**MEDICAL REHABILITATION IN PATIENT WITH ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)**

1**dr. Erni Cornelis**

**2Dr. dr. Theresia Isye Mogi, Sp. KFR (K), SH, MKes**

1PPDS-1 Ilmu Kedokteran Fisik dan Rehabilitasi Fakultas Kedokteran Universitas Sam Ratulangi Manado

2Spesialis Ilmu Kedokteran Fisik dan Rehabilitasi RSUP Prof. Dr. R. D. Kandou Manado

Email: ernicornelis83@gmail.com, dokter\_isye@gmail.com

**ABSTRACT** : Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable disease state characterized by airflow limitation that is not fully reversible. The air flow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles of gases, primarily caused by cigarette smoking. COPD is a lung disease characterized by airway obstruction in the airways that is progressively non reversible or partial reversible. COPD consists of chronic bronchitis and emphysema or a combination of both. Daily symptoms such as chronic and progressive dyspnea, cough, and sputum production deserve the blame for the burden and lead to activity limitation and ultimately COPD patients inability to work and take care of themselves. Pulmonary rehabilitation is an essential part of the management of COPD, alleviating dyspnea and fatigue, improving exercise tolerance and health-related quality of life, and reducing hospital admissions and mortality in COPD patients.

**ABSTRAK** : Penyakit Paru Obstruktif Kronik (PPOK) adalah suatu keadaan penyakit yang dapat dicegah dan diobati yang ditandai dengan keterbatasan aliran udara yang tidak sepenuhnya reversibel. Keterbatasan aliran udara biasanya progresif dan berhubungan dengan respon inflamasi abnormal paru-paru terhadap partikel gas berbahaya, terutama disebabkan oleh merokok. PPOK adalah penyakit paru yang ditandai dengan obstruksi jalan napas pada saluran napas yang bersifat progresif non reversibel atau reversibel parsial. PPOK terdiri dari bronkitis kronis dan emfisema atau kombinasi keduanya. Gejala harian seperti dispnea kronis dan progresif, batuk, dan produksi sputum patut disalahkan atas beban dan menyebabkan keterbatasan aktivitas dan pada akhirnya pasien PPOK ketidakmampuan untuk bekerja dan mengurus diri sendiri. Rehabilitasi paru adalah bagian penting dari manajemen PPOK, mengurangi dispnea dan kelelahan, meningkatkan toleransi latihan dan kualitas hidup yang berhubungan dengan kesehatan, dan mengurangi rawat inap dan kematian di rumah sakit pada pasien PPOK.

**INTRODUCTION**

 Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable disease state characterized by airflow limitation that is not fully reversible. The air flow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles of gases, primarily caused by cigarette smoking.1

 COPD are among the world’s most important causes of mortality. These disease are the fourth leading cause of death in the United States and are expected to become the third leading cause of death in the world by 2020. Every year, these diseases impose a significant cost to the national health care systems.COPD is a common pulmonary disease worldwide and is characterized by progressively persistent airflow limitation.[2](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref1) The economic and social burden of COPD is substantial and increasing.

 COPD is a lung disease characterized by airway obstruction in the airways that is progressively non reversible or partial reversible. COPD consists of chronic bronchitis and emphysema or a combination of both.2,4 Daily symptoms such as chronic and progressive dyspnea, cough, and sputum production deserve the blame for the burden and lead to activity limitation and ultimately COPD patients inability to work and take care of themselves.[5](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref3) Patients with COPD are trapped in a vicious circle of inactivity, which begins with breathlessness.[6](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref4)COPD is the most common cause of dyspnoea, limitation of physical activity, decreasing in quality of life and disability.1

 In Indonesia it is estimated that there are 4.8 million COPD patients and this number can increase with the increasing number of smokers who are the main risk factors for COPD.1 In COPD patients, decreased lung elastic recoil pressure and increased airways resistance lead to an increase in the mechanical time for lung emptying. Thus, insufficient exhalation causes an increase in operational lung volumes and progressive air retention called “air trapping”, resulting in dyspnea.7 The most dominant symptoms in patients with COPD is the shortness of breath often starts during activity.8

 Interventions in COPD patients comprise from two therapies namely pharmacological therapy and non-pharmacological therapy. One therapy non-pharmacological in COPD patients is pulmonary rehabilitation. Pulmonary rehabilitation has been defined by the European Respiratory Society (ERS) and American Thoracic Society (ATS) as ‘an evidence-based, multidisciplinary, and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often have decreased daily life activities. Pulmonary rehabilitation is designed to reduce symptoms, optimise functional status, increase participation, and reduce healthcare costs through stabilising or reversing systemic manifestations of the disease.9,10

 Pulmonary rehabilitation is an essential part of the management of COPD, alleviating dyspnea and fatigue, improving exercise tolerance and health-related quality of life, and reducing hospital admissions and mortality in COPD patients.9,10 The pulmonary rehabilitation programs that include physical training, education, nutritional advice and smoking cessation counseling are aimed to reverse patients to an independent functional status.A particular target of these programs is to teach patients on self-management in COPD, having a big influence on physical health, psychological well-being and life expectation. 1

**CASE REPORT**

**INITIAL PRESENTATION**

A 75 years old male come to the PMR department on May 2nd 2019. The patient complains of shortness of breath since 6 days before hospitalized. Initially he felt shortness of breath when he walked more than 100 meters or do a lot activitiy. The symptom getting worst 3 days before hospitalized, he can’t walking more than 10 meters, dressing, bathing or toileting by him self. In the end he complain about the shortness of breath until even when he is not doing activities or taking rest. He often wake up at night because hard to breath and he cannot sleep in supine position because of the shortness of breath, and to compensate that he felt sleep in a half-sitting position and sometimes in sitting position. Shortness due to changes in position (+), coughing (+) thick phlegm since 1 month ago, sputum was difficult to remove. Fever (+), chest pain (-), palpitations (-), nausea (-), vomiting (-), swollen feet (-). Since the patient was diagnosed with COPD last year the patient has lost of weight until 10 kg. He was treated in Internal Medicine Departement for 3 days, referred with Acute Exacerbation of Chronic Obstructive Pulmonary Disease. When the patient condition is checked, shortness of breath decreases, coughing (+) with thick phlegm, fever (-), chest pain (-), palpitations (-), weakness (-).

He had history of COPD since 1 years ago and had been hospitalized last year twice, not controlled regularly at pulmonology outpatient clinic. He smoke since he was junior high school, about 1 pack per day until 2 months ago. Patient lives in Titiwungen. He is a entrepreneur and imam at the mosque, have 3 children (1 daughter and 2 sons). They are married. He lives with his sisters, daughter, son in law and grandsons. His daugther are married has 2 children. His sisters are tailors and not married. His daughter is a house wife and her husband is a private employees. Patient lives in second floor semipermanent house with 3 rooms. For daily living costs there are savings and money from his daughter and sons. Power source from the State Electricity Company (Perusahaan Listrik Negara), the source of water from the Water Company (Perusahaan Air Minum). Patient has BPJS that guarantee his payment for medication.

**Geriatric Depression Scale (GDS) scoring :**

Answers in bold indicate depression. Score 1 point for each bolded answer.

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Question  | Yes | No |
| 1. | Are you basically satisfied with your life? | Yes\* | **No** |
| 2. | Have you dropped many of your activities and interests? | **Yes\*** | No |
| 3. | Do you feel that your life is empty? | **Yes** | No\* |
| 4.  | Do you often get bored? | **Yes**\* | No |
| 5. | Are you in good spirits most of the time? | Yes | **No\*** |
| 6. | Are you afraid that something bad is going to happen to you | **Yes\*** | No |
| 7. | Do you feel happy most of the time? | Yes | **No\*** |
| 8. | Do you often feel helpless? | **Yes\*** | No |
| 9. | Do you prefer to stay at home, rather than going out and doing new things? | **Yes\*** | No |
| 10. | Do you feel you have more problems with memory than most? | **Yes** | No**\*** |
| 11. | Do you think it is wonderful to be alive now? | Yes\* | **No** |
| 12. | Do you feel pretty worthless the way you are now? | **Yes** | No\* |
| 13. | Do you feel full of energy? | Yes | **No**\* |
| 14. | Do you feel that your situation is hopeless? | **Yes** | No\* |
| 15. | Do you think that most people are better off than you are? | **Yes** | No\* |
|  |  |  |  |

Table 1. Score Geriatric Depression scale : **8** (impression: mild depression)

**DIAGNOSIS**

In medical diagnosis, the clinical diagnosis is Acute Exacerbation of Chronic Obstructive Pulmonary Disease, the topical diagnosis is lung. Etiological diagnosis is inflammation. Functional diagnosis is body function, body structure, activities, participation, enviromental factors, and personal factors. The short term goals : Decrease dyspnea, Cleanser phlegm, Increased chest expansion, Improved nutrition and muscle mass, Reduce anxiety and depression, Improve ADL (dressing, bathing, toileting and ambulation), Improve cardiopulmonary fitness, and Improve his mobility (walking endurance). The long term goals : Prevent exacerbation of COPD and prepare when he get exacerbation, Maintain ADL, Maintain patient’s nutrition and psychology, Maintain cardiopulmonary fitness, and Go back to work with modification, recreational, and leisure activity.

**REHABILITATION TREATMENT PLAN**

1. Physiatrist

Explain the condition to the patient (its causes, incidence, prognosis, and treatment), reassure the patient, but be realistic (don’t give high expectations), advice the patient to following the rehabilitation program and to avoid therapy given by non-professionals, explain to the patient how the psychological state can affect the treatment, so avoid any emotional conflict and seek family or friend support to increase self-awareness and self-esteem, follow the given home program.

1. Physiotherapy

Breathing exercise ; pursed lip breathing and diaphragm breathing

1. Psychology

keep motivating patients so that when he have finished treatment at the hospital not return to smoking and stay away from people who smoke or wear masks when in a crowd of people who smoke.

1. Home program

Gradual mobilization : standing and walking around bed. ADL training with the principle of energy conservation.

**DISCUSSION**

 A man, 75 years old, consulted from Internal Medicine Department Prof. Dr. R. D. Kandou Hospital, with diagnose Acute Excacerbation of Chronic Obstrutive Pulmonary Disease (COPD). Patient was an inpatient at Internal Medicine for about 3 days. From the anamnesis patient complains shortness of breath that getting worsed even when he is not doing activities or taking rest, coughing with thick phlegm, sputum was difficult to remove and fever. Activity daily living is dependent. He had history of COPD since 1 years ago and hospitalized twice, not controlled regularly. He smoke since he was junior high school, about 1 pack per day until 2 months before hospitalized.

 In physical examination, in inspection this patient use of breath assist muscles, retractions on sternocleido, suprasternal and intercostal muscle. On palpation pulmonary fremitus is weakened, between ribs widens. The percussion of the lungs becomes hipersonor and the heart boundary shrinks, the diaphragm is low, the liver is pushed down. From auscultation there are crackles and wheezing during normal breathing or forced expiration, expiration extends, heart sounds sound far away. The results of physical examination in accordance with the physical examination of COPD patients. Result from chest x-ray examination with emfisematous Lung.

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines define COPD as “A preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in the individual patient. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.2 COPD is a common pulmonary disease worldwide and is characterized by progressively persistent airflow limitation.[2](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref1) The economic and social burden of COPD is substantial and increasing.[3](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref2) Incidence COPD in adult populations over 40 years, increased in the age more than 75 years, the prevalence of COPD ranges between 15–20 % and is higher in men than in women.11

In Indonesia it is estimated that there are 4.8 million COPD patients and this number can increase with the increasing number of smokers who are the main risk factors for COPD.1,2 Tobacco smoke is the major risk factor for developing COPD. Therefore, smokers should be provided with counselling for smoking cessation.13,14 Other risk factors such as air pollution, gender, respiratory infections, poor nutritional status, chronic asthma, impaired lung growth, poor socio-economic status and genetic factors deficiency of alpha 1 antitrypsin are also important for disease development. About 15–20 % of COPD cases are due to occupational exposures to pollutants at the workplace and about 50 % of subjects who died from COPD in developing countries have been exposed to biomass smoke during lifetime.11, 12 The patient in this case was a heavy smokers for decades.

 Daily symptoms such as chronic and progressive dyspnea, cough, and sputum production deserve the blame for the burden and lead to activity limitation and ultimately COPD patients inability to work and take care of themselves.[5](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref3) Patients with COPD are trapped in a vicious circle of inactivity, which begins with breathlessness.[6](https://www.dovepress.com/exercise-assessments-and-trainings-of-pulmonary-rehabilitation-in-copd-peer-reviewed-fulltext-article-COPD#ref4)



Picture 1. Normal lung and lung with COPD

The main clinical features of COPD are:2

* + - * Chronic cough, which may be daily and productive, but can also be intermittent and unproductive
			* Breathlessness on exertion, initially intermittent and becoming persistent
			* Sputum production: any pattern of sputum production may indicate COPD
			* Frequent exacerbations of bronchitis
			* A history of exposure to risk factors, especially tobacco smoke, occupational dusts, home cooking and biomass fuels.

This patient had been treated in Internal Medicine Department with an acute exacerbation on COPD. Acute exacerbation of COPD is a sudden worsening of COPD symptoms (shortness of breath, quantity and color of phlegm) that typically lasts for several days. For this patient may be triggered by an infection with bacteria because there are complaints of fever, an increase in temperature in the initial measurement of hospital admission, and there is an increase in the number of leukocytes on laboratory examination. Typically infections cause 75% or more of the exacerbations; bacteria can roughly be found in 25% of cases, viruses in another 25%, and both viruses and bacteria in another 25%. Airway inflammation is increased during the exacerbation resulting in increased hyperinflation, reduced expiratory air flow and decreased gas exchange.13,14 As COPD progresses, exacerbation tend to become more frequent, the average being about three episodes per year. 15 Acute exacerbations will be classified into three type (Indonesian Lung Doctors Association): Type I (severe exacerbation), has 3 symptoms above, type II (moderate exacerbation), has 2 symptoms above, type III (mild exacerbation), has 1 of the above symptoms plus upper respiratory tract infection for more than 5 days, fever for no other reason, increased cough, increased wheezing or increase in respiratory frequency> 20% baseline, or pulse frequency> 20% baseline. In this patient was classified in type II with moderate exacerbation.

Borg Rating Scale of Perceived Exertion (PRE) Scale : linear scale of rating from 6-20. This scale is valid indication of physical exertion and correlates linearly with HR, ventricular O2 consumption, and lactate levels. In this case, patient Borg Scale decreased from 13-9.

|  |  |  |
| --- | --- | --- |
| Effort | Breathiessness | Tired legs |
| 6 | 0 Not at all | 0 Not at all |
| 7 Very, very easy | 0,5 Just Noticeable | 0,5 Just Noticeable |
| 8 | 1 Very slight | 1 Very slight |
| 9 Very easy | 2 Slight | 2 Slight |
| 10 | 3 Moderate | 3 Moderate |
| 11 Easy | 4 Somewhat severe | 4 Somewhat severe |
| 12 | 5 Severe | 5 Severe |
| 13 Somewhat hard | 6 | 6 |
| 14 | 7 Very severe | 7 Very severe |
| 15 Hard | 8 | 8 |
| 16 | 9 | 9 |
| 17 Very hard | 10 Very, very severe | 10 Very, very severe |
| 18 | - | - |
| 19 Very, very hard | - | - |
| 20 | ? Unbearable | ? Unbearable |

Picture 2. Modified Borg Scale

Functional measurement with FIM (Functional Independence Measure) was used to assess physical and cognitive disability. FIM instrument is a basic indicator of patient disability and used to track the changes in the functional ability of a patient during an episode of hospital rehabilitation care. It contains 18 items composed of 13 motor tasks and 5 cognitive tasks. FIM is widely used in rehabilitation facilities. It measures how independent a person is on scale from 1 – 7 that ranges from total assistance (or complete dependence) to complete independence. Scores are given in the areas of self-care (eating, grooming, bathing, etc.), sphincter control, mobility, locomotion, communication, and social cognition; and are combined for a total FIM score. These scores are used for initial assessment, to measure progress and thus, maybe used as an outcome measure of a functional progress. FIM is very suitable in assessing physical and cognitive disability in patient with any cause of disabling injury with suspected cognitive problems. Possible scores range from 18 – 126, with higher scores indicating more independence, not disabled.17 Total FIM score in this patient was 64 on admission and we can see a significant functional improvement day by day after giving an exercise. On the last follow up, the total FIM score is 126.

The ability to walk for a distance is a quick and inexpensive performance based measure, and component quality of life, since it reflects the capacity to undertaken day to day activities. Six Minutes Walk Test (6-MWT) is common use to assesse exercise capacity in patient with COPD and to track functional change resulting from disease progression or therapeutic intervention. Test to assess aerobic endurance, which is important for walking distance, stair climbing, shopping, sightseeing while on vacation, etc.18 In this patient, assessment for cardiorespiration endurance was done using 6-MWT. 6-MWT was performed on the 1st visit to the policlinic. Patient was able to achieve total of 180 meters, with O2 saturation 96 %, VO2max = 4,56 and METs = 1,3. For second periode of 6MWT was done at 4th follow up with the distance achieved 360 meters, with O2 saturation 97 %, VO2max = 14,06, METs = 4,01.

COPD is characterized by impaired lung function, hyperinflation, dead space ventilation and increased energy consumption that lead to reduced ventilatory capacity and are associated with shortness of breath and limitation of daily activities. Interventions in COPD patients comprise from two therapies namely pharmacological therapy and non-pharmacological therapy. Since medications do not relieve all COPD symptoms nor cure the illness, pulmonary rehabilitation has been employed to improve performance of daily activities and quality of life.19 Pulmonary rehabilitation is recommended for all patients with COPD to improve physical function and quality of life. This multidisciplinary approach, which includes exercise training, education, smoking cessation counseling, nutritional intervention, and psychosocial support, improves dyspnea and functional capacity, and lowers the rates of hospital admission and mortality.

In physiotherapy subunit, this patient was prescribed breathing exercise, pursed lip breathing and diaphragm breathing, chest wall mobilization, effective cough thecnique, relaxation exercise (relaxation position, breathing controlled). Relaxation exercise was done with the aim to recovery from a frightening dyspneic attack and help patient to reduce chronic stress that can disturbing other system organ. This exercise is given in the form of educating patients in a good position to reduce the fatique due to the shortness of breath, such as high side lying position while sleep, forward lean sitting (forearm support on table) and also educate to control the breath.22

In patients with COPD, breathing techniques aim to relieve symptoms and ameliorate adverse physiological effects by: 1) increasing strength and endurance of the respiratory muscles; 2) optimizing the pattern of thoracoabdominal motion; and 3) reducing dynamic hyperinflation of the rib cage and improving gas exchange.21 Breathing exercise strategies used in pulmonary rehabilitation to reduce dyspnea are pursed lip breathing and diaphragmatic breathing. It helps to train the rib cage.22 Pursed lip breathing in COPD patient significantly decrease respiratory rate and increased tidal volume. Pursed lip breathing involves breathing patterns that can be combined with upper limb and trunk movements, as well as thoracic cage maneuvers. These exercises aim to improve the patient’s breathing pattern and increase lung expansion, respiratory muscle strength, functional residual capacity, and inspiratory reserve volume.23 Pursed lip breathing is performed by inhales through the nose for several seconds with mouth close, and than exhale slowly (for roughly twice as long as inhalation) through pursed lips held in wide, narrow slit.24 During purse lip breathing, no expiratory airflow occurs through the nose due to the involuntary occlusion on the nasopharynx by the soft palate. The slight resistance to expiration, provided during purse lip breathing, increases the positive pressure within the airways, which keeps open the smaller bronchioles, thus improving efficiency of ventilation. It is evident that purse lip breathing also helps to improve gas exchange, alveolar ventilation, and oxygenation, and reduces dyspnea. This procces help to reduce air trapping.19 Purse lip breathing recommended to all COPD patients for use during activities that precipitate dyspnea.

 Effective cough technique is a natural way of removing mucus or phlegm from the lungs and airways effectively. This technique was aims to eliminate the respiratory obstruction and to keep the lung clear. Position, upright or high sitting with support the head, neck and back, asked the patient for deep inspiration, and after that ask for contraction of the abdominalis and have the patient place the hands at the abdomen and make three huffs with expirations to feel the contraction of the abdominals. Ask the patient to take a deep but relaxed inspiration, followed by a sharp double cough. From the very beginning the examination found that the patient suffered from coughing with mucus which according to the patient was difficult to exclude, the patient complained that a cough was felt to aggravate the shortness of breath suffered, after being trained to do effective coughing technique at the second visit while the patient was still at the hospital it was found that coughing was very much reduced.

At the initial examination it was found that patients had limitations in transfer and mobilizing due to shortness of breath suffered. When the examination on the second visit in the hospital the shortness of breath experienced by the patient has decreased, therefore the patient is given education for gradual mobilization exercises starting from standing up from the bed and walking around the bed and of course adapted to the conditions of the patient himself, if there are complaints in the form of increased shortness of breath so the exercise is stopped. And after gradual mobilization and no complaints of increased shortness of breath, the patient finally can go to the bathroom alone but always monitored by his daugther.

After returning from the hospital and the patient conducting an outpatient examination in the polyclinic, he said that at home had begun trying to mobilize around the house but still felt shortness of breathness if the road was more than 20 meters. On subsequent examinations after a few weeks the patient says that he can walk further and the shortness of breathness has been greatly reduced even the patient can walk more than 100 meters and he can go to the bathroom by himself. In the last follow up patient can walk by himself from megamas to pasar 45 without shortbreath.

Resistance/strength training muscle atrophy and weakness are common in patients with COPD, and endurance training has little effect on the two problems. Many studies found that strength training can improve not only muscle strength and quality of life but also exercise capacity in patients with COPD. Free weights (eg, weight lifting, dumbbell, lead ball, etc.) or training with machines for arms and legs are common methods used in strength training. On this patient the resistance exercise at the upper limb muscle enhancement exercises are focused on the muscle group flexion and abduction of the shoulder, there are; deltoid, pectoralis major, biceps, coracobrachialis and supraspinatus. In addition to the expected effects on muscle strength, it is possible that resistance training may also assist with maintaining or improving bone mineral density, which has been shown to be abnormal low (e.g., osteoporosis, osteopenia) in about 50% of individuals with COPD. This exercise has greater potential to improve muscle mass and strength. Moreover, strength training result in less dyspnea during the exercise period.

In this patient therapy also uses superficial heat modalities, infrared. Infrared is one of the superficial heat therapy modalities that is used as a clinical physical therapeutic tool by utilizing the effects of heat from infrared radiation. Infrared light is the emission of electromagnetic waves with a wavelength of 760 nm-1mm which causes heat when absorbed. Infrared light used in medical therapy is an infrared type with a wavelength of 770-1500nm (near-infrared). The purpose of using infrared is to evoke the body's response so that it has physiological effects due to changes in temperature due to superficial heating. Physiological effects such as increasing metabolic activity, relaxing muscles, stimulating sensory responses, increasing body temperature and increasing the activity of sweat glands.

In COPD Patient with low BMI and particularly low fat free mass is associated with worse outcomes. Nutritional supplementation promotes significant weight gain and leads to significant improvements in respiratory muscle strength and overall health-related quality of life. For malnourished patients with COPD nutritional supplementation is recommended.2

Identification and reduction of exposure to risk factors is important in the treatment and prevention of COPD. Cigarette smoking is the most commonly encountered and easily identifiable risk factor for COPD, and smoking cessation should be continually encouraged for all individuals who smoke. Reduction of total personal exposure to occupational dusts, fumes, and gases, and to indoor and outdoor air pollutants, should also be addressed. In this patients have stopped smoking and avoid exposure to cigarette smoke from the environment.

 This patient has significant improvements such as the dyspnea scale, functional measurement, geriatric depression scale, chest expansion, cardiopulmonary fitness. Now patient can do the activity daily living by himself without short of breathness. The patient and his family are very happy with the patient's condition now. For months patient not have dyspnoe and can do all of the activity by himself.

**DAFTAR PUSTAKA**

1. Naglaa Bakry Elkhateeb, Ahmed A. Elhadidi a, Hosam H. Masood a, Amany R. Mohammed. Pulmonary rehabilitation in chronic obstructive pulmonary disease. Egyptian Journal of chest diseases and tuberculosis (2015) 64, 359-369.
2. Global Initiative for Chronic Obstructive Lung Disease [webpage on the Internet]. Global strategy for the diagnosis, management, and prevention of COPD: GOLD 2019. Available from: http://goldcopd.org/gold-2019-global-strategy-diagnosis-management-prevention-copd/Global. Accessed December 20, 2019.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006;3(11):e442.
4. Penyakit Paru Obstruktif Kronik. Dalam: Pedoman Diagnosis dan Penatalaksanaan di Indonesia. Perhimpunan Dokter Paru Indonesia, 2003
5. Kessler R, Partridge MR, Miravitlles M, et al. Symptom variability in patients with severe COPD: a pan-European cross-sectional study.Eur Respir J. 2011;37(2):264–272.
6. Singh S, Harrison S, Houchen L, Wagg K. Exercise assessment and training in pulmonary rehabilitation for patients with COPD. Eur J Phys Rehabil Med. 2011;47(3):483–497.
7. O’Donnell DE, Laveneziana P. Physiology and consequences of lung hyperinflation in COPD. Eur Respir Rev. 2006;15(100):61–67.
8. Gonzales P, Cucurullo S. Pulmonary Rehabilitation. In: Cucurullo S: Physical Medicine and Rehabilitation Board Review. Demos Med New York, 2004: 585-68
9. Puhan MA, Gimeno-Santos E, Scharplatz M, Troosters T, Walters EH, Steurer J. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev.2011;(10):CD005305.
10. McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2015;(2):CD003793.
11. Terzikan N, Verhameme K, Hoffman A. Prevalence and incidence of COPD In Smokers and non-smokers : the Rotterdam study. Eur J Epidemiol (2016) : 31:785-92.
12. Tan J. Chronic Pulmonary Problems. In: Practical Manual of Physical Medicine and Rehabilitation. Mosby. St.Louis,1998:665-707.
13. Rabe KF, Hurd S, Anzueto A, et al. (2007). "Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease: GOLD Executive Summary". Am. J. Respir. Crit. Care Med. 176 (6): 532–55. doi:10.1164/rccm.200703-456SO. PMID 17507545
14. Van Geffen WH, Slebos DJ, Kerstjens HA (2015). "Hyperinflation in COPD exacerbations". The Lancet Respiratory Medicine. 3 (12): 43–44. doi:10.1016/S2213-2600(15)00459-2. PMID 26679031.
15. Yuqin Zeng, Fen Jiang. Exercise assessments and trainings of pulmonary rehabilitation in COPD. International Journal of COPD 2018:13 2013–2023.
16. Tabatabai RR, Gruber PF. Chronic Obstructive Pulmonary Disease. Elsevier. 2018.
17. Pasquo F, Biscione G, Crigna G. Use of functional independence measure in rehabilitation of inpatients with respiratory failure. Respiratory Medicine (2009) 103, 471-76.
18. American Thoracic Society. ATS Statement : Guidelines for the six minute walk test. American Journal Of Respiratory and Critical Care Medicine (2002) Vol 166. Pp 111-117.
19. Rick Carter, Lakshmi Manasa Munuganti, Allen Sexton B.S. Prescribing Exercise for patient with COPD. Department of Exercise Sciences. Lamar University, Beaumont. RTmagazine@allied360.com. July 2014
20. Yuqin Zeng, Fen Jiang. Exercise assessments and trainings of pulmonary rehabilitation in COPD. International Journal of COPD 2018:13 2013–2023.
21. Gosselink R. Breathing techniques in patients with chronic obstructive pulmonary disease (COPD). Chronic Respiratory Disease 2004; 1: 163-172.
22. Perk J, Mathes P, Gohlke H, et al. Cardiovascular Prevention and Rehabilitation. London: Springer-Verlag. 2007.
23. Bolton CE, et al. British Thoracic Society Guideline on Pulmonary Rehabilitation in Adults. BMJ Publishing Group. 2013.
24. Nury Nusdwinuringtyas. Kumpulan Makalah Rehabilitasi Respirasi Edisi 3. Program Studi Pendidikan Spesialis-I IKFR FK UI Jakarta. Mei 2018.
25. Celli R Bartolome. Treatment of the Stable Patient with Chronic Obstructive Pulmonary Diasease. Elsevier. 2018.
26. Basoglu O, Atasever A, Bacakoglu F. The efficacy of incentive spirometry in patients with COPD. Respirology (2005) : 10, 349–53.
27. Hossein S, Farzad M, Heydari A. Comparing the Effect of Resistive Inspiratory Muscle Training and Incentive Spirometry on Respiratory Pattern of COPD patients. Evidence Based Care Journal (2016) 6 (3): 45-54.
28. Spruit M, Singh S, Garvey C, ZuWallack R. An Official American Thoracic Society/European Respiratory Society Statement: Key Concepts and Advances in Pulmonary Rehabilitation. American Journal Of Respiratory And Critical Care Medicine (2013) Vol 188 : 13-61.
29. Angela BM Tulaar, et.al. Layanan Kedokteran Fisik dan Rehabilitasi. PERDOSRI Cetakan I, januari 2013.
30. McKenzie, G. L, Harvath, T. A. Late-life depression. In Evidence-based geriatric nursing protocols for ssbest practice 5th Edition. 2016 : 211-32.