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Inpatient pulmonary rehabilitation: does it make sense?

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Among the nonpharmacological therapies, pulmonary rehabilitation (PR) is particularly appropriate for patients with chronic respiratory impairment who, despite any optimal drug management, are still symptomatic and experience restriction in every day activities. Pulmonary rehabilitation performed in inpatient, outpatient, or home settings demonstrates short- and long-term clinical efficacy. Although disease severity does not inherently dictate candidacy for exercise training, the degree of physiological and functional impairment may influence setting in which the training should occur. Therefore, inpatient rehabilitation is generally best-suited for the most sick and most disabled patients. The overall results from the literature confirm that the inpatient setting for a PR program is a feasible option and does not necessarily result in higher direct costs when balanced against duration and effectiveness in terms of improved outcomes. *Chronic Respiratory Disease* 2005; **2**: 43–46

Key words: COPD; economics; exercise

Introduction

The goals of pulmonary rehabilitation (PR) are to reduce symptoms, decrease disability, increase participation in physical and social activities, and to improve the overall quality of life for individuals with chronic respiratory disease.[1–3] These goals are achieved through several processes (including exercise training, patient and family education, psychosocial and behavioural intervention) that are implemented by a multidisciplinary team of health care professionals.

One of the most comprehensive definitions of PR is that promoted by the American Thoracic Society:[2] 'Pulmonary rehabilitation is a multidisciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimise physical and social performance and autonomy'.

Among all the nonpharmacological therapies, PR is particularly appropriate for patients with chronic respiratory impairment who, despite optimal drug management, are still symptomatic and experience restriction in every day activities.[4] Patients with chronic obstructive pulmonary disease (COPD) as well as patients with other respiratory conditions may be candidates for PR,[5] adhering to the same principles of ameliorating secondary morbidity.[1–3] For example, the degree of airway obstruction or hyperinflation of chronic obstructive pulmonary disease does not change appreciably with PR, but reversal of muscle deconditioning and better pacing enable patients to walk farther with less breathlessness. Thus, it should be emphasized that symptoms, disability and handicap,[6,7] and not the severity of physiological impairment of the lungs, dictate the need for PR.

Measures to assess impairments other than FEV_1, and disability in chronic respiratory diseases are useful to evaluate the effectiveness of PR. So far, weakness and dysfunction of peripheral[8] and respiratory muscles,[9] anxiety and depression,[10] and abnormalities of nutrition and body composition[11] have been shown to be responsive following PR in COPD patients with different degrees of severity of airway obstruction.

Referral to PR is more often reserved for those with far-advanced lung disease;[12] however, referral at an earlier stage would also facilitate preventive strategies such as smoking cessation, or better attitude and long-term adherence to exercise. The health economic benefits of PR are only just beginning to be explored,[13] but reductions in hospital admission frequency, duration of stay, exacerbation rate, general practitioner home visits, and bronchodilator usage have all been reported.[3,14]

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Settings for PR

Despite substantial variability in program structure, PR performed in inpatient,[15] outpatient,[16,17] or home settings[18] has documented short and long-term clinical efficacy. Nevertheless, PR programs are costly and access to rehabilitation facilities is limited.[14] Frequency, duration of session, length and location of program are important determinants of the PR outcomes. Both duration and location may profoundly affect costs of a PR.[2] As a result, a careful selection of patients for PR is required and controversy still exists regarding the most effective treatment schedule and setting.[1–3]

PR by setting may vary considerably in staff availability, program duration, structure and individual components. Many factors can influence the choice of setting. These include the prerehabilitation physical, functional and psychosocial status of the patient. The local availability to the program, the logistics, the health care reimbursement modality and stipulations, and the patient's preference are also considered important.[2] The various characteristics of outpatient, inpatient or home-based PR are listed in Table 1.

Inpatient rehabilitation is generally best suited for the most sick and most disabled patients.[19] In particular, PR for bed bound patients having problems of weaning and recovering from major surgery is gaining professional acceptance in hospital intensive care units.[20]

Outpatient rehabilitation (hospital-based or community-based) is currently the most widely available modality and, as such, has the potential to benefit the majority. A certain level of functional ability, however, must already be present for patients to physically attend outpatient sessions two to three times a week.[1–3,17]

Table 1 Characteristics of PR according to different settings

	Inpatient	*Outpatient*	*Home-based*
Medical monitoring	+++	++	+/−
Nursing/RT care	+++	++	+
Staff resources	+++	++	+
Exercise equipment	++	++	+/−
Total costs	+++	++	+
Cost/effectiveness	++	+++	+
Transportation	−	++	−
Reimbursement	+++	++	+/−
Group support	+++	++	−
Family participation	+	+/−	+++
Patient's convenience	+	++	+++
Long-term adherence	+/−	+	++

RT, respiratory therapist; + or − means the level of achievement and/or needing.

The concept of home-based pulmonary rehabilitation may vary considerably among programs. For example, a home-based program may provide regular supervized home exercise and education given by physiotherapists for patients who are too dyspnoeic to attend outpatient rehabilitation.[21] The principal advantages of home-based rehabilitation are convenience for the patient and family members and a familiar environment for training and the acquisition of techniques.

Inpatient PR

Clinical effectiveness (RCT versus observational studies)

In the last decades, clinical studies dealing with the effectiveness of PR almost universally describe those with COPD. In the two most relevant and recently published meta-analysis of randomized and controlled trials, only three out of 23 studies[22] and two out of 20 studies[23] have been performed in an inpatient setting. Therefore, only about 10% of the total amount of consistent literature of PR refers to effects obtained in hospitalized patients.

Overall, four major RCTs were identified in COPD patients with different degrees of severity and in comparison with the untreated controls. Cockcroft *et al.*[24] demonstrated that exercise tolerance in terms of 12-minute walking distance significantly improved in a group of moderate to severe symptomatic COPD trained in hospital by showing a treatment effect of +77 m in comparison with the control group. A significant improvement in exercise tolerance and health-related quality of life (HRQoL), as assessed by the CRD questionnaire,[25] has been obtained after eight weeks of comprehensive PR in another study by treating COPD of similar degree of severity.[15] Moreover, Vallet *et al.*[26] were also able to show that symptom-limited oxygen consumption and maximal ventilation have increased by ~20% in a group of moderate COPD patients after training at the heart rate corresponding to their metabolic ventilatory threshold, four times a week for a two-month period. An additional study by Nava *et al.*[27] demonstrated that early and progressive PR is effective (by improving exercise tolerance and decreasing dyspnoea) in very disabled COPD patients admitted to a respiratory ICU after and episode of acute respiratory failure leading to mechanical ventilation.

Several other observational, quasi-randomized or historically controlled studies have also shown that PR programs of variable duration delivered in different

settings might improve symptoms and optimize function in COPD patients of different degree of severity.[1–3,22] Some of these studies were performed on hospitalized patients, thus showing that generic measures of HRQoL,[28] functional status,[29] anxiety and depression,[30,31] as well as other outcome measures[28–31] may be improved by comprehensive PR programs.

Among these non-randomized trials, only two studies have compared the benefits of PR delivered as inpatient or outpatient program. Couser *et al.* [32] have shown that comprehensive two-month outpatient and two-week inpatient PR programs are as beneficial in older severe COPD patients as they are in younger individuals with similar lung function abnormalities. A more recent study,[33] confirmed that a shorter inpatient PR program may result in improvement of exercise capacity and symptoms similar to those obtained after a longer outpatient PR program in patients with mild to moderate chronic airflow obstruction.

Taking other non-COPD conditions into account, PR intervention has proven its efficacy in hospitalized patients. In one RCT, Fiatarone *et al.* [34] have shown that high-intensity resistance exercise training is a feasible and effective means of counteracting muscle weakness and physical frailty in very elderly people resident in long-term bed facilities. Furthermore, in an observational case study, Wijkstra *et al.* [35] demonstrated that physical activity and mobility can be maintained in very disabled and long-term ventilated patients (with restrictive underlying diagnosis) admitted and treated in a specialised ventilatory unit.

Costs

So far, PR has been demonstrated to be a cost-effective treatment in COPD patients,[12] providing a quality adjusted life years (QALY) gain ranging from 0.05 to 0.1 (benefit sustained for six months and then declined until 18 months). A comprehensive review from the DARE database[36] has shown that total cost of the service has been estimated as ~300–600 Euros (200–400 GBP) per patient. Cost savings might also accrue in terms of reduced general practitioner consultations and hospital admissions,[16] although there is still insufficient evidence for this to be quantified.

However, these calculations have been based on the outpatient model, which is currently considered as the most efficient form of delivery PR.[3] No definitive cost comparison among different settings has been made. A recent study performed in Italy comparing cost and program duration in patients with mild to moderate chronic airway obstruction,[33] has demonstrated that a short, intensive inpatient PR program, with up to 12 sessions held five days per week, led to comparable gains in exercise tolerance at a lower cost, compared to a longer outpatient program (exercise three times per week for about eight weeks). The decreased cost was attributable to fewer total sessions and the elimination of transportation costs.[33]

It is not clear whether a similar cost result could be achieved in a hospital setting in different countries, given the possible different criteria for admission to inpatient rehabilitation and the different healthcare reimbursement climate.

Conclusions

Rehabilitation for patients with chronic respiratory disorders is well established and widely accepted as a mean of enhancing standard therapy in order to alleviate symptoms and optimize function. In particular, it has been shown to be cost-effective in COPD patients, independent of disease stage. Exercise training/pulmonary rehabilitation may be undertaken in an inpatient, outpatient or home-based setting, depending on the individual needs of the patient and available resources.

Although disease severity does not inherently dictate suitability for exercise training, the degree of physiological and functional impairment does determine the optimal setting in which the training should occur.[37] Sick patients with severe functional impairment who need 24-hour medical or nursing intervention may benefit from inpatient rehabilitation. Even ventilator-dependent or elderly disabled patients who are medically stable may undergo rehabilitation with assistance from experienced hospital staff. While in some countries, patients who live too far to attend outpatient PR programs can undergo inpatient PR, this cannot be the case all over the world.[38]

However, inpatient setting for PR program is a feasible option and it does not necessarily result in higher direct costs when duration and improved outcomes are taken into account.

Declaration of interest

The authors of this paper have no conflict of interest to declare.

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