EDITORIAL

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Are Quality and the Extensive Use of Spirometry Compatible?

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Chronic obstructive pulmonary disease (COPD) was the focus of a program of activities and initiatives developed by the Spanish Society of Pneumology and Thoracic Surgery (SEPAR) in 2002, which was designated COPD Year in Spain. One of SEPAR's aims was to alert professionals and the public to the financial and health care repercussions of this disease. Data on the impact of the disease in both developed and developing countries are highly revealing.[1-4]

The editorial of the November 2002 edition of the ARCHIVOS DE BRONCONEUMOLOGÍA[5] launched an appeal for greater commitment and involvement by society as a whole in the campaign against COPD, which, it was indicated, should be centered on 4 care principles. One of the more salient aspects of the COPD campaign was its focus on the proper use of forced spirometry. This position is valid for any of the chronic respiratory diseases, which now constitute a priority area for the World Health Organization (WHO). A number of Spanish and international clinical guides,[6-10] moreover, point to widespread use of spirometry as the primary method for early detection of COPD. This is particularly important in view of the fact that a large proportion of COPD patients remain undiagnosed at even relatively advanced stages of the disease.[11,12]

Although the role of forced spirometry in primary care settings is well established, there is a great deal of controversy in relation to both inadequate spirometer use and the quality of results. Correct spirometry use is, in fact, crucial to the successful implementation of clinical guidelines. In this edition of ARCHIVOS DE BRONCONEUMOLOGÍA, Hueto et al[13] analyze the issue of correct spirometer use in the region of Navarra, Spain. According to this study, although nearly all (91%) the primary care centers in this region were adequately equipped, 22% of spirometers had never been used, and a significant percentage of them (62%) were underused (less than 5 spirometries performed per week). Noteworthy also is the fact that these data are very similar to those reported 10 years previously for a nationwide survey conducted in Spain.[14]

As for spirometry quality, the same study by Hueto et al[13] revealed that 86% of primary care centers did not have a calibration syringe, and only 2% of centers carried out regular calibrations. Spirometry testing was mostly performed by nurses, but only 64% of these nurses had received any kind of specialist training, and over half of them (51.2%) did not perform spirometries on a regular basis because of a high degree of staff rotation.

A study by de Miguel Díez et al[15] drew attention to both the inadequate use of spirometry in assessing respiratory illnesses and problems related to measurement quality. Only 63% of COPD patients were diagnosed using spirometry (11% in primary care and 51% in pneumology). A mere 49% of primary care physicians had access to spirometer, and only 30% of the centers had specially designated staff for spirometry testing. In only 22% of the cases were regular quality control procedures implemented. The consequence was a high degree of error in the use of spirometry in primary care settings, particularly in regard to: *a)* non-compliance with repeatability criteria,[16] *b)* underestimation of expiratory volume—forced vital capacity (FVC)—in 76% of cases, and *c)* interpretation errors in 40% of examinations.[13] As indicated in other studies,[17] forced expiratory volume in the first second (FEV_1) is a more reliable measure than FVC.

A number of authors have pointed to the importance of training in ensuring spirometric quality in primary care settings.[18] Eaton et al[17] evaluated 30 primary care units in New Zealand which had been randomly allocated to either a group of centers where training was provided or a group of control centers. It was observed that the centers that had received training carried out more correct spirometries than centers that had received no training. Although educational intervention was positive, the authors also indicated the need for ongoing supervision for the staff who performed the examinations, in addition to training. For Spain, López de Santa María et al[18] described a hierarchical model in which specialist hospital staff implemented 2-month training programs in primary care centers. In this case there was a good level of

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agreement between the professionals who performed the spirometry, as well as a high percentage of maneuvers that satisfied acceptability criteria. This would to some degree endorse the characteristics of such training programs.

Spirometry testing outside the specialist setting would undoubtedly improve with the use of spirometers equipped with software for detecting errors and for providing feedback to the staff conducting the test.[10] This would permit a reasonable degree of optimism with respect to ensuring compatibility between quality and extensive spirometry use in primary care settings. In sum, a definitive solution to the problem referred to in the title of this editorial lies in combining validated training programs, technological improvements, and ongoing evaluation programs.

In this edition of ARCHIVOS DE BRONCONEUMOLOGÍA, Pérez-Padilla et al[19] publish reference values obtained for a healthy population consisting of individuals aged between 40 and 90 years living in 5 South American cities. This clearly useful study furnished results that complement the COPD prevalence analysis implemented as part of the PLATINO project.[20] Although the reference values obtained by these authors were very similar to those obtained in other studies conducted in healthy populations,[21-24] they differed from values derived from the predictive equations of the European Coal and Steel Community[25] and the values reported by Knudson et al.[26] The same authors also explored the possible impact of ethnic origin and height above sea level, but—since these variables only explained a residual variance of 1.5%—it was concluded that they only had a marginal influence on the reference values. The observation was also made that data fit was not improved by the use of complex equation models. Taken together, these results would indicate that there is a certain degree of exaggeration in the age-old controversies in regard to reference values for forced spirometry; they would also reinforce the idea that having universal predictive equations is not only desirable but also perfectly plausible. We may, therefore, anticipate favorable developments in a number of areas: *a)* a revised definition of COPD (FEV_1/FVC expressed as a percentage of the reference value rather than as an absolute value) that would adjust diagnostic sensitivity in patients aged over 70 years, *b)* a reduction in spirometry interpretation problems arising from inappropriate use of reference values, and *c)* a simplification in—and hence, greater use of—spirometric testing.

The study by Hueto et al[13] showed that a mere 4% of health care professionals were aware of the reference values used in their spirometers, and from this it can be inferred that the impact of reference values on results interpretation is potentially great. Recent recommendations by the American Thoracic Society/European Respiratory Society[27] are underpinned by a widespread consensus obtained in relation to most of the issues affecting standardization of the test, although any hopes of developing universal predictive equations as yet remain unfulfilled. The study by Pérez-Padilla et al[19] undoubtedly represents a step forward in this regard, however.

Of note are the contributions of epidemiological studies to quality control in spirometry, particularly in terms of aspects that have been extrapolated to clinical practice.[28] A good example of this is the study by Pérez-Padilla et al.[19] The authors used the same methods and equipment in the 5 South American cities studied and developed a quality control model of particular merit. It was noteworthy that 95% of the subjects studied satisfied traditionally accepted repeatability criteria (200 mL) for FVC and FEV_1[15] and that almost 90% showed a variability of less than 150 mL in these variables —as stipulated by recently published criteria.[29] These results were undoubtedly achieved as a consequence of both the training provided for field study staff and the exhaustive quality control of the 70 spirometers used during the 3-6 months of the PLATINO study[30] (a variation of approximately 50 mL (1.7%) in 98% of the 3L syringe calibration controls). The fact that the model of spirometer used was capable of providing feedback on the quality of staff maneuvers also contributed to the good results obtained. All in all, therefore, there is room for optimism in regard to quality results when spirometry use in primary care settings is extensive.

The information and communication technologies are increasingly affecting working methods, and the impact of mobile telephones and the Internet in the last decade is merely a pale reflection of their enormous potential. As already indicated in a number of relevant studies,[31-33] it is extremely unlikely that spirometry will remain untouched by technological change. Finkelstein et al,[31] for example, analyzed a group of asthma patients who conducted spirometry tests at home controlled remotely over the Internet. Although most of these patients had no relevant technological experience (71%), they still managed to obtain reasonably good coefficients of variation in FVC (4.1%) and FEV_1 (3.7%). In another study, Morlion et al[32] observed good agreement between spirometries performed at home and in lung function laboratories. Their results, moreover, demonstrated that this approach was perfectly acceptable to patients and that Internet monitoring facilitated early detection of complications following lung transplants. Cooperative tasking technologies are extremely useful in developing quality control programs for variable measurements and also for providing ongoing training for any non-specialist health care staff that implement spirometric tests; furthermore, knowledge management technologies will undoubtedly provide new forms of health care support that will ensure optimized use of clinical guides in the future.

Spirometry is being increasingly used for diagnosis and lung function evaluation purposes. It is to be hoped that this expansion in use will take place fundamentally in primary care, and, moreover, that the quality of results will not be negatively affected as a consequence. A number of improvements are required, however, in certain aspects that directly affect the use of the test: *a)* inexpensive portable units should be used, *b)* calibration strategies should be optimized, *c)* measuring equipment should provide better information on the quality of maneuvers and on compliance with international recommendations, *d)* standard reference values should be established for individuals of Caucasian origin, and finally, *e)* inexpensive remote assistance strategies should be developed for the implementation of quality forced spirometry tests away from lung function laboratories.[33]

A number of international initiatives have been launched in this respect. The WHO and the Forum of International Respiratory Societies[33,34] are currently developing programs aimed at improving forced spirometry quality in primary care in countries at different stages of development. The successful diffusion of quality spirometry will depend on the level of involvement of the health authorities; it will also rely on a wide range of health care professionals (pneumologists, nurses, primary care teams, etc) promoting spirometry as a means of measuring respiratory health.

The potential health benefits that can be expected from improved spirometric testing and the expectations generated by the information and communications technologies together represent an exciting challenge for this health care sector.

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