

Metered-dose inhaler technique among healthcare providers practising in Oman

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مدى إتقان مقدمي الخدمات الصحية في السلطنة لإستعمال البخاخ المعير

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الملخص: الهدف: تقييم مدى صحة استعمال البخاخ المعير من قبل مقدمي الخدمات الصحية بالسلطنة. **الطريقة:** على هامش ندوات معالجة الربو في خمس مناطق بالسلطنة قام ١٥٠ مشاركا من زوار معرض الربو التثقيفي (١٠٧ أطباء و ٣٣ ممرضة و ١٠ صيادلة بعرض كيفية استخدام البخاخ المعير تحت مراقبة أحد أفراد فريق البحث وذلك للتأكد من مدى صحة استخدام البخاخ على ضوء قائمة مضبوطة مكونة من ٩ خطوات. وكان المشاركون قد أجابوا قبلها على استبيان مبسط يبين مدى مشاركتهم في وصف وتعليم طرق استخدام البخاخ للمرضى. **النتائج:** أظهرت الدراسة أن ١٤٨ مشاركا (٩٩%) كانوا يقومون فعلا بتعليم مرضى الربو طريقة استعمال البخاخ المعير وأن ١٠٣ من الأطباء (٩٦%) يقومون بوصف الأدوية لعلاج الربو، إلا أن ٢٢ مشاركا فقط أتقنوا جميع خطوات استعمال البخاخ المعير. وأوضحت الدراسة أن أداء الأطباء أفضل من غيرهم من المشاركين (٢٠% مقابل ٢%) وكان أداء أطباء الأمراض الباطنية أفضل من نظرائهم من أطباء الطوارئ (٩%) والأطباء العامين (٥%). **الاستنتاج:** تبين لنا أن معظم العاملين في الحقل الصحي ممن يقومون بتعليم مرضى الربو على استعمال البخاخ المعير لا يتقنون استعماله بالطريقة الصحيحة. مما يشير الى ضرورة تنظيم برامج تدريبية تشمل جميع من يقوم بإرشاد وتثقيف مرضى الربو لضمان إتقان الخطوات الصحيحة لاستعمال البخاخ.

ABSTRACT. Objective: To evaluate the correctness of metered-dose inhaler (MDI) technique in a sample of healthcare providers practising in Oman, considering that poor inhaler technique is a common problem both in asthma patients and healthcare providers, which contributes to poor asthma control. **Method:** A total of 150 healthcare providers (107 physicians, 33 nurses and 10 pharmacists) who were participants in symposia on asthma management conducted in five regions of Oman, volunteered for the study. After the participants answered a questionnaire aimed at identifying their involvement in MDI prescribing and counselling, a trained observer assessed their MDI technique using a checklist of nine steps. **Results:** Of the 150 participants, 148 (99%) were involved in teaching inhaler techniques to patients, and 103 of 107 physicians (96%) had prescribed inhaled medications. However only 22 participants (15%) performed all steps correctly. Physicians performed significantly better than non-physicians (20% vs. 2%, $p < 0.05$). Among the physicians, internists performed better (26%) than general practitioners (5%) and accident and emergency doctors (9%). **Conclusion:** The majority of healthcare providers responsible for instructing patients on the correct MDI technique were unable to perform this technique correctly indicating the need for regular formal training programmes on inhaler techniques.

Key Words: metered-dose inhaler, asthma management, inhaler technique

ASTHMA IS ONE OF THE MOST COMMON CHRONIC conditions affecting both adults and children and there is evidence that its prevalence and severity are increasing.¹ Despite the recent advances in the understanding of its pathophysiology and the availability of effective treatment, asthma continues to be a major cause of morbidity leading to a significant economic burden to individuals and societies.² Poor asthma control has been related to several common and important problems.¹ These include: underdiagnosis and inadequate treatment,¹ poor patient understanding of the disease and its treatment,^{3,4} non-

compliance,⁵ and incorrect use of inhaler devices.^{6,7}

Inhaled medications form the cornerstone of asthma treatment.⁶ However, incorrect patient inhaler technique has been identified as a common and persistent problem by many studies worldwide.⁸⁻¹² Up to 90% of adult patients have been reported to have inadequate inhaler technique with higher rates of errors in children and old patients.⁸⁻¹³ Poor inhaler technique reduces the drug delivery to the airways, decreasing the efficiency of the inhaled drug.^{6,14}

The high prevalence of incorrect inhaler technique by patients has been explained by several factors.^{15,16} Most

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healthcare providers do not spend sufficient time educating patients on the correct use of the inhalers.¹⁷ Another problem is the lack of regular periodic assessment of patients' inhaler technique, essential to ensure proper use.¹² More importantly, studies show that most providers themselves have poor inhaler technique.^{18–27} Thus, they may give incorrect instructions to patients.^{26,27} In addition, the correct use of inhalers has been shown to be influenced by patients' characteristics, such as their age,¹³ literacy,²⁸ and their understanding of asthma and its treatment.⁶ Therefore, the magnitude of the problem may vary in different populations. Furthermore, formal training and demonstration of the correct use of inhalers have been shown to improve the skills of inhaler use in both patients and healthcare providers.^{29–33} Local baseline information is, therefore, essential for each country to develop its own asthma care services and educational programmes targeted at their specific problems and needs.¹

Asthma is common in Oman³⁶ and most inhaler devices including MDI and dry powder inhalers (rotahalers diskhalers and turbohalers) are available for its treatment. However, there are no published data on the ability of patients and healthcare providers in Oman to use these inhalers correctly.

This study, accordingly, aimed to evaluate the ability of healthcare providers in Oman to demonstrate the correct MDI technique.

METHOD

THE PARTICIPANTS

Between December 1998 and November 1999, the respiratory units at Sultan Qaboos University Hospital and Royal Hospital conducted a series of symposia on asthma management guidelines in five different regions of Oman (Muscat, Dakhiliya, North Batinah, South Batinah, and Dhofar). All healthcare providers were invited to attend. Attendees included physicians (general practitioners, internists, paediatricians, and accident and emergency doctors), nurses and pharmacists. As part of the symposia activities, all attendees were asked and encouraged to volunteer to demonstrate their inhaler technique without prior knowledge of the purpose of the study.

PROTOCOL

After answering a brief verbal questionnaire aimed at identifying involvement in asthma management and MDI technique counselling, each participant was asked to demonstrate the use of the MDI by taking two puffs from a placebo MDI device (Glaxo/Welcome Inc. UK). One trained observer (a respiratory nurse with extensive involve-

ment in the assessment and teaching of inhalers technique to both patients and healthcare providers) using a checklist of nine steps graded the correctness of each participant technique. The nine steps [Table 2] were based on manufacturer's instructions and international clinical guidelines on the MDI technique.³⁷ Steps 1 and 4–6 were considered essential for proper delivery of the inhaled medications and the remaining steps were classified as recommended for optimal delivery but not essential.

Verbal questionnaire

This consisted of three questions: (1) What is your specialty? (2) Do you counsel patients on the use of inhalers? (3) Do you prescribe inhaler medications?

Steps of MDI technique

The acceptability of each step was defined as follows:³⁷ the participant must shake the canister vigorously and breathe out slowly and completely before each puff. Positioning was considered correct if the canister was held in the upright position and either inserted between closed lips or up to four centimetres in front the open mouth. The participant must then begin a slow inhalation just before depressing the canister once (actuation). The timing of actuation (co-ordination) was considered correct if it occurred anywhere during the first third of the slow inspiration including simultaneously with the start of inhalation. The slow inspiration must continue to total lung capacity after which the inhaler is removed and the lips kept closed, with breath-holding for at least ten seconds. Finally, the participants must wait at least 30 seconds before starting the second puff.

Table 1. Participants' specialties and involvement in MDI prescribing and counselling

Total number of participants	150
A. Physicians	107
Adult internists	27
Paediatricians	19
General practitioners	39
Accident and emergency physicians	11
Other physicians	11
Number of physicians prescribing MDI	103 (96%)
B. Non-physicians	43
Nurses	33
Pharmacists	10
Total number of participants who counsel patients on MDI use	148 (99%)

Data presentation and analysis

Data were analysed using a statistical software (SPSS for Windows) and presented in terms of frequencies. The different groups of participants were compared using the chi-square (χ^2) test and $p < 0.05$ was considered significant.

RESULTS

THE PARTICIPANTS

Table 1 shows the number of participants and their specialties. 148/150 (99%) participants reported involvement in teaching patients on the use of inhalers. The entire group consisted of three categories of healthcare providers: 107

Table 2. The nine steps of correct metered-dose inhaler technique and the percentage of healthcare providers performing each step correctly

Step	Procedure	% correct
1*	Remove cap and shake the inhaler vigorously	41
2	Breathe out slowly and completely	51
3	Hold the inhaler in the upright position	93
4*	Insert the mouthpiece into mouth between closed lips	67
5*	Depress the canister once and ...	58
6*	... at the same time begin slow deep inhalation (co-ordination)	40
7	Remove the inhaler with closed lips	42
8	Hold breath for 10-15 seconds	36
9	Wait for 20-30 seconds before starting the second puff	27

*The essential steps.

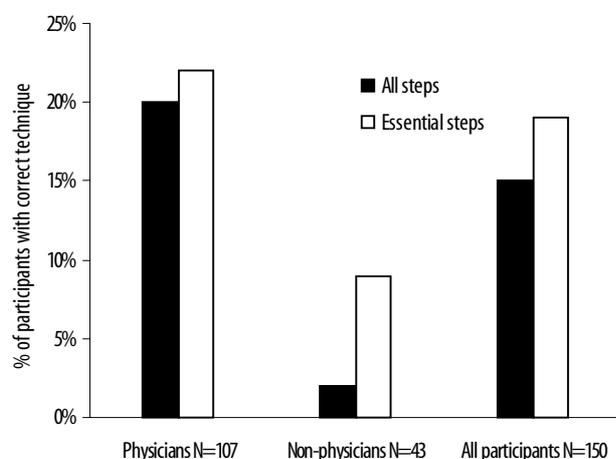


Figure 1. Percentage of health care providers who performed MDI steps correctly

physicians (71%), 23 nurses (22%) and 10 pharmacists (7%). Because of their small number, the nurses and the pharmacists were analysed as a single group: 'non-physicians'. The physicians group was heterogeneous consisting of internists, paediatricians, general practitioners, and A&E doctors. Ninety-six percent of the physicians acknowledged having prescribed inhaled medications.

INHALER TECHNIQUE

Table 2 lists the nine steps of correct MDI technique and the percentage of healthcare providers who had the correct technique for each step. Except for step 3 (holding the inhaler in upright position), the frequency of correct technique was low (27–67%). The frequency of participants who made errors was similar for both essential and preferred steps. Of the essential steps, shaking the inhaler and co-ordination (steps 1 and 6) had the highest frequency of errors (41 and 40% respectively), whereas inadequate breath-holding and waiting before starting a second puff (steps 8 and 9) were the most frequent non-essential (preferred) steps in error (36 and 27% respectively).

Figure 1 shows the frequency of participants' correct inhaler technique. Only 22/150 (15%) participants performed all steps correctly. When only essential steps were considered, the overall performance increased to 28/150 (19%). Physicians performed significantly better than non-physicians for all steps (20% vs. 2%, $p < 0.05$) and essential steps (22% vs. 9%, $p < 0.05$). Only one of the 43 non-physicians performed all steps correctly.

Figure 2 shows the frequency of physicians with correct inhaler technique according to their specialty. While the overall performance was very poor, internists (in both general medicine and paediatrics) performed relatively better

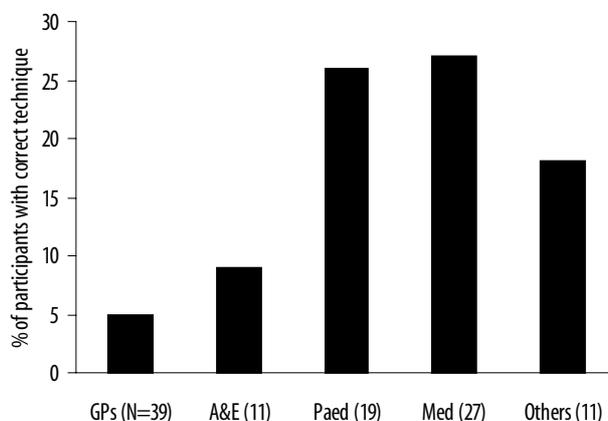


Figure 2. Percentage of physicians in different specialties who performed all MDI steps correctly

(26% each) than accident and emergency physicians (9%) and general practitioners.

DISCUSSION

The change from oral to inhaled medications as the preferred route of administration has been one of the most important developments in asthma treatment.¹ Inhaler therapy is now the preferred mode of delivery of many drugs used in the treatment of asthma and chronic obstructive pulmonary disease.^{6,11} It is the only way to deliver some drugs such as anticholinergics and sodium cromoglycate and is the preferred mode of delivery for B-agonists and corticosteroids. The major advantage of inhalation therapy is the direct delivery of medications in much smaller effective doses compared to systemic routes, thus reducing side-effects.¹¹ In addition, inhaled bronchodilators act more quickly.¹¹ The important limitation of inhaler devices is that they are more difficult to use and less convenient than tablets. Each inhaler device has its own specific sequence of steps for optimal drug delivery and it is therefore necessary to give careful and correct instruction to patients.¹ MDI, the most commonly used device, requires the patient to co-ordinate inhalation with action of the device (actuation) which can be difficult for some.^{6,16}

Patients with asthma have been shown to have poor inhaler technique, an important cause of poor asthma control.⁸⁻¹⁴ The problem is common in both children and adults affecting as many as 60 to 90% patients.^{8,15,16,25} As a result, international asthma management clinical guidelines emphasise the importance of demonstrating the correct inhaler technique at initial diagnosis and correcting patient performance at each follow-up visit.¹ Unfortunately, numerous studies consistently show that healthcare providers have poor inhaler technique.¹⁸⁻²⁷ The reported rate of correct inhaler technique among various groups of physician is in the range of 28-69% in different studies with respiratory specialist and internists performing relatively better than others.²¹⁻²⁷ For nurses, the reported rate of correct inhaler technique is in the range of 15-66%.^{20,27} In one study, respiratory therapists performed better than physicians.²¹ In another study, asthmatic patients performed better than both physicians and nurses.²⁷ However, this universal problem have been shown to improve by formal and regular training of both patients and healthcare providers.³⁰⁻³⁶

Asthma is common in Oman.³⁶ The present study is part of a comprehensive project evaluating the different aspects of asthma in this country to design a national programme for the management of asthma. The results of this study show that poor MDI technique was very common in this sample of healthcare providers. Despite being involved

in patients counselling on inhalers, only 15% of the participants were able to perform all steps correctly, which was substantially lower than reports from the literature. In addition, errors were equally frequent for both essential and non-essential (preferable) steps. Of the essential steps, the greatest number of errors occurred in shaking the inhaler and co-ordination (steps 1 and 6), whereas inadequate breath-holding and waiting before a second puff (steps 8 and 9) were the most frequent non-essential steps in error.

Although internists performed relatively better than other participants (26% had correct technique), this was still unacceptably low. Of special concern was the very poor performance of general practitioners, accident and emergency doctors, nurses and pharmacists. The burden of asthma has become so big that general practitioners and accident emergency doctors are the frontline physicians looking after asthmatic patients with the responsibility to teach them the correct use of inhalers. Because of their position, nurses and pharmacists also have opportunity to educate patients on this. It is therefore essential that all providers master the correct technique.

Training programmes involving instructions and demonstration of the inhaler technique have been shown to improve the skills of patients and providers.²⁹⁻³⁵ The very poor inhaler technique observed in our study is most probably due to the lack of any formal training for healthcare providers on the correct use of inhalers.

CONCLUSION

Healthcare providers' skill in the MDI technique in Oman is very limited, indicating the need for establishing regular educational programmes for both patients and providers. In addition, our results indicate that inhaler technique training programmes for healthcare providers must include not only the specialist, but also general practitioners, accident and emergency physicians, nurses, pharmacists and health educators. Special attention should be given to correct the errors in the essential steps of inhaler technique.

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