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Clinical Trial Paper

Optimizing inhalation technique using web-based videos in obstructive lung diseases

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ABSTRACT

Background: Inhaled agents are widely used in the treatment of chronic airway diseases. Correct technique is required to ensure appropriate drug deposition, but poor technique is common. This study investigated whether inhalation technique could be improved by patient training using short videos from the German Airway League.

Methods: Outpatients from a university hospital respiratory clinic who had incorrect inhalation technique were asked to demonstrate this again immediately after viewing the training videos, and after 4–8 weeks' follow-up. Inhalation technique was rated by a study nurse using specific checklists.

Results: One hundred and twelve patients with obstructive lung disease treated with inhaled bronchodilators or corticosteroids were included. More than half (51.8%) had at least one mistake in inhalation technique at baseline. Of these, most (88%) understood the training videos, 76% demonstrated correct device use immediately after training, and 72% were still able to demonstrate correct inhalation technique at follow-up ($p = 0.0008$ for trend). In addition, the number of mistakes decreased significantly after video training (by 1.82 [95% confidence interval 1.39–2.25]; $p < 0.0001$ vs. baseline).

Conclusions: German Airway League inhalation technique training videos were easy to understand and effectively improved inhalation technique in patients with airway diseases.

1. Introduction

Administration of bronchodilators or corticosteroids via the inhaled route is the most important principle in treating chronic airway diseases such as asthma or chronic obstructive pulmonary disease (COPD) [1,2]. Inhaled administration has the advantage of selective drug deposition in the airways thereby limiting systemic side effects. Since a drug can only be effective if it reaches the targeted airways, correct inhalation technique is crucial in this context. This has been highlighted by studies showing an association between poor inhalation technique and unfavourable outcomes in patients with a variety of airway diseases [3–5]. However, problems with inhalation technique are common in clinical practice. Although these issues were recognized shortly after the launch of pressurized metered-dose inhalers in the 1960s, a recent systematic review suggested that there has been no improvement over the last 40 years [6,7].

Numerous attempts have been made to try and train patients in the correct use of inhalators. In 2011 the German Airway League initiated the production of short web-based videos [8]. These have been filmed and published for all regularly used devices [9]. The training material includes videos, spoken text passages, and visual insertion of information covering all the important steps of inhalation therapy, such as preparation, administration and termination. In addition the videos are freely available in six different languages (German, English, Turkish, Arabic, Russian, and Slovak) [8]. However, whether or not these training materials provide benefit in clinical practice, both on a short- and long-term basis, has yet to be evaluated. Therefore, this study investigated improvements in inhalation technique after patients with obstructive airways disease were shown short videos demonstrating the correct technique.

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2. Material and methods

2.1. Study design

This open-label, single centre study was conducted from 9th September 2015 to 7th December 2016 in the respiratory outpatient clinic of the University Hospital RWTH Aachen. The study protocol was approved by the Institutional Review Board for Human Studies at RWTH University, Aachen, Germany, and all investigations were performed in accordance with the ethical standards laid down in the Declaration of Helsinki. Written informed consent was obtained from all patients prior to inclusion into the study.

2.2. Patients

All clinic patients who regularly used an inhaled therapy (corticosteroids or bronchodilators) to treat chronic airway disease were asked to participate in the study.

2.3. Inhalation technique training

After provision of written consent, patients were asked whether they knew how to use their inhalation device correctly and were asked to demonstrate the inhalation technique to a study nurse using a placebo-containing version of their regular inhaler. Inhalation technique was rated using specific checklists, which are available for different inhalation devices in two languages (German and English) [9]. If inhalation technique was correct, no further intervention was undertaken. Patients with one or more mistakes during their demonstration were shown short video sequences demonstrating the correct technique on a tablet computer. These sequences are available free of charge for non-profit uses in different languages (German, English, Turkish, Arabic, Russian and Slovak) via the homepage of the German Airway League [8]. After viewing the video material, patients were asked to re-demonstrate their inhalation technique to a study nurse, who again rated performance against the checklist. If the patient still did not use correct technique, this was demonstrated by the study nurse. Patients who had learnt the correct inhalation technique by watching the videos attended a follow-up visit after 4–8 weeks, where they were again asked to demonstrate correct inhalation technique to the study nurse, who rated this against the checklist.

2.4. Statistical analysis

Statistical analysis was performed using GraphPadPrism (GraphPad Software, La Jolla, USA). Unless otherwise stated, all data are presented as mean ± standard deviation (SD) after testing for normal distribution (Kolmogorov-Smirnov test). Pre- and post-interventional measurements were compared using the paired *t*-test for normally distributed data. A two-group comparison was performed using the unpaired *t*-test for normally distributed data. For normally distributed data, the 95% confidence interval of the mean (95% CI) is given where appropriate. For non-normally distributed data, the Wilcoxon signed rank test was used and the interquartile range (IQR) is given. The Fisher's exact test, the Chi-square test or the Chi-square test for trend were used for categorical data. Statistical significance was defined as a p-value <0.05.

3. Results

3.1. Patients

A total of 112 patients were included in the study. Detailed patient characteristics are summarized in Table 1. The study flow chart is shown in Fig. 1.

3.2. Inhalation technique on screening

More than half of all patients (51.8%) did not use their inhalator correctly (Fig. 2). Patients with incorrect inhalation technique were older, more likely to have COPD, and less likely to have had previous instructions compared with patients who had correct inhalation technique (Table 2).

3.3. Inhalation technique after having watched the video sequence

After viewing the video training material, the majority of patients with faulty inhalation technique (87.9%) stated that they now understood the sequence, and three-quarters (75.9%) were able to use their inhalation device correctly (Fig. 2).

3.4. Inhalation technique at follow-up

Follow-up was available for 50 patients with at least one mistake during their baseline demonstration of inhaler technique. The beneficial effects of the video-based training remained evident at the follow-up visit, with 72% of those who had incorrect inhalation technique at baseline still using their inhalator correctly ($p = 0.0008$ for trend). The improvement in technique was also demonstrated by a significant reduction in the number of mistakes made during demonstration of inhalation technique (reduction from baseline to follow-up of 1.82 [95% CI 1.39–2.25]; $p < 0.0001$) (Fig. 3). For patients with internet access at home (21/50; 42%), 9/21 (42.9%) reported watching the training video again at home; all but one of these (88.9%) had correct inhalation technique on follow-up.

4. Discussion

The results of this study show that the videos provided by the German Airway League demonstrating and explaining inhalation techniques are easy to understand and can be used successfully to teach patients about the correct inhalation technique. Three-quarters of all patients who made at least one mistake during initial demonstration showed correct inhalation technique after watching the videos and this was well maintained over time. The videos used in the study are short (between 1:42 and 3:11 min:sec in duration), widely available, and produced in six different languages. Therefore, they are an easy and efficient way to overcome one of the biggest problems in respiratory medicine, namely poor inhalation technique.

Table 1
Patient demographic data.

	Patients (n = 112)
Age, years	62.89 ± 14.82
Male, n	47 (42.0%)
Indication for inhaled therapy, n	
COPD	72 (64.3%)
Asthma	32 (28.6%)
Others	8 (7.1%)
Type of inhaler device, n	
Dry powder	89 (79.5%)
Metered dose	12 (10.7%)
Soft mist	10 (8.9%)
Patient training & skill, n	
Had previously received training on inhaler use	74 (66.1%)
Stated that they knew correct inhaler technique	100 (89.3%)

Data are presented as mean ± standard deviation, or number of patients (percentage). COPD: chronic obstructive pulmonary disease.