Pulmonary rehabilitation following acute exacerbation of COPD: what current evidence we have?

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Introduction

Acute exacerbation (AE) of COPD (AECOPD) is an event that is characterized by episode of acute worsening of the patients respiratory symptoms, particularly dyspnea, cough and sputum production beyond the normal daily variation leads to additional therapy. An AECOPD can impact the natural course of COPD in the following ways including worsening of quality of life, deterioration of symptoms and lung function (requiring a few weeks to recover), acceleration of decline of lung function, increase in socioeconomic burden and mortality.

Impact of AECOPD

A recent large database study found that fewer than half of COPD patients hospitalized for an exacerbation survived for a further 5 years, which suggests delaying successive severe exacerbation and optimization of management to reduce the risk of severe AECOPD are crucial therapeutic goals for patients with COPD. Patients with severe AECOPD are at substantial risk for re-hospitalization. In an analysis among U.S. Medicare beneficiaries, the cumulative risk of readmission in the year after discharge was 64.2%, and the cumulative risk of death was 26.2%. In the United Kingdom, 43% of patients hospitalized with AECOPD were readmitted and 12% died within 90 days. These findings suggest the need for additional post-discharge support and strategies to reduce readmission.

An AECOPD requiring hospitalization is associated with significantly reduced skeletal muscle strength and physical activity levels, which leads to aggravation of deconditioning and risk of readmission. Pitta et al. reported that time spent on weight-bearing activities (walking and standing) was markedly low both at day 2 and day 7 of hospitalization (median 7% and 9%, respectively) and 1 month after discharge (median, 19%).

Skeletal muscle dysfunction in AECOPD

Peripheral muscle weakness is enhanced during an acute exacerbation of COPD. The quadriceps muscle force and cross-sectional area decreased by 5% during five days of hospital admission. Muscle weakness has been reported because of reduced peripheral muscle force, steroid treatment, as well as systemic inflammation and low levels of physical activity.
Mechanisms of PR effects

Pulmonary rehabilitation (PR) is defined by the American Thoracic Society/European Respiratory Society (ATS/ERS) as a ‘comprehensive intervention based on a thorough patient assessment followed by patient tailored therapies that include, but are not limited to, exercise training, education, and behaviour change, designed to improve the physical and psychological condition of people with chronic respiratory disease’.9

Exercise training programme result in physiological adaptations reflecting enhanced peak oxygen uptake (VO₂). In addition, other mechanisms including desensitization to dyspnea, reductions in anxiety and reduced dynamic hyperinflation may contribute to improved performance.10

The evidence demonstrating the immune-regulatory and anti-inflammatory effects of regular exercise are well established. Mechanisms involved in exercise induced anti-inflammatory effects are as follows: reduction in visceral fat mass; increased production and release of anti-inflammatory cytokines from contracting skeletal muscle and reduced expression of Toll-like receptors (TLRs) on monocytes and macrophages.11

Evidence base for PR in AECOPD

PR has been shown to be an essential part of the management of COPD and is recommended as soon as possible after an AECOPD.12 Although not all, data support the impact of PR within the first 4 weeks following discharge to improve quality of life and reduce readmissions.12,13

Greening and colleagues conducted randomized controlled trial of 389 hospitalized patients with COPD to either usual care or a 6-week PR intervention comprising an inpatient component starting within 48 hours of hospitalization, followed by a post-discharge home-based supported self-management programme. The authors observed no difference in readmission risk (HR 1.10, 95% CI, 0.86-1.43, P=0.44) with intervention, nor any difference in recovery of physical function and health status. Moreover, they found that mortality at 12 months was higher in the intervention group.14

Puhan and colleagues reported the impact of PR following an AECOPD in a Cochrane systematic review.12 They included 20 trials (1,447 participants) and recommended PR had to commence immediately after initiation of exacerbation treatment or within three weeks of initiation of exacerbation treatment. PR after AECOPD appeared to be safe with no increased mortality. There was moderate quality evidence supporting a reduction in hospital readmission rates with PR, although results were heterogeneous. There was high quality evidence in improving health-related quality of life and exercise capacity with PR.

Another systematic review of 16 studies of early rehabilitation during AECOPD included all physiotherapy interventions (not only exercise training) and reported that physiotherapy interventions were significantly beneficial in improving dyspnea, quality of life, walking distance.15 Recently, a number of studies have included a comprehensive early PR program during an admission for AECOPD.

Despite evidence of the benefits of PR, there is underutilization of PR in patients hospitalized with AECOPD. Recent data have shown that multiple barriers to referral, patient uptake and completion exist in the post-AECOPD PR patient pathway.16 Moreover, unlike PR for stable COPD, no ideal model of early PR program specific to AECOPD has been developed.