SPECIAL ARTICLE

Pulmonary Rehabilitation and Respiratory Physiotherapy:
Time to Push Ahead

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Introduction

Given that the concepts of pulmonary rehabilitation and respiratory physiotherapy are commonly confused in the health care sector, we need to clarify the meaning of each from the outset. In 1974 the Committee on Pulmonary Rehabilitation of the American College of Chest Physicians defined pulmonary rehabilitation as “an art.”1 Nearly 20 years later another group of experts described it as “a service.”2 However, the definition contained in the recently published joint statement of the American Thoracic Society and the European Respiratory Society (ATS/ERS) probably represents the broadest and most suitable definition for our times. “Pulmonary rehabilitation is an evidence-based, multidisciplinary, and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often have decreased daily life activities. Integrated into the individualized treatment of the patient, pulmonary rehabilitation is designed to reduce symptoms, optimize functional status, increase participation, and reduce health care costs through stabilizing or reversing systemic manifestations of the disease.”3 The ATS/ERS statement further indicated as follows: “Pulmonary rehabilitation programs involve patient assessment, exercise training, education, nutritional intervention, and psychosocial support.” In regard to the education aspect, we would add that this includes physiotherapy (Table 1).

Respiratory physiotherapy, therefore, is just one component of a pulmonary rehabilitation program, which typically includes techniques whose general aim is to improve regional ventilation, gas exchange, respiratory muscle function, dyspnea, exercise tolerance, and health-related quality of life (HRQL).4 Respiratory physiotherapy—which consists of 3 kinds of techniques aimed at improving airway patency, relaxing the patient, and providing breathing training—focuses in a general sense, on improving mucociliary clearance and optimizing respiratory function by enhancing respiratory muscle efficiency and improving chest wall compliance4 (Table 2).

Until recently, Spanish legislation did not explicitly refer to pulmonary rehabilitation as a care option offered by the national health system. Moreover, although the Royal Decree enacted in September 20065—establishing a portfolio of common services to be provided by the national health system—included respiratory physiotherapy as a primary care service, no mention was made of pulmonary rehabilitation. The aim of this study is to draw attention to the demonstrated usefulness of pulmonary rehabilitation and to the possibilities offered by the new legislation with regard to pulmonary rehabilitation and, more specifically, respiratory physiotherapy.

Demonstrated Benefits of Pulmonary Rehabilitation

It can now be safely asserted that rehabilitation programs that include muscle training improve dyspnea, exercise tolerance, and HRQL in patients with chronic obstructive pulmonary disease (COPD)6-9 as well as other respiratory diseases.10 That said, not all pulmonary rehabilitation components produce the same benefits6-9 (Tables 3 and 4).

Educating patients about key aspects of their disease has been shown to be of little benefit to participants in a pulmonary rehabilitation program (level of evidence, C7)—possibly due to the fact that there are few well-designed studies available on this point. While education by itself has been demonstrated to have a beneficial effect on HRQL and exercise tolerance for asthmatic patients,11 this does not appear to be the case for COPD patients.12-16 Education combined with exercise training, on the other hand, can lead to significant improvements in both exercise tolerance and HRQL.17 The ATS/ERS statement recommends emphasizing self-management skills in the educational

TABLE 1

Table 1 Components of a Respiratory Rehabilitation Program

<table>
<thead>
<tr>
<th>Education</th>
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<tbody>
<tr>
<td>Respiratory physiotherapy</td>
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<tr>
<td>Muscle training</td>
</tr>
<tr>
<td>Lower extremity muscles</td>
</tr>
<tr>
<td>Upper extremity muscles</td>
</tr>
<tr>
<td>Respiratory muscles</td>
</tr>
<tr>
<td>Psychosocial support</td>
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<tr>
<td>Nutritional support</td>
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<tr>
<td>Occupational therapy</td>
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The role of psychosocial support in rehabilitation programs is debated (level of evidence, C7), despite the high incidence of depression and anxiety in patients with COPD.21 Several studies have demonstrated the benefits of relaxation techniques for patients with dyspnea and anxiety,22,23 but others conclude that psychosocial support programs do not positively affect exercise tolerance, anxiety, depression, or HRQL.24-26 Few studies have analyzed the impact of pulmonary rehabilitation on emotional disorders when no specific intervention has been undertaken. Some have concluded that rehabilitation reduces depression and anxiety,3,27-29 whereas others have found no improvement.12 The ATS/ERS statement3 recommends, nonetheless, that anxiety and depression be assessed in participants in a pulmonary rehabilitation program and that suitable support be provided to these patients.

Muscle training of the lower extremities is the main factor determining the success of rehabilitation programs (level of evidence, A). Recent studies have demonstrated that lower extremity training improves dyspnea, exercise tolerance, and HRQL,3,7-9 and also leads to structural and functional changes in muscles.30 Improvement is possible with both high31 and low intensity training programs.32,33 What remains unclear is the benefit of training other muscle groups. Upper extremity activity clearly has a significant metabolic and ventilatory impact, but there are few studies that have analyzed the specific benefits of arm exercises. Although some studies have demonstrated a significant improvement in the strength and resistance of muscle groups,3,8,9,34 none were able to lay claim to more general benefits—in terms of improved functional capacity or HRQL, for example. The ATS/ERS statement recommends training both the upper and lower extremities—combining strength and endurance training and preferably using the interval training method.3 The efficacy of specific training of respiratory muscles continues to be debated (level of evidence, C7).
Pulmonary rehabilitation programs are typically designed for hospital settings, irrespective of whether the patient has been admitted or is being treated as an outpatient. Programs for hospitalized patients, however, are rare, and typically have been designed in the USA and in Canada.

**Hospital-Based or Community-Based Pulmonary Rehabilitation?**

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**The Current Situation**

Despite the benefits of pulmonary rehabilitation, as described above, only a few countries expressly fund this care option through their public health systems. Furthermore, there are significant geographical variations even within countries that do offer such coverage; consequently, only a small proportion of patients who could benefit from pulmonary rehabilitation actually have access. In the UK, for example, only around 50% of patients have their treatment paid for from public funds. It is not known to what extent pulmonary rehabilitation programs are offered at the primary care level, as primary care rehabilitation is not centrally planned but is managed by the Primary Care Trusts. A recent study estimated that only 1.5% of patients diagnosed with COPD have access to pulmonary rehabilitation programs in the UK. These results are similar to those obtained for Canada, where around 40% of hospitals offer such programs, some regions have none at all, and only about 1.2% of all patients with COPD receive the treatment. In the USA, and despite

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**TABLE 5**

Studies Relating Degree of Bronchial Obstruction With Long-Term Maintenance of Benefits

<table>
<thead>
<tr>
<th>Authors, y</th>
<th>FEV&lt;sub&gt;1&lt;/sub&gt;</th>
<th>Maintenance, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ries et al,&lt;sup&gt;13&lt;/sup&gt; 1995</td>
<td>1.21 (0.55)</td>
<td>12</td>
</tr>
<tr>
<td>Grosbois et al,&lt;sup&gt;40&lt;/sup&gt; 1999</td>
<td>1.33 (0.7)</td>
<td>18</td>
</tr>
<tr>
<td>Güell et al,&lt;sup&gt;20&lt;/sup&gt; 2000</td>
<td>1.20 (0.5)</td>
<td>24</td>
</tr>
<tr>
<td>Troosters et al,&lt;sup&gt;44&lt;/sup&gt; 2000</td>
<td>1.20 (0.5)</td>
<td>18</td>
</tr>
<tr>
<td>Finnerty et al,&lt;sup&gt;43&lt;/sup&gt; 2001</td>
<td>0.99 (0.36)</td>
<td>6</td>
</tr>
</tbody>
</table>

Abbreviation: FEV<sub>1</sub>, forced expiratory volume in 1 second.

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**TABLE 6**

Studies Relating Training Program Duration and Frequency With Long-Term Maintenance of Benefits

<table>
<thead>
<tr>
<th>Authors, y</th>
<th>Frequency, Times/wk</th>
<th>Duration, wk</th>
<th>Maintenance, mo</th>
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<tbody>
<tr>
<td>Ries et al,&lt;sup&gt;13&lt;/sup&gt; 1995</td>
<td>2</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Singh et al,&lt;sup&gt;46&lt;/sup&gt; 1998</td>
<td>2</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Troosters et al,&lt;sup&gt;44&lt;/sup&gt; 2000</td>
<td>2-3</td>
<td>24</td>
<td>18</td>
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<tr>
<td>Grosbois et al,&lt;sup&gt;44&lt;/sup&gt; 1999</td>
<td>2</td>
<td>7</td>
<td>18</td>
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<tr>
<td>Güell et al,&lt;sup&gt;20&lt;/sup&gt; 2000</td>
<td>3</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Finnerty et al,&lt;sup&gt;43&lt;/sup&gt; 2001</td>
<td>2</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Foglio et al,&lt;sup&gt;45&lt;/sup&gt; 2001</td>
<td>3</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision. The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision. The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision. The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision. The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision. The benefits provided by these programs are undisputed, but several randomized controlled trials have recently demonstrated that a home-based pulmonary rehabilitation program produces a significant improvement in HRQL and exercise tolerance. It would even seem that the benefits of home-based programs last longer. Some home-based programs include intensive training with ergometers under supervision, similar benefits have been obtained, however, for simpler programs operated without equipment or direct supervision.
the efforts of scientific and professional associations, there is no explicit cover for pulmonary rehabilitation in any publicly funded health programs. Currently underway, however, is a legislative proposal supporting such cover for pulmonary rehabilitation. The situation is better in France, where the social security system does provide coverage, and programs are implemented in certain hospitals (for fully or partially hospitalized patients), for outpatients, and more infrequently, for home-based patients. Nonetheless, the French Minister of Health and Solidarity—in referring to a program of actions aimed at COPD patients for the period 2005-2010—has acknowledged that pulmonary rehabilitation is not sufficiently widely available. In Italy, this modality is offered as an outpatient service that is provided in both hospital settings and in community settings. However, there are considerable differences in availability of this treatment from one geographic area to another.

As far as we are aware, Andalusia is the only region in Spain that offers pulmonary rehabilitation to clinic outpatients and home-based patients as part of its portfolio of primary care services. It does so in accordance with Decree 137/2002 governing the provision of support to Andalusian families. In 2000, INSALUD (the Spanish National Health Institute) established a Framework Agreement for Rehabilitation (the Carrasco 2000 Reference Framework Contract), on the basis of which other autonomous regions of Spain have entered into agreements to provide rehabilitation services—including pulmonary rehabilitation—for both outpatients and home-based patients.

In Catalonia, rehabilitation in hospital and community settings is performed by multidisciplinary teams coordinated by a rehabilitation physician. These teams depend on hospitals in the network of hospitals subsidized for public use, hospitals and rehabilitation facilities providing primary care support services to the Catalan Health Institute, public companies, mixed public and private consortia, and contracted providers of rehabilitation services. Some of these centers offer pulmonary rehabilitation programs, including, in some cases, home-based programs. A Rehabilitation Plan placed before the Parliament of Catalonia in June 2005 specifically included pulmonary rehabilitation in the portfolio of services offered by the Catalan Health Service to patients with chronic respiratory diseases, and pulmonary rehabilitation has recently been put out to tender (as has happened with other physical rehabilitation programs). The Rehabilitation Plan distinguishes between respiratory physiotherapy and muscle training, describing specific indications and referral procedures for each. Referrals for pulmonary rehabilitation for both outpatients and home-based patients may come from the primary care level for the more frequent indications (COPD and bronchiectasis). Other conditions, such as cystic fibrosis and neuromuscular diseases, require referral from a specialist. Given the complexity of the initial assessment of patients who might need oxygen therapy or who may be receiving home mechanical ventilation, the referral for muscle training for both outpatients and home-based patients who fall into this category must come from certain designated hospitals.

Remarks

Pulmonary rehabilitation reduces dyspnea, improves exercise tolerance, and certainly improves HRQL in patients with COPD and other respiratory diseases. These benefits are obtained irrespective of whether the rehabilitation program is conducted in a hospital setting (the most typical location) or in the patient’s home. The evidence available in regard to the efficacy and benefits of pulmonary rehabilitation has inspired scientific and professional associations to recommend this treatment—particularly for patients with COPD. The recent ATS/ERS consensus in fact recommends its prescription for all patients who need it. That said, however, studies conducted in a number of countries indicate that pulmonary rehabilitation is not being offered in all hospitals that have the capacity to develop such programs. Furthermore, the extent to which pulmonary rehabilitation is implemented in community environments is unknown, given the few studies available in this regard. The care deficit means that most patients who could benefit from pulmonary rehabilitation are unable to obtain access and that access is also marked by a geographic imbalance. In some advanced countries, such as the USA and the UK, public funding of pulmonary rehabilitation is still precarious. The reasons are probably to be found in the fact that the benefits of pulmonary rehabilitation are not well known—by either the health care professionals treating respiratory diseases or by governmental agencies. This lack of knowledge is a consequence of the fact that the evidence available to support the use of pulmonary rehabilitation is as yet fairly recent.

No studies have been conducted in Spain on the characteristics or regional availability of pulmonary rehabilitation programs or on the percentage of patients who receive this treatment. We can suppose, however, that the situation in Spain is not likely to be very different from that in countries where such data is available. On this basis it can be assumed that there are significant differences—both between and within regions of Spain—in the provision of pulmonary rehabilitation, and that most potential candidates do not have access. In this regard, the recent Royal Decree establishing the services to be provided by the national health system and dictating the inclusion of respiratory physiotherapy in the primary care portfolio represents an important advance. Nonetheless, there remains some uncertainty as to the real scope of the service, given that respiratory physiotherapy is just one component. Furthermore, there is concern that respiratory physiotherapy will replace, or be performed instead of, genuine pulmonary rehabilitation, thereby limiting the potential benefits.

Consequently, in the interest of ensuring quality care while avoiding severe inequalities in terms of access to pulmonary rehabilitation, the systematic and beneficial development of pulmonary rehabilitation programs will require joint action by public bodies and scientific associations and the fostering of greater awareness among health professionals. It would be useful, for example, to raise awareness of pulmonary rehabilitation in pre- and
post-graduate training programs for key groups of professionals (pulmonologists, rehabilitators, physiotherapists, family physicians, nurses, etc.). It would be equally useful to map out the availability of pulmonary rehabilitation programs in Spain. Finally, the inclusion of pulmonary rehabilitation in health care planning and in specific autonomous community programs aimed at providing comprehensive treatment to patients with COPD and other respiratory diseases would also contribute to promoting the use of pulmonary rehabilitation. Along with measures to encourage people to quit smoking and to educate people in the proper use of medications, pulmonary rehabilitation is probably one of the interventions that would most contribute to improving the HRQL of patients with respiratory diseases. Given the substantial evidence already available in support of the usefulness of pulmonary rehabilitation, the way ahead is clear: for the good of patients with respiratory diseases and society in general, it is clearly time to push ahead with this promising addition to specialized respiratory care.

REFERENCES

5. Real Decreto 1030/2006, de 15 de septiembre, por el que se establece el procedimiento para su actualización. BOE n.o 222, de 16 de septiembre de 2006.