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COPD and pulmonary rehabilitation: new findings from Brazil

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Pulmonary rehabilitation (PR) has been demonstrated to reduce the symptom burden of dyspnea, increase exercise capacity, and improve quality of life in patients with COPD.[1] It is defined as "a comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies which include, but are not limited to, exercise training, education, and behaviour change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence of health-enhancing behaviours."[1] In the present issue of the *Jornal Brasileiro de Pneumologia* (JBP), four interesting papers have been published concerning different aspects of PR. They provide novel insights into the usability of the four-meter gait speed (4MGS) maximum test to screen for preserved exercise capacity,[2] the potential effectiveness of upper limb (UL) exercise training for the performance of activities of daily living (ADLs),[3] the effect of PR on serum myostatin levels in patients with COPD,[4] and the outcomes of a PR program between groups of patients with COPD with different exacerbation phenotypes.[5]

As stated in recent guidelines for PR,[1] a thorough patient assessment is key. An important component of the thorough patient assessment concerns the evaluation of exercise capacity. To date, the six-minute walk test (6MWT) and the cardiopulmonary exercise test (CPET) are the two most broadly used test procedures to evaluate exercise capacity. Even though the 6MWT is more practical and simple than is the laboratory-based CPET, it still requires space (a 30-m corridor), time (two 6MWTs with a 30-min interval), and trained personnel. As an alternative, Kon et al.[6] demonstrated the potential use of the 4MGS test as a simple functional assessment tool in patients with COPD. In this issue of the JBP, Tino et al.[2] evaluated four different 4MGS test protocols—combinations of walking at normal pace and at maximum speed along a 4-m course and an 8-m-course. The authors concluded that the 4MGS test at maximum speed along a 4-m course, considering the specific cut-off point of 1.27 m/s, can be used to discriminate preserved exercise capacity in patients with COPD. Preserved exercise capacity was defined by the lower limit of normal, which is equivalent to the mean − 1.645 × standard error, using reference values specific to the Brazilian population.[7] This is an interesting and clinically relevant finding because the 4MGS test at maximum speed is a simple, fast, reliable, and low-cost alternative to evaluating exercise capacity. Moreover, in another study, Kon et al.[8] showed that the 4MGS test results are responsive to PR.

Following a thorough patient assessment, another cornerstone of PR is multimodality exercise training, which can include endurance training, interval training, resistance training, flexibility training, neuromuscular electrical stimulation, and inspiratory muscle training.[1] To date, the focus on resistance training has often been on the lower limbs. Nevertheless, many problematic everyday tasks in patients with COPD involve the upper limbs (ULs), such as dressing, bathing, and shopping.[9] Dyspnea is reported to be one of the limiting factors to performing ADLs involving the ULs, which can be attributed to the occurrence of dynamic hyperinflation. Interestingly, patients with COPD also perform UL activities at a lower intensity and at a relatively higher muscle effort when compared with healthy subjects,[10] suggesting that also UL muscle function may be a limiting factor. Thus far, Vaes et al.[11] showed that a comprehensive PR program can improve the performance of ADLs in patients with COPD. After an 8-week PR program, the patients in that study needed significantly shorter time to perform ADLs and had lower metabolic load and perception of dyspnea. In this context, Kariagannis et al.[3] systematically reviewed randomized controlled trials to determine whether UL exercise training could improve the performance of ADLs involving the ULs in patients with COPD. The authors demonstrated that UL exercise training is safe and can provide significant improvements in the performance of ADLs involving the ULs. Nevertheless, contradictory results were found in the perception of symptoms during the execution of ADL tasks with the ULs. Of note, the current evidence regarding UL exercise to improve ADL performance should be interpreted with caution and cannot be generalized, because that review[3] was based on five randomized controlled trials with limited sample sizes, the majority of the participants being male. There is a need for well-designed trials since an important goal of PR is to improve ADL performance, because it increases the independence and the ability of patients for self-care.

It has been recognized that muscle and serum levels of myostatin are elevated in patients with COPD, which may contribute to muscle wasting and weight loss,[12,13] or even to a lack of increase in physical capacity following PR.[14] Studies performed in healthy men demonstrated that serum/plasma myostatin levels decreased by approximately 20% after 10 weeks of high intensity resistance training.[15] Previous studies, with contradicting results, evaluated the effect of exercise training on muscle myostatin levels in patients with COPD.[16,17] Nevertheless, for clinical practice, the use of blood instead of muscle samples would facilitate the assessment of myostatin levels. In this

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issue of the JBP, Araujo et al.[4] were among the first to show that even though PR (including aerobic training, lower limb and UL resistance training, education, and nutritional orientation) improved exercise capacity and the level of COPD severity, no changes in plasma myostatin levels were found. Considering that muscle weakness is an important extrapulmonary manifestation in patients with COPD, a better understanding of the role of serum myostatin in the underlying pathways of losing muscle mass is needed.

The natural course of COPD is punctuated by exacerbations, especially in patients with moderate to very severe airflow obstruction.[18] Exacerbations are defined as acute worsening of respiratory symptoms that results in additional therapy, worse clinical outcomes, negative and significant impact on quality of life and on disease progression, as well as higher mortality and health care costs.[19] PR has already been recommended as a nonpharmacological treatment after an exacerbation/hospitalization, because it is feasible and safe and can improve exercise capacity, symptoms, quality of life, and prevention of hospital readmission.[20] Bohn Júnior et al.[5] investigated whether outcomes of PR are different between exacerbation phenotypes. Patients with COPD with two or more exacerbations in the previous year or at least one exacerbation requiring hospitalization had a significantly greater response to a 12-week PR program when compared with those with no exacerbations. Indeed, those with the exacerbation phenotype achieved greater improvements in exercise capacity, regardless of the severity of airflow obstruction (FEV_1%). In addition, greater reductions were found for perception of dyspnea, and there was improvement in prognosis as measured by the BODE index. Baseline 6MWT variables, level of dyspnea, and the BODE index, as well as smoking history, were not different between the groups. The results emphasize that patients with the exacerbation phenotype are ideal candidates for PR.

In summary, a thorough and multicomponent PR program is recommended to alleviate symptom burden, increase exercise capacity, and improve overall health status. Novel findings, as highlighted in this editorial, help improve and tailor PR based on the needs of the patients.

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