

Errors in Turbuhaler Technique in a Spanish Population of Asthmatic Patients

Appropriate use of inhalers requires a number of steps to be performed correctly to ensure adequate medication delivery and to minimize side effects. Currently, with the advancements in asthma treatment, there is a wide variety of new inhaler devices, which are intended to improve drug administration. However, a recent literature review has shown that misuse of inhaler devices is frequent in practice,¹ leading to poor asthma control.²⁻⁴ Basheti et al⁵ have recently described the most frequent inhaler technique errors for patients treated with Turbuhaler and Diskus devices in Jordan and Australia.

Studies aimed at identifying frequent errors regarding inhaler technique are essential, since health strategies can be designed in order to educate asthmatic patients, reinforcing the most common problems related to each inhaler device. Pharmacists are ideally positioned to teach inhaler technique, as they are highly accessible health professionals who see asthmatic patients regularly. In Spain, asthma guidelines recommend that pharmacists should form part of a team approach to patient education about the use of inhalers.⁶

According to national and international asthma guideline recommendations, the AFasma project integrated 51 community pharmacies in the Spanish provinces of Madrid and Málaga into multidisciplinary teams supporting patients with asthma. As part of this study aiming to investigate the effect of an educational intervention on the control of asthma, we collected information about errors in the Turbuhaler technique performed by 362 asthmatic patients treated with budesonide/formoterol (Symbicort Turbuhaler, AstraZeneca). To our knowledge, this is the first approach in Spain to the most frequent inhaler errors for Turbuhaler users. Inhaler technique was assessed according to guidelines in the Spanish Guide for Asthma Management,⁶ using a 10 step Turbuhaler checklist. Interestingly, this checklist integrated additional steps (Table 1: steps 8, 9, and 10) not considered by other authors, which are also included in the

Table 1. Proportion of Patients With Incorrect Performance of Steps for Turbuhaler Inhaler Technique (*n* = 367)

Step No.	Description	Incorrectly Done	
		<i>n</i>	%
1	Unscrew and lift off the cover.	10	2.8
2	Hold the inhaler upright.	85	23.5
3	Twist the red grip fully to the right as far as it will go and twist it back again to the left. A "click" will be heard.	44	12.2
4	Breathe out gently taking care not to breathe into the Turbuhaler.	170	47.0
5	Place mouthpiece between teeth and lips.	56	15.5
6	Inhale forcefully and deeply.	78	21.5
7	Remove inhaler from mouth, hold breath for 8 seconds, and exhale away from the mouthpiece.	154	42.5
8	If further doses are needed, wait 30 seconds and repeat steps from 2 to 7*	65	51.6
9	Replace white cap.	24	6.6
10	Rinse mouth with water. Do not swallow.	155	42.8

* This step was assessed in those patients prescribed with 2 consecutive inhalations (126 patients)

package leaflet of the product as important steps that should be performed for proper inhaler use. A descriptive analysis of the errors observed is shown in Table 1.

In our study, 21.3% of patients performed the 10 Turbuhaler steps correctly, 47% of the patients failed to "breathe out gently, not breathing into the Turbuhaler" (step 4), and 42.5% failed to "remove inhaler from mouth, hold breath for 8 seconds, and exhale away from the mouthpiece" (step 7). Despite using a different inhaler technique assessment tool, these results are similar to those described by Basheti et al,⁵ who found that a high proportion of Turbuhaler users failed to exhale to residual volume, to exhale away from the mouthpiece, and to hold the breath for 5 seconds.

A relevant finding of our study is that neither the 51.6% of patients prescribed a double dose performed step 8 (if further doses are needed, wait 30 seconds and repeat steps from 2 to 7), nor did 42.8% perform step 10 (rinse mouth with water, do not swallow). As previously commented, these steps were not assessed by other authors. In our opinion, they should be considered when giving a complete inhaler tech-

nique education. First, patients treated with inhaled corticosteroids risk having local side effects when not rinsing the mouth with water. Second, waiting 30 seconds between consecutive doses (step 8), which was performed by more than one third of our cohort (34.8%), allows patients to administer a deeper second inhalation, which could improve the effectiveness of the asthma medication.

In conclusion, we have identified an opportunity to reinforce and complete educational interventions for asthmatic patients. Moreover, given the high proportion of patients who failed to perform steps 8 and 10, and the clinical relevance related to effectiveness and safety of asthma treatment, they should be integrated in every inhaler technique assessment tool and taken into account when designing educational programs to improve asthma control.

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The authors respond:

We thank García-Cárdenas et al for their comments on our paper, and for providing data that show high rates of incorrect inhaler technique among a large group of patients in Spain. These findings add to our data about incorrect inhaler technique by patients and pharmacists in Jordan and Australia.¹

Heterogeneity among inhaler checklists is a problem when comparing results of studies conducted in different populations. In our study we used 9 step checklists for Turbuhaler and Diskus inhaler technique assessment. García-Cárdenas et al recommend

checking an additional 3 steps when assessing Turbuhaler technique:

- If further doses are needed, wait 30 seconds and repeat steps from 2 to 7.
- Replace the device cap.
- Rinse the mouth with water and do not swallow

Although not reported in our paper, these steps were asked or observed for the patients in the Jordanian arm of our study ($n = 40$). Turbuhaler users who were prescribed 2 doses (25%) were asked what they knew about using 2 consecutive doses; the results were similar to those from García-Cárdenas et al, with only 20% ($n = 10$) saying that they waited between the doses. After the technique assessment, patients using inhaled corticosteroids were asked, "What do you do following your dose administration?" and only 30% ($n = 12$) reported that they rinsed their mouth. However, all patients were observed to replace the cap on their Turbuhaler after they finished their inhaler technique assessment.

Although these steps may be of importance in clinical practice, we do not believe that they should necessarily all be included in the actual assessment checklist. One perspective is that a device specific assessment checklist should reflect the principle established by Appel et al,² that the better the inhaler technique (the more correct steps performed) by the patient, the higher the clinical response expected.^{3,4} In addition, individual steps included in a standardized checklist need to be relevant to all patients using the device, so that the maximum potential score is the same on each occasion and scores can be compared between patients, visits, and studies.

The instruction to wait for 30 seconds between doses does not appear on the manufacturer's leaflets in countries such as Jordan, Canada, Australia, and the United States, and there does not appear to be any published evidence to support a 30 second delay. This step would also be relevant

only to patients prescribed 2 or more inhalations from their Turbuhaler, limiting the extent to which inhaler technique scores could be compared.

We agree with García-Cárdenas et al that replacing the Turbuhaler cap after use is important to avoid absorption of moisture by the drug, which would impact drug delivery.⁵ This step is included in the manufacturer's instructions, but in fewer than half of published Turbuhaler checklists. This may be an oversight, or because the potential impact of drug aggregation on clinical effectiveness would be gradual, and would depend on factors such as ambient humidity.

The third extra step is rinsing the mouth after use of the Turbuhaler. We agree that this is important in clinical practice for patients using inhaled corticosteroids, to reduce the risk of side effects. However, it should not be an obligatory component of a Turbuhaler technique checklist, because Turbuhalers are also used for delivery of short- or long-acting β_2 agonists, for which mouth rinsing is not required.

Nevertheless, we agree with García-Cárdenas et al that these steps should be considered while delivering a complete Turbuhaler technique education. Patients for whom a second dose or mouth rinsing is relevant may need to be asked about these steps during their visits, as they may not necessarily think to perform these steps when asked, outside their home setting, to demonstrate how they use their inhaler.

The divergence between inhaler technique checklists used for the same device in different studies makes direct comparison of results difficult. This may introduce inaccuracy in the way the results are compared, and cause confusion for patients and health professionals. The issue of inhaler technique checklist heterogeneity is important and has been addressed since more than a decade ago.⁶ The present discussion supports the fact that further work needs to be done to standardize inhaler technique assessment checklists.

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