Original Article

Comparing the Effects of Face-to-face and Video-based Education on Inhaler Use: A Randomized, Two-group Pretest/posttest Study

Abstract

Background: The quality of inhaler use can significantly affect the effectiveness of inhalation medications. This study was done to compare the effects of face-to-face and video-based education methods on inhaler use. **Materials and Methods:** A quasi-experimental, pretest/posttest clinical trial study was conducted on 120 patients with respiratory diseases who were under treatment with metered-dose inhalers. Patients were randomly allocated into two groups to receive either face-to-face (n = 60) or video-based education (n = 60) about correct inhaler use. Inhaler use was assessed using a 15-item checklist before, 2 weeks, and 1 month after the education. Chi-square and independent sample t-test as well as repeated-measures analysis of variance were used for data analysis. **Results:** At baseline, the groups did not differ significantly in inhaler use as shown by the mean score (t = 0.81, p = 0.33). Repeated-measures analysis showed that the mean score of inhaler use significantly increased in both groups 2 weeks and 1 month after the intervention (F = 585.07, $p < 0.001$). The t-test showed that at 2 weeks and 1 month after intervention the amount of increase in the face-to-face group was significantly greater than the video-based group (t = 3.31 and 5.93, $p < 0.001$). **Conclusions:** Both face-to-face and video-based education methods significantly improve inhaler use, even though the effects of the face-to-face method are significantly greater. Nurses can use either of these two methods or both for education of patients about inhaler use.

Keywords: *Health education, metered dose inhalers, patients, teaching*

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Background

Chronic obstructive pulmonary disease (COPD) and asthma are among the most prevalent health problems worldwide.[1] The prevalence of COPD and asthma in Iran is around 5.57 and 8.80%, respectively.[2]

Inhalation therapy is among the most prevalent treatments for COPD and asthma. The effectiveness of inhalation therapy greatly depends on the correct use of inhalers.[3] Studies showed that 4–94% of patients with respiratory diseases use inhalers incorrectly.[4-7] In addition, it has been shown that only 15–69% of healthcare providers (including physicians and nurses) can demonstrate correct inhaler use[8] and only 14.2% of physicians had an adequate knowledge of inhalation therapy.[9] Incorrect inhaler use not only results in ineffective symptom management[7] but also wastes $7–15 billion each year.[10] Patient education is believed to improve inhaler use.[11] Yet, a study reported that even after patient education, about 25% of patients still used inhalers incorrectly.[4] The contradictory results may be due to the type of methods used for education.[12] Moreover, studies are incongruent about the appropriate training method. Some studies reported that verbal instruction combined with physical demonstration is the most effective method for patient training about inhaler use.[13,14] However, another study reported a greater effectiveness of concept mapping than face-to-face education in improving inhaler use skills.[15] Some of the studies have also used of multimedia[16,17] to improve the patients' skill of inhaler use. Nonetheless, a recent systematic review concluded that the existing evidence cannot say for sure "what is the best way to teach people how to use their inhaler properly?"[10]

As nurses are responsible for patient education and given the controversies surrounding the effects of different educational methods, the present study was done to compare the effects of face-to-face and video-based education methods on inhaler use.

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Materials and Methods

This quasi-experimental, two-group, pretest/posttest study was conducted from November 21, 2016 to May 22, 2017. The study participants were patients with respiratory diseases who referred to the asthma and allergy clinic of Shahid-Beheshti Hospital, Kashan, Iran. Inclusion criteria were inhaler use for chronic respiratory diseases, vital signs stability,[5,12] no simultaneous participation in other educational programs on inhaler use,[6] no history of mental, cognitive, or motor dysfunctions[12] (as mentioned in patients' medical records), access to computer or smartphone for watching the educational video,[18] and access to phone for follow-up assessments. Exclusion criteria were reluctance to stay in the study, changes in patient treatment plans, or failure to watch the educational video. Patients were consecutively recruited and randomly allocated to face-to-face and video-based education groups.

Using the results of an earlier study,[15] and with a type I and II errors of, respectively, 0.01 and 0.2, and considering $S_1 = 0.4$, $S_2 = 0.6$, $\mu_1 = 9.7$, and $\mu_2 = 9.5$, the needed sample size for each group was estimated as 60.

Before the sampling started, a randomization plan was developed using the Statistical Package for the Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, IL, USA) software. For this purpose, we entered numbers 1–120 in the data sheet of the software and using the "random numbers" option in the "compute" and "function group box" in the transform menu. We randomly assigned 120 supposed samples into the two conditions. Then, numbers in each list were sorted and the lists were used to assign recruited patients either into the face-to-face or to the video-based education group.

Two instruments were used for data collection. The first was a demographic and clinical characteristics questionnaire that contained items about personal information, the duration of using inhalers, the duration of suffering from respiratory diseases, comorbid conditions, previous educations about inhaler use, and the number of times watching the video (in the video-based education group). The second instrument was a researcher-made checklist that was made through literature review[9,19-21] and contained 15 items on the steps of correct inhaler use. Wrong and right answers were scored zero and one, respectively. Therefore, the total score of the checklist ranged from zero to 15; higher scores showed more correct inhaler use. For content validity, the checklist was amended based on the comments provided by 10 faculty members affiliated to Kashan Nursing and Midwifery School, Kashan, Iran. For reliability assessment, the second author and a trained research assistant used the checklist to simultaneously assess inhaler use by 10 patients. Inter-rate Kappa agreement coefficient was 0.84.

At the beginning of the study, each patient was asked to use his/her inhaler, while the research assistant assessed his/her performance via the checklist. Then, the second author provided patients in the face-to-face group with 5-min face-to-face education about correct inhaler use. Besides verbal educations, she practically showed patients how to correctly use inhalers. Patients' questions, if any, were also answered.

Patients in the video-based group were provided with a 5-min video clip, in which the second author provided verbal education about correct inhaler use and practically showed the procedure. The video was operable in all computer systems and smartphones. Patients who had access to smartphones were provided with a copy of the video on their phones. All the patients in this group were allowed to watch the video as many times as they preferred. One day after providing patients with the video, we contacted them to ensure their ability to operate and watch it and also to remind them of watching it. Besides, we contacted them 2 days after the first contact in order to ensure that they had watched the video for at least two times. Two weeks and 1 month after the second reminder contact, the research assistant contacted all patients, arranged an appointment with them, and visited them to assess their inhaler use performance using the checklist.

Descriptive statistics (frequency, percentage, mean, and standard deviation) were calculated. Kolmogorov–Smirnov test was used to examine the normal distribution of the data. Chi-square test was used to compare the nominal variables of the two groups. However, the independent-sample *t*-tests or the Mann–Whitney *U* test were used to compare the mean of quantitative variables of the two groups. Also, the repeated-measures analysis of variance (ANOVA) was used to compare the mean groups' performance in inhaler use through the three subsequent measurement time points. Moreover, Greenhouse-Geisser estimation was used for epsilon correction and Bonferroni test for pairwise comparisons. Level of significance was <0.05.

Ethical considerations

This study was approved by the Ethics Committee of Kashan University of Medical Sciences (No. IR.KAUMS.REC.1395.79, date: 21 November, 2016). The second author recruited eligible patients, introduced herself to them, and provided them with clear explanations about the aim of the study, confidential management of the data, and voluntary participation in and withdrawal from the study. Written informed consent was obtained from all patients. The researchers observed all ethical issues in accordance with the Helsinki ethical declaration.

Results

At the 2-week follow-up, one patient from the face-to-face group was dead and the number of patients in this group reduced to 59. As Table 1 shows, the two groups did not significantly differ from each other respecting demographic and clinical characteristics ($p > 0.05$).

Table 1: Participants' demographic and clinical characteristicsa

Variables	Groups		Test results	
	Face-to-face	Video-based	Test statistics	*p*
Age, mean (SD), years	50.54(16.59)	53.16(17.77)	t=−0.64, df=117	0.407[a]
Gender, *n*(%)			χ^2=0.20, df=1	0.651[b]
Male	31(52.50)	34(56.70)		
Female	28(47.50)	26(43.30)		
Marital status, *n*(%)			-	0.491[c]
Single	3(5.10)	6(10.00)		
Married	56(94.90)	54(90.00)		
Educational status, *n*(%)			χ^2=1.26, df=4	0.853[b]
Illiterate	14(23.70)	17(28.30)		
Primary	15(25.40)	19(31.70)		
Guidance school	7(11.90)	5(8.30)		
High-school diploma	17(28.80)	14(23.30)		
Bachelor's degree	6(10.20)	5(8.30)		
Employment status, *n*(%)			-	0.981[c]
Housewife	24(40.70)	25(41.70)		
Employee/Student	5(8.50)	5(8.30)		
Self-employed	16(27.10)	14(23.30)		
Laborer/Farmer	8(13.60)	8(13.30)		
Retired/Unemployed	6(10.20)	8(13.30)		
Place of residence, *n*(%)			χ^2=0.80, df=1	0.369[b]
Urban areas	41(69.50)	37(61.70)		
Rural areas	18(30.90)	23(38.30)		
The duration of inhaler use, Mean(SD), months	4.88(5.670)	4.55(3.65)	t=0.30, df=117	0.703[a]
Number of inhalers used, Mean(SD)	2.28(1.110)	2.58(1.07)	t=−1.57, df=117	0.661[a]
Duration of suffering from respiratory disorder, Mean(SD), years	6.11(5.93)	6.35(4.90)	t=-0.30, df=117	0.352[a]
History of previous training about inhaler use, *n*(%)			χ^2=0.06, df=1	0.794[b]
Yes	24(40.70)	23(38.30)		
No	35(59.30)	37(61.70)		
Comorbidity, *n*(%)			χ^2=2.42, df=1	0.120[b]
Yes	26(44.10)	35(58.30)		
No	33(55.90)	25(41.70)		

[a]*t*-test, [b]Chi-square test, [c]Fisher's Exact test

At baseline, the mean scores of inhaler use in the face-to-face and the video-based education groups were not significantly different (t = 0.81, p = 0.339). However, the mean scores of both groups have significantly increased at 2-week and 1-month follow-ups [Table 2]. In repeated-measures ANOVA, the Mauchly's test illustrated that sphericity was not assumed [χ^2 (2) = 67.51; p < 0.001], then the degrees of freedom were corrected using the Greenhouse-Geisser test. The results showed that over time, the intervention significantly increased the mean score of inhaler use among the participants [F = 59.07; p < 0.001; Table 2]. Moreover, a significant interaction was observed between time and the mean scores on inhaler use in the two groups (F = 7.19, df = 1.38, p = 0.004) [Table 2]. Considering the observed interaction, t-test was used to conduct pairwise comparisons between the two groups at the three measurement time points. The results revealed that the mean scores of the two groups were significantly different at the second (t = 3.31, p < 0.001) and the third (t = 5.93, p < 0.001) time points.

Table 2: Comparing the face-to-face and the video-based education groups regarding the mean (SD) scores of inhaler use at all assessment time points

Time	Groups		p^a	p^b	p^c
	Face-to-face	Video-based			
Before	5.76(3.48)	5.21(3.38)	<0.001	<0.001	0.004
Two weeks after	10.96(2.17)	9.40(2.92)			
One month after	14.22(1.17)	11.98(2.65)			

[a]Repeated-measures analysis of variance, test of between subjects effects; [b]Test of within subjects effects; [c]Interaction between time and group

Besides, the tests of between-subjects effects showed a significant difference between the mean scores of inhaler use in the two groups (p = 0.001). Figure 1 shows that the trend of variations in the mean patients' performance in inhaler use was upward and significant in both the

groups, although the level of improvement was better in the face-to-face education group. The pairwise comparisons also showed that in each of the groups, all measurements were significantly different from each other ($p = 0.001$).

Table 3 shows the results of repeated-measures ANOVA when the patients' group and their personal variables (i.e., sex, place of residence, and history of training about inhaler use) were entered in the model as between-subjects factors, and their age, education level, and duration of inhaler use as covariates. Among all variables examined, the variable of time as well as the interactions between time and patients' group ($p < 0.002$), age ($p < 0.027$), and duration of inhaler use ($p < 0.004$) significantly affected patients performance regarding inhaler use. The parameter estimates of the model indicated that the beta coefficient (B) of the model was negative during all the measurement time points (i.e., −0.03, −0.08, and −0.07, respectively). In addition, although the beta coefficient of duration of inhaler use was positive at the first measurement, it was negative at the other two measurement time points (i.e., −0.01 and −0.01, respectively).

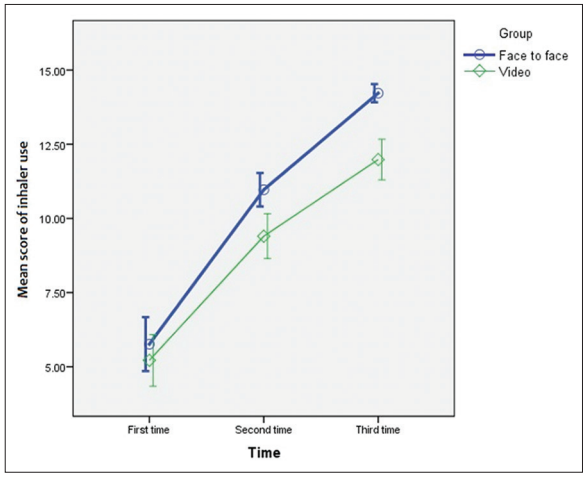

Figure 1: The trend of mean score of inhaler use in the two study groups

Table 3: The results of repeated-measures ANOVA when the patients' characteristics entered into the model

Source of variation	Type III sum of squares	Mean square	*F*	df	*p*
Time	218.75	154.83	40.34	1.41	<0.001
Time × group	45.24	32.02	8.34	1.41	0.002
Time × age	23.35	16.53	4.30	1.41	0.027
Time × sex	2.35	1.67	0.43	1.41	0.579
Time × education	16.04	11.35	2.95	1.41	0.072
Time × place of residence	0.70	0.50	0.13	1.41	0.804
Time × history of training about inhaler use	7.31	5.17	1.34	1.41	0.258
Time × the duration of inhaler use	38.32	27.12	7.06	1.41	0.004
Error	601.88	3.83		156.83	

Discussion

Findings revealed that at baseline, the mean scores of inhaler use in both the groups were low. Previous studies also reported the same finding.[5,6,12] This finding confirms that healthcare providers do not pay serious attention to patient education about inhaler use, which consequently can reduce the effectiveness of inhalation medications.

The findings of this study indicated that both face-to-face and video-based education methods significantly improved the mean score of inhaler use, even though improvement following face-to-face education was significantly greater than video-based education. Some of the previous studies are on the benefit of face-to-face verbal instruction, especially when this method is combined with physical demonstration of the skill[13,14] and some other reported that using multimedia and interactive video[16,17] might be superior to face-to-face trainings. Some of the studies also showed that education, irrespective of its method, enhances patients' self-efficacy, treatment adherence, and self-care.[22-24] Despite controversies about the effects of different educational methods, some scholars consider face-to-face verbal method as the gold standard for patient education.[25,26] In face-to-face education, teacher–learner interaction is stronger and patients have the opportunity to ask their questions and broaden their understanding of the provided educational materials. This method helps nurses and other healthcare providers alleviate patients' concerns, focus on their educational needs, receive their feedbacks, correct their misconceptions, and modify their health-related behaviors.

The parameter estimates of the repeated-measures analysis showed that the beta coefficient of the model was negative for the patients' age during the study. This finding might suggest that the increased age is correlated with a decreased adherence. Results of studies on the relationship between patients' age and their adherence of health care recommendations are not consistent. A study reported that patients' compliance increases with the increasing age.[27] However, another study have found that advancing age decreases the patients' compliance.[28] Elderly patients may have problems in vision, hearing, and memory. They may also have more difficulties in following therapy instructions due to cognitive impairment or decreased physical dexterity. On the contrary, older people are more concerned about their health than younger patients, so that their noncompliance is nonintentional in most cases. As a result, if they can get the necessary help from nurses or family members, they may be more likely to be compliant with therapies.

This study also showed that the beta coefficient of the model was negative for the duration of inhaler use at the second and the third measurement time points. In other words, longer duration of inhaler use negatively affected the effectiveness of interventions. Perhaps, patients with longer

duration of inhaler use relied more on their experiences than on the training they received. Perhaps, longer duration of the health condition as well as the longer duration of treatment period may adversely affect compliance. The findings about the negative effects of age and duration of inhaler use on the outcome of the intervention have important implications for nurses to provide older adult patients with more intensive and repeated trainings and follow-up, in order to be assured about the patients' adherence with recommendations. Among the study limitations was the probability of watching the video clip with other family members in the video-based group, while patients in the face-to-face group received educations personally. In order to minimize the confounding effects of family members on patients' learning and inhaler use, future studies can provide educations about correct inhaler use to both patients and their family members. Also, the patients were aware of being under investigation and this might affect their performance. Future studies are recommended to keep patients blind of the evaluation. Moreover, due to the short course of the study, we were unable to evaluate the long-term effects of the two educational interventions. Therefore, studies with longer courses are still needed.

Conclusion

Although both face-to-face and video-based education methods significantly improve inhaler use among patients with respiratory diseases, the effects of the face-to-face method are significantly greater than those of the video-based method. Nurses can use either of these two methods or both for patient education about inhaler use. Of course, they may be able to produce better patient outcomes using the face-to-face method.

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Conflict of interest

Nothing to declare.

References

1. Cukic V, Lovre V, Dragisic D, Ustamujic A. Asthma and chronic obstructive pulmonary disease (COPD) – Differences and similarities. Mater Sociomed 2012;24:100-5.
2. Varmaghani M, Farzadfar F, Sharifi F, Rashidian A, Moin M, Moradi-Lakeh M, *et al*. Prevalence of asthma, COPD, and chronic bronchitis in Iran: A systematic review and meta-analysis. Iran J Allergy Asthma Immunol 2016;15:93-104.
3. Haughney J, Price D, Barnes N, Virchow C, Roche N, Chrystyn H. Choosing inhaler devices for people with asthma: Current knowledge and outstanding research needs. Respir Med 2010;104:1237-45.
4. Lavorini F, Magnan A, Dubus JC, Voshaar T, Corbetta L, Broeders M, *et al*. Effect of incorrect use of dry powder inhalers on management of patients with asthma and COPD. Respir Med 2008;102:593-604.
5. Ahmad H, Farooqi R, Ashraf S, Afridi MZ. Assessment of inhaler technique of patients admitted with acute exacerbation of chronic obstructive pulmonary disease at pulmonology unit Khyber Teaching Hospital Peshawar. KJMS 2013;6:231.
6. Onyedum CC, Desalu O, Nwosu N, Chukwuka C, Ukwaja K, Ezeudo C. Evaluation of inhaler techniques among asthma patients seen in Nigeria: An observational cross sectional study. Ann Med Health Sci Res 2015;4:67-73.
7. Fadaei S, Pourahmad M, Asghari M, Kohan M, Sepidkar A. Correct or incorrect use of inhalers in patients with dyspnea. Par J Med Sci 2014;12:23-8.
8. Inhaler Error Steering Committee, Price D, Bosnic-Anticevich S, Briggs A, Chrystyn H, Rand C, *et al*. Inhaler competence in asthma: common errors, barriers to use and recommended solutions. Respir Med 2013;107:37-46.
9. Plaza V, Sanchis J, Roura P, Molina J, Calle M, Quirce S, *et al*. Physicians' knowledge of inhaler devices and inhalation techniques remains poor in Spain. J Aerosol Med Pulm Drug Deliv 2012;25:16-22.
10. Normansell R, Kew KM, Mathioudakis AG. Interventions to improve inhaler technique for people with asthma. Cochrane Database Syst Rev 2017;3:CD012286.
11. Basheti IA, Armour CL, Bosnic-Anticevich SZ, Reddel HK. Evaluation of a novel educational strategy, including inhaler-based reminder labels, to improve asthma inhaler technique. Patient Educ Counsel 2008;72:26-33.
12. Leiva-Fernández F, Leiva-Fernández J, Zubeldia-Santoyo F, García-Ruiz A, Prados-Torres D, Barnestein-Fonseca P. Efficacy of two educational interventions about inhalation techniques in patients with chronic obstructive pulmonary disease (COPD). TECEPOC: Study protocol for a partially randomized controlled trial (preference trial). Trials 2012;13:64. doi: 10.1186.
13. Capstick TGD, Clifton IJ. Inhaler technique and training in people with chronic obstructive pulmonary disease and asthma. Expert Rev Respir Med 2012;6:91-101.
14. Bosnic-Anticevich SZ, Sinha H, So S, Reddel HK. Metered-dose inhaler technique: The effect of two educational interventions delivered in community pharmacy over time. J Asthma 2010;47:251-6.
15. Bozorgzad P, Sarhangi F, Moein M, Ebadi A, Saadat A, Razmjouei N. Comparing of visual concept map (painting) and face to face method to educate asthmatic children in using spray. Iran J Nurs Res 2010;5:53-60.
16. Carpenter DM, Lee C, Blalock SJ, Weaver M, Reuland D, Coyne-Beasley T, *et al*. Using videos to teach children inhaler technique: A pilot randomized controlled trial. J Asthma 2015;52:81-7.
17. Poureslami I, Nimmon L, Doyle-Waters M, Rootman I, Schulzer M, Kuramoto L, *et al*. Effectiveness of educational interventions on asthma self-management in Punjabi and Chinese asthma patients: A randomized controlled trial. J Asthma 2012;49:542-51.
18. Brown S, Lehr VT, French N, Giuliano CA. Can a short video improve inhaler use in urban youth? J Pediatr Pharmacol Ther 2017;22:293-9.

19. Batterink J, Dahri K, Aulakh A, Rempel C. Evaluation of the use of inhaled medications by hospital inpatients with chronic obstructive pulmonary disease. Can J Hosp Pharm 2012;62:111-8.
20. National Asthma Council Australia. Inhaler technique for people with asthma or COPD 2016: Available from: https://assets.nationalasthma.org.au/resources/Inhaler_technique_for_people_with_asthma_or_COPD-web_CURRENT.pdf. [Last accessed on 2018 Apr 05].
21. Sanchis J, Gich I, Pedersen S, Aerosol Drug Management Improvement Team. Systematic review of errors in inhaler use: Has patient technique improved over time? Chest 2016;150:394-406.
22. Sheikh Abumasoudi R, Kashani F, Karimi T, Salarvand S, Hashemi M, Moghimian M, *et al*. Comparison of two methods of training (face-to-face and electronic) on depression, anxiety and stress in breast cancer patients. Iran J Breast Dis 2015;8:24-34.
23. Astley CM, Chew DP, Aylward PE, Molloy DA, De Pasquale CG. A randomised study of three different informational AIDS prior to coronary angiography, measuring patient recall, satisfaction and anxiety. Heart, Lung Circ 2008;17:25-32.
24. Hasanzadeh F, Shamsoddini S, Moonaghi HK, Ebrahimzadeh S. A comparison of face to face and video-based education on attitude related to diet and fluids adherence in hemodialysis patients. Horizon Med Sci 2011;17:34-43.
25. Hong J, Nguyen TV, Prose NS. Compassionate care: Enhancing physician–patient communication and education in dermatology: Part II: Patient education. J Am Acad Dermatol 2013;68:364.e1-e10.
26. Mousavi S, Sabzevari S, Abbaszade A, Hosseinnakhaie F. The effect of preparatory face to face education to reduce depression and anxiety in open heart surgery adult patient in Shafa hospital in Kerman, 2008. Iran J Nurs Res 2011;6:29-38.
27. Rolnick SJ, Pawloski PA, Hedblom BD, Asche SE, Bruzek RJ. Patient characteristics associated with medication adherence. Clin Med Res 2013;11:54-65.
28. Abu Hussein NB, Iman M, Eissa IM, Ahmed A, Abdel-Kader AA. Analysis of factors affecting patients' compliance to topical antiglaucoma medications in Egypt as a developing country model. J Ophthalmol 2015;2015:234157.