ORIGINAL ARTICLE

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A Course Proposal on Office Spirometry and Peak Flowmetry Usage for Family Physicians and Evaluation of its Effectiveness

ABSTRACT

Objective: The diagnosis, treatment, and follow-up of chronic obstructive pulmonary disease (COPD) and asthma are crucial in family practice. However, the utilization of pulmonary function tests in Turkey has been not sufficient and also the interpretation of spirometric test results is not adequate due to lack of knowledge. This study was aimed to provide a course on using office spirometry and peak flowmetry for family physicians and to help them become competent in approaching the respiratory system.

Methods: A course with an original and unique content was developed and administered to family physicians. A 20-item test covering the educational content was applied to the participants before and after each course. Oral and written feedback was taken from the participants to evaluate the course program.

Results: 115 family physicians joined the study. Pre-test and post-test scores were 40.39±12.8% and 75.22±11.12%, respectively. Primary outcome of the study was the difference in the mean test scores before and after the trainings, which revealed significant ($p<0.001$).

Conclusions: Extending this kind of courses to all family physicians might be useful in facilitating the diagnosis of respiratory diseases, enabling more conscious diagnoses, and possibly more efficient utilization of the health resources, leading to better health outcomes.

Keywords: Spirometry, Expiratory Peak Flow Rate, Family Practice, Respiratory Function Tests

Aile Hekimlerine Yönelik Ofis Spirometresi ve Peak Flow Metre Kullanma Eğitimi Hazırlanması ve Etkinliğinin Değerlendirilmesi

ÖZET

Amaç: Kronik obstrüktif akciğer hastalığının (KOAH) ve astımın tanısı, tedavisi ve izlenmesi aile hekimleri için oldukça önemlidir. Bununla birlikte, Türkiye'de solunum fonksiyon testlerinin kullanımı yeterli değildir ve spirometrik test sonuçlarının yorumlanması da eğitim ihtiyacından dolayı yetersizdir. Bu çalışma, aile hekimleri için ofis spirometresi ve peakflowmetre kullanımı ile ilgili bir eğitim vermeyi ve aile hekimlerinin solunum sistemi hastalıklarına yaklaşımında yardımcı olmayı amaçlamaktadır.

Gereç ve Yöntem: Özgün içeriğe sahip bir kurs geliştirildi ve aile hekimlerine uygulandı. Katılımcılara her kurstan önce ve sonra eğitim içeriğini kapsayan 20 maddelik bir test uygulandı. Kurs programını değerlendirmek için katılımcılardan sözlü ve yazılı geri bildirim alınmıştır.

Bulgular: Çalışmaya 115 aile hekimi katıldı. Ön test ve son test puanları sırasıyla % 40,39±12,8 ve % 75,22±11,12 idi. Çalışmanın en önemli çıktısı, eğitim öncesi ve sonrası ortalama test puanlarındaki fark olup, bu durum anlamlı bulunmuştur ($p<0.001$).

Sonuç: Bu tür kursların tüm aile hekimlerine yaygınlaştırılmasıyla; solunum hastalıklarının tanısının kolaylaşması, tedavisinin daha bilinçli yapılması, sağlık kaynaklarının daha etkili bir biçimde kullanılması ve sağlık çıktılarının iyileşmesi beklenebilir.

Anahtar Kelimeler: Ofis Spirometresi, Peak Flowmetre, Aile Hekimliği, Solunum Fonksiyon Testleri

INTRODUCTION

Spirometry is a basic test used in the evaluation of pulmonary functions (1,2). Nowadays, it is used in the diagnosis of respiratory system diseases, quantify lung impairment, determination of bronchodilator activity, monitoring the effects of occupational exposures, and determination the effects of medications. Since it is a non-invasive method, spirometry attracts the attention of many physicians (3,4).

Peak flowmetry, on the other hand, is a much cheaper and portable instrument that measures the peak flow rate of the lungs (5). Peak flowmetry is not only useful in monitoring the signs and symptoms of asthma, but also helps to identify an attack before symptoms develop. The peak flow rate of each patient is different. Thus, the "personal best" peak flow is defined, which is the highest peak flow recorded for the individual. To find the "personal best" peak flow, peak flow measurements need to be done every 2-3 weeks. This is a number you can use to find the correct asthma zones. ‘’The personal” best measurements are never measured during an asthma attack (2,6). A color-coded system is used to evaluate the peak flowmetry results. This coding uses three color-coded zones: green, yellow, and red. This system tells you what to do when you are in each zone. The color-code for each zone reflects progressively more-severe symptoms (7).

Functional assessment of respiration for family physicians is are essential. Considering the group of patients examined by family medicine, pulmonary diseases constitute a large part. According to the data obtained from the Turkish National Burden of Disease project, pulmonary diseases have been shown to be in the first four among mortality reasons in Turkey (8). In this sense, family physicians should be able to use the spirometry and peak flowmetry to diagnose and treat their chronic obstructive pulmonary disease (COPD) and asthma patients. For this reason, we considered that‘s necessary to have a course for family physicians to diagnose, treat, and follow-up the lung diseases. The fact that there have been no courses in this field adds a unique value to this study.

This study aimed to provide a course on using office spirometry and peak flowmetry for family physicians and helping them become competent in approaching the respiratory system. With this method, it will be easier to diagnose, treat, and follow-up important diseases such as COPD and asthma in family practice.

MATERIAL AND METHODS

This study was designed as a non-randomized, before-and-after intervention study. The study population consisted of the 219 family physicians who were working in Erzurum in March 2015. Total 115 family physicians (79 from the city center and 36 from the districts) joined the study.

The Sample Size: Sample size calculation was based on the comparisons between the pre-test and post-test scores. Calculations were done with the G*Power (9). It was estimated that 97 cases would be required assuming a standard deviation of 1.5, alpha error 0.05, an effect size of 0.33, and a power of 0.90.

Ethical Approval and Permissions: The ethical approval of the study was obtained from the Atatürk University Medical Faculty Clinical Research Ethics Committee (Approval date: 24.04.2014 and Approval number: B.30.2.ATA.0.01.00/58). Also, the project was evaluated and authorized by T. R. Ministry of Health, Public Health Agency of Turkey and Evaluation Commission for Research Requests in Primary Health Care Services (Issue: 67350377 / 770- Date: 06.11.2014).

Research Protocol: A one-day course with unique content was administered to family physicians in groups consisting of a maximum of 20 participants at convenient times without interfering with their service provision. A 20-item test covering the educational content was applied to the participants before and right after each course. Feedback was taken from the participants to evaluate the course program.

The Course: The primary outcome measure of this study was to measure the basic knowledge and skills of participants on pulmonary function tests (PFTs) and peak flowmetry. For this purpose, we prepared a 20-item and multiple-choice test covering the educational content. The test was first applied to 17 research assistants working at Ataturk University, Faculty of Medicine, and Department of family medicine. Subsequently, an item analysis of the test was performed by the Sınavmatik© software (Pilot Software, Ankara, http://www.pilotltd.com/urunler/sorubank). Difficulty index, discrimination index, and distractor efficiency of the questions were examined. In the light of these examinations, seven questions were changed. The new test was applied as pre-test and post-test to the study population (115 family physicians).

The course consisted of two 40-minutes presentations in addition to group works and demonstrations. The presentations covered the basic topics of pulmonary function tests and provided information about spirometry and peak flowmeters. In addition to the presentations, a “peakflowmeter use guideline”, a “spirometer course learning guide”, and spirometer reports of real patients were used. Duration of the course was around four hours.

Statistical Analysis: Statistical analysis was performed with the Statistical Package for the Social Sciences (SPSS, version 20X, IBM, Armonk, New York 10504, NY, USA). As descriptive statistics, categorical variables were presented as number (n) and percentage (%) while numerical variables were summarized as mean (± standard deviation) or median (min., max. values) as indicated. Normal distribution of the numerical variables was checked with histogram graphs. As hypothesis tests we used paired samples t-test, Student t-test, Mann-Whitney U test and tests. Statistical significance level p was set to <0.05. Item analysis of the pre-and post-test was done with the Sınavmatik© software.

RESULTS

Descriptive Statistics: Total 115 family physicians joined the study. Of the participants, 68.7% (n=79) were males and 31.3% (n=36) were females.

Mean age of the participants was 35.48±7.15 years. Of the participants, 68.69% (n=79) were living in the city center while 31.30% (n=36) were from the districts. They were practicing as physicians for an average of 10.41±6.83 years.

Participants saw in average 189±103.48 (median: 170, minimum: 0, and maximum: 700) patients per week from which 11.90±12.28 (median: 10, minimum: 0, and maximum: 75) were COPD or asthma patients. Pre-test and post-test scores were 40.39±12.82% and 75.22±11.12%, respectively. The courses were finished after 10 sets of pieces of training; four being conducted in the city center and remaining six in the districts. The mean scores of the pre-test and post-test are given in Table 1. The score changes between the courses are presented in Figure 1.

One participant scored the highest (70 points) from the pre-test, and three participants got the lowest (10 points). On the other hand, six participants scored the highest (95 points) from the post-test, while one participant got the lowest (45 points).

Table 1. The mean pre-test and post-test scores

Course #		Pre-test score	Post-test score	
	n	Mean	Mean	Difference
1.	23	36.30	74.57	38.26
2.	19	35.00	75.53	40.53
3.	19	43.68	75.79	32.11
4.	19	41.05	74.21	33.16
5.	5	40.00	84.00	44.00
6.	6	42.50	72.50	30.00
7.	7	42.14	73.57	31.43
8.	3	48.33	68.33	20.00
9.	9	42.78	75.00	32.22
10.	5	51.00	80.00	29.00
Mean		**40.39**	**75.22**	**34.83**

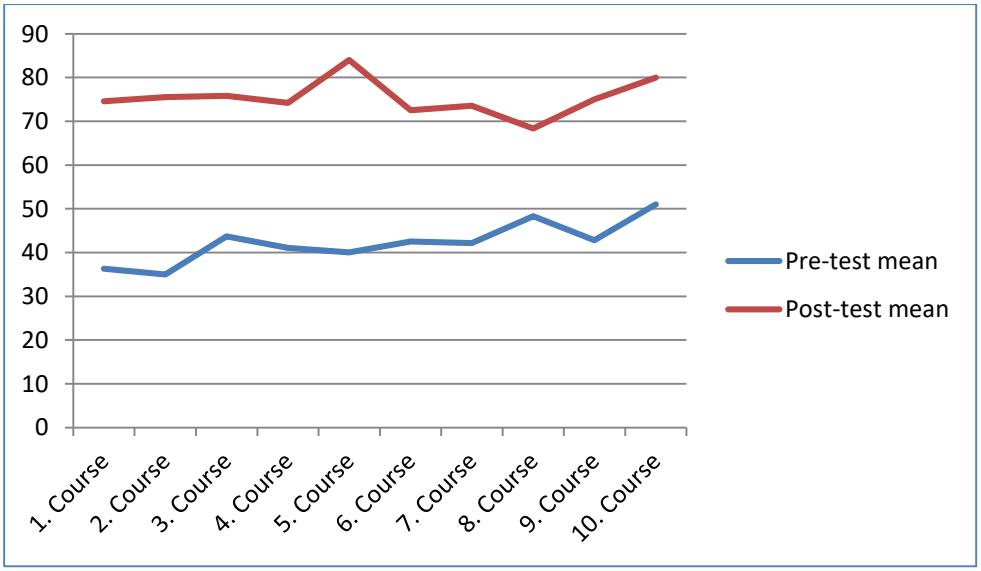

Figure 1. Pre-test and post-test score changes between the courses

One participant scored the highest (70 points) from the pre-test, and three participants got the lowest (10 points). On the other hand, six participants scored the highest (95 points) from the post-test, while one participant got the lowest (45 points).

Hypothesis Tests: The mean pre-test scores of the females were significantly higher than the mean pre-test scores of the males (t= 2.46; p= 0.018; 95% CI: [0.709; 11.752]). However, no significant difference was detected between the females and males in terms of mean post-test scores (t= -0.30; p= 0.671; 95% CI: [-5.131; 3.742]) (Table 2). When the mean pre-test and post-test scores of all participants were compared according to their working area, there was a significant difference between groups (p>0.05) (Table 2).

The relationship between the duration of practice as a physician and pre-test scores was analyzed with the Pearson correlation analysis, which showed a significant but weak negative correlation (r= -0.310; p=0.001).

Table 2. The comparison between groups according to gender and working area

	Pre-test score Mean±SD	**Post-test score Mean±SD**	**t; p (Before/After)**	**t; p (Between groups)**
Male (n=79)	42.34±11.51	75.00±11.26	-19.72; <0.001	2.46; 0.018*
Female (n=36)	36.11±14.59	75.69±10.96	-16.04; <0.001	-0.30; 0.671**
City center (n=79)	39.05±13.37	75.00±11.03	-20.71; <0.001	-1.67; 0.102*
District (n=36)	43.33±11.14	75.69±11.47	-13.85; <0.001	-0.30; 0.669**
Total (n=115)	40.39±12.82	75.22±11.12	-24.85; <0.001	

Course Evaluation: The course program was evaluated by the participants using a 13-item feedback form. Questions were scored using a Likert scale ranging from 1 to 5. Mean satisfaction from the course was calculated as 4.81±0.29. The mean satisfaction scores from the educations are given in Figure 2.

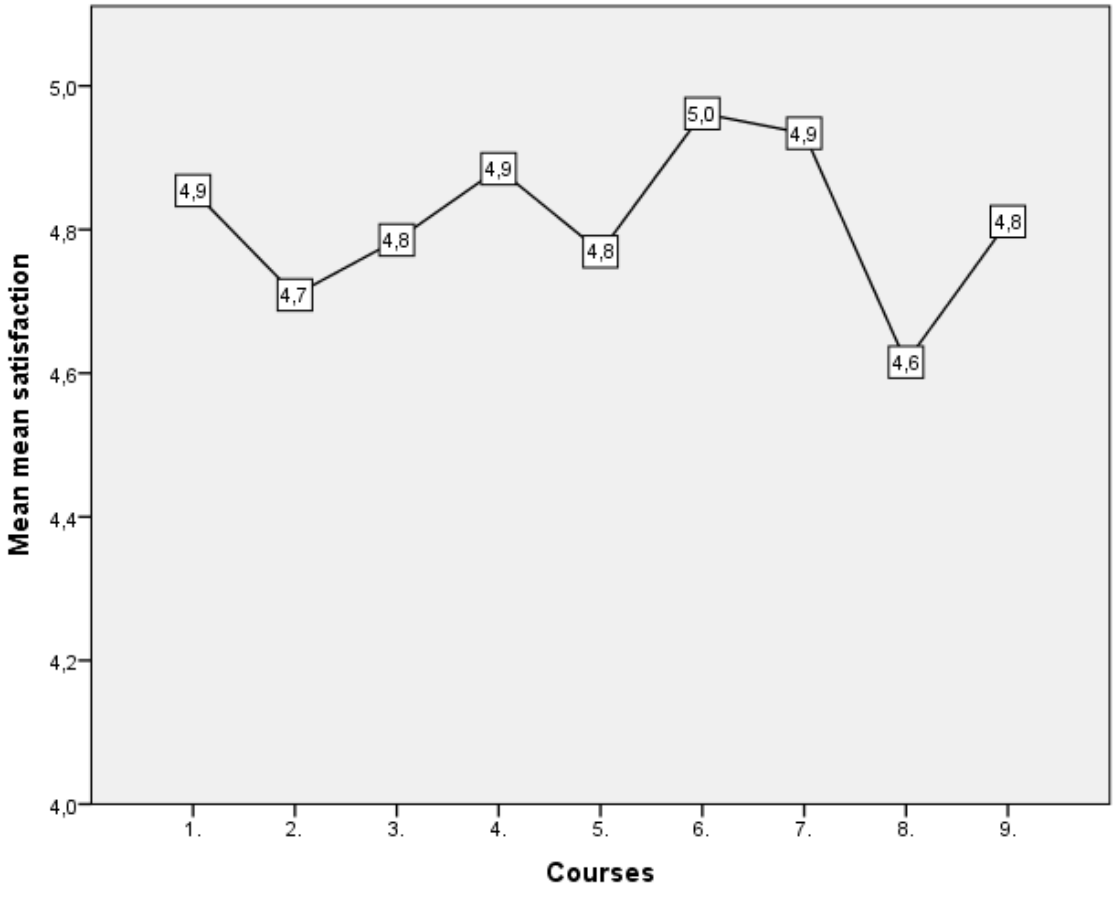

Figure 2: The chart of mean satisfaction values according to courses

DISCUSSION

This one-day training course program included the basic topics of PFTs that could be used in primary care. By the way, this training course is the pioneering study in Turkey that provides knowledge and skills on PFTs for primary care. In many countries, more long-term educations have been conducted on this subject (10,11). There are also some studies that include online courses about spirometer measurements and telemedicine applications (12,13).

According to the data obtained from the pre-test and post-test scores of our study, the increased knowledge level of the participants about spirometry and peak flowmetry shows how much these educations are necessary. A study performed by Derom et al. (11) emphasized the importance of this condition, and they advocated that this education should be given in the primary care according to the American Thoracic Society (ATS) and the European Respiratory Society (ERS) guidelines (2,11). In addition, the increase in the skills of physicians to evaluate spirometry results will be beneficial in medical practice (14).

On the other hand, it was seen clearly from both the pre-test –post-test comparisons and the course evaluation forms that the awareness of primary care physicians about PFTs increased at the end of the training. This situation shows that there is a serious need for postgraduate education programs concerning pulmonary diseases in primary care (10,11).

In our study, it was seen that the mean scores of the pre-test were low (40.39 points) and only 6.1% (n=7) participants scored 60 points and over. In a study conducted by Sogut et al. in primary care (15), it was observed that family physicians had insufficient knowledge levels about asthma and only 23% of the participants scored 60 points before the training course. This has also revealed the postgraduate training need for the family physicians to recognize and treat pulmonary diseases, such as asthma and COPD (16–18). In a study conducted in Spain (19), the insufficient use of spirometry was considered as an important factor in the increase in morbidity and mortality of COPD.

We observed that this course helped family physicians to increase their knowledge. Family physicians will be able to better recognize and treat obstructive and restrictive lung diseases if they apply and evaluate PFTs (14). In this respect, the use of spirometry and the evaluation of spirometric results are inevitable in family practice (11). Unfortunately, spirometry devices are mostly not available for primary care. To implement a change, the use of spirometry and peak flowmetry should become widespread, and educations should also be given in order to obtaining more quality results. For example, in a study performed in primary health care centers in Spain the use of spirometry and measurement quality was found very low (20). A study conducted by Schermer et al., (21) emphasized the importance of education for successful and quality spirometric results in primary care. However, a randomized controlled study of primary care physicians claimed that no significant changes were observed in the diagnosis of diseases after the education (22).

In this study, besides theory content, lots of practical applications were performed with the participants. The effectiveness of the combined theoretical and practical courses in PFTs has been proven by Represas and his friends' study (11). Moreover, another study has detected a 50% reduction in patient referrals and consultation numbers (14).

On the other hand, reinforcements should also be given in order to ensure that learning becomes permanent. The spirometry training given by Eaton et al. (23) was partially forgotten after a while. However, it was observed that this condition had improved with a reminder workshop. Also, it was argued that reminder courses increased the quality in spirometry (10).

We observed that the correct answers given to all questions increased after the training. In a study conducted by Carr et al., (14) 38% of the spirometry measurements before the training were technically inaccurate and this rate reduced to 2% after the training. In another study, it was argued that the patients were misdiagnosed as a result of not evaluating the spirometric results correctly (23).

Our study has increased the knowledge level of physicians using peak flowmetry for monitoring asthma and has created awareness about this issue. Parallel to our outcomes, courses given by Eaton et al. (23) informed the primary care physicians, nurses, and patients about peak flowmetry. The educations about peak flowmetry should be given to patients as well as to physicians. Patients with asthma should be educated in this regard and be encouraged for the use of peak flowmetry (24). A previous study showed that the use of peak flowmetry reduced asthma attacks (25). Additionally, it was reported that asthma patients increased their quality of life with the use of peak flowmetry (26). In Turkey, the use of peak flowmetry in primary care patients is almost negligible, and so is the awareness of family physicians in this issue.

CONCLUSION

The utilization of pulmonary function tests in our sample is not sufficient and also the interpretation of spirometric test results was not adequate due to lack of knowledge. The applied course was efficient in improving the knowledge of participating physicians. Extending this kind of courses to all family physicians might be useful in facilitating the diagnosis of respiratory diseases, enabling more conscious diagnoses, and possibly more efficient utilization of the health resources leading to better health outcomes. Improving health outcomes and more effective use of health resources can be expected as indirect results of this kind of courses.

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