Evaluation of the Usage Techniques of the Inhalation Devices and the Effect of Training Nurses

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Abstract

Background: Incorrect usage techniques of the inhalation devices are prevalent among medical personnel.

Objective: The aim of the present study was to evaluate the nurses' usage techniques of the inhalation devices, and the early and late phase impacts of training.

Methods: This study included randomly selected 30 nurses. Four different placebo inhalation devices (metered-dose inhaler, metered-dose inhaler plus spacer, diskhaler and turbuhaler) were given to the nurses. The usage techniques of the inhalation device of nurses were evaluated in 11 steps on the first day. The evaluation was repeated at the first and 9th month following the completion of the training.

Results: The number of the nurses performing all the steps correctly was 7 for metered-dose inhaler, 5 for metered-dose inhaler plus spacer and 2 for diskhaler at pre-training phase. None of the nurses could use turbuhaler properly. The number of the nurses properly performing inhalation techniques significantly increased with training ($p<0.0001$). However, this number decreased at the late phase following training compared with the early phase ($p<0.01$). The highest percent demonstration score was obtained by MDI in pre-training phase. The percent demonstration score was 68.9 ± 28.0 for MDI, 54.5 ± 32.7 for MDI plus spacer, 35.4 ± 38.1 for diskhaler and 5.8 ± 16.8 for turbuhaler. After training, mean percent demonstration scores for all inhalation devices significantly increased ($p<0.0001$), but these values decreased at the late phase ($p<0.01$).

Conclusion: The knowledge of the nurses about the usage of inhalation devices is not sufficient. If the nurses are to be in charge in the follow-up and training of asthmatic patients, they should be trained and this training must be frequently repeated.

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Key words: *nurses, inhalation devices, usage techniques, training*

Abbreviations: *MDI: Metered Dose Inhaler, Spacer: MDI plus spacer, DH: Diskhaler, T: Turbuhaler, DS%: Percent demonstration score*

Introduction

Bronchial asthma affects about 10 million Americans and accounts for nearly 4 million office visits and 450 000 hospital admissions per year in United States. Asthma-related morbidity and mortality has increased in the last three decades (1). A significant cause of the increased morbidity and mortality is deficiency of education provided to asthmatic patients. Recently, the importance of patient education in the treatment of asthmatic patients has been emphasized and providing education to the patients has been recommended (2). Teaching the proper use of the inhalation devices composes an important part of the patient education (2-4). Inhaled aerosol treatment is the major component of asthma management and the optimal therapeutic benefit depends upon proper inhalation technique (4-6). Poor inhalation technique is an important and prevalent issue among patients with asthma and chronic obstructive

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pulmonary disease (7-11). Inadequate inhaler technique for metered dose inhalers has been reported to be as high as 62-69% (5,10).

It is very important that the physicians prescribing aerosolised medication should evaluate their patients' inhalation techniques and provide appropriate instructions. This clearly requires the medical personnel to be familiar with the correct techniques (5). Several studies have shown that many physicians, pharmacists, and nurses are not familiar with proper inhalation techniques (1,4,5,12-15). The nurses are responsible for teaching the patients the correct use of the inhalation devices in many hospitals. These facts emphasize the need to provide adequate training of nurses before they are assigned in the task of training the patients (1). In this study, we aimed to evaluate the usage techniques of the inhalation device of the nurses, and the early and late phase impacts of the training.

Material and Methods

The study was conducted from March 1996 to January 1997 in SSK Süreyyapaşa Center for Chest Diseases. Randomly selected 30 nurses were included in the study. Mean age of the nurses was 32.5 years (range 24 to 42) and mean working duration was 13.9 (range 5 to 20) years. All of the nurses were involved in the follow-up period of the patients with asthma and chronic obstructive pulmonary disease.

The same investigator who is a specialist in chest diseases interviewed all participants. Four different placebo inhalation devices (MDI, Spacer, Diskhaler and Turbuhaler) were given to the nurses and their ability to use these devices was evaluated in 11 steps on the first day (5,7,9,15). Then, correct usage techniques of inhalation devices were taught to nurses orally and by written material, and the investigator demonstrated the correct usage technique of the devices. The usage techniques of the inhalation devices by the nurses were re-evaluated at the first month (early phase) and the 9th months (late phase) following the completion of the training. The results were measured as the number of cases performed all the steps correctly and mean percent demonstration score (DS%). Percent Demonstration Score was formulated as follows: (number of correct steps/number of total steps) x 100. The steps used for evaluation of the usage techniques of the inhalation devices are shown in Table 1.

Table 1. Steps used for evaluation of the usage techniques of the inhalation devices

Steps	MDI	SPACER	DISKHALER	TURBUHALER
1	Remove the cover	Remove the cover	Remove the cover	Remove the cover
2	Shake the inhaler	Keep MDI + Spacer together	Keep DH horizontal and shake	Keep turbuhaler upright
3	Hold inhaler upright	Exhale to FRC/RV	Prepare DH (place the capsule and perforate	Rotate grip anti-clock wise and back until "click"
4	Keep head upright or slightly tilted	Keep head upright or slightly tilted	Exhale to FRC/RV	Exhale to FRC/RV
5	Exhale to FRC/RV piece between lips	Position the mouth piece between lips	Position the mouth-piece between lips	Position the mouth
6	Position the mouth-piece between lips or	Activate MDI and inhale	Inhale forcefully and deeply	Inhale forcefully and deeply
7	keep 2-4 cm away Inhale slowly and activate MDI	Continue to slow and deep inhalation	Remove the device from mouth before exhalation	Remove the device from mouth before exhale
8	Continue to slow and deep inhalation	Hear the whistle like sound	Hold breath for 10 seconds	Hold breath for 10 seconds
9	Hold breath for ten seconds	Hold breath for 10 seconds or repeat the	Exhale and get ready for 2nd use 7th -9th steps	Exhale and get ready for 2nd use
10	Exhale and wait for 20 seconds for 2nd use	Wait for 20 seconds for 2nd use	Keep DH horizontal	Keep turbuhaler upright
11	Shake the inhaler before second use	Shake MDI + Spacer before second use	Place the 2nd capsule and perforate	Rotate grip again

The results were compared by Fischer-exact and ANOVA tests.

Results

Table 2 shows mean DS% of the nurses referring to the inhalation devices. The highest DS% value was obtained by MDI at the pre-training phase, by turbuhaler at the early phase and by MDI plus spacer at the late phase following training. There was no statistically significant difference among the inhalation devices at the early phase following the training with respect to percent demonstration scores ($p>0.05$). After the training, mean DS% values for all the inhalation devices significantly increased ($p<0.0001$), but at the late phase these values decreased ($p<0.01$).

Table 2. Mean percent demonstration scores of the nurses referring to the inhalation devices

	Pre-training	After training	
		Early phase	Late phase
MDI	68.9±28.0†§	96.9±5.4	83.1±20.7
MDI+SPACER	54.5±32.7‡	96.1±8.6	89.1±14.2*
DISKHALER	35.4±38.1†	96.6±4.9	73.6±32.4
TURBUHALER	5.75±16.8§‡	98.1±5.9	64.2±33.1*
$^{\dagger}p<0.001$	$^{\S}p<0.0001$	$^{\ddagger}p<0.005$	$^{*}p<0.005$

The number of the nurses correctly performed all the steps are shown in Table 3. None of the nurses was able to use turbuhaler properly at the pre-training phase. The inhalation device most properly used by the nurses was MDI before the training and turbuhaler at the early phase following the training. The number of nurses properly performed the inhalation techniques significantly increased with the training ($p<0.0001$). However this number decreased at the late phase following the training as compared with the early phase ($p<0.01$).

Table 3. Number of nurses performed all the steps of inhalation devices properly

	Pre-training	After training	
		Early phase	Late phase
MDI	7†§	22	13§
MDI+SPACER	5†	23	13
DISKHALER	2	20‡	13§
TURBUHALER	0*†	27‡	8§
$^{\dagger}p<0.001$	$^{\S}p<0.0001$	$^{\ddagger}p<0.005$	$^{*}p<0.005$

Table 4. Number of the nurses performed the inhalation maneuvers improperly with respect to the steps at the pre-training phase

	MDI	SPACER	DH	T
Steps	n	n	n	n
1	0	4	9	22
2	4	10	14	29
3	5	11	19	29
4	3	6	19	28
5	13	9	17	29
6	3	18	22	29
7	13	14	20	28
8	13	11	22	29
9	16	17	22	30
10	17	25	20	29
11	14	25	20	29

Table 4 shows the distribution of the improper trials with respect to the steps. The steps mostly performed improperly at the pre-training phase were 9 and 10 for MDI, 10 and 11 for MDI plus spacer, 6, 8 and 9 for diskhaler and 9 for turbuhaler.

Discussion

Inhaled aerosol therapy is the preferred way in the management of asthmatic patients (4,15). The improper usage of the inhalation technique is common among asthmatic patients, and this condition leads to decreased efficacy and increased cost due to the unnecessary use (4,9). Many patients need appropriate training and repetitive instructions to master the correct inhalation technique (5,15). Undoubtedly, the prescribing physicians bear the primary responsibility for this task. However, other medical personnel such as nurses have also an important role in the patient training, particularly in instructing the patients on the correct use of the inhalation devices in many hospitals (1,15).

The present study demonstrates that most of the nurses have inadequate knowledge of the inhalation techniques. This result includes four different inhalation devices. The highest rate of correct technique at the pre-training phase was obtained with the MDI. Seven of 30 nurses (23.3%) had the correct MDI technique. This result is higher than the 2% of Interiano et al (3), but does not achieve the result of 50% in Guidry's report (4). Twenty-three nurses (76.7%) had inadequate MDI technique. Our result is even worse than 62% of De Blaquiere et al. (10) reported for patients. MDI plus spacer was the second best inhalation device with respect to the proper technique. Five of the 30 nurses used this device properly. While only two

nurses had correct diskhaler usage technique, none of the nurses could use turbuhaler correctly. In a previous study (12), proper usage technique of the nurses was reported as 6% for turbuhaler. Kesten et al (15) reported that MDI was better than turbuhaler with respect to proper usage technique among pharmacist. This result is similar to our results. The highest correct usage rates among patients were reported for diskhaler in Pale's report (7). In the latter study, results of turbuhaler were better than MDI. The differences between the studies were probably due to the prescription rate of the inhalation devices. During the study period, MDI was the most prescribed device in our center while turbuhaler was recently presented. There was no difference among the devices with respect to the proper usage technique at the early phase following the training. The lowest proper usage rate was obtained by turbuhaler at the late phase following the training.

Training the nurses led to an increase in DS% and the number of nurses having correct usage techniques at the early phase following the training. The difference among devices disappeared after the training. Our results support Interiano et al's suggestion of training the nurses (3). DS% values decreased during the period without any retraining attempts, but were still higher compared with the baseline values. This finding shows that nurses couldn't maintain the ability obtained through training and training should be repeated.

The steps most frequently performed inadequately by the nurses varied according to the inhalation device. The steps performed improperly at most were 9 and 10 for MDI; 10 and 11 for spacer; 6, 8 and 9 for diskhaler and 9 for turbuhaler. The steps performed improperly at most for MDI and diskhaler were important steps with respect to access and distribution of the drugs in the lung. Most of the nurses did not perform the manoeuvres necessary to receive the second dose of the drug in MDI plus spacer and turbuhaler. These mistakes make the aimed therapeutic benefit with the inhalation therapy impossible and lead to increased cost.

In conclusion, knowledge of the nurses about the usage of the inhalation devices is not sufficient. Training the nurses for once does not solve the problem. If the nurses are to be in charge in the follow-up and training of asthmatic patients, this task should be assigned to specifically trained nurses and the training should be repeated with regular intervals.

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