



ASSESSMENT AND BARRIERS REGARDING INHALER TECHNIQUE AMONG ADMITTED PATIENTS OF OBSTRUCTIVE LUNG DISORDERS OF PULMONOLOGY WARD

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ABSTRACT

Introduction: Occupational lung diseases, COPD, and other chronic respiratory ailments including asthma are among the world's major causes of morbidity and mortality. With little information about inhaler strategies, Pakistan has a large prevalence of COPD and asthma. For efficient disease treatment, medications must be administered using pressurized metered dosage inhalers, and improper breathing technique can lead to disappointing pharmacological effects and increased consequences. As a result, the purpose of this study was to analyze the assessment and barriers regarding use of inhaler technique among admitted patients of obstructive lung disorders of pulmonology ward (a cross sectional study).

Objectives: To analyze the assessment and barriers regarding use of inhaler technique among admitted patients of obstructive lung disorders of pulmonology ward.

Methods: A mixed-methods study with an embedded design was conducted, comprising a cross-sectional quantitative survey supplemented by qualitative in-depth interviews (IDIs). The study was carried out in the Pulmonology wards of Lady Reading Hospital (LRH), Peshawar, over a period of six months in year 2023. The study population included adult patients diagnosed with obstructive lung diseases who were using pressurized metered-dose inhalers (pMDIs). For the qualitative component, both patients and physicians involved in inhaler use and management were included. For Quantitative component, A total of 244 patients were enrolled for the cross-sectional survey and Four in-depth interviews were conducted, including two physicians and two patients, to explore perceptions and experiences in greater depth. Sampling Technique A non-probability convenient sampling technique was used for both quantitative and qualitative components. Data were collected using a semi-structured questionnaire for the quantitative survey and an in-depth interview guide for the qualitative component. Interviews were conducted to gain deeper insights into barriers, practices, and perceptions related to inhaler use. Quantitative data were analyzed descriptively, while qualitative data from IDIs were analyzed using thematic analysis, following systematic coding and theme development. Ethical

Considerations were strictly observed. Confidentiality and anonymity of both patients and physicians were maintained throughout the study, and informed consent was obtained prior to participation.

Results: This study investigated inhaler use among 243 patients with obstructive respiratory disorders. The participant pool had a balanced gender distribution and a mean age of 49.3 years. The primary diagnoses were asthma (57.8%, N=141) and COPD (32.8%, N=80). Family History showed 53% (N=129) reported a family history of respiratory problems. Smoking Status were 22.1% (N=54) were smokers where as Education Level was 33.4% (N=83) were illiterate, 49.6% (N=121) had an undergraduate degree, and 16.4% (N=40) had a graduate degree.

Regarding inhaler technique and training ;78.7% (N=192) of patients received instruction on inhaler technique, mostly from nurses (61.5%, N=150) .34% (N=83) of patients utilized a spacer with their inhaler. Only two steps—removing the cap and pressing down on the canister—were correctly performed by all participants

Important results showed that poor inhaler technique was significantly correlated with older persons (51 years of age and older) ,Improper inhaler technique was more common in patients, and medication adherence was strongly correlated with technique. Counseling on inhaler technique demonstrated a strong correlation with proper use, underscoring the need of such treatments. According to physicians approximately 20% to 60% of patients attending Pulmonology OPD in LRH did so in practice.

Conclusions: Inhaler technique counselling is a highly reliable indicator of proper technique. The study emphasizes the necessity for healthcare professionals to take into account a variety of variables like age, education status, disease duration, medication adherence, proper counselling, and periodic assessment of patient when recommending inhaler devices to patients in order to facilitate obstructive lung disease patients to improve disease outcome.

Keywords: Inhaler Technique, Obstructive Lung Disorders, Pulmonology

INTRODUCTION

The mainstay in managing patients with chronic obstructive lung diseases like Asthma or COPD is the decision regarding the correct selection and use of inhalers. A single device cannot be suitable for all these patients. There has been wide use of these inhalation devices for a long period irrespective of the fact whether patients can use them properly or not and whether it is having any significant impact on their outcome or otherwise. It is a well-known fact that diseases like Asthma and COPD have a worldwide prevalence and Metered dose inhalers (MDI) are the most common choice of treatment. Almost 33% patients from all over the world have Asthma and at the same time, 10 % of the adult population more than 40 years of age have COPD. There are 4 types of inhalation devices available in the market. Metered dose inhalers (MDIs), Dry powder inhalers ,Breathe actuated inhalers.Nebulizers . The selection of a device depends on several factors patient age, their preference for the device, severity of their disease as well as cost and availability of the device. Out of all possible available devices, Metered dose inhalers have become the most selected devices with clinicians because of their cost, ease of use, multiple doses and easy availability. 3 Metered dose inhalers were introduced in 1950 as portable devices for bronchodilation. Since these devices have a local effect, they have multiple advantages like their rapidity of action, for being locally deposited in the lung. In addition, they have very few systemic effects. Among many other factors, the one which seems to be contributing the most towards poor control of disease and increased outdoor as well as emergency visits is poor inhaler technique. The NICE and the Global Initiative for Chronic Obstructive Lung Disease as well as the UK Inhaler Group (UKIG) have recommended that when a clinician is putting patient on any new type of inhalation device, they should teach them properly the whole technique of using the new device. It has also been recommended that management does not end with the teaching of the technique of the new device but at the same time to check this technique periodically during regular follow-up visits of the patients. It has been observed that out of all patients affected with this disease, almost 25% were never told the technique of using the inhaler. Poor inhaler technique by the patient has led to several problems which include poor control of disease, increased side effects of the

drug, and increased visits to outpatient department and increased emergency visits. All of these factors ultimately lead to increased health care costs putting a lot of burden on the country's economy. As a matter of fact, despite all these factors and poor outcomes of disease, the need to educate patients about inhalation techniques is still being underestimated by clinicians. On account of multiple factors like the old age of the patient, poor comprehension, poor educational status and poor explanation by the clinicians, about 94% of patients do not know their inhaler technique properly and may need multiple and repeated sessions for this purpose. Correct inhaler technique requires certain steps to be performed in proper sequence. Barriers observed were Failure to exhale before inhaler use, Failure to perform a strong inspiratory effort during inhalation, Failure to hold breath at the end of inspiration after using inhaler. The aim of this study was to evaluate assessment and barriers identification regarding inhaler technique among admitted patients of pulmonology ward of tertiary care hospital, Peshawar.¹

MATERIAL AND METHODOLOGY

A mixed-methods research design. The quantitative component of the study used a cross-sectional survey design, while the qualitative component used in-depth interviews study setting was Pulmonology ward of Lady Reading Hospital, Peshawar study duration was Six Months and sample size was 244 cases. Four IDIs, two from physicians (working as pulmonologist at pulmonology OPD) and two from patients of obstructive lung disease (attending pulmonology OPD). Inclusion criteria was adult patients aged 18 years and above with obstructive lung diseases who are using pressurized meter dose inhalers for disease control whereas Exclusion Criteria was Patient having disease duration of less than six months and Patient having neurological or psychiatric issues.

An informed consent was taken from the patients, and a semi-structured questionnaire was used to collect the data for the survey component. The pilot study was conducted on a 10% sample size to test the feasibility of the questionnaire (pilot study data was not included in data analysis). The study used a non-probability convenient sampling strategy to select participants who meet the inclusion criteria of being over 18 years of age and presenting to the Pulmonology OPD with a history of inhaler use. The data collection process was monitored regularly on the bases of sample election i-e inclusion and exclusion criteria, to ensure data quality, and any missing or incomplete data was followed up with the participants via telephone or during next visit. A self-administered questionnaire was used to collect data on patient biography, knowledge of inhaler technique and previous training on inhaler use. The questionnaire was developed based on a review of the literature, pilot study and validated tools. For the quantitative component of a study IDIs were conducted with two physicians and two patients using a topic guide to explore the facilitators and barriers to proper inhaler technique. The physicians were selected based on their experience and expertise in treating respiratory diseases, while the patients were selected based on their willingness to participate in the study and their experience with inhaler use. The IDIs was conducted using a semi-structured interview guide developed based on a review of the literature and expert opinions. Data analysis for the quantitative component involved descriptive statistics and inferential statistics. In descriptive statistics mean, and standard deviation, frequencies and percentages were find out. In Inferential statistics i-e chi-square and logistic regression tests, were used to explore relationships between variables. The qualitative data was analyzed using thematic analysis, which involves identifying and categorizing patterns and themes within the data. Data from both components were integrated to provide a comprehensive understanding of the facilitators and barriers to inhaler technique among patients presenting to the Pulmonology OPD. For the qualitative component of the study, the IDIs were recorded and transcribed manually, and the data was analyzed using content analysis to identify themes and patterns in the data. The analysis of the data was conducted using SPSS for the survey data. IDIs data was analyzed manually. The confidentiality of patient information were maintained throughout the data collection and analysis process.

RESULTS

Table 1 showed Continuous Variable distribution table:

Variable	Minimum	Maximum	Mean	Std. Deviation
Age	21.0	66.0	41.242	12.8429
Duration of Illness (in years)	2.0	11.0	6.549	2.4397
Duration of Inhaler Use (in years)	2.0	9.0	5.557	1.9816

Table 2 showed Frequencies and Percentages of different categorical variables:

S.No	Variable	Frequency	Percentage (%)
1	Gender		
	Female	122	50%
	Male	122	50%
2	Illness		
	Asthma	141	57.8%
	COPD	80	32.8%
	Others	23	9.4%
3	Family History		
	No	115	47%
	Yes	129	53%
4	Smoker		
	No	190	77.9%
	Yes	54	22.1%
5	Education		
	Illiterate	83	34.0%
	Undergraduate	121	49.6%
	Graduate	40	16.4%
6	Disease control with inhaler		
	No	113	46.3%
	Yes	131	53.7%
7	Counselling Regarding Inhaler Technique		
	No	52	21.3%
	Yes	192	78.7%
8	Counselled By		
	Non	52	21.3%
	Doctor	12	4.9%
	Nurse	150	61.5%
	Technician	30	12.3%
9	Use of Spacer		
	No	161	66%
	Yes	83	34%
10	Frequency of inhaler use per day		
	Once	21	8.6%
	Twice	157	64.3%
	Thrice	66	27.05%
11	Number of Inhaler devices		
	One	131	53.7%
	Two	99	40.6%
	Three	14	5.7%

Table 3) Steps of inhaler technique, and percentage of study population practicing it correctly.

S.No	Steps of inhaler technique	Percentage of study population practicing
1	Removal of Cap	100% (N=244)
2	Dose Counter Check	78.2% (N=191)
3	Shake Vigorously	56% (N=137)
4	Breath out slowly	23.8% (N=58)
5	Seal the mouth	82.8% (N=202)
6	Apply pressure on canister	100% (N=244)
7	Take in slow breath	42.6% (N=104)
8	Hold breath for 5sec	29.5% (N=72)
9	Take inhaler out while holding breath	11.1% (N=27)
10	Breath out slowly (after inhaling)	30.7% (N=75)
11	Repeat instruction properly	59% (N=144)
12	Reposition the cap	60% (N=146)

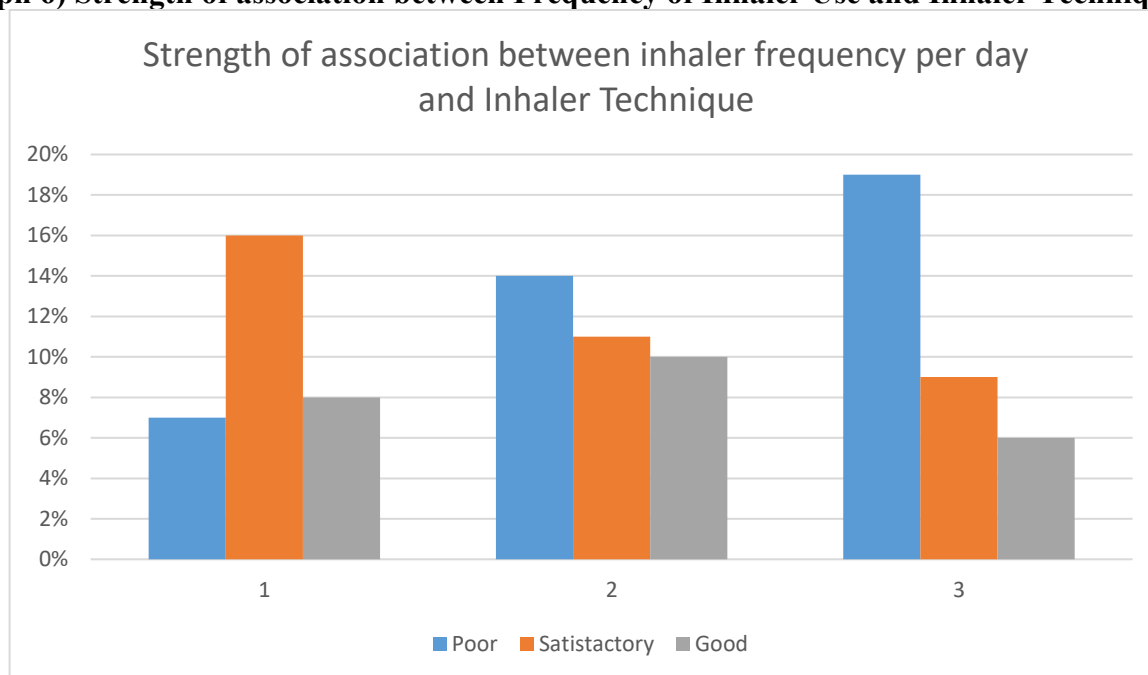
Table 4) Associations b/w different variables with correct inhaler technique

S.No	Associations b/w different variables with correct Inhaler Technique	Analysis
1	Age	The percentage of people who report improper inhaler technique rises with age group
2	Education level	Patients with higher levels of education are less likely to report using the inhaler incorrectly
3	Type of illness	The majority of asthmatic patients use improper inhaler technique.
4	Medication adherence	Patients who have poor medication adherence having a higher likelihood of using the wrong technique

Table 5: Strength of association between major variables

S.No	Strength of associations	P value	Analysis
1	Counselling regarding inhaler technique and correct inhaler technique	P< 0.001	Those who received counselling have higher chances of using the proper inhaler method than those who did not.
2	Education level and inhaler technique	P = 0.01	The analysis indicates that having a higher education level is a significant predictor of using an inhaler correctly
3	Duration of illness and inhaler technique	P = 0.323	As the length of the illness increases, the probability of having poor inhaler technique also increases
4	Frequency of inhaler use and inhaler technique	P = 0.367	Patients who often use their inhalers may have poor inhaler technique, whereas those who occasionally use their inhalers may have excellent or good inhaler technique.

Graph 6) Strength of association between Frequency of Inhaler Use and Inhaler Technique:



Qualitative analysis: In-depth interviews were conducted with two physicians and two patients. The key conclusions drawn from physicians' interviews are summarized below:

1. Technicians regularly assess patients' adherence to correct inhaler technique; however, the frequency of these assessments varies.
2. The language used for counseling and evaluating adherence is tailored according to the patient's preference and understanding.
3. Standardized checklists and protocols, including the amended British Thoracic Society (BTS) guidelines, are routinely followed.
4. Variability in adherence rates was reported; one physician estimated adherence at approximately 20%, while another estimated it to be between 40% and 60%.
5. Additional supportive measures include repeated instruction, demonstration of inhaler technique, provision of spacers, switching inhaler devices when necessary, and the use of educational videos.²

DISCUSSION

The aim of this study was to perform a comprehensive analysis of inhaler technique in individuals with obstructive lung disorders. This meant evaluating the level of inhaler proficiency, determining the variables linked to improper technique, and exploring the enablers and impediments that affect inhaler proficiency.

The aim of this study was found out the barriers that lack of proper counseling, old age, illiteracy, prolong disease duration, poor adherence to inhaled medications and frequent use of inhaler are some key indicators which leads to incorrect use of inhaler devices.³ On the bases of indepth interview it was found that overflow of patient in OPD, lake of man power, lake of dummy inhaler devices for demonstration and lake of technological advancement like video demonstration of correct inhaler technique on LCD screens in OPD waiting areas are some major barriers leading to incorrect inhaler techniques and poor disease control. This study also elaborate that the core facilitators of proper inhaler technique is proper counseling of the patients by experts.⁴

We will conduct a thorough examination of the major findings and place them in the larger framework of respiratory care in this discussion part. We will also look at how these findings affect healthcare policy and patient management. It is also important to note that 53.7% (N=131) of the sample group stated that using inhalers to control their disease was effective. This suggests that a significant

percentage of patients are effectively controlling their respiratory conditions, which emphasizes the critical role inhaler medication plays in attaining illness control. The most common respiratory ailment was found to be asthma (57.8%), N=141, followed by COPD (32.8%) N=80, and other respiratory diseases (9.4%) N=23. These data demonstrate the necessity for individualized approaches to inhaler teaching depending on the particular respiratory condition and provide insightful information about the distribution of respiratory illnesses among the research population.⁵

It is encouraging to note that a significant proportion of patients (78.7%) N=192 were instructed on inhaler technique, with nurses accounting for the majority of these sessions (61.5%) N=150. This emphasizes how important it is for nurses to teach patients the subtleties of using inhalers correctly. It is imperative to acknowledge that a considerable proportion of the patient cohort may not have had sufficient guidance, underscoring the necessity of implementing standardized, uniform, and all-encompassing inhaler teaching initiatives at healthcare establishments. This can play a critical role in closing the knowledge gap between those who receive instruction and those who do not, which will ultimately improve patient quality of life and illness treatment.^{6,7}

According to the study, roughly 34% (N=83) of patients said they used a spacer with their inhaler and 66% (N=161) said they didn't. By ensuring that medication enters the lungs more effectively, spacers are essential in improving the efficacy of inhaler therapy. The comparatively poor patient uptake of spacers highlights an important point: greater patient education is required regarding the benefits of using a spacer with inhalers. It is the duty of healthcare providers to inform patients about this issue, emphasizing the observable advantages of using spacers and clearing up any misunderstandings or worries that would discourage patients from doing so.⁸

Several interesting results were obtained from a detailed analysis of particular steps in the inhaler technique. Patients showed a high degree of adherence to some basic procedures, such as unscrewing the inhaler cap and pressing the canister, but there were significant differences in how well they adhered to other processes, like checking the dose counter (78.2%) (N=191) and shaking the inhaler (44%) (N=107). These results highlight the areas in which patients could gain from more focused instruction. To guarantee that patients regularly receive the recommended amount of their medication, it is important to highlight the significance of these particular measures.⁹

The study revealed an interesting trend: older people and people with less education were more likely to use the wrong inhaler technique. These results suggest that customized educational initiatives and interventions are needed for various demographic groups. To guarantee proper inhaler technique, older patients may need specific teaching that takes into account age-related problems, such as cognitive or physical limitations. In order to close the educational disparities, patients with lower levels of education should also be given access to resources written in plain language and extra assistance. It's interesting to note that asthmatics seemed to be more likely to use the wrong inhaler technique. This discovery may be explained by the fact that asthma inhalers are inherently complex and frequently require multiple steps to operate. In order to overcome this difficulty, asthmatic patients ought to receive tailored instruction and assistance from medical specialists, with the goal of facilitating the inhaler procedure and promoting compliance. Furthermore, an important result is the association between poor drug adherence and improper inhaler technique. This relationship highlights the necessity for medical professionals to treat both aspects at the same time when assisting patients, since bettering inhaler technique may have a beneficial knock-on effect on medication adherence, resulting in better disease management and enhanced health outcomes. A clear conclusion from the study was that having good inhaler technique was significantly predicted by obtaining inhaler technique counselling. This demonstrates how patient counselling and education can significantly improve illness outcomes and control. Patient counselling and education should be given top priority by healthcare professionals as essential elements of comprehensive treatment. Creating organized counselling programs and supporting them with frequent follow-ups can help guarantee that patients have the information and abilities necessary for the best possible inhaler use.¹⁰

- a) According to this study, the percentage of people who report using an inhaler improperly rises with age group. This result is in line with earlier researches conducted in 1998 and 2013, which suggests that cognitive or physical deficits in older persons may make using an inhaler difficult.¹⁰
- b) Patients who have completed more schooling are less likely to report using the wrong inhaler technique. This result is in line with earlier study conducted in United States in 2011 which claim more education is linked to improved health literacy and self-management skills.¹⁰
- c) Asthmatic patients appear to use erroneous inhaler technique the most frequently. This result is in line with earlier research conducted in 2011, which suggests that asthmatics may struggle with inhaler technique because of the devices' intricacy and the requirement for multi-step coordination
- d) Incorrect inhaler technique is more prevalent among individuals with poor medication adherence, according to a cross-tabulation of these two variables. This findings is in line with earlier research conducted in 2008, which contends that inhaler technique and medicine adherence are strongly connected, with poor adherence potentially leading to improper technique and inadequate asthma control
- e) For instance, a Saudi Arabian research found that 74% of patients had poor inhaler technique, with the most typical mistakes being failure to exhale before inhaling and failure to shake the inhaler.⁵⁷ While according to our study, it was found that 41% of patient didn't fulfil the criteria of satisfactory inhaler technique, Most common mistakes perform by patients while using inhaler devices are breathing out slowly before using inhaler device, holding breath for 5 sec after inhaling medicine and taking inhaler out while holding breath. In both countries lack of manpower and illiteracy are the major factors.
- f) Approximately 50% of patients, according to another study done in the US, had poor inhaler technique, with older folks and people with limited health literacy being more at risk for mistake ^{5,8}. This finding is aligned with our study which shows that the practice of correct inhaler technique decrease with increase in age due to prolonged disease, and different health related issues including forgetfulness in old age.
- g) Furthermore, a Canadian study indicated that 60% of patients had poor inhaler technique, with the most typical mistakes being failure to employ a spacer and failure to exhale before inhalation.¹¹ These findings correlate positively with our study which shows that use of spacer have a positive association with disease control.
- h) According to the findings of the current study, the majority of patients (78.7%) got instruction on using an inhaler, largely from nurses (61.5%). This is in line with other studies, which emphasizes the critical function of nurses, in particular, in informing and advising patients on optimal inhaler technique ⁶⁰. The study also discovered that receiving inhaler technique counselling significantly predicts having the proper technique, and that individuals who receive counselling are more likely to have the proper technique than those who do not.¹¹

CONCLUSION

The study's conclusions show that when educating and supporting patients who are using inhaler devices, healthcare professionals need to take a variety of issues into account. The findings of the study have important repercussions for the advancement of inhaler technique and disease outcomes.

REFERENCES

1. Batool M, Dar SI, Ahmad R, Khan HS, Haider S, Fareed A. Assessment of Inhaler Use Techniques among the Patients of Chronic Obstructive Lung Diseases at a Government Hospital of Islamabad. *J Islamabad Med Dental Coll.* 2022; 12(3):186-192.
2. Iftikhar IH, Bhatia S, Riaz M, et al. Risk of Misdiagnosis, Health-Related Quality of Life, and BMI in Patients Who Self-Referred to Sleep Center for Evaluation of Sleep Apnea. *J Clin Sleep Med.* 2013;9(3):229-35. doi: 10.5664/jcsm.2474.

3. Iftikhar IH, Bhatia S, Riaz M, et al. Risk of Misdiagnosis, Health-Related Quality of Life, and BMI in Patients Who Self-Referred to Sleep Center for Evaluation of Sleep Apnea. *J Clin Sleep Med*. 2013;9(3):229-35. doi: 10.5664/jcsm.2474
4. Plaza V, Sanchis J. Medical personnel and patient skill in the use of metered dose inhalers: a multicentric study. *Respiration*. 1998;65(3):195-198.
5. DeWalt DA, Broucksou KA, Hawk V, et al. Developing and testing the health literacy universal precautions toolkit. *Nurs Outlook*. 2011;59(2):85-94.
6. Chrystyn H. The Diskus: a review of its position among dry powder inhaler devices. *Int J Clin Pract*. 2007;61(6):1022-1036.
7. Lavorini F, Magnan A, Dubus JC, et al. Effect of incorrect use of dry powder inhalers on management of patients with asthma and COPD. *Respir Med*. 2008;102(4):593-604.
8. Al-Jahdali H, Ahmed A, Al-Harbi A, Khan M, Baharoon S, Bin Salih S, Al-Moamary M. Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. *Allergy, Asthma & Clinical Immunology*. 2014;10(1):8.
9. Press VG, Arora VM, Shah LM, Lewis SL, Ivy K, Charbeneau J, Krishnan JA. Teaching the use of respiratory inhalers to hospitalized patients with asthma or COPD: a randomized trial. *Journal of General Internal Medicine*. 2016;31(4):377-384.
10. Plaza V, Peiró M, Torrejón M, Fletcher MJ, López-Viña A, Ignacio-García JM, López-Silvarrey V. A repeated short educational intervention improves asthma control and quality of life. *J Asthma*. 2016.
11. 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(6):930-938. doi:10.1016/j.rmed.2011.01.005.