

Evaluation of proficiency in using different inhaler devices among intern doctors

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ABSTRACT

Context: Doctors may have deficiencies in the ability to use different inhalers, which in turn, can result in improper technique by the patients and poorly controlled asthma and chronic obstructive pulmonary disease (COPD). **Aims:** To evaluate intern doctors' proficiency in using various inhaler devices. **Materials and Methods:** Seventy interns were evaluated for their proficiency in using pressurized metered dose inhaler (pMDI), pMDI with spacer, rotahaler, turbuhaler, and nebulizer. A structured assessment sheet was scored for identification and preparation of device, administration, coordination, and skill of explanation on a scale of 0–5. Common errors such as failure to shake pMDI before use, inability to identify the empty device, inadequate breath holding, and failure to advise gargles after use were recorded. **Results:** pMDI and pMDI with spacer were identified correctly by 89% and 79% of interns. Over 90% could identify rotahaler and nebulizer whereas only 9% could identify turbuhaler. 79% and 60% could prepare pMDI and pMDI with spacer appropriately. Nebulizer preparation was performed correctly by 79% and almost all interns could not prepare turbuhaler. Only one intern administered turbuhaler correctly. About half of the participants knew the correct co-ordination for pMDI and pMDI with spacer. Two interns showed proper co-ordination in using turbuhaler. None could provide correct explanation for turbuhaler usage; whereas 76% and 70% did it for nebulizer and rotahaler, respectively. Only 43% of interns remembered to shake pMDI before use. **Conclusions:** Proficiency in using different inhaler devices amongst interns is poor. It is essential to provide adequate training for inhaler devices usage to medical graduates for proper management of asthma and COPD patients by those future primary care physicians and specialists.

Keywords: Improper technique, inhaler devices, interns, proficiency

Introduction

Management of obstructive airway diseases continues to pose a common challenge for both the primary care practitioners and specialists. Primary care practitioners serve as the first point of contact for most of the asthma and chronic obstructive pulmonary disease (COPD) patients.^[1,2] In a developing country like India, a large proportion of asthma and COPD patients do not see a specialist. All the recent guidelines available for the management of asthma and COPD recommend the use

of inhaled medications.^[3,4] It is always presumed that clinicians and health care providers have adequate knowledge about selecting an appropriate inhaler device for their patients and are proficient enough to teach their patients the correct inhaler technique. Although there are a very few studies carried out to examine the level of proficiency among the health care professionals in respect to the selection and use of various inhaler devices, there is some evidence available to suggest that a large number of patients do not receive inhaler instructions from the treating health care professionals. The pressurized metered dose inhaler (pMDI) was the first one to be introduced in 1956.^[5] Although, there are various inhalers available to deliver a variety of inhaled medications to patients with asthma and

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COPD, a significant proportion of these patients do not derive optimal benefit from the inhaler device prescribed to them, because of poor inhaler technique.^[6] It is proven through the review of various randomized controlled trials^[7-12] that there is no difference in the efficacy of various devices available, rather patients demonstrate sub-optimal inhaler technique^[13,14] because of lack of proper information, education and demonstration of inhaler technique by the treating health care professionals. To achieve optimal drug delivery into the lungs, different inhaler devices require to be used with a correct technique. For an example, while using pMDI, certain crucial steps need to be followed such as removing the cap, shaking the device, inhalation timed to synchronize with device actuation (co-ordination), inhaling from functional residual capacity or residual volume, inhalation has to be slow and deep and breath-hold of 5–10 s. The most frequent error encountered while using pMDI is a failure to co-ordinate.^[15-17] Similarly, the patients with severe airflow obstruction are unable to generate sufficient energy inside their dry powder inhaler (DPI). In such cases, inhaler technique needs to be checked routinely and if necessary, alteration in the type of the device should be considered.^[18] Poor inhalation technique can be associated with poorer asthma control, increased morbidity, mortality, and cost of asthma treatment.^[8] Some of the patients may initially have satisfactory inhalation technique and with time they may develop poor handling of the inhaler device.^[19] Regular assessment, education, and reinforcement are needed to ensure the correct inhalation technique.^[20]

Objective and rationale

The study was designed with an objective of assessing and evaluating the possibility of a gap between theoretical knowledge and practical competency among intern doctors regarding techniques of using various inhaler devices. As most of the guidelines recommend primary assessment and treatment of asthma and COPD by primary care practitioners (family physicians) and many of the recently graduated interns would pursue primary care as their career, it is vital for them to be satisfactorily familiar with the usage of common inhaler devices.

Materials and Methods

Seventy intern doctors of one academic year and same class who were taught in same circumstances were evaluated after their written and informed consent regarding their proficiency in using five inhaler devices namely pMDI, pMDI with spacer, two DPIs including rotahaler and turbuhaler and nebulizer. Placebo devices were used for our study. There were 49 males (70%) and 21 (30%) females. None of the interns were using inhaler devices for themselves or for their family members. A structured assessment sheet was prepared to maintain objectivity and trustworthiness of data collection and the technique for usage of different inhaler devices was scored with parameters such as identification of the device, preparation of the device, drug administration, coordination (synchronization) and skill to educate or explain the patients regarding the inhaler technique [Table 1]. Data

collection and assessment was done by primary investigator only to prevent interobserver errors. One point was given for each skill performed correctly and zero for incorrectly. The maximum score was 5 for each device. The number of interns who performed each skill correctly or incorrectly was noted for individual inhaler devices. The score distribution for different inhalers was noted on a scale of 0–5. We also recorded the occurrence of common errors committed by the participants including failure to shake the pMDI before use, inability to identify the empty device, inadequate breath holding, and failure to advise for gargles or mouth rinsing after use [Table 2]. The number and percentage of subjects making each error were noted. The study was approved by the Human Research Ethics Committee of our Medical College and Teaching Hospital. The participation was voluntary for interns and written informed consent was obtained from each participant before inclusion in the study.

Results

We have analyzed results in three aspects named interns' proficiency in using each device, comparison of proficiency for various devices and occurrence of common errors.

Assessment of proficiency of different skills to use various inhaler devices

Table 3 and Figure 1 show the number and percentage of interns who performed the essential skills correctly, for each inhaler device. pMDI and pMDI with spacer were identified correctly by 89% and 79% of participants, respectively. The number of interns who identified rotahaler and nebulizer was above 90% whereas majority of interns could not identify turbuhaler. Rotahaler showed the highest number of interns who could prepare the device correctly (89%). Seventy-nine percent of interns could prepare pMDI appropriately but the number

Table 1: Structured assessment sheet for proficiency for inhaler devices

Skill	Various inhaler devices (correct=1 and incorrect=0)				
	pMDI	pMDI with spacer	Rotahaler	Turbuhaler	Nebulizer
Identification					
Preparation					
Administration					
Co-ordination					
Explanation					
Total score (out of 5)					

pMDI: Pressurized metered dose inhaler

Table 2: Assessment sheet for common errors

Skill	Done correctly (yes=1/no=0)
Shake pMDI before use	
Breath holding after inhalation	
Advise gargles after use	
Identify empty device	

pMDI: Pressurized metered dose inhaler

dropped down to 60% when pMDI was combined with spacer. Nebulizer preparation was performed correctly by 79% of subjects and again, almost all of the interns could not prepare turbuhaler. A moderate number of participants administered pMDI (70%) and pMDI with spacer (61%) correctly. 11% and 16% of them could not properly administer rotahaler and nebulizer, respectively. Only one intern administered turbuhaler correctly. About half of the participants knew the correct technique of co-ordination or synchronization for pMDI and pMDI with spacer. 79% and 71% of them could perform co-ordination correctly for nebulizer and rotahaler. Two interns showed proper co-ordination in using turbuhaler. None could provide correct explanation for turbuhaler usage; whereas 76% and 70% did it for nebulizer and rotahaler, respectively. 39% showed correct explanation skills for pMDI with spacer and 54% for pMDI.

Comparison of competency

All the interns were given a score on the scale of 0–5 according to their ability to perform the various skills correctly for each device. A score of five for a particular device implies complete proficiency in using that inhaler. Thirty-four percent of interns scored 5 for pMDI and pMDI with spacer while 64% and 61% of them scored 5 for nebulizer and rotahaler, respectively. No intern could achieve a score of 5 or even 4 in the case of turbuhaler. 11% and 13% of interns got a score of 0 (meaning no proficiency at all) for pMDI and pMDI with a spacer, respectively. Less than 10% of them got a score of 0 for nebulizer and rotahaler [Table 4 and Figure 2].

Common errors

We also noted the occurrence of four common errors. Only 43% of interns remembered to shake pMDI before use. Proper

breath holding after inhalation was seen in 64% of participants. Sixty-nine percent of interns advised to perform gargles or mouth rinsing after usage, when they were asked to explain and provide instructions for using inhalers. Half of the participants could identify the empty device [Table 5 and Figure 3].

Discussion

In our country, primary care practitioners manage a vast majority of asthma and COPD patients.^[1,2] As the primary care physicians are commonly seen to be dealing with a large number of patients in short encounters, inhaler technique takes a back seat. Poor inhalation technique is associated with poorer asthma control, increased morbidity, mortality, and cost of asthma treatment.^[8]

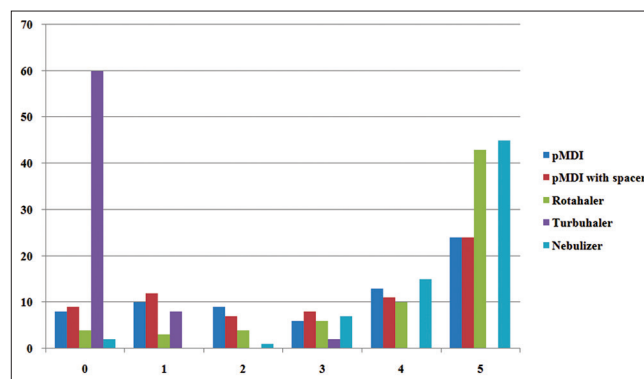


Figure 1: Proficiency for various inhaler devices

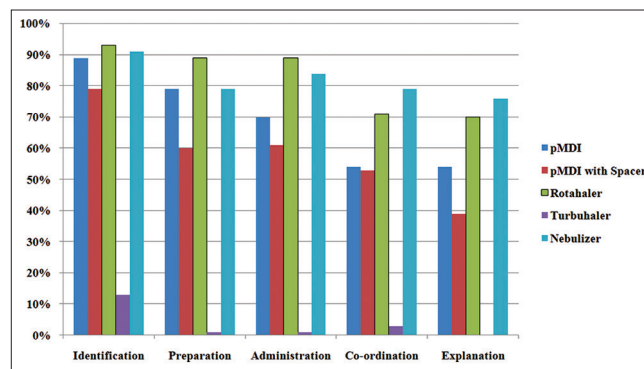


Figure 2: Proficiency of various steps of using inhaler devices

Skill	Number of interns who performed correctly (n=70) (%)				
	pMDI	pMDI with spacer	Rotahaler	Turbuhaler	Nebulizer
Identification	62 (89)	55 (79)	65 (93)	09 (13)	64 (91)
Preparation	55 (79)	42 (60)	62 (89)	01 (1)	55 (79)
Administration	49 (70)	43 (61)	62 (89)	01 (1)	59 (84)
Co-ordination	38 (54)	37 (53)	50 (71)	02 (3)	55 (79)
Explanation	38 (54)	27 (39)	49 (70)	00 (0)	53 (76)

pMDI: Pressurized metered dose inhaler

Score	Number of interns (n=70) (%)				
	pMDI	pMDI with spacer	Rotahaler	Turbuhaler	Nebulizer
0	08 (11)	09 (13)	04 (06)	60 (86)	02 (03)
1	10 (14)	12 (17)	03 (04)	08 (11)	00 (00)
2	09 (13)	07 (10)	04 (06)	00 (00)	01 (01)
3	06 (09)	08 (11)	06 (09)	02 (03)	07 (10)
4	13 (19)	11 (16)	10 (14)	00 (00)	15 (21)
5	24 (34)	24 (34)	43 (61)	00 (00)	45 (64)

pMDI: Pressurized metered dose inhaler

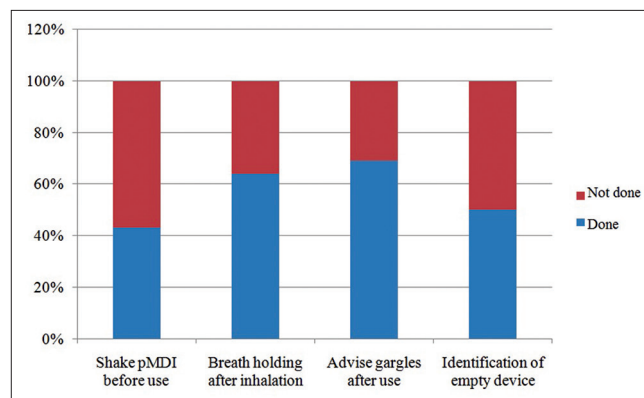


Figure 3: Common errors while using inhaler devices

Table 5: Common errors

Skill	Done correctly?	Number of interns (%)
Shake pMDI before use	Yes	30 (43)
	No	40 (57)
Breath holding after inhalation	Yes	45 (64)
	No	25 (36)
Advise gargles after use	Yes	48 (69)
	No	22 (31)
Identify empty device	Yes	35 (50)
	No	35 (50)

pMDI: Pressurized metered dose inhaler

Patients with poor inhaler technique are seen to have a less stable asthma than those who make correct use of the inhaler device.^[8]

As observed in the study by Kelling *et al.*,^[21] we also found that physicians' knowledge about the correct technique of using pMDI is poor, and we further extended their findings that doctors' knowledge and proficiency is limited not only for pMDI but also for other inhaler devices, especially the newer ones. Although correct inhaler technique means certain steps being performed correctly and in a proper order, it is not uncommon to see low levels of proficiency even among healthcare professionals in using inhalers effectively. Our results are similar to that of Hanania *et al.*,^[22] showing the proficiency of using turbuhaler to be significantly lesser than that of pMDI and pMDI with spacer. In their study, the majority of participants were totally unfamiliar with turbuhaler and in our study also, most of the interns were not able to identify turbuhaler. The common errors encountered by them were improper coordination and inadequate breath holding after inhalation, and the same pattern was observed in our study.

Exhalation to functional residual capacity or residual volume is one of the basic steps which should precede inhalation.^[23] While using pMDIs, good coordination with slow (<60 L/min) and deep inhalation is required.^[9-11] Not using slow and deep inhalation is found to be more common a mistake than the failure of co-ordination.^[12,24,25] Too fast an inhalation while using pMDI increases the chances of drug deposition in the oropharynx.^[26] Slow and deep inhalation with breath hold of 10 s helps to achieve the greatest drug deposition in the lungs.^[10] On the other hand, the inhalation has to be as deep and hard as possible while using DPI. Using DPI with slow inhalation results in the large sized particles getting deposited in the oropharynx.^[18,27-29] The absence of the essential skills and occurrence of common mistakes mentioned above were seen in our study in a significant number of interns.

All current asthma and COPD guidelines recommend assessing and evaluating treatment compliance and inhaler technique before making any alterations in the therapy.^[30,31] The results of meta-analyses have proven that all the inhaler devices are equally effective as long as patients use them correctly.^[32,33] Health care provider must make an assessment of the fact whether the patient has been prescribed an appropriate inhaler device as per the type

and severity of the disease or not. Device selection has been reviewed in the guidelines produced by the American College of Chest Physicians/American College of Allergy, Asthma, and Immunology Committee and it has been suggested that there has to be a dedicated person to assess, train, and monitor the inhaler technique in every follow-up visit.^[32]

Limitation of the study

We could not do an intervention in the form of individualized training for different inhaler devices and reevaluate for proficiency for inhaler devices. We did not have recording of evaluation process or neutral person to evaluate interns proficiency other than investigator to prevent bias.

Conclusions

The proficiency in using different inhaler devices amongst intern doctors is not satisfactory. The lack of proper technique, if not rectified, may lead to its reflection in the incorrect method of inhaler usage by patients and ultimately, poorly controlled asthma and COPD. It is required to provide adequate training for inhaler devices usage to medical graduates for proper management of asthma and COPD patients by those future primary care physicians and specialists. Skill-based education and assessment of inhaler techniques must be assured in the curriculum of medical education.

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Conflicts of interest

There are no conflicts of interest.

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