

Evaluation of Knowledge and Skills of Using Inhalation Techniques among Patients with Pulmonary Diseases

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Abstract

Original Research Article

Background: The use of one or more inhalation devices is frequently the most efficient method for managing asthma and chronic obstructive pulmonary disease (COPD). In contrast to oral therapies, inhalation therapy requires the use of equipment that patients must learn to self-administer. The majority of inhaled medications (MDI) could be administered using a standard metered dose inhaler until about ten or twenty years ago. Every medication must now be given using a particular device that the patient must learn to use. All asthmatic and COPD patients should learn how to use the device correctly because improper use will lead to ineffective treatment. **Objective:** This study's objective is to evaluate the knowledge and skills of COPD and bronchial asthma (BA) patients at Queen Alia Military Hospital (QAMH) in the Royal Medical Services regarding the inhaling technique. **Method:** An observational study was conducted on COPD or BA patients with known or confirmed diagnoses who attended the outpatient internal medicine or pulmonology clinics in QAMH. Age, sex, education, disease duration, and the type of device being used, are among the demographic and baseline clinical data. A device-specific checklist was used to conduct the evaluation, which covered the MDI, Breezhaler, Respimat, and Turbuhaler. A scoring system was used in this study; a successfully completed step received a score of 1, whereas an incorrect or poorly performed step will receive a score of 0. Scores of seven or higher with an effective demonstration of the crucial stages were deemed "excellent," scores of five or higher with an effective demonstration of the crucial stages were deemed "moderate," and scores of four or lower with any ineffective demonstration of the crucial stages were deemed "poor." **Results:** The mean age of the 200 participants was 51 years (SD: 14.2), and 122 (61%) of them were men. COPD (n=118, 59% of the respiratory conditions) was the most prevalent. The most frequently used inhalation device (n=83, 41.5%) was a meter-dose inhaler (MDI). Knowledge of inhalation devices was significantly correlated with age (p=0.031) and education level (p=0.001), according to the Spearman's correlation test and Student's t-test, respectively. Higher educated participants were more likely to possess more in-depth knowledge of inhalation devices. **Conclusion:** Our research concluded that patients with respiratory conditions do not always know how to use inhalation devices properly. To improve patient outcomes, medical professionals should instruct patients on how to use inhalation devices.

Keywords: Asthma, COPD, Knowledge, Inhalation Techniques.

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INTRODUCTION

Patients with pulmonary diseases like cystic fibrosis, chronic obstructive pulmonary disease (COPD), and asthma are managed primarily through inhalation therapy [1]. It involves administering medication directly into the lungs using inhalation tools like nebulizers, dry powder inhalers, and metered-dose inhalers [2]. Inhalation devices must be used correctly for inhalation therapy to be effective, which necessitates that patients have a working knowledge of inhalation

techniques [3]. Monitoring patients and their lung function frequently, limiting environmental factors, and using medications are the cornerstones of effective pulmonary disease management [4]. In general, inhaler medications (IDs) can be divided into four groups: nebulizers (NBs), dry powder inhalers (DPIs), breath actuated inhalers (BAIs), and metered dose inhalers (MDIs) [5]. An effective medication is delivered right to the lungs through inhalation therapy. Inhalation therapy offers faster and more effective treatment at lower doses than systemic therapy and has fewer

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systemic side effects [6]. Exacerbations and lingering symptoms are common in patients with pulmonary disease, though. The improper use of inhaler devices is a significant contributing factor to this situation. Correct inhaler use helps to achieve desired drug levels in the lung, reduces disease symptoms, prevents exacerbations, and improves respiratory function and quality of life [7]. Inhaler corticosteroid therapy must be administered correctly and with good adherence if pulmonary disease is to be controlled. Unfamiliar drug administration methods and the necessity of daily use for prolonged periods of time may be the root of poor adherence and improper use of inhaler treatment [8]. In actual use, however, patients even experienced users continue to experience problems due to improper inhaler use and device handling [9]. Noncompliance and improper inhaler handling can affect drug delivery and lessen its therapeutic benefits [10]. Inhaler using errors were linked, according to a large number of studies, to worse disease outcomes in asthma or COPD patients [11]. Misuse of inhalers and poor adherence were linked to an increased risk of hospitalisation, ER visits, oral steroids, and antimicrobials, as well as poor disease control [12]. Patients who, on the other hand, managed to cut back on errors over time experienced better results [11]. Both the therapy itself and the error rate when using inhalers depend on the patient's compliance with inhaler device therapy. Patients with COPD or asthma who adhered to their treatment less well had worse outcomes [13]. Providing adequate instruction on how to use the inhaler devices is the most efficient way to prevent incorrect usage. Furthermore, limiting the patient's inhaler usage at predetermined intervals will lower the rate of incorrect usage. Family doctors frequently encounter asthma and COPD in their daily practises, which are significant in public health due to their high rates of morbidity and mortality. However, even after receiving adequate instruction on how to use MDIs, most patients still struggle to coordinate the correct usage [14, 15]. It is the duty of the healthcare provider to instruct patients on how to properly use each inhaler device because there are numerous upcoming non-traditional inhalation devices. As a result, the goal of this study is to assess how well-versed patients with respiratory diseases are in using various inhalation devices.

MATERIALS AND METHODS

Study Design

A cross sectional study was conducted at Queen Alia Military Hospital (QAMH) in Amman/Jordan in the internal medicine clinic which treat patients with chronic internal disease including pulmonary diseases. Two hundred pulmonary disease patients who attended the outpatient internal medicine clinics of a QAMH hospital between February 2023 and May 2023 participated in the study. An organised questionnaire and a checklist were used to gather information about users' knowledge and proficiency with inhalation techniques. The questionnaire asked about the patients' knowledge of inhalation therapy, inhalation devices, and appropriate inhalation techniques in addition to demographic information. There were instructions on how to correctly use each inhalation device on the checklist.

Ethical Considerations

The protocol of this study was approved by the ethics committee in the Royal Medical Services.

Evaluation of Patient Knowledge Regarding Appropriate Use of Inhalation Device

An evaluation checklist, which shown in Table 1, was used to conduct the evaluation. In this study, a scoring system was applied, where a performed step received a score of 1, while an unperformed or incorrect step received a score of 0. Scores of seven or more with a successful demonstration of the crucial steps were deemed "good," five or more and a successful demonstration of the crucial steps were deemed "moderate," and four or fewer with a successful demonstration of the crucial steps were deemed "poor."

Statistical Analysis

The mean value and standard deviation for each device were used to calculate the participants' skill scores. SPSS for Windows, Version 24 was used to conduct statistical analyses. The relationship between skill scores and age was assessed using the Spearman's correlation test, and the relationship between skill scores and gender, as well as the participants' educational background and inhaler device usage, was assessed using the student's t-test. Statistical significance was defined as a p value less than 0.05.

Table 1: Device-specific checklists

	MDI	Turbohaler	Respimat	Diskus	Breezhaler
1	Remove cap	Remove cap by unscrewing	Hold inhaler upright with the cap closed	Open cover using thumb grip	Remove cap
2	Shake inhaler	Hold the device upright	Turn base in direction of arrows until it clicks (half a turn)	Hold horizontally, load dose by sliding lever until it clicks	Flip mouthpiece to open
3	Hold inhaler in upright Position	Twist the grip below the device forwards	Open the cap until it snaps fully open	Breathe out gently, away from the inhaler	Remove capsule from blister and place in chamber

	MDI	Turbohaler	Respimat	Diskus	Breezhaler
		and backwards until a click is heard			
4	Keep your head Up	Keep your head up	Breathe out gently, away from inhaler	Place mouthpiece in mouth and close lips to form a good seal, keep inhaler horizontal	Close mouthpiece until it clicks and Press side buttons in once and release (do not shake)
5	Breathe out	Breathe out	Place mouthpiece in mouth and close lips to form a good seal. Do not cover air vents	Breathe in steadily and deeply	Breathe out gently, away from inhaler
6	Put the mouthpiece between your lips	Breathe in strongly and deeply	Breathe in slowly and deeply through mouth and, at the same time, press down on the dose button	Hold breath for about 5 seconds or as long as comfortable	Put mouthpiece between teeth without biting and close lips to form good seal
7	At the start of inspiration, slowly press canister down	Hold breath for about 5 seconds or as long as comfortable	Keep breathing in slowly and deeply	While holding breath, remove inhaler from mouth	Breathe in quickly and steadily, so capsule vibrates and Hold breath for about 5 seconds, or as long as comfortable
8	Continue to inhale deeply	Remove inhaler from mouth	Hold breath for 5 seconds or as long as comfortable	Breathe out gently, away from the inhaler	While holding breath, remove inhaler from mouth
9	Hold breath for 10 sec	Breathe out gently away from the inhaler	Breathe out gently away from the inhaler	If an extra dose is needed repeat steps 2 to 8	Breathe out gently, away from inhaler and Open mouthpiece and remove capsule
10	Breathe out slowly and completely and wait for 20–30 min before repeating the steps	If an extra dose is needed, repeat steps 2 to 9 and Replace cover	If an extra dose is needed, repeat steps 2 to 9 and Replace cover	Close cover to click shut	If more than one dose is needed, repeat steps 3 to 12 and Close mouthpiece and cap

RESULTS

A total of 200 patients, including 82 with asthma and 118 with COPD, took part in the study. The test subjects' mean age was 56 (SD: 20.1) and their

mean disease duration was 11.9 (SD: 11.1). The patient population's characteristics at the time of the survey are shown in Table 2.

Table 2: Characteristics of the Patient Population

N	200
Gender	
Male, <i>n</i> (%)	122 (61)
Female, <i>n</i> (%)	78 (39)
Diagnosis, <i>n</i> (%)	
Asthma	82 (41)
Male	46 (56)
Female	36 (44)
COPD	118 (59)
Male	78 (66)
Female	40 (34)
Patient age, mean (SD), years	56.0 (17.4)
Asthma patients	47.4 (17.1)
COPD patients	68.0 (8.53)

N	200
Age categories, n (%)	
18–40 years of age	24 (22.9)
41–60 years of age	28 (26.7)
> 60 years of age	53 (50.5)
Disease duration, mean (SD), years	
Asthma patients	12.7(10.9)
COPD patients	15.4(15.4)
Educational Level	
Illiterate	8.9 (8.0)
Primary/secondary school	15 (7.5)
High school	34 (17)
University degree	77 (38.5)
	74 (37)

Overall, the most frequently used devices were MDIs (41.5%), Turbohalers® (18.6%), and Respimat® (14.1%). MDIs (50%) and the Turbohaler® (25.6%) were the most widely used inhaler products among the group of asthmatics. Patients with COPD most frequently used the Respimat® (20.3%) and MDI (35.5%). The fact that MDIs are frequently used as rescue medication accounts in part for the high rate of MDI users. According to table 3, the average skill scores for using inhaler devices were 7.96 ± 2.91 for

MDI, 7.54 ± 3.93 for discus, 6.12 ± 4.22 for turbuhaler, 5.98 ± 4.1 for breezhaler, and 5.72 ± 4.59 for respimat. No difference between males and females was found in skill scores for using an inhaler device ($p=0.477$ for MDI, $p=0.259$ for Turbohaler, $p=0.877$ for Diskus, $p=0.511$ for Breezhaler, and $p=0.585$ for Respimat). On the other hand, the results show a negative correlation between getting older and using inhalers correctly (Table 4).

Table 3: Overview of prescribed inhaler devices used by 200 patients

Type of Device	Total number of patients, n (%)	Mean±SD skill scores for the usage of inhaler	Proportion within Asthma patients, %	Proportion within COPD patients, %
MDI	83 (41.5)	7.96 ± 2.91 (Good)	41 (50)	42 (35.5)
Turbohaler	37 (18.6)	6.12 ± 4.22 (Good)	21 (25.6)	16 (13.56)
Respimat	20 (10)	5.72 ± 4.59 (Moderate)	0 (0)	24 (20.3)
Diskus	33 (16.5)	7.54 ± 3.93 (Good)	11 (13.4)	20 (16.9)
Breezhaler	27 (13.4)	5.98 ± 4.1 (Moderate)	9 (4.5)	16 (13.56)

Table 4: Association between skill score and age of the participants

Skill scores classification for the usage of inhaler	Age Category	N (%)	*P value
Excellent Moderate Poor	18–40	24 (22.9)	0.031
	41–60	28 (26.7)	
	> 60	53 (50.5)	

P value was calculated with Spearman's correlation test

Table 5: Association between skill score and educational level of the participants

Skill scores classification for the usage of inhaler	Educational Level	N (%)	*P value
Good Moderate Poor	Illiterate	15 (7.5)	0.001
	Primary/secondary school	34 (17)	
	High school	77 (38.5)	
	University degree	74 (37)	

*P value was calculated with Student's t-test

DISCUSSION

Each type of inhaler device has benefits and drawbacks that govern whether it is appropriate for a

particular patient with asthma or COPD. Knowing these benefits and drawbacks may aid clinicians in selecting the best device for each patient. The effectiveness of

any inhaled medication as a treatment depends on using the proper inhalation technique. Numerous studies have shown that it is very typical for inhaler devices to be used incorrectly [17, 18]. Because they demand more patient coordination and cognitive abilities, metered dose inhaler (MDI) devices have been linked to higher rates of misuse. The incorrect use of MDI devices was discovered in seven large-scale studies to range from 71% to 89%. Inability to hold one's breath and failure to coordinate inhalation and device actuation were the most frequent mistakes [19, 20]. In one study, the MDI was the most frequently used inhaler device, but in other studies [21, 22], Turbuhaler and Diskus were each used by 39.2% and 40% of patients, respectively. With 83 (41.5%) of our patients currently using an MDI, we discovered from our study that this usage was the most widespread among our patients. While some studies did not find a relationship between gender or age and the ability to use inhaler devices, others [23- 25] found a relationship between advancing age and a lower success rate or that men are better at using the correct inhaler technique. According to Van Beerendonk *et al.*, [20] sex did not significantly influence the use of inhaler devices. Mirici *et al.*, [24] reported that females were more adept at using inhaler devices than males were, but they hypothesised that this difference might be partially explained by the slightly older mean age of the males. Younger patients utilised the proper inhalation technique more frequently than older patients, according to Sen *et al.*, [26] report. Patient sex was not linked in the current study to a significant difference in the overall skill score. However, when age was taken into account as a variable in our study, there were significant differences ($P=0.031$) between age groups in terms of the overall score. Williams *et al.*, [27] argued that education level is a key component of effective inhalation technique, and Mirici *et al.*, [24] and Aydemir [21] found a link between education level and effective inhaler use. In our study, the patients' educational attainment was significantly correlated with their overall skill score ($P 0.001$). With higher levels of education, we saw improved skills, a sense of ease when using the treatment, and benefits. Additionally, higher total scores were associated with higher levels of education ($P 0.001$) when total scores, ease of use, and perceived benefit among patients were compared. Additionally, as education level rose, more advantages and simplicity of inhaler use were seen. Our study revealed that education is significant and that a lack of it is associated with poor dexterity.

CONCLUSION

This study emphasises the need for healthcare professionals to educate and train patients more on how to use inhalation devices properly. When selecting between various inhaler devices for the treatment of conditions requiring inhaled therapy, patients' ages, educational levels, and skills should be taken into account. In relation to the proper use of an inhaler

device, higher education level was found to be associated with higher overall scores, greater skills, and perceived therapeutic benefit. Our results highlight the significance of determining patient preferences for an inhaler device, as doing so may improve disease outcome by increasing patient adherence to therapy. Therefore, prescribing an inhaler device shouldn't be standardised, and each patient needs to be treated uniquely.

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