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in preschoolers, children and adults. Can Respir J, 19(2):127-164.
- Quirt J, Hildebrand KJ, Mazza J, Noya F, Kim H. (2018). Asthma. Allergy Asthma Clin Immunol, 14(Suppl 2):50. doi:10.1186/s13223-018-0279-0
- O'Donnell DE, Hernandez P, Aaron S, et al. (2003). Canadian Thoracic Society COPD guidelines: summary of highlights for family doctors. Can Respir J, 10(8):463-466. doi:10.1155/2003/831291
- Usmani OS. Choosing the right inhaler for your asthma or COPD patient. (2019). Ther Clin Risk Manag, 15, 461-472. doi:10.2147/TCRM.S160365.
- Tack G, Tjia-Leong E, Davies L, Warburton CJ. P229 Factors affecting inhaler choice and adherence in urban Liverpool. Thorax. 2011;66(Suppl 4):A161-A161. doi:10.1136/thoraxjnl-2011-201054c.229
- Woodcock A, Janson C, Rees J, et al. (2022). Effects of switching from a metered dose inhaler to a dry powder inhaler on climate emissions and asthma control: posthoc analysis. Thorax. doi: 10.1136/thoraxjnl-2021-218088
- Barry PW, O'Callaghan C. (1996) Inhalational drug delivery from seven different spacer devices. Thorax, 51(8):835-840. doi:10.1136/thx.51.8.835
- 20. Wilkinson AJK, Anderson G. (2020). Sustainability in Inhaled Drug Delivery. Pharm Med, 34(3):191-199. doi:10.1007/s40290-020-00339-8
- Jeswani HK, Azapagic A. (2019). Life cycle environmental impacts of inhalers. Journal of Cleaner Production, 237:117733. doi:10.1016/j.jclepro.2019.117733
- 22. Yang CL, Hicks EA, Mitchell P, et al. (2021). Canadian Thoracic Society 2021 Guideline update: Diagnosis and management of asthma in preschoolers, children and

adults. Canadian Journal of Respiratory, Critical Care, and Sleep Medicine. doi:10.1080/24745332.2021.1945887

- Nwaru, B. I., Ekström, M., Hasvold, P., Wiklund, F., Telg, G., & Janson, C. (2020). Overuse of short-acting β2agonists in asthma is associated with increased risk of exacerbation and mortality: A nationwide cohort study of the global SABINA programme. European Respiratory Journal, 55(4). doi:10.1183/13993003.01872- 2019
- Bloom, C. I., Cabrera, C., Arnetorp, S., Coulton, K., Nan, C., van der Valk, R. J. P., & Quint, J. K. (2020). Asthma Related Health Outcomes Associated with Short-Acting β2-Agonist Inhaler Use: An Observational UK Study as Part of the SABINA Global Program. Advances in Therapy, 37(10), 4190-4208. doi:10.1007/s12325-020-01444-5
- Salpeter SR, Ormiston TM, Salpeter EE. (2004). Meta-Analysis: Respiratory Tolerance to Regular β2-Agonist Use in Patients with Asthma. Annals of Internal Medicine, 140(10):802-813. doi:10.7326/0003-4819-140-10-200405180-00010
- 26. Stanford RH, Shah MB, D'Souza AO, Dhamane AD, Schatz M. (2012). Short-acting β-agonist use and its ability to predict future asthma-related outcomes. Annals of Allergy, Asthma & Immunology, 109(6):403-407. doi:10.1016/j.anai.2012.08.014
- 27. Stoloff SW, Stempel DA, Meyer J, Stanford RH, Carranza Rosenzweig JR. (2004). Improved refill persistence with fluticasone propionate and salmeterol in a single inhaler compared with other controller therapies. Journal of Allergy and Clinical Immunology,113(2):245-251. doi:10.1016/j.jaci.2003.10.011
- 28. Björnsdóttir, U. S., Sigurðardóttir, S. T., Jonsson, J. S., Jonsson, M., Telg, G., Thuresson, M., Naya, I., & Gizurarson, S. (2014). Impact of changes to reimbursement of fixed combinations of inhaled corticosteroids and long acting β2-agonists in obstructive lung diseases: A population-based, observational study. International Journal of Clinical Practice, 68(7), 812-819. doi:10.1111/ijcp.12473
- Becker LA, Hom J, Villasis-Keever M, van der Wouden JC. (2015). Beta2-agonists for acute cough or a clinical diagnosis of acute bronchitis. Cochrane Database of Systematic Reviews, 9: CD001726. doi:10.1002/14651858.CD001726.pub5
- Melani AS, Bonavia M, Cilenti V, et al. (2011). Inhaler mishandling remains common in real life and is associated with reduced disease control. Respiratory Medicine., 105(6):930-938. doi:10.1016/j.rmed.2011.01.005 51.
- Duarte-de-Araújo A, Teixeira P, Hespanhol V, Correia-de-Sousa J. (2019). COPD: misuse of inhaler devices in clinical practice. Int J Chron Obstruct Pulmon Dis, 14:1209-1217. doi:10.2147/COPD.S178040
- 32. Giraud V, Roche N. (2002). Misuse of corticosteroid metered-dose inhaler is associated with decreased asthma stability. Eur Resp J, 19(2):246-251. doi:10.1183/09031936.02.00218402

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- Melani AS, Zanchetta D, Barbato N, et al. (2004).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, 93(5):439-446. doi:10.1016/S1081-1206(10)61410-X
- Volerman A, Carpenter D, Press VG. (2020). What can be done to impact respiratory inhaler misuse: exploring the problem, reasons, and solutions. Expert Rev Respir Med,14(8):791-805. doi:10.1080/17476348.2020.1754800
- 55. Vanderman AJ, Moss JM, Bailey JC, Melnyk SD, Brown JN. (2015). Inhaler Misuse in an Older Adult Population. The Consultant Pharmacist, 30(2):92-100. doi:10.4140/TCP.n.2015.92
- 36. AL-Jahdali H, Ahmed A, AL-Harbi A, et al. (2013). Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. Allergy Asthma Clin Immunol, 9(1):8. doi:10.1186/1710-1492-9-8
- Basheti IA, Reddel HK, Armour CL, Bosnic-Anticevich SZ. (2007). Improved asthma outcomes with a simple inhaler technique intervention by community pharmacists. Journal of Allergy and Clinical Immunology, 119(6):1537-1538. doi:10.1016/j.jaci.2007.02.037
- Martin MA, Catrambone CD, Kee RA, et al. (2009). Improving asthma self-efficacy: Developing and testing a pilot community-based asthma intervention for African American adults. J Allergy Clin Immunol, 123(1):153-159.e3. doi:10.1016/j.jaci.2008.10.057
- 39. Deerojanawong J, Sakolnakorn V, Prapphal N, Hanrutakorn C, Sritippayawan S. (2009). Evaluation of Metered- Dose Inhaler Administration Technique among Asthmatic Children and Their Caregivers in Thailand. Asian Pacific journal of allergy and immunology / launched by the Allergy and Immunology Society of Thailand, 27: 87-93.
- 40. Thompson CJ, Irvine MT, Grathwohl CK, Roth MB. (1994). Misuse of Metered-dose Inhalers in Hospitalized Patients. Chest, 105(3):715-717. doi:10.1378/chest.105.3.715
- Harnett CM, Hunt EB, Bowen BR, et al. (2014). A study to assess inhaler technique and its potential impact on asthma control in patients attending an asthma clinic. Journal of Asthma, 51(4):440-445. doi:10.3109/02770903.2013.876650
- 42. How to Use a Dry Powder Inhaler. Allergy & Asthma Network. https://allergyasthmanetwork.org/what-isasthma/how-is-asthma-treated/how-to-use-a-dry-powderinhaler/
- Juntunen-Backman K, Kajosaari M, Laurikainen K, et al. (2002). Comparison of Easyhaler Metered-Dose, Dry Powder Inhaler and a Pressurised Metered-Dose Inhaler plus Spacer in the Treatment of Asthma in Children: Clinical Drug Investigation, 22(12):827-835. doi:10.2165/00044011- 200222120-00003
- 44. Smith IJ, Parry-Billings M. (2003). The inhalers of the future? A review of dry powder devices on the market

today. Pulmonary Pharmacology & Therapeutics, 16(2):79-95. doi:10.1016/S1094-5539(02)00147-5

- Starup-Hansen J, Dunne H, Sadler J, Jones A, Okorie M. (2020). Climate change in healthcare: Exploring the potential role of inhaler prescribing. Pharmacology Research & Perspectives, 8(6):e00675. doi:10.1002/prp2.675
- 46. Müller V, Gálffy G, Eszes N, et al. (2011). Asthma control in patients receiving inhaled corticosteroid and long-acting beta2-agonist fixed combinations. A real-life study comparing dry powder inhalers and a pressurized metered dose inhaler extrafine formulation. BMC Pulmonary Medicine, 11(1):40. doi:10.1186/1471-2466-11-40
- Virchow JC, Crompton GK, Dal Negro R, et al. (2008). Importance of inhaler devices in the management of airway disease. Respiratory Medicine, 102(1):10-19. doi:10.1016/j.rmed.2007.07.031
- 48. Fullwood I, Evans T, Davies B, et al. (2022). Do you know when the inhaler is empty? Archives of Disease in Childhood. doi:10.1136/archdischild-2022-324027
- Wilkinson AJK, Braggins R, Steinbach I, Smith J. (2019). Costs of switching to low global warming potential inhalers. An economic and carbon footprint analysis of NHS prescription data in England. BMJ Open, 9(10):e028763. doi:10.1136/bmjopen-2018-028763
- Cho-Reyes S, Celli BR, Dembek C, Yeh K, Navaie M. (2019). Inhalation Technique Errors with Metered-Dose Inhalers Among Patients with Obstructive Lung Diseases: A Systematic Review and Meta-Analysis of U.S. Studies. Chronic Obstr Pulm Dis, 6(3): 267-280. doi:10.15326/jcopdf.6.3.2018.0168.
- 51. Khassawneh BY, Al-Ali MK, Alzoubi KH, Batarseh MZ, Al-Safi SA, Sharara AM, Alnasr HM. (2008). Respiratory Care, 53 (3) 324-328.
- 52. Kaplan A, Price D. (2018). Matching Inhaler Devices with Patients: The Role of the Primary Care Physician. Can Respir J, 23;2018: 9473051. doi: 10.1155/2018/9473051.
- 53. Wilson SR, Strub P, Buist AS et al. (2010). Shared treatment decision making improves adherence and outcomes in poorly controlled asthma," American Journal of Respiratory and Critical Care Medicine, 181(6): 566-577.
- 54. Gilbert I, Wada K, Burudpakdee C, Ghai C, Tan L. (2020). The Impact of a Forced Non-Medical Switch of Inhaled Respiratory Medication Among Patients with Asthma or Chronic Obstructive Pulmonary Disease: A Patient Survey on Experience with Switch, Therapy Satisfaction, and Disease Control. Patient Prefer Adherence, 20(14):1463-1475.

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