

**Original Article**

**KNOWLEDGE, ATTITUDES AND PREFERENCES AMONG SPANISH COMMUNITY PHARMACISTS REGARDING INHALED THERAPY (THE OPTIM PHARMACY STUDY)**

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**ABSTRACT**

**Objective:** To assess knowledge, attitudes, and preferences regarding inhaled therapy among Spanish community pharmacists.

**Methods:** An 11-item questionnaire was developed and distributed to community pharmacists throughout the country. Data collected included demographics, the source of knowledge of inhaler use, known and preferred devices, steps for correct use of metered-dose (pMDI) and dry-powder (DPI) inhalers, important variables when prescribing an inhaler device, patient education, and checking inhaler technique.

**Results:** Of a total of 3000 questionnaires delivered, 1722 (57.4%) were returned. The most common source of knowledge was the package insert (46.9%) followed by personal experience (33.3%). Diskus™ and Turbuhaler™ were the best-known devices (96.4% and 93.4%), and DPIs the preferred inhalers. Although more than half of the surveyed pharmacists were aware of the most important step for correct inhalation with pMDI and DPI, only 18% identified the correct answer 'Patient's preference' as the most important variable when prescribing an inhaler device. Most of the respondents had inadequate knowledge of inhaled therapies. Statistically, significant differences were found according to geographical areas. Moreover, the mean score on inhaled therapy with one knowledge source was higher than for those with none ( $P < 0.05$ ). Additionally, patient education was poor.

**Conclusion:** In spite of the increasing involvement of Spanish community pharmacists in patients' care, their knowledge of inhaler use and attitudes towards inhaled therapy needs to improve, so that they can provide better patient education.

**Keywords:** Inhaler devices, Inhalation techniques, Community pharmacist, Misuse of inhalers

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**INTRODUCTION**

Drug delivery by inhalation allows faster onset of action and causes fewer and milder adverse events as compared with systemic delivery routes [1]. Although inhaled therapy can be utilized in a variety of diseases [2], its main use is in obstructive respiratory diseases. Inhaled therapy is the recommended treatment of choice in the clinical guidelines for asthma [3, 4] and chronic obstructive pulmonary disease (COPD) [5, 6]. Many inhalation devices are currently available, thus allowing customized prescriptions. However, this wide range of devices also represents a drawback because healthcare providers should know the different types and the differences between them.

Moreover, benefits of inhaled therapy can be limited by inadequate inhalation maneuvering and inhaler handling [7, 8]. The main problem with inhalers is the inhalation technique especially with pressurized metered-dose inhalers (pMDIs) [4]. Even though the newest dry-powder inhalers (DPIs) can be easier to use than older devices [9], patient education is paramount. For that reason, the main guidelines on asthma and COPD, such as GINA (Global Initiative for Asthma) [3], GEMA (Spanish Guide for Asthma Management) [4], and GOLD (Global Initiative for Chronic Obstructive Lung Disease) [6] recommend patient education and training in all stages of the disease. Training and follow-up in the use of inhalation devices are regarded as the most important steps in education programs. Similarly, national societies such as the Spanish Society of Pneumology and Thoracic Surgery (SEPAR) [10] and international societies such as the European Respiratory Society (ERS) and the International Society of Aerosol in Medicine (ISAM) [11] have developed guidelines and consensus reports for the use of inhaled therapy.

Community pharmacists have an important role in education and training of patients with obstructive respiratory diseases [3, 12]. As shown in a COPD case finding a program in community pharmacists as a new strategy to reduce COPD underdiagnosis [13], community pharmacists were able to select and assessed patients using a questionnaire and spirometric testing. Also, when pharmacists have been trained, results of their intervention in educational programs were similar to those obtained by physicians and/or nurses [3, 4]. Pharmacists working in community pharmacies should be included in interdisciplinary teams to educate patients and thus obtain the maximum benefit from inhaled therapy [14-18].

The OPTIM Pharmacy Study is a project aimed to assess knowledge, attitudes, and preferences regarding inhaled therapy among health care providers in Spain. In two previous national surveys regarding the level of knowledge and attitudes of both practicing physicians from specialties that frequently prescribe inhaler devices [19] and nurses working with respiratory patients using inhaler devices [20], knowledge of inhalers and inhalation techniques remains poor in Spain. The present study was designed to assess knowledge about inhalation therapy in the third group of professionals involved in respiratory patients' care: pharmacists, specifically those working in community pharmacies.

**MATERIALS AND METHODS**

**Design and study population**

This was a cross-sectional survey study, the objective of which was to assess the level of knowledge, attitudes, and preferences related to inhaled therapy among community pharmacists. Between May and November 2014, a questionnaire specifically designed for the study

was distributed to community pharmacists throughout Spain by sales representatives of a pharmaceutical company (Chiesi España).

### Questionnaire

An 11-item questionnaire (table 1) was developed based on those used in the prior surveys among Spanish physicians [19]

and nurses [20]. Moreover, responses to items 6 to 8 were scored as 0 (incorrect response) or 1 (correct response).

The sum of the scores allowed respondents to be classified according to their general knowledge of inhaled therapy: null or no knowledge (0 points), poor (1 point), limited (2 points), and adequate (3 points).

**Table 1: Administered questionnaire**

**1. Sex** Male/Female

**2. Age** (years)

**3. Which area of Spain do you work in?**

Andalusia

Aragon

Asturias

Balearic Islands

Canary Islands

Cantabria

Catalonia

Castile-La Mancha

Castile-Leon

Ceuta and Melilla

Extremadura

Galicia

La Rioja

Levante

Madrid

Murcia

Navarre

Basque Country

**4. Your knowledge of inhaler use comes mainly from:**

Attendance at meetings, courses, or workshops organized by scientific societies

Attendance at meetings, courses, or workshops organized by pharmaceutical companies

Reading articles or specialized books

Reading the device leaflet

Directly from personal clinical experience and common sense

**5. Please mark**

**a) All the devices you know**

Accuhaler™

Aerolizer™

Breezhaler™

pMDI

pMDI with inhalation chamber

pMDI with Modulite™system

Easyhaler™

Handihaler™

Nexthaler™

Novolizer™

Respimat™

Twihaler™

**b) Your preferred device (one only)**

Accuhaler™

Aerolizer™

Breezhaler™

pMDI

pMDI with inhalation chamber

pMDI with Modulite™system

Easyhaler™

Handihaler™

Nexthaler™

Novolizer™

Respimat™

Twihaler™

**6. In your opinion, the most important step for correct pMDI inhalation is:**

To shake the device before inhalation

To exhale deeply before inhalation

To fire the device during inhalation

To inhale deeply and forcefully

To inhale slowly and progressively

**7. In your opinion, the most important step for correct DPI inhalation is:**

To shake the device before inhalation

To exhale before inhalation

To fire the device during inhalation

To breath in deeply and forcefully  
To inhale slowly and progressively

**8. When prescribing an inhaler device, which of the following variables do you consider the most important?**

Disease to be treated  
Patient's preferences  
Patient's age  
Patient's experience with a specific device  
Patient's cultural level

**9. When dispensing an inhaler device, do you assess the patients' skill with inhalation technique?**

Always  
Usually  
Sometimes  
Rarely  
Never

**10. At your pharmacy, who trains the patients in the inhalation technique of the prescribed device?**

You, personally  
A pharmacy assistant  
Either a pharmacy assistant or you, it depends on  
Nobody. They only receive written information  
Nobody. No written information is provided

**11. Do you check at least once a year the inhalation technique used by your patients treated with inhaled therapy?**

Yes  
No  
If you answered No:  
I think that they should already know how to do this  
I do not think that it is necessary

DPI, dry-powder inhaler; pMDI, metered-dose inhaler, <sup>a</sup>Percentages were estimated based on the number of valid answers.

**Statistical analysis**

Categorical variables were expressed as frequencies and percentages, and continuous variables as mean and 95% confidence interval (CI). When the questionnaires were not fully completed, the response rates for each incomplete item were calculated on valid responses. Descriptive statistics were gathered and the results were expressed as a number of respondents, percentages, and valid percentages. Additionally, scores were analyzed using contingency tables, chi-square test and analysis of variance (ANOVA) to assess general knowledge of inhaled therapy. Statistical significance was set at a P value<0.05. Analyses were performed using Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL, USA) version 19 for Windows.

**RESULTS**

Of a total of 3000 questionnaires delivered during the survey period, 1722 (57.4%) were returned.

**Demographic characteristics**

There were 747 men and 949 women (missing data, n = 26), with a mean age of 46.6 y (95% CI 45.7 to 47.5) (range 20-81 y) (missing data for age, n = 53).

Most pharmacies were located in towns with a population of over 5000: 1389 pharmacies vs. 298 in towns with a lower population.

This question was not answered in 35 questionnaires. Thus, the valid percentages were 82.3% and 17.7%, respectively.

As far as the Spanish geographical area where pharmacists were working, and excluding the 13 questionnaires with missing data, numbers and valid percentages were as follows: 318 (18.6%) in the Northern area, 410 (24.0%) in the Central area, 343 (20.1%) in the Southern area, 609 (35.6%) in the Eastern area, and 29 (1.7%) in the Canary Islands, Ceuta and Melilla. This geographical allocation is a grouping of autonomous communities and cities corresponding to the commercial areas of Chiesi España.

**Knowledge sources**

The most important source of knowledge was the package insert of the devices, followed by the pharmacist's personal experience (table 2). The answer and percentage totals in table 2 are higher than 1722 and 100%, respectively, because respondents were able to choose more than one answer. By a number of knowledge sources, 56 respondents (3.3%) declared no source, 1309 (76.0%) only one source and 357 (20.7%) more than one. This last group included two sources reported by 240 respondents (13.9%), three sources reported by 92 respondents (5.3), four sources reported by 17 respondents (1.0%), and five sources reported by 8 respondents (0.5%).

**Table 2: Knowledge sources**

Item	No. (%)
<b>4. Your knowledge of inhaler use comes mainly from:</b>	
Attendance at meetings, courses, or workshops organized by scientific societies	196 (11.4)
Attendance at meetings, courses, or workshops organized by pharmaceutical companies	328 (19.0)
Reading articles or specialized books	268 (15.6)
Reading the package insert	808 (46.9)
Directly from personal clinical experience and common sense	573 (33.3)

**Known and preferred inhalers**

Among inhalation devices available in Spain, Diskus™ (Accuhaler™ in Spain) was the best known, followed by Turbuhaler™, while Twisthaler™ was the least known (table 3). The sums of answers and percentages in table 2 are higher than 1722 and 100%, respectively, because item 5a also allowed multiple responses. This question was not answered by 22 respondents.

By number of inhalers known, 245 respondents (14.2%) were familiar with the 13 proposed devices. When the numbers of known inhalers were grouped, 22 respondents (1.3%) did not mark any device; 634 (36.8%) knew from 1 to 6; 549 (31.9%) from 7 to 9; and 517 (30%) knew ten or more inhalers. Nexthaler™ was the preferred inhaler, followed by Accuhaler™, while Twisthaler™ was the least preferred (table 4).

Table 3: Knowledge of inhalers

Item	No. (%)
<b>5a. Which device do you know?</b>	
Accuhaler™	1660 (96.4)
Aerolizer™	804 (46.7)
Breezhaler™	956 (55.5)
pMDI	1297 (75.3)
pMDI with inhalation chamber	1116 (64.8)
pMDI with Modulite™system	894 (51.9)
Easyhaler™	703 (40.8)
Handihaler™	828 (48.1)
Nexthaler™	1304 (75.7)
Novolizer™	664 (38.6)
Respimat™	1008 (58.5)
Turbuhaler™	1608 (93.4)
Twisthaler™	562 (32.6)

pMDI, pressurized metered-dose inhaler

Table 4: Preference for one inhaler

Item	No. (%)
<b>5b. Which device do you prefer?</b>	
Accuhaler™	368 (25.7)
Aerolizer™	22 (1.5)
Breezhaler™	26 (1.8)
pMDI	75 (5.2)
pMDI with inhalation chamber	125 (8.7)
pMDI with Modulite™system	46 (3.2)
Easyhaler™	15 (1.0)
Handihaler™	27 (1.9)
Nexthaler™	385 (26.9)
Novolizer™	9 (0.6)
Respimat™	55 (3.8)
Turbuhaler™	274 (19.1)
Twisthaler™	6 (0.6)

pMDI, pressurized metered-dose inhaler

By type of preferred device, 1132 respondents (79.0%) answered DPis, 246 (17.2%) pMDIs and 55 (3.8%) Respimat™. A further 289 respondents (16.8% of questionnaires returned) did not answer the question or marked more than one preferred device.

#### Knowledge of inhalation techniques and prescription

More than half of the respondents answered correctly that the most important step for a correct inhalation technique using pMDI devices

is firing the device during inhalation (table 5). In contrast, 77 respondents did not answer this question or marked more than one option.

Similarly, more than half of the respondents stated correctly that the most important step for correct PDI inhalation is to breathe in deeply and forcefully (table 4). Fifty-three respondents did not answer this question or marked more than one option.

Table 5: Knowledge of inhalation techniques and prescription

Item	No. (%)
<b>6. The most important step for correct pMDI inhalation is:</b>	
To shake the device before inhalation	152 (9.2)
To exhale deeply before inhalation	195 (11.9)
To fire the device during inhalation <sup>a</sup>	912 (55.4)
To inhale deeply and forcefully	174 (10.6)
To inhale slowly and progressively	212 (12.9)
<b>7. The most important step for correct DPI inhalation is:</b>	
To shake the device before inhalation	37 (2.2)
To exhale deeply before inhalation	259 (15.5)
To fire the device during inhalation	179 (10.7)
To inhale deeply and forcefully <sup>a</sup>	929 (55.7)
To inhale slowly and progressively	265 (15.9)
<b>8. When prescribing an inhaler device, which of the following variables do you consider the most important?</b>	
Disease to be treated	438 (26.6)
Patient's preferences <sup>a</sup>	304 (18.5)
Patient's age	335 (20.3)
Patient's experience with a specific device	478 (29.0)
Patient's cultural level	92 (5.6)

DPI, dry-powder inhaler; pMDI, pressurized metered-dose inhaler. <sup>a</sup>Correct answer.

Regarding the most important variable when prescribing an inhaler, the most frequent answer was "Patient's experience with specific devices" (table 4), but this answer was incorrect. Roughly 18.5% of pharmacists surveyed answered correctly "Patient's preferences". As in previous items, some respondents (n = 75) did not answer or marked more than one option.

### Patient education

Most of the respondents reported that, when dispensing the inhaler, they only sometimes or rarely assessed the patient's skills with the device (table 6). Ten respondents (0.6%) did not answer this question.

**Table 6: Patient education**

Item	No. (%)
<b>9. When dispensing the device, do you assess the patient skill with its use?</b>	
Always	133 (7.8)
Usually	313 (18.3)
Sometimes	673 (39.3)
Rarely	450 (26.3)
Never	143 (8.4)
<b>10. At your pharmacy, who trains the patients in the inhalation technique?</b>	
A pharmacist	208 (12.2)
A pharmacy assistant	122 (7.2)
Either a pharmacist or a pharmacy assistant	812 (47.6)
Nobody. We asked them if they have been trained	564 (33.1)
<b>11. At your pharmacy, do you check the inhalation technique of your customers?</b>	
Yes	459 (26.7)
No	1263 (73.3)
If you do not, why not?	
I think that they should already know how to do this	857 (71.7)
I do not think that it is necessary	338 (28.3)

With regard to the training of patients in inhalation technique, the most frequent answer was "Either a pharmacist or a pharmacy assistant". However, one-third of respondents stated that they do not train them and that they ask the patients if they have been educated by their doctor or nurse (table 6). Sixteen respondents (0.9%) did not answer.

Finally, only about a quarter of the respondents checked the inhalation technique of their patients. Among those who did not

check the inhalation technique, most respondents considered that the patients should already be familiar with it (table 6) and 68 respondents (5.4% of those who did not check the inhalation technique) did not answer.

### Analysis of inhaled therapy knowledge

Most of the respondents had an inadequate or limited knowledge of inhaled therapy, while only a small percentage had an adequate knowledge (table 7).

**Table 7: Score distribution of inhaled therapy knowledge**

Knowledge level	Frequency	%
Null or no knowledge (0 points)	301	17.5
Inadequate (1 point)	667	38.7
Limited (2 points)	650	37.7
Adequate (3 points)	104	6.0

Results showed no statistically significant differences according to sex (chi-square test,  $P = 0.96$ ), age of respondents (Kruskall Wallis test,  $P = 0.30$ ), and population size of the town where their pharmacy office was located (data not shown) (chi-square test,  $P = 0.29$ ). However, differences among geographical areas were statistically significant, with the lowest scores in the Central area, the Canary Islands, and Ceuta and Melilla (chi-square test,  $P = 0.002$ ).

The relationship between the knowledge source and the number of known devices was assessed using two contingency tables (data not shown). An ANOVA test identified statistically significant differences ( $P < 0.05$ ) between scores of pharmacists with no knowledge source and those with one source. Differences were not statistically significant for those with more than one knowledge source. In contrast, the number of known devices did not account for statistically significant differences (data not shown).

### DISCUSSION

Community pharmacists are increasingly involved in the healthcare of patients with chronic diseases [21, 22], including patients with chronic respiratory conditions [23]. It has been shown that pharmaceutical care of patients with obstructive respiratory diseases improves medication adherence [24-27] and achieves a better use of inhalers [26, 28-30] and control of the disease [31, 32]. In a randomized controlled study to investigate the effect of a simple educational intervention concerning DPI technique delivered by community pharmacists to patients with asthma, a simple educational

intervention taking only 2.5 min and targeting inhaler technique was feasible for delivery by community pharmacists and resulted in improved clinical and humanistic outcomes for patients with asthma [33]. Also, in a comparison of the effectiveness of four different instructional interventions in training proper inhaler technique, a 2-minute pharmacist counseling session was more effective than to read a metered dose inhaler (MDI) package insert pamphlet or to watch a Centers for Disease Control and Prevention video or YouTube video demonstrating MDI technique [34].

The present survey among Spanish community pharmacists showed interesting findings. Firstly, knowledge regarding inhaled therapy was inadequate or limited in 76.4% of the study sample, and only 6% of community pharmacists had an adequate knowledge. Secondly, patient education was unsatisfactory. The skills of patients when dispensing an inhaler was checked only sometimes or almost never in 65.6% of the cases. Also, training in correct inhaler technique was not provided by 33.1% of respondents and the inhalation technique was not checked by 73.3%.

Other studies, although with a different methodology, also found the poor knowledge of inhaled therapy among community pharmacists. In a sample of Spanish community pharmacists who were asked to demonstrate the inhalation technique with three inhalers, the mean percentage of correct steps was 47.4% with a pMDI, 55.9% with Turbuhaler™ and 49.4% with Accuhaler™ [35]. In a study carried out in Jordan in a convenience sample of 31 pharmacists who attended an educational workshop, at the initial assessment few pharmacists demonstrated correct technique (Turbuhaler™ 13%, Diskus™ 6%) but 2 y after training, pharmacists in the intervention group showed significantly better inhaler technique than pharmacists in the control group ( $P < 0.05$ ) for Turbuhaler™ and Diskus™ (83% vs. 11%; 75% vs. 11%, respectively) [36]. In a study that evaluated the most problematic steps in the use of Diskus™ and Turbuhaler™ among pharmacists from two countries, Jordan and Australia, few professionals in either country demonstrated correct technique for step 3 (exhale to residual volume) or step 4 (exhale away from the device) [37]. In a French study, among the 57 pharmacists who gave a demonstration of the use of inhaler devices, 16.3% showed all the steps in the use of a metered dose aerosol [38].

However, different studies have shown that educational interventions improve community pharmacists' competence in inhaled therapy. In a study in which community pharmacists were asked to demonstrate the proper steps in the actuation sequences of Diskus™ and Turbuhaler™ and then received an instructional session on the proper inhalation technique, the mean change between baseline and post-instruction percentage scores for Diskus™ and Turbuhaler™ were  $22.6 \pm 18.7\%$  and  $17.1 \pm 15.4\%$ , respectively [39]. Therefore, a single instructional session can dramatically improve a community pharmacist's ability to demonstrate the correct method of actuation [39]. As previously mentioned, the sample of 31 pharmacists in the study carried out in Jordan, also showed significant increases in the correct use of the inhaler technique 2 y after training as compared to pharmacists assigned to the non-intervention group [36]. Similarly, skills in the use of pMDI, breath-actuated pMDI and DPI improved significantly ( $P < 0.001$ ) after 10 y of continuing pharmaceutical education [38, 40]. Some efforts have been made to improve Spanish community pharmacists' knowledge inhaled therapy knowledge, but our survey shows that more educational initiatives are needed.

More than half of the respondents correctly identified the most important step for using a pMDI or DPI inhaler (items 6 and 7 of the questionnaire). However, 81.5% of those surveyed failed to respond correctly to question 8, which asked about the most important variable when prescribing an inhaler device (the correct answer "Patients' preferences" was selected by only 18.5% of pharmacists). There were no differences in knowledge of inhaled therapy according to sex, age and size of the population of the area. However, scores by geographical area differed. This result may indicate that pharmacist education requires different approaches according to a geographical area.

The number of devices known did not modify the scores relating to knowledge of inhaled therapy. By contrast, the number of knowledge sources did: pharmacists with one knowledge source had higher scores than their colleagues with none ( $p < 0.05$ ) or more than one source ( $p$  non-significant). Package insert and personal experience were the most frequent knowledge sources, but that does not necessarily mean that all respondents with one source used either one or the other. It may perhaps be useful to analyze scores by knowledge source. Nonetheless, this result highlighted the importance of being informed about inhalation devices. In agreement with our findings, in a Canadian study [41], the only knowledge source for 33% of community pharmacists was the package insert, while 40% had received instruction from a pharmaceutical representative. The authors concluded that community pharmacists' knowledge of inhalation devices was proportional to the length of time the device had been available.

Patient education has been assessed in studies with simulated patients. In a study carried out in the United States that evaluated a pharmacist's practice in patient education when dispensing an MDI

to an investigator posing as a patient, only 13% of pharmacists offered initially to provide information regarding correct technique, and when asked for instruction on MDI usage, 53% of pharmacists offered information [42]. Also, in a simulated patient study performed in 160 Australian community pharmacies in 2009, only 24% of pharmacists provided counseling on inhalation technique [43]. Furthermore, in a recent survey in a sample of 77 Australian community pharmacists, 54% reported that they demonstrated the inhalation technique for new inhaled medicines and 35% checked for written asthma self-management plan possession. Although 65% of pharmacists reported confidence in communication skills, most pharmacists were not confident in setting short-/long-term goals with the patient and career for managing asthma at home [44]. This study concludes that Pharmacists need more appropriate continuing education programs that can translate into improved pediatric asthma self-management practices and thus improved asthma outcomes in children. In fact, these and many other studies have addressed the effects of education and assessment by community pharmacists of patients with asthma or COPD by community pharmacists [15, 26, 30-33, 45-47], including children with asthma [58] and elderly subjects [59]. Moreover, in community pharmacies from different countries several initiatives to improve inhaler use have been implemented, such as the Australian Inhaler Technique Labels [50], the Pharmacy Asthma Management Service (PAMS) [53], and the Danish Inhaler Technique Assessment Service (ITAS) [60].

## CONCLUSION

Despite Spanish community pharmacists' increasing involvement of in-patient care, their knowledge of, and attitudes towards, inhaled therapy needs to improve in order to provide better patient education.

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## CONFLICTS OF INTERESTS

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