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**Editorial**

# Pulmonary Rehabilitation in Chronic Respiratory Diseases

Chronic respiratory diseases, such as chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), tuberculosis (TB) and lung cancer together are the leading causes of morbidity and mortality that are increasing all over the world. These are characterised by pulmonary and extra-pulmonary manifestations that contribute to the severity of the disease in individual patients. Involvement of lung airways and parenchyma by inflammation, effusion, cavitation and fibrosis in these diseases leads to reduced compliance and increased elastic recoil, neuro-mechanical dissociation, ventilation-perfusion derangement and cardiovascular limitations. Recent studies[1,2] have shown that in addition to abnormal inflammatory response of the lung parenchyma, there is systemic inflammation that leads to immuno-suppression, oxidative stress and increased circulating levels of inflammatory cytokines, such as C-reactive protein (CRP), interleukin (IL)-6 and IL-8. Typically, patients with chronic respiratory diseases undergo a downhill course. Due to continuing airway and parenchymal inflammation and destruction, there is gradual increase in breathlessness on exertion and reduction in functional exercise capacity. Obliteration of the normal architecture of the lungs increases work of breathing and makes them more prone to infections. Increased secretions due to recurrent infections and ongoing inflammation impair gas exchange resulting in hypoxia and free radical injury during rest and activity. Prolonged disuse, steroid-induced myopathy, malnutrition and hypoxia culminates into severe skeletal and inspiratory muscle dysfunction leading to dyspnoea and disability in activities of daily living.[3] Early fatigue constrains patients to go out into the community lest they get breathless which makes them socially isolated and depressed. Functional disability and repeated hospitalisations reduces their efficiency at home and at work-place and is associated with an increased expense and health care utilisation, resulting in socio-economic burden.

Pulmonary rehabilitation, an evidence-based, multi-disciplinary and comprehensive non-pharmacological intervention, has emerged as a recommended standard of care for patients suffering with respiratory diseases.[4] Pulmonary rehabilitation (PR) is advised for patients with chronic lung conditions who have dyspnoea or other respiratory symptoms, reduced exercise tolerance, restriction in activities because of their disease, or impaired health status despite optimal pharmacological treatment. Roots of PR can be traced back to late 19th Century; when patients with varied chronic respiratory and poor physical conditions while recovering with bed rest learned that daily walks relieved dyspnoea, improved appetite and instilled a feeling of well-being. Early leaders like Laennec, Beddoes and Denison observed two centuries ago that exercise is an important element in the care of patients with lung and heart diseases, especially in tuberculosis. Until 1950's, patients with COPD were advised to avoid activities that causes shortness of breath. Dr Barach, a pioneer in the field of PR at the beginning of the 20th Century, observed that dyspnoea during exercise in patients with emphysema can be relieved with the use of oxygen and their exercise capacity can be improved with an exercise training programme. In late 1960's Dr Thomas Petty (1932-2009) from University of Colorado, who is regarded as the '*Father of Modern Respirology*', described the scientific basis of long-term oxygen therapy and established a standardised out-patient programme of PR. He highlighted the importance of individualising the programme and developed the concept of multi-disciplinary approach with emphasis on education and breathing re-training along with exercise.[5,6] Presently, the updated American Thoracic Society/European Respiratory Society (ATS/ERS) definition describes pulmonary rehabilitation 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 emotional condition of people with chronic respiratory diseases and to promote the long-term adherence of health-enhancing behaviours*'.[7]

Pulmonary rehabilitation programmes vary in settings, duration and goals. A multi-disciplinary team including physicians, exercise physiologists, nurses, dieticians, respiratory therapists, physical and occupational therapists may be involved in these programmes. These programmes can be provided as either in-patient, out-patient, home-based or community-based settings and comprise of thorough patient assessment, breathing re-training, exercise training, education, oxygen supplementation, bronchial hygiene, nutritional counselling and psychosocial support. Though there is no consensus on the optimal duration of the programme, on an average, 24 to 30 sessions are required to obtain substantial benefits. However, prolonged sessions have been shown to confer greater improvements. Goals of PR include recovery in functional exercise capacity, greater participation in physical and social activities, improvement in quality of life and reduction

in frequency of symptoms, disability and health-care utilisation. Overall, the primary aim of a PR programme is to restore the patient to the highest possible level of independent functioning by assisting them in becoming more physically active, educating them more about their disease, treatment options and coping strategies. There are no specific pulmonary function inclusion criteria for admission to PR programme; since it is the symptoms and functional limitations, and not the severity of the underlying physiology, that directs the need for PR. Pulmonary rehabilitation has been shown to be beneficial to all patients with chronic lung conditions, such as COPD, asthma, ILD, cystic fibrosis, bronchiectasis, and thoracic cage abnormalities.[7] It has also been used successfully as part of the evaluation and pre-operative optimisation of health status for surgical treatments, such as lung transplantation and lung volume reduction surgery. Patients who cannot be included into the PR programme include those with significant orthopaedic or neurologic problems that reduces mobility, unstable angina, recent myocardial infarction, lack of willingness or motivation, psychiatric disorders, language barrier and current smokers.[8] Benefits of PR are even seen in irreversible pulmonary disorders, since skeletal muscle deconditioning is reversible, learning better pacing and breathing re-training enables patients to walk farther and with less dyspnoea. Though the degree of derangements in lung function parameters does not change appreciably with PR, nevertheless, peripheral and respiratory muscles dysfunction, anxiety and depression, and abnormalities of nutrition are responsive to treatment. Although various clinical studies[4,7,9] have reported an improvement in health-related quality of life and decrease in health-care utilisation with PR, its impact on mortality still remains contentious.

In conclusion, pulmonary rehabilitation is a new hope for patients with chronic respiratory diseases. It is a treatment that reduces dyspnoea and increases activities of daily living, exercise tolerance, decrease in hospital visits and better quality of life.

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## References

1. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (GOLD). *Updated 2014;6-7*.
2. Gan WQ, Man SF, Senthilselvan, Sin DD. Association between chronic obstructive pulmonary disease and systemic inflammation: a systemic review and meta-analysis. *Thorax* 2004;59:574-80.
3. American Thoracic Society, European Respiratory Society. Skeletal muscle dysfunction in chronic obstructive pulmonary disease: a statement of the American Thoracic Society and European Respiratory Society. *Am J Respir Crit Care Med* 1999;159:S1-S40.
4. Ries AL, Bauldoff GS, Carlin BW, Casaburi R, Emery CF, Mahler DA, *et al*. Pulmonary rehabilitation: Joint ACCP/AACVPR evidence-based clinical practice guidelines. *Chest* 2007;131 (Suppl. 5):4S-42S.
5. Berra K. Cardiac and pulmonary rehabilitation: historical perspectives and future needs. *J Cardiopulm Rehabil* 1991;11:8-11.
6. Casaburi R. A brief history of pulmonary rehabilitation. *Respir Care* 2008;53:1185-9.
7. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, *et al*. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. *Am J Respir Crit Care Med* 2013;188:e13-64.
8. Ambrosino N, Foglio K. Selection criteria for pulmonary rehabilitation. *Respir Med* 1996;90:317-22.
9. Cote CG, Celli BR. Pulmonary rehabilitation and the BODE index in COPD. *Eur Respir J* 2005;26:630-6.