

## THE ROLE OF PULMONARY REHABILITATION IN ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

RAHMAD<sup>1</sup>, SHABRINA NARASATI<sup>1\*</sup>, EKO NUGROHO<sup>1</sup>, DJOKO WITJAKSONO<sup>1</sup>, DWI INDRIANI LESTARI<sup>1</sup>,  
M. BARLIAN NUGROHO<sup>1</sup>, SAMIAH RACHMAWATI<sup>1</sup>, M. RIDWAN<sup>1</sup>

<sup>1</sup>Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Universitas Brawijaya–dr. Saiful Anwar Hospital, Malang, Indonesia

Email: shabrina@student.ub.ac.id

Received: 13 Oct 2019, Revised and Accepted: 17 Feb 2020

### ABSTRACT

**Objective:** Chronic obstructive pulmonary disease (COPD) reduces lung function and generates systemic effects that decrease the quality of life. COPD is a major cause of chronic morbidity and mortality worldwide. Pulmonary rehabilitation can reduce symptoms of dyspnea and improve exercise capacity and quality of life in COPD patients.

**Methods:** We report a case of a 60 y old male with an acute exacerbation (AE) of COPD and pneumonia. The inpatient pulmonary rehabilitation program was 5 consecutive days of 3 repetitions of cough control, 2 sets of 6 repetitions of pursed-lip breathing, 2 sets of 6 repetitions of deep breathing exercises, postural drainage, and manual clapping twice daily. Postural drainage in the lateral basal segment and manual clapping in the right lower lobe was chosen according to the chest x-ray (CXR).

**Results:** At the initial visit, the following information was noted: inspiration capacity with incentive spirometry, 600 cc/s; chest expansion, 1.5 cm; and single-breath counting (SBC), 11. The activities of daily living (ADL) score according to the Barthel Index was 70, and CXR results showed COPD and pneumonia in the right lower lobe. After 5 d of pulmonary rehabilitation, there was a clear airway and improvement in shortness of breath (SOB), and the following was noted: incentive spirometry, 900 cc/s; chest expansion, 2 cm; SBC, 20; and Barthel Index score, 100.

**Conclusion:** Early inpatient pulmonary rehabilitation in COPD AEs is clinically effective and safe, controls breathing and coughing, strengthens the respiratory muscles, and improves the clearing of the airway, which improves the patient's pulmonary function capacity and quality of life.

**Keywords:** Activities of daily living, Chronic obstructive pulmonary disease, Early pulmonary rehabilitation, Respiratory function tests

© 2020 The Authors. Published by Innovare Academic Sciences Pvt.Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)  
DOI: <http://dx.doi.org/10.22159/ijap.2020.v12s3.39466>

### INTRODUCTION

Chronic obstructive pulmonary disease (COPD) reduces lung function, generates systemic effects that decrease quality of life, and is a leading cause of chronic morbidity and mortality worldwide [1]. Pulmonary rehabilitation can be defined as a comprehensive intervention for chronic respiratory disease patients, including thorough assessment and individually designed for patients that includes exercise training, education, and behavioral changes. Pulmonary rehabilitation aims to improve not only patients' physical condition but also patients' psychological condition. Pulmonary rehabilitation is safe and effective, controls breathing and coughing, reduces dyspnea, and improves patient pulmonary function capacity and quality of life [3, 4].

A study conducted by Riario-Sforza showed that outpatient pulmonary rehabilitation improved exercise tolerance in mild COPD patients. The pulmonary rehabilitation program consisted of physical training, upper-limb and trunk exercise training, and respiratory muscle training. The improvement was shown by an increase in the walking distance evaluated by the 6-min walk test (6MWT). A study by Jacome *et al.* revealed that mild COPD patients showed improvements following a 12-week pulmonary rehabilitation program consisting of exercise training and psychoeducation by improving dyspnea evaluated with several testing methods, including the Timed Up and Go Test, the Modified Medical Research Council questionnaire, a 10-repetition maximum test, the 6MWT, and quality of life. Based on these results, it was suggested to routinely include mild COPD patients in these programs.

A large proportion of pulmonary rehabilitation is performed when the patient's clinical condition is already stable in the outpatient setting after optimal therapy has been delivered. However, pulmonary rehabilitation may also be beneficial during a COPD exacerbation. Patients with COPD who experience recurrent

exacerbations commonly have muscle atrophy in addition to reduced exercise capacity and a higher mortality rate [6]. However, most COPD patients are reported to be notably inactive both during and 1 mo after an exacerbation [7]. This situation creates a vicious cycle of exacerbation, recurrent dyspnea, and poor exercise capacity and quality of life, which leads to rehospitalization [7, 8]. Pulmonary rehabilitation as early intervention during exacerbations may improve outcomes according to several studies [8]. This case report was conducted to determine whether early pulmonary rehabilitation in a COPD patient in the inpatient setting following an acute exacerbation (AE) can effectively improve pulmonary function capacity and quality of life.

### CASE REPORT

A 60-year-old male patient was referred to the pulmonology ward on the first day of hospitalization with an AE of COPD and pneumonia. The patient complained of shortness of breath (SOB), a high fever, and a productive cough. At the initial visit, the results of the patient's assessment were as follows: the pulmonary function capacity assessment showed an inspiration capacity with incentive spirometry of 600 cc/s; chest expansion of 1.5 cm; and single-breath counting (SBC) of 11; the activities of daily living (ADL) score according to the Barthel Index was 70, and the chest x-ray (CXR) results showed COPD and pneumonia in the right lower lobe.

### METHODS

This case report was conducted in the Department of Physical Medicine and Rehabilitation at the hospital in Malang, Indonesia, from 2-6 September 2019. This study received ethical approval from the Ethical Committee of our hospital.

### RESULTS

The inpatient pulmonary rehabilitation program consisted of twice-daily supervised private sessions for 5 consecutive days. The

program included 3 repetitions of cough control, 2 sets of 6 repetitions of pursed-lip breathing, 2 sets of 6 repetitions of deep breathing exercises, postural drainage, and manual clapping. Postural drainage in the lateral basal segment and manual clapping in the right lower lobe was chosen according to the CXR.

After 5 d of pulmonary rehabilitation, the examination results showed that there were a clear airway and improvement in SOB. The incentive spirometry increased from 600 cc/s to 900 cc/s; chest expansion increased from 1.5 cm to 2 cm; SBC increased from 11 to 20; and the Barthel Index increased from 70 to 100.

**Table 1: Results of the pulmonary function test and quality of life assessment before and after the pulmonary rehabilitation program in a patient following an acute exacerbation of COPD**

Test	Assessment before pulmonary rehabilitation program	Assessment after pulmonary rehabilitation program
Pulmonary function test		
Incentive Spirometry	Inspiration capacity: 600 cc/s	Inspiration capacity: 900 cc/s
Chest expansion	1.5 cm	2 cm
Single-breath counting	11	20
Quality of life	Barthel Index: 70	Barthel Index: 100

## DISCUSSION

Pulmonary rehabilitation reduces symptoms of dyspnea and improves exercise capacity and quality of life in the COPD patient in this case report. Our pulmonary rehabilitation program is in line with the recommendations by The Global Initiative for Chronic Obstructive Lung Disease (GOLD). In addition, evidence supporting pulmonary rehabilitation is of the highest level (A, B, and C levels).

A Cochrane review of randomized control trials conducted by Puhan *et al.* revealed that pulmonary rehabilitation in AEs of COPD is clinically safe and improves patients' exercise capacity and health-related quality of life. Consistent with our study, the aims of pulmonary rehabilitation in their study were to control breathing and coughing, strengthen the respiratory muscles, and improve clearing of the airway, which leads to improvements in patients' pulmonary function capacity and quality of life. Pulmonary rehabilitation was also found to reduce the risk of hospital admission and mortality due to AEs of COPD. No adverse effects of pulmonary rehabilitation in AEs of COPD were discovered. In conclusion, pulmonary rehabilitation is considered safe [9].

A randomized controlled study in 97 elderly patients hospitalized with COPD AEs by Eaton *et al.* demonstrated that early inpatient-outpatient pulmonary rehabilitation was feasible and safe. In addition, the rehabilitation was associated with a nonsignificant trend in reducing COPD-related rehospitalization and length of stay. A case report by Jette *et al.* of a 64-year-old woman who participated in an outpatient pulmonary rehabilitation program after three COPD AEs over a four-month period revealed results similar to those of our case; there were clinically significant improvements in the patient's quality of life and exercise capacity [10].

## CONCLUSION

The rehabilitation program in this case, aimed to strengthen respiratory muscles, control breathing and coughing, and improve the clearing of the airway, which led to improvements in the patient's pulmonary function capacity and quality of life. Early inpatient pulmonary rehabilitation in AEs of COPD is clinically effective and safe and can improve many aspects of respiratory function.

## ACKNOWLEDGEMENT

None

## AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

## CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

## REFERENCES

- Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, *et al.* Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the global burden of disease study 2010. *Lancet* 2012;380:2095-128.
- Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, *et al.* An official American Thoracic Society/European Respiratory Society statement: Key concepts and advances in pulmonary rehabilitation. *Am J Respir Crit Care Med* 2013;188:e13-64.
- Lacasse Y, Goldstein R, Lasserson TJ, Martin S. Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2006;CD003793.
- Jacome C, Marques A. Impact of pulmonary rehabilitation in patients with mild COPD. *Respir Care* 2014;59:1-6.
- Riario Sforza GG, Incorvaia C, Paterniti F, Pessina L, Caligiuri R, Pravettoni C, *et al.* Effects of pulmonary rehabilitation on exercise capacity in patients with COPD: A number needed to treat study. *Int J Chron Obstruct Pulmon Dis* 2009;4:315-9.
- Mikelsons C, Wedzicha W. Pulmonary rehabilitation and exacerbation. *Semin Respir Crit Care Med* 2009;30:649-55.
- Pitta F, Troosters T, Probst VS, Spruit MA, Decramer M. Physical activity and hospitalisation for exacerbation of COPD. *Chest* 2006;129:536-44.
- Eaton T, Young P, Ferguson W, Moodie L, Zeng I, O'kane F, *et al.* Does early pulmonary rehabilitation reduce acute health-care utilization in COPD patients admitted with an exacerbation? A randomized controlled study. *Respirology* 2009;14:230-8.
- Puhan MA, Scharplatz M, Troosters T, Walters EH, Steurer J. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2009;CD005305.
- Jette DU, Bourgeois MC, Buchbinder R. Pulmonary rehabilitation following acute exacerbation of the chronic obstructive pulmonary disease. *Physical Ther* 2010;90:9-12.