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Original Article

Inter-Regional Changes in the Performance and Interpretation of Spirometry in Spain: 3E Study☆

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ABSTRACT

Objectives: This report shows the results of a nation-wide survey on spirometry to assess regional differences.
Methods: Observational cross-sectional study conducted by means of a telephone survey in 805 primary care (PC) and specialized centers (SC) in all regions. The survey was carried out among technicians in charge of spirometry and consisted of 36 questions related to the test.
Results: The results showed major differences between regions. Most centers had 1–2 spirometers. The number of spirometry tests per week ranged from 2 to 8.9 in PC and between 34.3 and 98.3 in SC. Some training had been given in most centers (63.6%–100% in PC and 60.0%–100% in SC) but not on a regular basis. Most centers used several short-acting bronchodilators for the bronchodilation test, but with insufficient inhalations (2.0–3.8 in PC and 2.0–3.3 in SC) and frequently incorrect waiting time (29.4%–83.3% in PC and 33.3%–87.5% in SC). Daily calibration was not performed in all centers (0%–100% in PC and 66.7%–100% in SC). Significant inter-regional differences in spirometry quality criteria were observed, with 6 or more criteria met in 9.1%–84.6% of PC centers and 37.5%–100% in SC.
Conclusions: Our results show the current situation of spirometry in primary and specialized care in Spain, highlighting considerable variability and areas for improvement. This information should be considered by health officials to improve the quality and accessibility of such tests.

Cambios interregionales en la realización e interpretación de las espirometrías en España: estudio 3E

Palabras clave:
Espirometría
Calidad
Prueba broncodilatadora
Asma
Enfermedad pulmonar obstructiva crónica

RESUMEN

Objetivos: El presente trabajo muestra los resultados de una encuesta nacional sobre espirometría con el objetivo de que sirva para evaluar diferencias territoriales en España.
Método: Estudio observacional transversal mediante encuesta telefónica de 805 centros de atención primaria (AP) y atención especializada (AE) en todas las comunidades autónomas en España. La encuesta iba dirigida al técnico encargado de la realización de espirometrías y constaba de 36 preguntas sobre el uso del espirómetro.
Resultados: Los resultados presentaban una amplia variabilidad entre comunidades autónomas. La mayoría de los centros tenían 1-2 espirómetros. El número de espirometrías por semana oscilaba entre 2 y 8,9 en AP y entre 34,3 y 98,3 en AE. La mayoría de los centros habían recibido algún tipo de formación

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(63,6-100% en AP y 60,0-100% en AE), pero no solía ser periódica. La mayoría de los centros emplean varios broncodilatadores de acción corta para la prueba broncodilatadora, pero con un número de inhalaciones insuficiente (2,0-3,8 en AP y 2,0-3,3 en AE) y un tiempo de espera frecuentemente incorrecto (29,4-83,3% en AP y 33,3-87,5% en AE). No todos los centros calibraban el espirómetro a diario (0-100% en AP y 66,7-100% en AE). Se observaron notables diferencias en los criterios de calidad de la espirometría entre comunidades autónomas, con 6 o más criterios cumplidos en 9,1-84,6% de AP y 37,5-100% en AE.

Conclusiones: Nuestros resultados retratan la situación actual de la espirometría en España en AP y AE, mostrando una considerable variabilidad y áreas de mejora. Esta información debería ser tenida en cuenta por los responsables sanitarios para mejorar su calidad y accesibilidad.

Introduction

Spirometry is required for the diagnosis of numerous chronic respiratory diseases, and consists of measuring dynamic volumes and expiratory flow rates. The Global Initiative for Asthma (GINA)[1] recommends spirometry for measuring airflow limitation and its reversibility, and to confirm a diagnosis of asthma. According to the Global Initiative for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease (GOLD COPD), spirometry is a requirement for diagnosis and an essential tool for establishing the best possible treatment.[2] Similarly, Spanish COPD guidelines (GesEPOC) recommend that healthcare staff treating patients with COPD should be competent in its early diagnosis and in performing and interpreting forced spirometry, and that this should used as a confirmatory test when COPD is suspected in an active or former smoker with chronic respiratory symptoms.[3] In fact, the prevention as well as an early detection of COPD is 1 of the 6 key strategies in the Spanish National Health System's Strategy on COPD, which recommends developing initiatives to extend the use of spirometry, or setting up screening programs.[4] The use of spirometry in the assessment of restrictive ventilatory impairment is equally important, as in the case of interstitial lung diseases and rib cage abnormalities.[5,6]

The implementation of spirometry in the Spanish National Health System is known to vary greatly depending on the region and care setting. A recent study in Spain (Spirometry in Spain: 3E Study) evaluated the use of spirometry in primary care (PC) and specialized care (SC) centers, revealing major differences in the use, training and maintenance of spirometers.[7] This study consisted of a telephone interview with the technician in charge of spirometry testing in a randomized sample of 805 Spanish PC and SC centers. Although the overall results of the project have been published,[7] the differences between regions (known as autonomous communities or ACs) were not reported. This study analyzes the data in more depth to distribute the results of the 3E study by AC, and enable the situation in the different regions to be evaluated. This will reveal the real status in each AC and provide information that can be used to create specific strategies to strengthen regional weaknesses.

Methods

The methodology used in the 3E study has previously been described in detail.[7] Briefly, this was a cross-sectional observational study consisting of a telephone survey of 805 PC and SC centers in Spain selected randomly from among those routinely assessing adult patients with chronic respiratory disease.

The survey was completed by the technician in charge of performing spirometry in each center, and the questionnaire consisted of 36 items dealing with human and material resources, training received, use of the spirometer, aspects of the bronchodilator test (BDT), and calibration and maintenance of the equipment. The survey was carried out between January and March 2012 by means of a semi-structured, computer-based interview that took, on average, 20 min.

The centers surveyed were randomly selected within each AC in order to include 20% of all PC centers and 25% of all SC centers in each region. If a particular center stated that they did not have a spirometer, did not perform spirometry, or declined the invitation to participate in the survey, it was replaced by another until the target sample size was reached.

The quality of spirometry testing was evaluated using 8 criteria: conducted in a specific location, conducted according to a specific schedule, regular spirometry training given, patients given recommendations before performing the test, weather station available, equipment calibrated daily, person in charge of maintenance, and a different filter used for each patient. As the study was a survey and not a spirometry audit, information on spirometry quality could not be collected.

BDT performance was compared against current guidelines, and 5 quality criteria were identified: inhalation therapy suspended prior to the test, bronchodilator used, dose administered, wait time according to the drug used, and criteria used to identify a positive test. In accordance with current BDT guidelines,[8,9] the following criteria were taken to be correct: salbutamol, terbutaline and ipratropium were considered the correct drugs for the test; correct doses were 400 mg (4 puffs of salbutamol using a measured dose inhaler [MDI]), 1000 mg of terbutaline (2 puffs using the turbuhaler), and 80 μg of ipratropium bromide (4 puffs using the MDI); acceptable wait time was ≥10 min, up to 15 min after a short-acting β_2-agonist, and 30 min after a short-acting anti-muscarinic; a correct positive result was an increase in FEV_1 of at least 200 ml and 12% with respect to the baseline.

Data Analysis

Data analysis was performed using *Statistical Package for Social Sciences* (SPSS) version 18.0 (IBM Corporation, Somers, NY, USA). Absolute and relative frequencies were used to describe categorical variables, and mean and standard deviation to describe quantitative variables. Inferential studies were performed by comparing the PC and SC data from each AC with the mean of the other ACs using the Chi-square test with Fisher's correction when necessary. The Student's *t*-test was used for independent data after applying the Levene test to check the equality of variances. To distribute BDT criteria the analysis focused on criteria met: if no data were available in a particular case, criteria were considered not met. Using this information, maps were constructed showing the mean values for each AC. The alpha error was set at 0.05.

Results

A total of 1259 PC and SC centers were contacted, of which 805 eventually participated. Distribution of participating centers by AC is shown in Table 1. Information on spirometer use between ACs is shown in Table 2. Most PC and SC centers had between 1 and 2 spirometers. However, significantly fewer spirometries were performed each week in PC vs SC (P<.05). Geographical distribution