Editorial

Spirometry: what's normal?

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In the middle of the XIX century, Hutchinson measured vital capacity and sought to establish, under the prevailing conditions at the time, clinical correlations and reference values of normality for his patients.[1] Today, even with the recent technological advances, some difficulties in obtaining appropriate reference tables have yet to be overcome. Some variables interfere with the establishment of patterns of normality, such as age, weight, or height extremes; ethnic and regional diversities; individual and collective exposure to environmental factors; in short, everything that can influence pulmonary function.

In recent decades, tables of normality based on heterogeneous populations, and constructed without standardized inclusion criteria, have been proposed in North America and in Europe. Since the spirometers used in Brazil are usually imported, and the equations of normal predicted values for the country of origin are enclosed in them, these parameters have been used in our routine, especially the table by Knudson et al.[2] Some authors have demonstrated a significant deviation in the means predicted by five equations that are widely used in individuals between 20 and 40 years of age (Quanjer, Knudson, Paoletti, Crapo, and Roca), drawing attention to the need to re-evaluate the current recommendations.[3] In an attempt to reduce the technical variability of spirometric tests, pulmonology societies have standardized tools and procedures to measure pulmonary function.[4,5] However, such societies have yet to set their own parameters of normality.

The biggest challenge for those who worry about the quality of spirometric tests is, on the one hand, to ensure that the functional values obtained are accurate and, on the other hand, to establish whether or not they are normal. Quality equipment, ongoing technical training, and patient cooperation are qualifying factors. In addition, it is essential that the table of normality predicted for individual patients be appropriate to their characteristics, especially regarding gender, biotype, age, and race. The determination of the lower limits of normality is the parameter that constitutes one of the most crucial challenges.[6]

A cause of concern for us, Brazilian pulmonologists, has long been the knowledge that the tables of spirometric normality created in other countries, based on population samples that are different from ours, are not satisfactory. A table of our own, appropriate for our population and obtained using a proven methodology, has yet to be created.

In 1992, the Pneumobil Project made it possible to construct the first national reference table of normal spirometric values.[7] A bellows spirometer was used, the technical performance was not uniform, and the cases were recruited through voluntary search. Recently, with the Breathe and Live Program, there has been a new opportunity to assess pulmonary function in the Brazilian population.[8] For the present study, the methodology has been changed in an attempt to avoid some of the biases of the previous study. The more recent study presented the following features: inclusion of a greater number of elderly individuals; inclusion of Caucasians only; exclusion of individuals exposed to situations that can influence pulmonary function, such as massive exposure to environmental tobacco smoke or to smoke from wood-burning stoves, as well as of cases of excess weight; a more accurate analysis of the forced expiratory curve in view of the stricter criteria for the acceptance of such curves; measurement of instantaneous flows and of the ratio of forced expiratory volume in one second to forced expiratory volume in six seconds; use of quality flow spirometers (Multispiro; Creative Biomedics, San Clemente, CA, USA); and better training of spirometry technicians. According to the authors, the values of forced vital capacity and of forced expiratory volume in one second were higher than those obtained in 1992, probably due to technical factors.

The principal objective of these two Brazilian initiatives, which were sponsored by the pharmaceutical industry (Boehringer and Boehringer-Pfizer, respectively), was to detect cases of chronic obstructive pulmonary disease at an early phase. Naturally, the more recent study also has biases. However, it is the best one available to date. In the future, the table of normality for pulmonary function might be more appropriate as long as some methodological items are improved: randomization of the sample, inclusion of all races (you should bear in mind that the Brazilian population is essentially miscegenated), and inclusion of a greater number of individuals presenting the major variables and their diversifications in terms of race, age, height, and weight. Furthermore, the possibility of regionalization of the tables should be evaluated, given the great differences

between the north and the south of the country in terms of population characteristics.

Reflecting critically, considering that normal pulmonary function can present great variation, especially at age and biotype extremes, the most appropriate technique would be individual monitoring. Therefore, a pattern would be established for each individual and, upon the individual becoming sick, the differences between current and previous values would be unambiguously attributed to the disease itself.

Local reference values of normality for spirometry should be periodically reviewed using an appropriate methodology, especially in terms of sample selection, accurate equipment, and training of technicians. Some temporal differences, such as increased longevity, environmental changes, and epidemiological changes, require this re-evaluation. Naturally, this would require a strong institutional commitment by the Brazilian Thoracic Society (BTS) through its Pulmonary Function Department.

We cannot overlook the work of Dr. Carlos Alberto Pereira, who has greatly contributed to the development of pulmonary pathophysiology and to the development of pulmonary function tests in our country. Ratto, Rigatto, and Lemle, among others, have also made valuable contributions, and, in response to the effort of these colleagues, and of many others who work in this area, we make the suggestion that the BTS should, in conjunction with the competent organs, make it compulsory that each spirometer being used in the country have the official BTS table in its software.

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