
Textbook of Pulmonary Rehabilitation

Enrico Clini • Anne E. Holland
Fabio Pitta • Thierry Troosters
Editors

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 Springer

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Enrico Clini
Department of Medical and Surgical
Sciences
University of Modena
Azienda Ospedaliero Universitaria di
Modena Policlinico
Modena, Italy

Fabio Pitta
State University of Londrina
Londrina, Paraná, Brazil

Anne E. Holland
Alfred Health and Institute for Breathing
and Sleep, La Trobe University
Melbourne, Australia

Thierry Troosters
Department of Rehabilitation Sciences
KU Leuven, Respiratory Division
and Rehabilitation
University Hospital Leuven
Leuven, Belgium

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Foreword

To borrow a phrase from Charles Dickens, for pulmonary rehabilitation this is the best of times and the worst of times. A strong scientific basis has been gathered which makes pulmonary rehabilitation arguably the most effective therapy we have to offer patients with pulmonary disease. Yet the lack of availability to the vast majority of patients lessens its impact. This is manifestly true for patients with chronic obstructive pulmonary disease (COPD), and even more so for patients with other chronic pulmonary conditions. This volume helps to clarify these issues and, hopefully, will provide a path forward.

Pulmonary rehabilitation is no longer a young discipline. Founded in the concepts of Alvan Barach, who more than 60 years ago posited that exercise was effective therapy for his emphysema patients. Made tangible by Tom Petty, who organized the first multidisciplinary team to deliver pulmonary rehabilitation almost 50 years ago. Nurtured by practitioners who understood the benefits, established programs and spread the word. Recognized by exercise scientists who established the scientific basis of the exercise programs that are the core of pulmonary rehabilitation, introducing concepts such as limb muscle dysfunction and dynamic hyperinflation, which have helped to rationalize new adjuncts to exercise programs. And then promoted as standard of care by every relevant professional organization in authoritative documents. The 2016 GOLD Guidelines concludes "...all COPD patients appear to benefit from rehabilitation and maintenance of physical activity, improving their exercise tolerance and experiencing decreased dyspnea and fatigue."

It is worth trying to discern why pulmonary rehabilitation is so little used despite its unequivocal benefits. Consider that there are three major therapies widely recognized as effective for COPD: bronchodilators, supplemental oxygen, and pulmonary rehabilitation. Although we have little in the way of head to head trials, it may be concluded that rehabilitation, in comparison to the other two, yields superior benefits in terms of enhancement of exercise tolerance, reduction of dyspnea, and improvement of health-related quality of life, all highly relevant patient-centered benefits. Yet uptake of these three therapies by COPD patients is quite the opposite. Bronchodilators, especially the long-acting variety, are almost universally used. Supplemental oxygen is widely available to those patients demonstrating clinically significant hypoxemia. In contrast, a 2013 survey (Desveaux et al., J. COPD) concludes: "the annual national capacity for pulmonary rehabilitation...consistently translated to $\leq 1.2\%$ of the estimated COPD population" for the countries sur-

veyed. In the United States, a recent Medicare database examination (Nishi et al. *J Cardiopulm Rehabil*, 2016) revealed that, among Medicare beneficiaries, pulmonary rehabilitation participation rate increased from 2.6% in 2003 to (only) 3.7% in 2012. As many COPD patients lack Medicare coverage, these percentages likely overestimate the participation in the overall COPD population in the United States. A 2015 American Thoracic Society/European Respiratory Society (ATS/ERS) Policy Statement (Rochester et al., *Am J Respir Crit Care Med*), dealing with strategies to enhance the implementation of pulmonary rehabilitation, concludes that “the ATS and ERS commit to undertake actions that will improve access to and delivery of PR services for suitable patients. They call on their members and other health professional societies, payers, patients, and patient advocacy groups to join in this commitment.” But this call seems to be going largely unanswered.

This situation persists despite the fact that all three therapies have essentially universal support as standard of care for symptomatic COPD. Is this because of cost differentials? No, it can be seen that the annual cost of standard bronchodilator therapy, long-term oxygen therapy, and a program of pulmonary rehabilitation is roughly in the same range. In fact, analyses such as the one conducted by the British Thoracic Society (BTS Reports, 2012) conclude that pulmonary rehabilitation has a substantially lower cost per quality-adjusted life-year (QALY) than does bronchodilator therapy. It might be asked what pulmonary rehabilitation lacks that bronchodilator therapy and supplemental oxygen possess that explains the differential in uptake of these therapies. On reflection, bronchodilator therapy uptake is supported by an extensive marketing effort, both directly to patients and to medical providers. Oxygen therapy, on the other hand, is not marketed, but its provision is near mandatory because it is widely accepted that failure to provide long-term oxygen therapy to hypoxemic COPD patients is associated with substantially increased mortality. This conclusion is founded on two, relatively small, randomized clinical trials (total of about 300 patients) performed more than 35 years ago. Nevertheless, the perception that survival is enhanced by long-term oxygen therapy has made its provision (and funding) more or less mandatory for those meeting the criteria established in these clinical trials. Indeed, it may be asserted that *all* therapies that prolong survival have high priority.

It seems unlikely that pulmonary rehabilitation will ever be supported by an extensive marketing effort, but it might be asked whether rehabilitation reduces COPD mortality. It seems understandable that this information is not available. Large-scale multicenter investigations of pulmonary rehabilitation are almost nonexistent. Even if a substantial survival benefit is postulated, because, in stable COPD, the likelihood of dying in the short term is rather low, it would take a very large randomized clinical trial (many thousands of participants) to provide adequate resolution. A design that might be more feasible would be to study rehabilitation of patients shortly after a COPD hospitalization. Because post-hospitalization patients have a relatively high mortality, the number of participants to adequately investigate a given postulated reduction in mortality would be appreciably reduced.

As we look forward, it seems important to incorporate “next generation” features into our model of pulmonary rehabilitation. Formal behavior modifi-

cation techniques can improve adherence and, especially, promote increases in physical activity in everyday life. Maintenance programs, perhaps incorporating telemedicine approaches, can help prolong benefit. Addition of these components might well increase the likelihood of the survival advantage whose establishment can be predicted to change the attitude of patients, providers, and payers alike, resulting in increased demand and better provision of pulmonary rehabilitation services.

Richard Casaburi, Ph.D., M.D.
UCLA School of Medicine, Rehabilitation Clinical Trials Center
Los Angeles Biomedical Research Institute,
Torrance, CA, USA

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