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RESEARCH ARTICLE

Counseling of inhalation medicine perceived by patients and their healthcare providers: insights from North Cyprus

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Abstract

Background In order to achieve patient adherence, individuals require different levels of information. Basic and adequate information must be provided by different health care providers to patients. *Objective* To assess the information level of patients with asthma and chronic obstructive pulmonary disease (COPD) and to determine the source of their information regarding the medicine they use in addition to their satisfaction, inhalation usage techniques and perception of the information providing role of health care professionals. *Setting* Respiratory disease clinics in Nicosia and Famagusta state hospitals and community pharmacies in North Cyprus. *Method* A cross-sectional multicentered observational study was carried out in respiratory disease clinics and community pharmacies. Patients' knowledge and healthcare providers' perceptions of their roles were evaluated using "The satisfaction with information about medicines scale". Evaluation of patient's inhalation techniques was performed using a validated checklist. *Main outcome measure* (a) Patients' knowledge of their medication and satisfaction with the information provided by health care professionals, (b) the prevalence of critical inhalation mistakes, (c) health care professionals' perceptions of their patient counseling practice. *Results* A total of 110 patients were evaluated, and 6 physicians and 76 pharmacists were recruited for the interview. The health care professionals reported that they talk about the action and the use of medicines with the patients. The standardized average patients' satisfaction score for action and use was 0.35 (±0.21), whereas for potential side effects, it was 0.26 (±0.15). Even though 92% of patients believed that they use their inhaler properly, 75% of the patients made at least one critical mistake while using the inhalation demo, which would likely affect the delivery of the medicine to the lungs. *Conclusion* In spite of health care professionals feeling comfortable with their counseling practices, the majority of patients reported dissatisfaction with the information they provided about medicine, and three out of four patients were making critical mistakes in the use of inhalers. More effort is warranted by health care professionals on patient education to limit critical mistakes.

Keywords Asthma · COPD · Cyprus · Health education · Inhalation · Inhalation administration

Impacts on practice

- Gaps in patient education affect the quality of patient care provided resulting in patient's dissatisfaction and critical medication use errors that may negatively impact proposed outcomes.
- Optimizing patient education role of pharmacists in hospitals and community settings is necessary to enhance patient satisfaction, minimize errors and achieve partnership in the use of medicine between patients and HCPs.
- A need exist for agreement between health professionals on the role and responsibility of each profession in terms of providing education to patients.

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Introduction

Asthma and chronic obstructive pulmonary disease (COPD) are chronic respiratory diseases that have an impact on patients' quality of life and result in an economic burden on the healthcare system. It has been reported that there are 235 million people with asthma and 64 million people with moderate COPD globally [1, 2]. In spite of the presence of effective therapies, the morbidity and mortality rates of asthma and COPD remain high [1, 2].

Inhalation medicine has been the main drug delivery method of bronchodilators and steroids in the care of asthma and COPD patients for decades [3, 4]. The goal is to minimize the impact of a current exacerbation and to prevent the development of subsequent exacerbations that are associated with emergency visits, hospital admissions and the reported mortality [3–6]. Previous studies have shown that errors in inhaler handling are frequent in all types of devices [e.g., metered-dose inhalers (MDIs), dry-powder inhalers (DPIs)] [7, 8]. In addition to adherence, poor inhalation technique is among the major factors that contribute to the poor control of diseases, since the medication is not effective unless it reaches the targeted airways [9–15]. Identifying inhaler technique errors of patients and correcting the errors is a crucial aspect of disease management [16–19]. Patients' competency on inhaler device use should be assured by healthcare providers (HCPs) [16–19]. However, many HCPs claim that they are unable to educate or counsel patients about inhaler device use due to various reasons (e.g., busy clinic hours, inadequate number of HCPs, etc.) [20–23].

As patient engagement in disease management is important in treating asthma and COPD, patients on discharge are eager to acquire information about their treatment in terms of side effects, risks, duration of therapy, appropriateness of current treatment and other treatment options [24–26]. An important indicator of the quality of the information provided to the patients regarding their therapy is that their individual needs are met and patients are satisfied with the given information [27]. Evaluating the level of satisfaction of patients with medication information is an important component of predicting the quality of patient care provided and a prerequisite for partnership in the use of medicine to achieve proposed outcomes [27]. HCPs have a mutual responsibility to provide coordinated information about the medications [28, 29].

No studies have been carried out in North Cyprus to evaluate patients' inhalation techniques and their satisfaction with information provided by different healthcare professionals.

The aim of the study

The aim of this study is to assess (1) asthma and COPD patients' knowledge of their medicine and inhalation techniques, (2) patients' satisfaction with the information provided by HCPs, and (3) HCPs' perceptions of their information providing role in North Cyprus.

Ethics approval

Confidentiality was assured during the study for patient's privacy. Ethical approval for this study (YTK1.01-629-18-E.724) was obtained from the Dr. Burhan Nalbantoglu State Hospital Ethical Committee. Written informed consent was obtained from all participants. Only initials were used during the study, while the patient's addresses and other nonclinical, personal information was not recorded. The research was conducted in accordance with the Declaration of Helsinki.

Method

A cross-sectional multicentered observational study was carried out in respiratory disease clinics in Nicosia and Famagusta state hospitals and community pharmacies in North Cyprus between 01 March and 30 April 2018. In the first part of the study, asthma or COPD patients using inhalers regularly were invited to an in-person structured interview using a published and validated checklist to assess their inhaler use technique [30] and a validated questionnaire "The Satisfaction with Information About Medicines Scale" (SIMS) [27] to evaluate the patient's knowledge of their medicine and satisfaction with information about medicine obtained from different HCPs and other sources. In the second part, a trained pharmacist administered the SIMS questionnaire to investigate respiratory specialized physicians' and community pharmacists' perceptions of their information providing role in their setting.

Patient selection and recruitment

Upon the patients arrival at their appointment for examination at one of the hospitals, patients who were eligible for the study were referred by doctors to a clinical research pharmacist for the purpose of conducting the interviews. Adult patients aged over 18 years who had previously been diagnosed with either asthma or COPD and who were using inhalers were considered eligible. Patients who were

unable to read or write as well as those who were severely sick were excluded.

Patient questionnaires and data collection

Patients were interviewed using The Satisfaction with Information About Medicines Scale (SIMS) questionnaire. The questionnaire contains 17 items. Items 1–9 of this questionnaire assess perceived knowledge and satisfaction of patients regarding the effects and usage of medicines. Items 10–17 assess information regarding possible side effects of the medicine [27].

Knowledge was measured using SIMS questions, and patients were asked to "please rate the extent to which you know the following.". Response categories ranged between "knows" as 3, "partially knows" as 2 and "does not know" as 1. In addition, patients were asked about their source of information regarding the knowledge as follows: "What is the source of information on …?". Response categories were as follows: physician, pharmacist, both physician and pharmacist or other. Finally, patients were asked, "Are you satisfied with the information you received about … ?". Patients were asked to rate the amount of information they were provided using a response scale with the following options: "too much", "about right", "too little", "none received", "none needed".

Patients who reported that the information was ''about right'' or ''none needed'' were classified as satisfied and scored 1. Patients who reported that the information was ''too much'', ''too little'' or ''none received'' were classified as dissatisfied and scored 0 [27]. Patients' responses for each item were examined to determine specific types of information perceived to be inadequately addressed.

In the 8th question of the SIMS, patients were further requested to demonstrate how they use their inhalers using placebo devices. The patient's inhaler use techniques for each device were assessed through observation using a pre-examined checklist (Fig. 1). This checklist was derived from the manufacturers' recommendations and a previously published inhalation technique evaluation checklist [30]. The Kuder–Richardson (KR-21) Formula was utilized to measure the reliability of the checklist tool. The result showed that

MDI
1. **Remove cap**
2. **Shake well**
3. Breathe out normally
4. Keep head upright or slightly tilted
5. Seal lips around mouthpiece
6. **Inhale slowly, actuating once during first half of inhalation**
7. **Continue slow and deep inhalation**
8. Hold breath for 5 or more seconds

MDI with spacer
1. **Remove caps**
2. **Shake MDI well**
3. Insert MDI into spacer
4. Breathe out normally
5. **Seal lips around mouthpiece**
6. **Actuate MDI**
7. Inhale slowly and deeply
8. Hold breath for 5 or more seconds

HandiHaler
1. **Open lid and mouthpiece**
2. **Place capsule in chamber**
3. Close mouthpiece, ensuring click is heard
4. **Holding inhaler upright, press blue button fully**
5. Breathe out normally and away from inhaler
6. Seal lips around mouthpiece
7. Inhale forcefully and deeply so that capsule vibrates
8. Hold breath for 5 or more seconds
9. **Repeat steps 6–8**

Diskus
1. **Open to expose mouthpiece**
2. **Slide lever until click heard**
3. **Keep level throughout**
4. Breathe out normally and away from inhaler
5. Seal lips around mouthpiece
6. **Inhale forcefully and deeply**
7. Hold breath for 5 or more seconds
8. Exhale but not through inhaler

Turbuhaler
1. **Hold upright without occluding air vents**
2. **Turn coloured wheel one way, then back**
3. Breathe out normally and away from mouthpiece
4. Seal lips around mouthpiece without occluding air vents
5. **Inhale forcefully and deeply**
6. Hold breath for at least 5 seconds
7. **Exhale but not through inhaler**

Fig. 1 Inhaler checklist [30]. *MDI* Metered dose inhaler. Bold indicates steps that are critical, for which incorrect performance would lead to little or no medication reaching the lungs

KR21 = 0.89, indicating a homogeneous test. Mistakes in specific steps in the checklist were considered to be critical (shown with bold in Fig. 1). Incorrect application of any of these steps could cause little or no medication to reach the lungs [31] and thus was considered a critical mistake. Minor mistakes were defined as those that affect the medication reaching the lungs (e.g., for MDI usage, not breathing out before inhaling the medication was considered a minor mistake).

Translation of both tools from English to Turkish was performed according to the guidelines published by Tsang et al. [32]. To estimate the internal consistency of the tools, Cronbach's alpha was calculated. A pilot study with 30 patients was conducted, and the results were analyzed. The resulting Cronbach's alpha score was 0.765. The pilot study subjects were not included in the study.

Healthcare provider's perspective

The perception of the informative role of and practices of HCPs was also assessed based on SIMS. All physicians who specialized in respiratory diseases (a total of 8 specialists) and were registered with the Cyprus Turkish Medical Association were invited to participate along with 114 registered community pharmacies in the two cities. HCPs were questioned regarding how often they discussed each of the SIMS information topics with their patients and what they perceived their responsibility to be in discussing these topics with patients. A 5-point Likert scale ("always", "often", "when asked", "rarely" or " never") was used to collect the HCPs' answer. The Cronbach's alpha score for the HCP SIMS version was 0.839.

Statistical analysis

The sample size (SS) was calculated using the following equation: $SS = Z^2 \times p \times (1-p)/c^2$, where Z represents the level of confidence (e.g., 1.96 for a 95% confidence level), p is the estimated percentage of picking a choice (assigned 50%), and c is the desired level of precision, which is 0.05 [33, 34]. According to the Health Ministry of North Cyprus, 5% of the adult population suffers from asthma and COPD. Hence, we estimated that we would be drawing from a population of 11,500 eligible patients and thus it would be necessary to include at least 96 patients in the analysis. SPSS (Statistical Package for Social Sciences, version 17.0) was used to conduct statistical analyses. Patient satisfaction scores were standardized so that comparisons could be made between the 9-item Action and Usage scale and the 8-item Potential Problems scale. The Wilcoxon signed-rank test was used to compare satisfaction scores of "action and usage" with those of "potential problems and side effects". The Kruskal–Wallis test was used to determine the relation among diagnosis, education and satisfaction scores. The Mann–Whitney U test was used to determine the relation between gender, duration of treatment and satisfaction scores. Also, Mann–Whitney U test and Chi squared test were used where relevant to determine differences between demographic groups and occurrence of a critical mistake during inhaler use demonstration. In addition, the Chi squared test was used to determine whether using more than one type of inhaler results in more critical mistakes than using only one type of inhaler.

Results

Study sample

Interviews were conducted with 110 patients out of 140 patients approached (79% response rate). Six respiratory physicians of the 8 currently working in North Cyprus (75% response rate) and 76 out of 114 pharmacists (67% response rate) were also interviewed. Patient characteristics are summarized in Table 1.

Patient knowledge

According to the interviews, the majority of patients perceive that they know "how to use your medicines" (92%), "how to get additional supplies" (89%) and "what is their medicine called" (59%). Patients also perceive that they are less knowledgeable about potential side effects (74%

Table 1 Patients characteristics

Characteristics	Frequency (%)
Gender, Male	62 (56)
Mean age (years) ± SD	44.0 ± 19.2
Education level	
Primary school	22 (20)
Middle school	10 (9)
High school	38 (34.5)
University	40 (36.5)
Diagnosis	
Asthma	91 (83)
COPD	8 (7)
Both	11 (10)
Duration of treatment (month)	
1–60	54 (49)
61–120	24 (22)
121–240	23 (21)
> 240	9 (8)
Smoker (currently smoking)	42 (38)

Table 2 Patient-perceived knowledge towards their therapy, source of information and the percentage of satisfied patients for related items

Questions	Patients' perceived knowledge n (%)			Patients' source of information n (%)					Satisfied patient (%)
	Knows	Partially knows	Doesn't know	Doctor	Pharmacist	Doctor and pharmacist	None	Other*	
What is your medicine called?	65 (59)	21 (19)	24 (22)	73 (66)	8 (7)	6 (6)	23 (21)	–	66
What is each medicine for?	55 (50)	47 (43)	8 (7)	72 (65)	–	17 (16)	12 (11)	9 (8)	45
What your medicine does?	36 (33)	45 (41)	29 (26)	29 (26)	2 (2)	7 (6)	45 (41)	27 (25)	16
How does your medicine Works?	15 (14)	30 (27)	65 (59)	34 (30)	4 (4)	6 (6)	63 (57)	3 (3)	17
How long will your medicine take to act?	45 (41)	42 (38)	23 (21)	28 (25)	5 (5)	1 (1)	55 (50)	21 (19)	11
How can you tell if it is working?	36 (33)	60 (55)	14 (12)	25 (23)	13 (12)	7 (6)	43 (39)	22 (20)	22
How long will you use your medications?	53 (48)	24 (22)	33 (30)	45 (41)	1 (1)	–	64 (58)	–	31
Do you know how to use your medicine?	101 (92)	8 (7)	1 (1)	49 (44)	23 (21)	21 (19)	1 (1)	16 (15)	45
How to get a further supply?	98 (89)	11 (10)	1 (1)	80 (73)	7 (6)	13 (12)	10 (9)	–	71
Whether the medicine has any unwanted effects?	27 (25)	42 (38)	41 (37)	21 (19)	5 (5)	–	59 (53)	25 (23)	12
What are the risks of you getting side effects?	10 (9)	19 (17)	81 (74)	7 (6)	–	2 (2)	100(91)	1 (1)	6
What should you do if you experience an unwanted effects?	47 (43)	17 (15)	46 (42)	32 (29)	2 (2)	8 (7)	57 (52)	11 (10)	26
Whether you can drink alcohol with your medicine?	12 (11)	7 (6)	91 (83)	11 (10)	–	–	93 (84)	6 (6)	81
Whether the medicines interfere with other medicines	9 (8)	6 (6)	95 (86)	9 (8)	2 (2)	–	99 (90)	–	4
Medications make you feel drowsy?	40 (36)	14 (13)	56 (51)	6 (6)	8 (7)	3 (3)	67 (61)	26 (23)	10
Whether the medication will affect your sex life?	8 (7)	3 (3)	99 (90)	2 (2)	–	–	99 (90)	9 (8)	57
What should you do if you forget to take a dose?	25 (23)	25 (23)	60 (54)	20 (18)	4 (4)	2 (2)	69 (63)	15 (13)	5

*Other: Source of information is either the internet or patient information leaflets or both

don't know) and drug interactions (86% don't know). Additional results are provided in Table 2.

Patients' source of information

Patients reported that physicians were more likely than pharmacists to provide information such as what is the medication used for, 81% of the patients said that physicians provided this information and 16% said that pharmacist provided this information (Table 2). Patients also reported that they did not receive any information about drug-alcohol interactions from the pharmacists.

On the other hand, patients reported that they also obtained information about what the medicine does (25%), whether the medication caused drowsiness (23%), and the side effects of the medications (23%) from other resources, such as the internet or patient information leaflets (Table 2).

Patient's satisfaction

Patients were significantly more satisfied with the information related to the action and usage of medicine than with information on potential problems of the medicine ($p < 0.001$). The standardized average satisfaction score for action and use was 0.35 (± 0.21), whereas for potential side effects, it was 0.26 (± 0.15). Patients reported the highest satisfaction with "how to obtain additional supplies" and "what is your medicine called" (71% and 66%, respectively). The lowest satisfaction scores were reported with "medicines interfere with other medicines" and "what should you do if you forget to take a dose" (4% and 5%, respectively) (Table 2). The study also found that there was no relation between satisfaction score and gender, duration of treatment, diagnosis, and education level of the patients ($p = 0.249$, $p = 0.961$, $p = 0.258$, $p = 0.906$ respectively).

Table 3 Frequency table of types of inhalers that patients use

Type of inhaler	Frequency	Percent (%)
MDI (alone)	43	39
Diskus (alone)	11	10
Turbuhaler (alone)	4	4
Handihaler (alone)	17	15
MDI with Diskus	31	28
MDI with Turbuhaler	4	4

Inhalation techniques

Patients participating in the study used four different types of inhalers (Table 3). A total of 68% of patients used a single inhaler, and 32% used two different inhalers. The most common inhaler type used was a metered-dose inhaler (n = 78, 71%), and the least common was a turbuhaler (n = 8, 7%). Even though 92% of patients perceived that they know how to use their medications, our assessment showed that only 10 patients (9%) were using inhalers correctly, while 75% of the patients made at least one critical mistake during the inhaler use demonstration. The frequencies of the observed mistakes are shown in Fig. 2. Demographic factors have no significant effect on the occurrence of critical mistakes during inhaler use ($p < 0.05$). Regarding making critical mistakes, there was a significant difference between users with only one type of inhaler and those with two type inhalers (71% and 97% respectively, $p < 0.0001$).

HCPs' perception

Physician's perceptions about responsibility in counseling patients

According to the information obtained from the interviews, physicians stated that they talked with patients more frequently about the effect and use of medicines than about potential side effects ($p < 0.001$). Physicians stated that they informed patients about the names of medicines used for treatment, what each medicine does, how to use the medicines and how to obtain additional supplies on every visit. Regarding potential side effects, they expressed that they occasionally talked to patients about them (Table 4).

Most physicians (4 out of 6) thought that they are responsible for informing patients about the action and usage of the medications. Only half of them thought that both physicians and pharmacists have a mutual responsibility in informing patients on potential side effects and warnings.

Pharmacist's perception about responsibility in counseling patients

The majority of pharmacists considered themselves to be responsible for counseling patients in each topic of action-usage and potential problems. In contrast to these perceptions, pharmacists expressed that in their actual practice, they counseled patients only when patients asked a question about the effects and use of medicines and potential

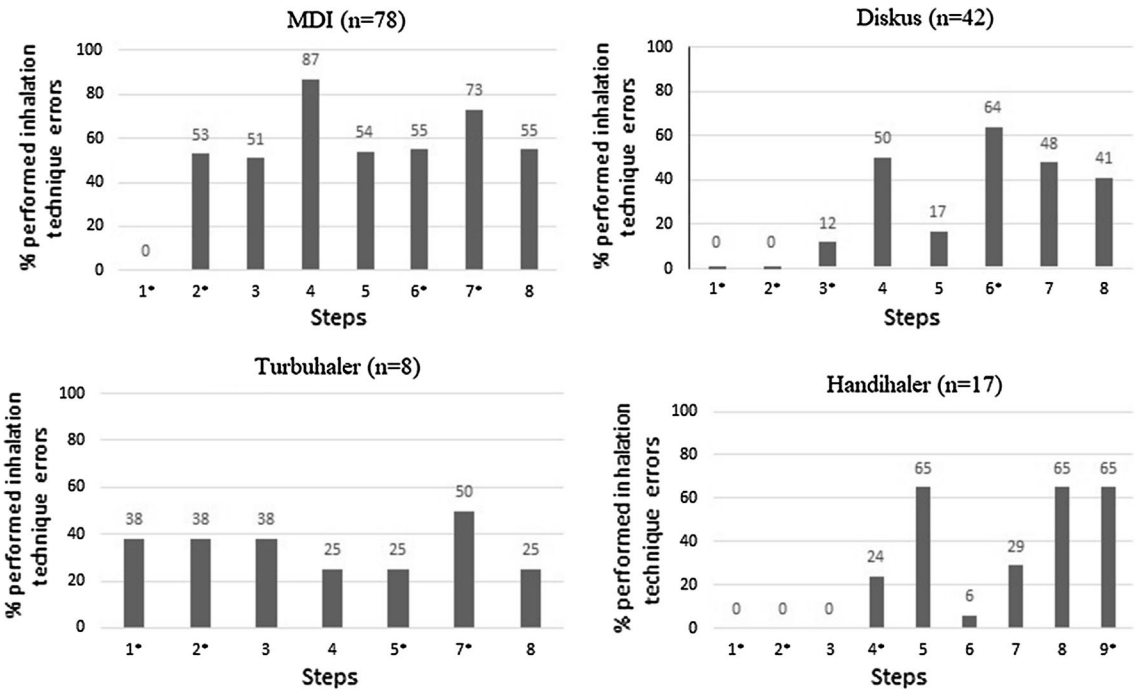

Fig. 2 Percentage of patients demonstrating inhalation errors for each step of the checklist. *Critical mistakes (shown in Fig. 1)

Table 4 Frequency table of HCPs role perception and how often they discuss topics with patients

	Whose responsibility is it to discuss these topics? Frequency (%)						How often do you discuss these topics with your patients? Median (IQR)	
	Dr			Pharm				
	Doctor	Pharmacist	Both	Doctor	Pharmacist	Both	Doctors	Pharmacists
What is your medicine called?	4 (67)	–	2 (33)	24 (32)	9 (12)	43 (56)	5 (0)	4 (1)
What is each medicine for?	4 (67)	–	2 (33)	12 (16)	21 (28)	43 (56)	5 (0.5)	4 (2)
What your medicine does?	4 (67)	–	2 (33)	6 (8)	30 (40)	40 (52)	5 (0)	4 (1)
How does your medicine Works?	4 (67)	–	2 (33)	8 (10)	34 (45)	34 (45)	5 (0.25)	2 (2)
How long will your medicine take to act?	4 (67)	–	2 (33)	14 (18)	32 (42)	30 (40)	5 (1.25)	3 (1)
How can you tell if it is working?	4 (67)	–	2 (33)	6 (8)	39 (51)	31 (41)	5 (2)	3 (1)
How long will you use your medications?	4 (67)	–	2 (33)	23 (30)	17 (22)	36 (48)	5 (0.25)	2 (1)
Do you know how to use your medicine?	3 (50)	–	3 (50)	2 (3)	42 (55)	32 (42)	5 (0)	2 (0)
How to get a further supply?	4 (67)	–	2 (33)	8 (10)	34 (45)	34 (45)	5 (0)	5 (2)
Whether the medicine has any unwanted effects?	4 (67)	–	2 (33)	22 (29)	15 (20)	39 (51)	5 (0)	4 (3)
What are the risks of you getting side effects?	4 (67)	–	2 (33)	5 (7)	27 (35)	44 (58)	5 (1.25)	4 (2)
What should you do if you experience an unwanted effects?	4 (67)	–	2 (33)	14 (18)	23 (30)	39 (51)	4.5 (2)	2 (2)
Whether you can drink alcohol with your medicine?	4 (67)	–	2 (33)	27 (35)	15 (20)	34 (45)	5 (1)	2 (1)
Whether the medicines interfere with other medicines	3 (50)	–	3 (50)	1 (1)	53 (70)	22 (29)	4 (1.25)	4 (2.75)
Medications make you feel drowsy?	4 (67)	–	2 (33)	5 (7)	52 (68)	19 (25)	3.5 (2.25)	3 (2)
Whether the medication will affect your sex life?	4 (67)	–	2 (33)	3 (4)	51 (67)	22 (29)	2.5 (4)	3 (1.75)
What should you do if you forget to take a dose?	4 (67)	–	2 (33)	16 (21)	33 (44)	27 (35)	2 (2)	2 (0)

How often do you discuss with your patients? (1 never, 2 rare, 3 when asked, 4 often, 5 always)

IQR Interquartile range

problems, while some of them provided counseling only if the patient came to the pharmacy with a prescription and was going to use that prescribed drug for the first time (Table 4).

Discussion

This is the first study in North Cyprus that examines patients' inhaler handling techniques and measures their satisfaction and the perceived role of HCPs. In our study, we found that the majority of patients made critical errors during inhaler use (75%). Also, surveyed patients were not satisfied with the information they received about potential problems and side effects.

The results observed from our study in terms of the knowledge and satisfaction of patients regarding the information they received is similar to the findings of other studies carried out using the same instrument to measure patients' satisfaction [35–39]. Patients had less knowledge and were not satisfied with the information they received from the HCPs about potential problems and side effects. Most of the patients stated that they largely do not receive enough relevant information. Although physicians reported that they always counsel their patients, yet most of the time they inform about action and usage of medications only. However, pharmacists counsel their patients only when patients ask a question regarding their medicine. A study conducted by Auyeung et al. also reported that patients had less knowledge about potential problems and side effects of drugs and that healthcare professionals discussed this less frequently with patients [35]. Informing patients about side effects has some risks. HCPs may avoid talking about the side effects of medications because this may lead to discontinuation of the therapy. The attitudes of HCPs toward educating on side effects were also similar in previous studies conducted elsewhere on different patient groups [29, 38–42]. This attitude of HCPs may cause dissatisfaction and make patients seek other resources. Many patients reported that they seek information from the internet, patient information leaflets or other experienced patients. As the quality and quantity of information obtained from these resources are not equally standardized, the information received from some of these resources can negatively affect the treatment process. Healthcare professionals should provide the necessary information to patients and direct them to accurate resources (Patient information leaflets, official websites, official drug information resources, etc.) in order to avoid potential negative outcomes of biased or inaccurate information.

Selinger proved in his study that the information obtained from informal websites did not contribute any positive effects towards the treatment of patients, but in fact had a negative impact [43]. Acquiring the right patient education from the right information resource is of utmost importance for the effectiveness of treatments. It has been observed that sufficient patient education was not achieved because most pharmacists were not proactive in delivering patient education, although some were aware of their responsibility to educate patients.

To achieve treatment goals in asthma and COPD patients, assuring patients' competency in using inhalers is crucial (4, 5). Our study found that 75% of patients make critical mistakes during inhaler use, which is significantly greater than the incidence of inhalation errors reported in the literature, which ranged between 19.8% and 59% [16, 30, 44–49]. In other studies, while factors such as age, gender, level of education have been found to affect the incidence of critical errors [47–51], in this study it has been observed that these factors have no significant effect on the occurrence of critical errors during inhaler use. Coordination and inhalation mistakes were found to be frequent and critical in our study. Other studies had similar findings with MDI use and proved that such mistakes can cause poor disease control and decrease medication outcomes [16, 44, 45]. Dry-powder inhalers (Diskus, Turbuhaler, Handihaler) require a different inhalation technique. Our findings show that the most frequent and critical error with this type of inhaler is the method of inhalation. Patients generally inhale with these inhalers as if they are breathing normally. This may cause low deposition of the medication in the lungs. Other studies have also shown the same trend with DPI use and proved that this mistake is critical due to the associated poor disease control and decreased medication outcomes [16, 44, 45]. It is also important to highlight that the prevalence of making critical mistakes was greater in patients using two different types of inhalers. Different types of inhalers require different usage techniques. The majority of patients who use different types of inhalers may not be aware of this, which may explain the increased prevalence of critical mistakes in this population. To overcome this, it is recommended prescribing the same type of inhaler devices for relevant patients [52–55]. HCPs can also prevent such problems by providing proper and adequate education and training. In the long term, HCPs should regularly control and verify the patients' competency on inhaler handling [16]. In the state hospitals of North Cyprus, pharmacists working in the hospital pharmacy are only responsible for supplying drugs to inpatients. They do not provide any other pharmacy services. Counseling patients before discharge from the hospital by a pharmacist may improve therapeutic outcomes. To overcome busy clinic hours and share the responsibility of patient education, clinical pharmacist services can be integrated in the state hospitals of North Cyprus. In addition to receiving physicians' advice, patients should be counseled by a pharmacist before they are discharged from hospital. Studies showed that when patients are educated by clinical pharmacist before being discharge from the hospital, this has a significant effect on patient adherence and therapeutic outcomes [56, 57].

One of the major limitations of this study is that only six respiratory disease physicians working in government hospitals were surveyed, while 76 pharmacists were interviewed. This difference in numbers limits statistical comparison between the two groups. Even though nurses are healthcare professionals, they were excluded in this study because the outpatients did not have contact with the nurses during their clinical visit. Another limitation is due to the prevalence of asthma and COPD. In the study setting less number of COPD patients were surveyed compared to asthma which may restrain the generalization of results to this population. Future studies may qualitatively assess the barriers preventing effective counseling in pharmacies in North Cyprus.

Conclusion

In spite of patients' positive perceptions of their knowledge of drug use and HCPs' satisfaction with their counseling practice, three quarters of the patients made at least one critical mistake when using inhalation demonstration kits. Patients reported that they obtain the least amount of counseling information from pharmacists, though they are generally dissatisfied with information they receive from HCP. Similarly, pharmacists stated that they mostly provide counseling on patient request. Major differences between the expectations of physicians and pharmacists in patient education were observed; respiratory physicians play a more prominent role in patient education on medicine, while pharmacists' contribution was less visible. Patients also reported that they are less satisfied with the information regarding potential side effects. More effort is warranted by HCPs (especially pharmacists) on patient education to limit critical mistakes while using inhalers, as the integration of clinical pharmacy services into government hospitals may further improve the quality of patient education and care provided to respiratory disease patients.

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