Internists in training; what do they know about inhalers?

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ماذا يعرف المقيمون المتدرِّبون عن الـمَنَاشِق

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الخلاصة: أُجريت هذه الدراسة بغرض اختبار مدى قدرة الأطباء المقيمين في المستشفيات للتدريب على التعرُّف على ستة أنماط مختلفة من الـمَنَاشِق وعرض كيفية استخدامها. وقد بلغت نسبة من لم يتعرَّف على الـمَنَاشِق الشائع استخدامها، 61٪ للمنشقة المحدَّدة الجرعات metered-dose inhaler، و49٪ للمِنْشَقَة من نمط تربوهيلر Turbuhaler، و78٪ للمِنْشَقَة من نمط ديسكوس Diskus، و90٪ للمِنْشَقَة من نمط ديسك هيلر Diskhaler. وكانت نسبة من لم يتمكن من عرض طريقة الاستعمال الصحيحة لهذه الأنماط من المناشق: 24٪، و53٪، و81٪، و93٪ على الترتيب. ولم يتمكن أي من هؤلاء الأطباء (صفر٪) من التعرُّف على الـمِنْشَقَة من نمط روتاهيلر Rotahaler والـمِنْشَقَة من نمط أيروليزر Aerolizer أو معرفة طريقة الاستعمال الصحيح لهما. ولم يكن أي من الأطباء قد حصل على تثقيف رسمي حول طريقة استعمال الـمَنَاشِق في مرحلة التدريب، في حين أن 2٪ منهم فقط حضروا دورات تدريبية على يد مثقفين طبيِّين.

ABSTRACT The study tested the knowledge of internal medicine residents in recognizing the types and demonstrating the ways of using 6 different inhalers. Of the residents 61%, 49%, 78% and 90% were unable to recognize commonly used devices (a metered dose inhaler, Turbuhaler, Diskus and Diskhaler respectively), while 24%, 53%, 81% and 93% were unable to demonstrate the correct the ways of using them. None of the residents (0%) were able to recognize or to demonstrate the use of Rotahaler and Aerolizer correctly. None of them had received any formal education about the use of the inhalers during their training, while only 2% had attended sessions with medical educators.

Formation des médecins internistes : que connaissent-ils des inhalateurs ?
RÉSUMÉ Cette étude a évalué les capacités de résidents en médecine interne à distinguer les différents types d'inhalateurs et à faire la démonstration du mode d'emploi de 6 inhalateurs différents. Soixante et un pour cent (61 %), 49 %, 78 % et 90 % des résidents se sont révélés incapables de reconnaître les dispositifs inhalateurs d'usage courant, à savoir respectivement un inhalateur-doseur et les dispositifs Turbuhaler, Diskus et Diskhaler, tandis que 24 %, 53 %, 81 % et 93 % d'entre eux se trouvaient dans l'incapacité d'en expliquer correctement le mode d'emploi. Aucun (0 %) de ces résidents n'a été en mesure d'identifier ou de faire fonctionner les modèles Rotahaler et Aerolizer correctement. Aucun des résidents n'avait été formé à la manipulation des inhalateurs dans le cadre du cursus officiel et seuls 2 % avaient suivi un stage sous la direction de formateurs spécialisés.

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Introduction

Patient education has become an important component in the management of bronchial asthma. The latest, national and international guidelines have stressed the importance of education for asthmatics [*1–4*]. However, these guidelines have a wide range of recommendations that provide patients with appropriate simple facts about the nature of asthma, to correct any sociocultural misconceptions regarding asthma and when and how to use the inhaled therapy and the inhaler devices correctly [*1–4*]. However, education should be individualized according to the patient's requirements, as these are different from one country to another. In a study from Riyadh, more than 50% of asthmatics have poor inhalation technique mainly due to lack of proper education [*5*]. Good inhalation technique has been associated with decreased asthma symptoms [*6–8*] and improvement in forced expiratory volume in 1 second (FEV1) and peak expiratory flow rate (PEFR) [*9,10*].

A previous study from King Abdulaziz University Hospital, Jeddah, has shown a positive correlation between good inhalation technique and reduction of emergency room visits and hospitalizations in chronic asthmatics [*10*]. Another study from our centre has shown a significant reduction of incorrect inhalation technique before and after an educational programme used in 2 sets of patients using a metered dose inhaler (MDI), and the Turbuhaler® [*11*]. The success of this protocol was related to the fact that it was provided by a pulmonologist and a medical educator nurse in the outpatient's asthma clinic. Poor inhalation technique is not limited to the patients themselves but physicians responsible for education may not understand the factors responsible for optimal aerosol delivery [*12–17*].

Most of the teaching hospitals in the western province of Saudi Arabia have medical educators and an asthma clinic where almost all residents do a rotation as part of their training. However, observations suggest that residents have inadequate training and most of them are unable to recognize the different types of currently used inhalers or to demonstrate the ways of using it correctly. Therefore, the aims of this study were to assess the ability of internal medicine residents to recognize 6 different inhalers commonly used by asthmatics in this country and to assess their knowledge and skills to demonstrate the correct way of using each inhaler. It also assessed whether the level of residency has an effect on recognition and use of such inhalers.

Methods

This study was performed prospectively in 8 teaching hospitals in the western province of Saudi Arabia: 5 hospitals in Jeddah, 2 hospitals in Mecca and 1 in Taif. These hospitals were recognized by the Saudi Council for Medical Specialties as training centres for residents enrolled for the Saudi Board of Internal Medicine.

A total of 41 internal medicine residents were recruited for the study (29 from Jeddah hospitals, 9 from Mecca, and 3 from Taif). All residents were interviewed, and asked to fill a questionnaire that included personal data such as age, sex, date of graduation, duration of experience, centre of training, and the level of residency (from year R1 to R4). They were also asked whether they had done a rotation in the asthma clinic, participated in educating patients in using their inhalers or had attended any of the teaching sessions provided by the medical educators. The average number of asthma patients

seen per clinic per week was recorded. They were also asked if they ever have had any formal teaching in the use of inhalers during their training.

In this study, 6 types of different inhalers were used: a metered dose inhaler (MDI) (Glaxo, England), the Turbuhaler® (AstraZeneca, Sweden), the Diskus® (Glaxo, England), the Diskhaler® (Glaxo, England), the Rotahaler® (Allen and Hanburys, England) and the Aerolizer® (Novartis, Switzerland). Each resident was shown the inhalers one by one and asked to name the type of inhaler and then to demonstrate the essential steps of using it correctly. Any resident who did not recognize the inhaler was also asked to demonstrate its mode of use. This process was repeated with each inhaler. All residents were interviewed in their centre for 20–30 minutes by the same researcher during the whole period of the study. The inclusion criteria for the study were: internal medicine residents from R1 to R4, already done a rotation in the asthma clinic during training, worked in teaching hospitals recognized by the Saudi Council for Medical Specialties, and agreed to participate in the study. Residents who were unable to demonstrate one or more of the essential steps for using any of the 6 inhalers were considered as "Don't know" for that particular inhaler. For cross-tabulation analysis R1 and R2 residents were grouped together and considered as junior residents while R3 and R4 residents were considered as senior residents.

Data management and statistical analysis

The data was entered into a computer database and scrutinized for outliers. The analysis was carried out using *SPSS,* version 10. Descriptive statistics [mean, standard deviation (SD) and frequencies] were performed to describe the studied variables. Chi-squared test was used from cross-tabulations. The level of significance was < 0.05.

Results

A total of 41 internal medicine residents were studied (Table 1); 73.2% were male, and the overall mean (SD) age was 29.6 (3.0) years (minimum 25 and maximum 39 years). The mean (SD) duration of experience was 4.3 (2.2) years (minimum 1

Table 1 Characteristic of the internal medicine residents (n = 41)

Variable	Value	
	Mean	(SD)
Age (years)	29.6	(3.0)
Duration of experience (years)	4.3	(2.2)
	No.	%
Sex		
Male	30	73
Female	11	27
Level of residency		
R1	13	32
R2	11	27
R3	3	7
R4	14	34
No. of asthma patients seen/ clinic/week		
1–5	17	42
6–10	10	24
11–15	13	32
≥ 16	1	2
Received formal education about inhalers	0	0
Learned about inhalers during rotation	27	66
Attended with medical educator	1	2
Ever educate asthmatics about use of inhalers	21	51

SD = standard deviation.

and maximum 10 years). Two thirds of the residents were in R4 and R1 (34.0% and 31.7%).

Though all residents had done a rotation in an asthma clinic, only 2% of residents had attended with medical educators during their rotation. None of the residents (100%) had ever received any formal education during their training regarding the use of such inhalers. However, 66% of the residents had learned on their own about the use of some inhalers. Only 51% of the residents had participated in educating asthma patients; 32% of residents had regularly seen up to 15 patients per clinic per week, while 42% of residents had only seen up to 5 patients per clinic per week.

Overall 39% and 51% of residents recognized the MDI and Turbuhaler devices, respectively, while only 22% and 10% of them recognized the Diskus and the Diskhaler, respectively (Table 2). Overall, 76% and 46% of residents correctly demonstrated the ways of using MDI and Turbuhaler respectively (Table 2), while the minority of residents (20% and 7%) correctly demonstrated the ways of using Diskus and Diskhaler respectively. None of the residents recognized the types or demonstrated the ways of using the Rotahaler and the Aerolizer devices correctly (Table 2).

Table 3 compares junior (n = 24) and senior residents (n = 17) in recognizing the types and the ways of using the inhalers correctly. A higher proportion of senior residents recognized and correctly demonstrated the ways of using the older device (MDI) (41% and 82% respectively) than did the junior residents (38% and 71%). However, a higher proportion of junior residents recognized the new devices (Diskus and Diskhaler) (25% and 13% respectively) than did the senior residents (18% and 6% respectively) and more of them correctly demonstrated their mode of use (21% and 8%) than the senior residents (18% and 6%). However, the differences between the 2 groups were not statistically significant ($P > 0.05$).

Discussion

This prospective study assessing residents' recognition and knowledge of use of 6 different inhalers has shown 3 important

Table 2 Percentage of internal medicine residents (n = 41) who recognized and knew how to use the 6 different inhalers commonly used by asthmatics

Type of inhaler	Recognize the type		Don't recognize		Know how to use it		Don't know how to use	
	No.	%	No.	%	No.	%	No.	%
Metered dose inhaler	16	39	25	61	31	76	10	24
Turbuhaler	21	51	20	49	19	46	22	54
Diskus	9	22	32	78	8	20	33	81
Diskhaler	4	10	37	90	3	7	38	93
Rotahaler	0	0	41	100	0	0	41	100
Aerolizer	0	0	41	100	0	0	41	100

Table 3 Comparison of junior (years R1 and R2), and senior residents (years R3 and R4) in recognizing the type and the way of using inhalers correctly

Item	Junior residents (n = 24) %	Senior residents (n = 17) %	P-value
Recognize the type			
Metered dose inhaler	38	41	1.0
Turbuhaler	46	59	0.53
Diskus	25	18	0.71
Diskhaler	13	6	0.63
Know how to use it			
Metered dose inhaler	71	82	0.48
Turbuhaler	50	41	0.75
Diskus	21	18	1.0
Diskhaler	8	6	1.0

P > 0.05.

findings. First, most of the residents (61%, 49% and 78%) did not recognize the most commonly used inhalers—MDI, Turbuhaler and Diskus respectively—while up to 90%, 100% and 100% did not recognize the less commonly used ones—Diskhaler, Rotahaler and Aerolizer respectively. Second, 24%, 54%, 81%, 93%, 100% and 100% of residents were unable to demonstrate the correct ways of using MDI, Turbuhaler, Diskus, Diskhaler, Rotahaler and Aerolizer respectively. Third, there were no statistically significant differences between the senior and the junior residents in recognizing the types or in correctly demonstrating the ways of using inhalers correctly.

This study highlighted that internal medicine residents who have done a rotation in the asthma clinic and interacted directly with patients were inadequately trained in the proper use of different types of inhalers usually used by our patients. Currently, MDI, Turbuhaler and Diskus are the commonest 3 devices used by our patients. Although MDI was the oldest device available in our pharmacies, and the most widely used for a long time by our patients, surprisingly 61% of residents did not recognize the device and 24% were still unable to demonstrate the essential steps of using it correctly. This study was comparable with a previous study by Interiano et al. that showed up to 39% of house staff was unable to use the MDI correctly [*14*]. A similar study by Kelling showed physician's knowledge of the correct use of inhalers was inadequate [*12*]. In 1995, Jones et al. concluded that emergency physicians, house staff and nurses responsible for instructing patients in optimal inhaler use have poor skills with these devices [*16*]. Interestingly, another study by Taylor found that patients and health care professionals made remarkably similar mistakes in inhaler technique [*18*].

Turbuhaler is a multi-dose dry powder inhaler [*19*]. It has become very popular and is commonly prescribed for patients because of its simplicity to use over the MDI. In a previous study on our asthmatics we found that mistakes in inhalation technique

in asthmatics using Turbuhaler and MDI were almost reduced to zero after education [*11*]. Interestingly, 49% of our residents did not recognize the Turbuhaler device while 54% did not know how to demonstrate its use correctly.

Diskus is another dry powder inhaler that has been recently introduced into the Saudi Arabian markets and gained wide popularity because the device is relatively simple to use. Therefore, we were surprised that only 22% of our residents could recognize it, while less than 20% could demonstrate its use correctly.

Although Diskhaler was introduced into our markets earlier than Diskus it did not gain wide popularity among doctors or patients, because the device was relatively difficult to use. This could explain why more than 90% of our residents neither recognized it nor demonstrated its use correctly.

Rotahaler was one of the oldest devices that used to be prescribed more commonly for our asthmatics. However, since the introduction of the MDI and the Turbuhaler devices, it has become less popular among doctors for prescribing.

Aerolizer is also a dry powder inhaler that had been introduced into our markets earlier and used by our asthmatics for a longer period of time than Diskus. The fact that none of the residents recognized the Rotahaler or the Aerolizer may raise a question regarding the quality of training they have received.

Due to the high prevalence of bronchial asthma in Saudi Arabia [*20*], most of the teaching hospitals nowadays have introduced asthma clinics and medical educators into their services. The aims of these services are to provide asthmatics with better care, to educate patients about the ways of using their inhalers correctly and in addition to train residents regarding asthma management. Training is usually under the supervision of faculty consultants who are specialists in the field and according to well-known guidelines for asthma management [*1–4*]. Several studies have shown that care by specialists with a special interest in asthma was associated with better outcomes [*21–23*].

Although all residents in this study had done a rotation in an asthma clinic, most of them were unable to recognize the types of most inhalers or to demonstrate the correct ways of using them. This indicates that there is a significant defect in their training, confirmed by the fact that none of the residents reported having received any formal education regarding the use of such inhalers, while those who have learned on their own (66%) still had poor performance. Formal teaching on the use of such inhalers is not a part of the core curriculum training in many teaching hospitals including the hospital in this study.

Teaching asthmatics how to use their inhalers is always a time-consuming process that requires between 10 and 25 minutes for each patient [*11,24*]. Therefore, on most occasions in our hospitals it is carried out by the medical educators rather than by the hospital consultants, and very few of our residents had ever participated with the medical educators in any teaching sessions for asthmatics. Busy clinics leave the attending physicians with no spare time to educate their residents. Another factor is the rapid innovation of new devices every few years.

It appears, therefore, that several factors may have contributed to the disappointing knowledge of the residents in the proper use of different inhalers. The consequences of the lack of proficiency in the correct use of inhalers on the part of internal medicine residents may lead to poor inhalation technique by our asthma patients. Several

studies have shown a positive correlation between a poor inhalation technique and an increased incidence of emergency visits and hospitalizations in asthmatics that was reduced significantly after educating them on how to use their inhalers correctly [*6–8,10*]. Therefore, training our residents to recognize the types and to demonstrate the correct ways of using the inhalers to their patients may help to control patient's symptoms, reduce asthma exacerbations and improve long-term management of asthma. This study has an advantage in that it was the first to evaluate the knowledge and the skills of our residents to use 6 different inhalers at one time. There were no similar previous studies to compare their findings with ours. However, the drawback of this study was the small number of residents involved and the strict criteria used to assess the correct ways of using such inhalers.

In conclusion, this study has shown clearly that most of the internal medicine residents were unable to recognize the different types of the most commonly used inhalers or to demonstrate the correct ways of using them. Absence of formal teaching from the core curriculum training in all of the teaching hospitals was considered as the main factor responsible for that particular defect in their training. Therefore, we recommend a formal education about the use of the inhalers to be added to the core curriculum training of our residents. It should include demonstration of the correct ways of using all kind of inhalers available, whether old or new types, and must be considered an essential skill to be mastered before graduation.

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