

Chronic Obstructive Pulmonary Diseases: Journal of the COPD Foundation



Editorial

Editorial—How Important Are Inhaler Technique Errors?

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Abbreviations: chronic obstructive pulmonary disease, **COPD**; metered-dose inhalers, **MDIs**; dry powdered inhalers, **DPIs**

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Introduction

Treatment of respiratory diseases, including chronic obstructive pulmonary disease (COPD) and asthma, depends primarily on inhaled medications. Because of the complexity of inhaled medication delivery, patients' mastery of inhalers presents a major challenge to these treatments. Further, the skill requirements vary across medication devices, including metered-dose inhalers (MDIs), breath-activated MDIs, soft-mist inhalers, dry-powder inhalers (DPIs), and nebulizers, adding further potential confusion for both prescribers and patients. A large body of literature has documented the frequency of patient inhaler errors and the correlation of these with worsening outcomes¹ accounting for nearly \$900 million in direct and indirect costs.² The manuscript by [Cho-Reyes et al in this issue of the Journal of the COPD Foundation](#) adds to this literature, combining a systematic review and meta-analysis. Ten previously published reports including 1360 patients revealed that

86.7% of patients made at least 1 inhalation technique error, and that 76.8% of patients made multiple errors. These results confirm a previous report of 54 studies showing that 86.8% of patients using an MDI and 60.9% of patients using a DPI made at least 1 error.³

Gaps in Our Understanding

Still, gaps remain in our understanding of the relationships between inhaler errors and disease control. (1) Across studies, a large collection of different inhaler errors have been observed and measured. Cho-Reyes and colleagues list 12 errors found in the 10 reports they reviewed. While documenting every possible error may suggest scientific rigor, such splitting of hairs may in fact artificially increase the apparent error rate. Each error is not likely to have equal importance in the prevention of effective delivery of the medication to the lungs. Correct timing, speed, and duration of inhalation and breath holding clearly impact delivery, but other errors including “removing the cap,” “holding the inhaler upright,” and “exhaling and breathing normally” are arguably not as crucial. Yet if these less-than-crucial errors constitute the majority of errors reported in individual studies, the magnitude of the inhaler-error problem may be exaggerated.

(2) A review of “critical inhaler errors” narrowed the focus to studies that reduced error-counting to apparent key skills necessary to drug delivery.⁴ Although 299 critical-error definitions were identified, the converging definition was summarized as “action affecting the lung deposition of inhaled drug, resulting in little or no medicine being inhaled or reaching

the lungs.”⁴ A greater number of critical errors was associated with poorer disease control. However, the collective evidence does not separate whether critical and non-critical errors are differentially associated with outcomes, or which “critical errors” are more important.

(3) Without a clearer understanding of which errors have greatest consequence, we are prevented from developing more effective educational strategies. Most inhaler-error studies and reviews embrace the conclusion that patients need regular inhaler training. While it is impossible to argue with that recommendation and despite its frequent repetition, we are apparently making no progress in changing patient behavior. A meta-analysis of 24 studies published in 2001 showed that 77% of patients with asthma or COPD made at least 1 inhaler error.⁵ In other words, our patients today are showing no greater inhaler mastery than they did 18 years ago. It is therefore time to consider whether the approach to inhaler education is failing or whether it is even possible to teach most COPD patients to use their inhaler correctly. This being the case, it becomes significantly more important to change educational strategies, develop inhalers that are easier to use, or both. Patients express preference for inhalers with directions that are easier to follow.⁶ Pharmaceutical companies understand this problem and have been evolving toward more user-friendly inhalers. Additionally, given the very different performance requirement of MDIs and DPIs, prescribing multiple medications requiring both types of devices almost certainly invites greater confusion and more errors; development of a single inhaler platform and avoiding mixing of different inhaler delivery types may help to further decrease errors.⁷

(4) The correlation between frequency of inhaler errors and disease outcomes does not establish a causal relationship. The operative assumption seems to be that the more errors made by a patient, the more deposition of the medication in the lungs is compromised, resulting in poor disease control. This assumption missed another possible explanation. Patients who seldom use their medication are logically less likely show inhaler mastery. As adherence decreases, inhaler technique error is more likely to occur.⁸ Half of medications prescribed for COPD are abandoned in the first year,⁹ leading to increased hospitalizations, mortality, and cost.¹⁰ It would follow that assessing inhaler technique in patients who have

not taken any medication in recent months would likely reveal a great many inhaler errors. In this case, the conclusion that increasing inhaler errors leads to poor disease control may obscure the actual reason for increased symptoms, i.e., the patient is simply not using the medication. Sorting out these causal relationships requires new study designs. Studies of inhaler errors should control for medication adherence before concluding that inhaler errors are directly related to disease control.

Conclusion

Regardless of how inhaler errors compromise deposition, patient education remains important, but approaches to inhaler medication may require re-evaluation. Emphasis on select, critical elements of inhaler use affecting delivery to the lungs deserves consideration. Employment of newer, easier-to-use inhalers allows for greater focus on these critical elements. In-office education can exploit newer educational tools being employed in many practices, including use of smart phone applications (apps) and brief training videos that can be delivered periodically to patients to help remind them of the importance of correct use of daily medications. This approach serves the dual purposes of encouraging greater adherence and refreshing understanding of correct inhaler use.

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