



Letter

Metered-dose inhaler technique per the Global Initiative for Asthma and Expert Panel Report 3

Why do pharmaceutical companies have one critical difference?

Among 40 million Americans with asthma or chronic obstructive pulmonary disease (COPD),^{1,2} most will use metered-dose inhalers (MDIs) at some point in their treatment. Incorrect use of MDIs by patients and health care professionals is very well documented, and national and international guidelines stress the need to teach patients repetitively.^{3–8}

National and international asthma guidelines make recommendations regarding the correct steps to using MDIs.^{3,4} The impetus for this communication is a discrepancy between evidence-based guidelines and drug company patient instructions for one key step. After shaking well and exhaling, the correct use indicated by the guidelines is as follows: “As you start breathing in slowly through your mouth, press down on the inhaler one time. Keep breathing in slowly, as deeply as you can”³ and “...at the start of inspiration, which should be slow and deep, press canister down and continue to inhale deeply.”⁴ However, for most MDIs marketed in the United States (see manufacturers’ instructions for each MDI), the instructions for this step are different as follows: “While breathing in deeply and slowly through your mouth, press down...” or “Take a deep breath in slowly through your mouth. While doing this press down firmly...”.

Although this deviation from the guidelines may seem trivial to the casual observer, for clinicians who teach patients in clinics and other ambulatory settings, as well as at the bedside, this difference is not trivial in the least. We have observed the following problem for decades: if patients are instructed to begin inhaling slowly and deeply and then press down on the MDI canister, many patients continue inhaling to total lung capacity (TLC) before they activate the MDI. Other patients inhale to near TLC and can inhale perhaps for another second. Melani et al⁷ found that 5% of patients activated the MDI after the end of inhalation and 18% during the second half of inhalation. Giraud and Roche⁸ reported that 18% of patients activated the MDI at the end of inspiration. Both these studies reported reduced disease control associated with poor inhalation technique.^{7,8} If the results of these 2 key studies are close to consistent with the US population of patients with asthma and COPD, then roughly 2 million to 7.2 million patients will inhale to TLC before device activation. Worldwide, this number is obviously much higher.

Regarding inhalation during the second half of the maneuver (vs earlier during inspiration), we acknowledge that pulmonary deposition is increased with hydrofluoroalkane (HFA)–MDI, despite poor hand-lung coordination. Leach et al⁹ reported that with HFA-beclomethasone press and breathe MDI, pulmonary deposition was 50% in patients who actuated the MDI late into

inspiration (1.5 seconds into a 3-second inspiration). Patients who had a coordinated technique had 59% lung deposition, and patients who pressed down on the MDI canister first and then inhaled had 37% pulmonary deposition. Thus, with HFA-MDI use, the percentage of lung deposition is much higher than with the formerly used chlorofluorocarbon-MDI for beclomethasone (<10%), including actuating the MDI before inhaling. The study by Leach et al⁹ was in a small population of patients with asthma (n = 7). Newman et al¹⁰ assessed the pulmonary deposition of ciclesonide via HFA-MDI in 12 adults with asthma. Patients inhaled slowly and deeply, and the MDI was actuated during inhalation by an investigator. Pulmonary deposition was 52%, consistent with the study by Leach et al.⁹ Further studies are needed in larger populations of patients with asthma and COPD to determine differences in inhalation technique with HFA inhalers regarding outcomes, efficacy and untoward effects.

We believe that it is easier for patients to correctly use the MDI by teaching them per the Expert Panel Report 3 (EPR3) and Global Initiative for Asthma (GINA) guidelines to press down on the MDI canister at the *start* of a slow, deep inhalation. We are unaware of any evidence that following EPR3 and GINA instructions are detrimental to patient response to medications inhaled via MDI. This approach may be of particular help for patients who have moderate to severe COPD. Airflow limitation and low lung volumes make it difficult for these patients to inhale deeply for several seconds. For patients with asthma or mild COPD who learn the skill to press down on the MDI canister in the middle of an inhalation lasting several seconds, that technique is supported by the available data. However, many patients will find it very difficult to master such a skill.

Although many patients will likely not read the manufacturers’ printed instructions for MDI use, for those who read them, we are concerned that they will not press down on the canister until reaching TLC. Furthermore, some patients will watch the manufacturers’ video demonstrations, which we hope will specify activating the MDI well before reaching TLC. One excellent website (www.nationaljewish.org/healthinfo/multimedia/asthma-inhalers) has videos for each inhalation device, including MDIs with inhalation techniques consistent with the guidelines. We applaud pharmaceutical manufacturers for developing inhaled medications for treatment of asthma and COPD, and we appreciate their efforts in patient education. However, at this point, we hope patients and health care professionals will follow EPR3 and GINA instructions regarding correct MDI technique. We suggest that the patient instructions in the product insert be unambiguously aligned with the guidelines.^{3,4} Regardless of the printed or video instructions, health care professionals should be observing their patients’ inhaler

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technique (MDI or other inhalers) in office practices, clinics, pharmacies, and hospitals.^{3,4} By helping to ensure correct use of these devices, everyone benefits, especially patients and their families.

Timothy H. Self, PharmD*

Lauren M. Hoth, BS*

J. Michael Bolin, PharmD*

Charles Stewart, CPNP†

*Department of Clinical Pharmacy

University of Tennessee Health Science Center

Memphis, Tennessee

†UT Le Bonheur Pediatric Asthma and Allergy Clinic

LeBonheur Children's Hospital

Memphis, Tennessee

tself@uthsc.edu

References

- [1] Centers for Disease Control and Prevention. Asthma. <http://www.cdc.gov/nchs/fastats/asthma.htm>. Accessed February 22, 2016.
- [2] Centers for Disease Control and Prevention. Chronic Obstructive Pulmonary Disease (COPD). <http://www.cdc.gov/copd/index.html>. Accessed February 22, 2016.
- [3] National Institutes of Health. *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma*. Bethesda, MD: National Heart, Lung, and Blood Institute; 2007. NIH publication 07–4051.
- [4] Global Initiative for Asthma (Updated 2016). Global strategy for asthma management and prevention. www.ginaasthma.org/2016-online-appendix (Previous URL: www.ginaasthma.org/inhalers/12). Accessed February 23, 2016.
- [5] Global Initiative for Chronic Obstructive Lung Disease. Updated 2016. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. www.goldcopd.org. Accessed February 19, 2016.
- [6] Self TH, Arnold LB, Czosnowski LM, Swanson J, Swanson H. Inadequate skill of healthcare professionals in using asthma inhalation devices. *J Asthma*. 2007; 44:593–598.
- [7] Melani AS, Bonavia M, Cilenti V, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med*. 2011; 105:930–938.
- [8] Giraud V, Roche N. Misuse of corticosteroid metered-dose inhaler is associated with decreased asthma stability. *Eur Respir J*. 2002;19:246–252.
- [9] Leach CL, Davidson PJ, Hasselquist BE, et al. Influence of particle size and patient dosing technique on lung deposition of HFA-beclomethasone from a metered dose inhaler. *J Aerosol Med*. 2005;18:379–385.
- [10] Newman S, Salmon A, Nave R, Drollmann A. High lung deposition of 99mTc-labeled ciclesonide administered via HFA-MDI to patients with asthma. *Respir Med*. 2006;100:375–384.