

Multidisciplinary approach to pulmonary rehabilitation – an overview

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Abstract

Chronic respiratory diseases cause significant morbidity and lead to poor quality of life. Along with regular medications, pulmonary rehabilitation is an integral part in the management of such conditions to alleviate the suffering. This paper is an attempt to give an overview of the programme and its benefits. There is description about various components, staffing, setting, details about preprogramme evaluation, the programme *per se* and postprogramme follow up. This review is oriented largely towards how to run the programme in a resource poor setting.

Keywords: Chronic obstructive pulmonary disease, exercise therapy, quality of life, rehabilitation

Introduction

Pulmonary rehabilitation is accepted as an integral part in the management of chronic respiratory disorders which has been proven to improve the quality of life in these set of patients. Patients with chronic respiratory disorder experience significant morbidity from cardiac, muscular, nutritional and psychological dysfunction. The current view is to institute this programme at the earliest possible opportunity than as a last resort. The pulmonary rehabilitation programme has gained progressive improvement and is not just attending monotonous elaborate lectures, but stresses the ways for self-management. There are several studies describing the various approaches in pulmonary rehabilitation

programme. American College of Chest Physicians (ACCP) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) has come out with practice guidelines in this regard.¹ The currently available literature deals mainly with the effect of pulmonary rehabilitation in chronic obstructive pulmonary disease (COPD). The purpose of this review is to stress on the Indian perspective of pulmonary rehabilitation though literature on the work going on in this field in our country is lacking.²⁻⁵

History

Before 1950s, patients were advised to avoid exertion, as dyspnoea was the most difficult to treat and predominant symptom in chronic respiratory illness. Alvan L Barach understood the concept of exercise training and its favourable response on COPD patients in early 1950s. Thomas L Petty, in late 1960s set up a team to manage an outpatient pulmonary rehabilitation programme. In 1974, American College of Chest Physicians came out with a definition for pulmonary rehabilitation. In 1980, American Thoracic Society issued an official statement describing the components and beneficial

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effects of the programme. 1980s were the dark ages of the programme. Doubts about the efficacy of this programme raised by the scientific community lead to its reduced acceptance. 1990s showed the resurgence and wider acceptance. It has now got incorporated in to the treatment protocol and gained substantial improvement in the content and implementation.⁶

Definition

Pulmonary rehabilitation is an evidence-based, multidisciplinary and comprehensive intervention for patients with symptomatic chronic respiratory diseases with limitation of daily life activities. Pulmonary rehabilitation, when combined with treatment is designed to reduce symptoms, optimise functional status and reduce health-care costs through stabilising or reversing systemic manifestations of the disease. Comprehensive pulmonary rehabilitation programmes include patient assessment, exercise training, education and psychosocial support.⁷

Components of pulmonary rehabilitation programme

1. Preprogramme evaluation
2. Exercise training
3. Self-management education
4. Nutritional care
5. Psychosocial intervention
6. Postprogramme assessment
7. Maintenance programme

Preprogramme evaluation

Pulmonary rehabilitation should be considered for all patients with chronic respiratory disease who have persistent symptoms, limited activity, and/or are unable to adjust to illness despite the otherwise optimal medical management. Pulmonary rehabilitation is generally considered a necessary component before and after lung volume reduction surgery and lung transplantation.⁷ Before recruiting the patient with chronic respiratory disorder for the pulmonary rehabilitation programme, we should look for any contraindications. Exclusion criteria include patients with limited mobility due to neurologic and skeletal deformities and poorly

controlled comorbidities especially psychiatric or unstable cardiac disease.

Initial evaluation stresses on exercise ability by using dyspnoea scores such as Medical Research Council (MRC) score, baseline 6 minute walk distance (6 MWD), spirometry, diffusion capacity for carbon monoxide and arterial blood gas measurement (ABG). Parameters such as body mass index (BMI) and fat-free mass (FFM) are also measured to get the baseline values which will help us in monitoring the progress. Health related quality of life is assessed using Saint George Respiratory Questionnaire (SGRQ), Chronic Respiratory Disease Questionnaire (CRDQ) or Airway Questionnaire 20 (AQ 20). BODE index (body mass index, airflow obstruction, dyspnoea and exercise capacity) assessment may be done. Though BODE index helps to predict the mortality in COPD cases, studies have shown that the index may be useful in pulmonary rehabilitation programme also.⁸

The programme

The pulmonary rehabilitation programme can be conducted in 3 different settings, namely, inpatient, outpatient and home-based. Inpatient programme is costlier when compared to the other two.⁹ In a study by Babu AS *et al*, 'on call', 'out of hour' physiotherapy showed significant improvement in peak expiratory flow rates, six-minute walk distance and sustained maximal inspiration when compared to regular physical therapy in a hospital based pulmonary rehabilitation programme.¹⁰ According to Fernández AM *et al*, home-based pulmonary rehabilitation is safe and effective even in patients with very severe COPD.¹¹ Pande A *et al* found in their study, a 6 weeks home-based pulmonary rehabilitation programme was effective in improving dyspnoea, exercise endurance and quality of life in patients with COPD.¹² There are other similar studies which favour home-based rehabilitation programme.¹³⁻¹⁶

The team

Pulmonary rehabilitation should be done by a dedicated multidisciplinary team led by a medical director and a programme co-ordinator. The team should include a physician, physiotherapist, respiratory therapist, psychiatrist and dietician.

Guidelines are in place regarding the staffing pattern and the competency expected of the members.¹⁷ In a resource-poor setting, an experienced physician may be sufficient to perform most of the roles.⁵

Exercise training

Exercise is the most important part of the pulmonary rehabilitation programme which improves dyspnoea as well as the health-related quality of life (HRQL) of the patient. Patients with chronic respiratory disease after acute exacerbation are excellent candidates for exercise training. The training should be directed towards improving muscle strength and endurance. Various modes of exercises have been studied of which lower limb muscle training have been found to be very useful. Most of the patients with chronic respiratory disorder have lower limb muscular dysfunction which will improve with the training. Muscle strengthening exercises have been compared with endurance exercises and the former was found to be more effective in improving HRQL. Treadmill and cycle ergometer are used in order to increase endurance and strength of lower extremities. Upper limb muscles take part in most of the daily activities of the patient. Upper extremity exercise training may be done using arm cycle ergometer, free weights and elastic bands. Studies showed combined training of upper and lower limb muscles result in significant improvement. If the situation permits combined upper and lower extremity training should be instituted. In resource-poor settings, the exercise training can be performed by using simple techniques. Lower limb endurance may be attained by walking, cycling and climbing upstairs, upper extremity endurance and strength by using weights and lower limb strength by squats, straight leg raise and sitting to standing from a low chair.⁵ Among the respiratory muscle strengthening exercises, inspiratory muscle training (IMT) is found to be having significant effect.^{18,19} Chest physiotherapy techniques such as pursed lip breathing, diaphragmatic breathing and postural drainage are found to be effective.²⁰ A study done on the effect of regular singing classes on COPD patients showed minimal improvement in lung function and significant improvement in quality of life.²¹

Frequency and intensity of exercise training has been studied. According to the guidelines,¹ a minimum of 20 sessions, at least three times a week should be practiced. High intensity exercise produces better benefit, though low intensity training may also be effective in subset of patients who cannot tolerate the former method.²² The intensity of exercise training should be modified according to the severity of the symptoms. Interval training may be useful in attaining high level of exercisability in more symptomatic patients. In bed bound patients with extreme skeletal muscle weakness, neuromuscular electrical stimulation (NMES) at home may be helpful.

Pharmacological methods to improve muscle mass

Anabolic steroids, growth hormone, progestational agent such as megestrol acetate and testosterone administration have been studied previously and had shown improvement in muscle mass and exercise capacity. Routine use of such agents is not recommended in view of frequent unwanted side-effects.⁷

Self-management education

The patient as well as family should be educated properly about the chronic nature of the disease, its complications, need for daily medications and proper use of inhalers. This education sessions help to change the attitude of the caregivers towards the patients. The patient should be encouraged to attend the education sessions with their partner or caregivers so that it translates to their home based care. This helps them to identify the warning symptoms and to seek medical help at the right moment. Education sessions can be made interesting by use of the visual media. Education should be directed towards making the subject aware of the pathological changes of the disease condition, stressing the need for compliance with medications especially inhalers, importance of exercise and nutrition, need for early treatment of exacerbations and regular vaccinations. Other topics that should be addressed in education programmes are breathing and bronchial hygiene techniques, diet, smoking cessation and irritant avoidance, anxiety and panic

control measures such as relaxation techniques and leisure, travel and sexuality. Chronic respiratory diseases can affect the marital quality of life due to various reasons including sexual dysfunction. The education programme prepares the patient in taking end of life decisions.

Nutritional support

Chronic respiratory disorders is associated with cachexia due to loss of muscle mass (sarcopaenia) and fat-free mass (FFM) measurement using dual-energy x-ray absorptiometry (DXA) scan gives an idea about this. Patients with sarcopaenia demand better nutrition as their resting energy expenditure itself is more due to increased work of breathing. The daily calorie intake should be increased by 50% of resting energy expenditure in order to reverse the depletion in body weight. Protein rich, low carbohydrate diet is recommended in these set of patients. Protein should be supplemented at a rate of 1.5 to 1.7 mg/kg of body weight/day.⁵ Micro and macronutrients supplementation should be done. The patient should be encouraged to eat smaller meals frequently than large meals three times a day. They should eat slowly and avoid food items that cause gaseous distension of abdomen. Osteoporosis is another nutritional problem which needs attention and can be diagnosed by DXA scan. Major cause of osteoporosis in these cases are nutritional and due to corticosteroid therapy. Calcium and vitamin D need to be supplemented in such cases. Treatment with bisphosphonates and calcitriol help to replenish the lost bone mineral density. The nutritional supplementation helps to restore the muscle mass and helps the patient to cope up with exercise programmes. On the other hand, obese patients need dietary education and restriction of calorie which promote weight reduction and in turn improves their functional capacity.

Psychosocial and behavioural components in pulmonary rehabilitation

Chronic respiratory disorders are associated with increase in the incidence of anxiety, depression, low self-efficacy and other psychosocial components. Psychosocial aspects of pulmonary rehabilitation focus on quality of life. The quality of life depends

on various psychological dimensions such as anxiety, depression and cognitive functions, sexuality, and self-efficacy. The review reveals that in general psychosocial intervention programmes increase the psychological well-being (*i.e.*, distress associated with the disease) and improved quality of life. Long term psychosocial and educational intervention provides benefits to the patients.²³ Among the COPD patients, depression and anxiety were the commonly reported psychological symptoms. Depressed patients often feel pessimistic, worthless and hopeless. There is a linear relation between the level of depression and physical impairment, in this group.²⁴ Similarly, cognitive impairment in COPD consists of memory performance, and higher cognitive skills such as attention and complex visual-motor processes, abstraction ability, and verbal tasks. Sexuality is another critical component associated with COPD patients. Sexuality in COPD patients is associated with significant reduction of sexual desire or erectile dysfunction which have significant impact on the patients' self-concept and efficacy.²⁵ Self-efficacy is defined as the belief in one's capabilities to organise and execute the course of action required to produce given attainment.²⁶

Psychological intervention is categorised into three major components: first, psychosocial interventions such as cognitive behavior therapy (CBT), stress-management, relaxation, patient education, support group addressing depression and anxiety, sexual relations, family and work relationships facilitating information and emotional support sharing. Secondly, health behaviour interventions consist of smoking cessation and dietary change and finally adherence intervention include compliance with exercise and medical therapies.

Cognitive behaviour therapy (CBT) is an effective intervention addressing their depression, anxiety and stress, and smoking habits through cognitive and behaviour therapy techniques. Cognitive therapy techniques resolve their negative thoughts and evaluation about themselves. It focuses on to reduce the catastrophic appraisals and somatic symptoms, repeated exposure to feared situations. The major components of CBT consist of education, breathing

retraining and progressive muscle relaxation, cognitive restructuring, problem-solving, social skill training and interoceptive and *in vivo* exposure to feared bodily sensations. Relaxation is a sequence of exercises in which the patient tenses group of muscles and then abruptly releases the tension, breathing calmly and saying, 'Relax' to him, thus experiencing that muscle group in a more relaxed state. The purpose of relaxation training is to reduce the emotion-induced bronchoconstriction and increase coping strategy during stronger symptom episodes. Recent studies reported that relaxation training helped to improve the lung function.²⁷ Stress-management largely focuses on reappraisal of the situations and effective way of coping. Mindfulness-based stress reduction intervention was found to be effective in improving quality of life and perceived stress among asthma patients.²⁸

Psychological intervention focusing on improving self-regulation of the patient, shows significant impact on COPD patient's behaviour and overall changes.²⁹ Psychosocial interventions focusing on preventive care related to smoking cessation intervention plays vital role in maintaining COPD patient's behaviour. Adherence training focuses on educating the patients about the importance of adherence to prescribed medication. Studies have shown that problem-solving training was effective technique to overcome the barriers to adherence. On the whole psychosocial intervention is considered as an adjunct to other interventions to improve the quality of life.

Maximising pulmonary function before exercise training

In patients with airflow limitation, optimal bronchodilator therapy should be given before exercise training which may enhance the effort tolerance. The beneficial effect may not only be due to reducing airway resistance but also reducing dynamic hyperinflation. Those patients can exercise more effectively and attain the desired results.

Post-programme assessment

The assessment of the programme can be done during the programme or after the programme.

Health related quality of life, dyspnoea and functional capacity can be measured. HRQL can be measured by self-administered St. George respiratory questionnaire. For measuring the dyspnoea, MRC and Borg scales may be used. Functional capacity can be measured by the most accepted 6 minute walk distance.

Post-rehabilitation maintenance strategies

The effect of pulmonary rehabilitation wanes over time. Patients require refresher programmes in order to gain continued optimal results. Attrition is problematic in this group due to various reasons such as exacerbations of disease, lack of motivation, transportation barrier, programme costs and personal issues. The programme should address these issues which help to circumvent them and maintain the improvement in disease state following the initial pulmonary rehabilitation programme.

Oxygen supplementation as an adjunct to pulmonary rehabilitation

Supplemental oxygen should be used in those patients who experience hypoxaemia during exercise training which in turn improves their exercise capacity and endurance. Administering supplemental oxygen during high intensity exercise programmes to patients without exercise-induced hypoxaemia has beneficial effect on gains in exercise capability.

Noninvasive ventilation

Noninvasive ventilation has shown modest additional improvement in exercise performance in selected cases of severe COPD.

Benefits

Pulmonary rehabilitation is having proven effect on health related quality of life.³⁰ Several systematic reviews and meta-analysis are available which deal with various aspects of the programme and its effects.^{18,19,30-35} According to an evidence-based practice guideline,¹ pulmonary rehabilitation reduces the number of hospital days and other measures of health care utilisation in patients with COPD. Pulmonary rehabilitation is cost-effective in patients with COPD. The data is insufficient to

conclude that pulmonary rehabilitation improves the survival in patients with COPD. Pulmonary rehabilitation improves the exercise endurance, dyspnoea, quality of life and functional capacity of patients with chronic respiratory illness.³⁶ Longer pulmonary rehabilitation programmes produce greater sustained benefits when compared to shorter programmes.¹

In resource-poor setting, physician should be able to cater to all major demands. With locally available equipment and customised plan, one can run a successful programme. Motivating the patients at every possible occasion to be active will work wonders in such set of patients. The awareness about the programme should reach patients, their family and the care givers. Physician, particularly primary care level, should encourage the patients to practise the programme and prevent dropping out.

Need for constant motivation for the team

Pulmonary rehabilitation is incorporated in to the curriculum of physiotherapy and respiratory therapy undergraduate and postgraduate programmes. According to a questionnaire-based survey conducted among the practising physiotherapists in India, the assessment of patients were done without stressing much on functional exercise capacity and quality of life and treatment strategies lack measures for strength training.³⁷ This study depicts the importance of continuous monitoring of the programme content and to motivate the team to practise it appropriately. Education programmes should be organised at regular intervals to refresh the team about the strategies and to create awareness among them on the newer developments in the field.

Conclusion

Pulmonary rehabilitation is recognised as an essential component in management of chronic respiratory diseases. Multidisciplinary approach is the important feature of this programme which stresses the need for close cooperation between treating physician and other members of the rehabilitation team. The beneficial effects of the programme include improvement in exercise capacity, dyspnoea and quality of life. Though there are proper guidelines

for setting up and implementing the programme, it should be customised according to patients in addition to the available resources. There should be mechanisms to check the deterioration of the programme mainly by monitoring and continuous education measures. In resource-poor setting treating physician should sufficient to run the programme successfully. The beneficial effects of the programme diminish after a period of time. This demands shepherding refresher courses periodically. Patients should be advised to continue the various techniques taught in the programme while at home and must be monitored during the follow up visits. Pulmonary rehabilitation is a ray of hope for these patients that help them to cope up with the disease and lead a quality life.

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