Implementation of a Rehabilitation Nursing Homecare Program in Patients with Chronic Obstructive Pulmonary Disease

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ABBREVIATIONS

ADL – Activity of Daily Living

BMI – Body Mass Index

BODE –Body Mass Index, Airflow Obstruction, Dyspnoea and Exercise Capacity index

BP – Blood Pressure

COPD - Chronic Obstructive Pulmonary Disease

DBP – Diastolic Blood Pressure

FEV_1 – Forced expiratory volume in one second

FVC – Forced Vital Capacity

GOLD – Global initiative for chronic Obstrutive Lung Disease

HCU-CA – Health Care Unit of Carrazeda Ansiães

HR – Heart Rate

IPB – Instituto Politécnico de Bragança

Kg – kilogram

Kg/m^2 – Kilograms per square meter

L/min – Liters per minute

LCADL – London Chest Activity of Daily Living

LHU-NE – Local Health Unit of Northeast

M0 – Initial Assessment

M1 – Pos-intervention assessment

M2 –2 months after the end of the intervention assessment

M*baseline* – Pre-intervention assessment

Md – Median

mmHg – millimeters of mercury

mMRC – Medical Research Council Dyspnoea Scale Questionnaire

N – Absolute frequency

nº – Number

p – significance

$PaCO_2$ – Partial pressure of carbon dioxide in the arterial blood

PaO_2 – Partial pressure of oxygen in arterial blood

PEF - Peak expiratory flow

RR – Respiratory Rehabilitation

r_s – Spearman's rho Test

SBP – Systolic Blood Pressure

SD – Standard Deviation

SpO_2 –Oxygen peripheral saturation

SPSS – Statistical Package for the Social Sciences

TPUY – Tobacco-packet unit year

UCC-CA – Unidade de Cuidados na Comunidade de Carrazeda de Ansiães

ULSNE – Unidade Local de Saúde do Nordeste

Z – non-parametric wilcoxon test

Summary

ABSTRACT

Objective: To evaluate the effects of a respiratory rehabilitation nurse program at home of clients with COPD requiring supplemental oxygen.

Methods: We identified 15 clients diagnosed with COPD, requiring home oxygen therapy. During 15 sessions of home RR were taught/trained breathing exercises, therapy management, energy conservation techniques and strengthening exercises. Were performed evaluations of the oxygen peripheral saturation (SpO2), peak expiratory flow (PEF), Medical Research Council Dyspnoea Scale Questionnaire (mMRC), London Chest Activity of Daily Living (LCADL) and Euro Qol.

Development: We conducted a baseline assessment to 15 users (70,20±12,03 years), 12 men and 3 women. COPD is diagnosed for an average of 15,27±10,24 years and the oxygen treatment is performed for and average of 7,27±3,99 years. We have found a statistically significant increase in SpO_2 final assessment (97,4±1,12%) when compared to baseline (92,2±1,78%), as in the PEF (290,67±141,5L/min and 164,0±69,78L/min, respectively). On the scale mMRC we observed a statistically significant decrease in the sensation of dyspnoea (baseline assessment of 3±0,76 and post-intervention assessment of 2,4±0,91). In assessing the LCADL, there was a statistically significant improvement between baseline and post-intervention (34,33±9,07 and 26,47±7,99 respectively). At Euro Qol VAS users reported an improvement in his health over the course of the RR comparing the two evaluations periods (40,67±5,94 at baseline and 58±6,76 in post-intervention).

Conclusions: The patients evaluated had statistically significant improvements in SpO_2 values, in PEF and in the results of the scales used, when comparing the two evaluations moments. These data confirm that the RR is translated into health gains for users with COPD.

Keywords: Rehabilitation; Home care; Dyspnea, Activities of Daily Living, Quality of Life

INTRODUCTION AND BACKGROUND OVERVIEW

Chronic Obstructive Pulmonary Disease (COPD) is characterized by an essentially irreversible bronchial obstruction and it is a pathology with a large representation in the world but stills underestimated and under diagnosed (1) (National Institute for Health and Clinical Exellence, 2010).

COPD causes irreversible damages and it is a highly debilitating disease. In young ages causes considerable social and economical (2) costs. Nonetheless, when diagnosed early, the treatment can be direct and delay the diseases consequences.

According to the data from the National Centre for Respiratory Diseases 2010 report there are over 63 million cases of symptomatic COPD across the world and it is estimated that the disease reaches nearly 210 million people.

In terms of the mortality observed in high-income countries, COPD is responsible for 5.1% of deaths, leading in 4th place as cause of death, only preceded by ischemic heart disease, cerebral vascular disease (CBVD) and infections of the lower airways (3). In Portugal chronic respiratory diseases affects about 20% of the population with COPD representing 14.2% of these diseases in people over 40 years old. Consequently, it is expected that exists 800,000 Portuguese with COPD (4).

The tobacco (5) it is the most prevalent risk factor in COPD. The airway obstruction in smokers is continuous with noticeable results in early onset of functional disability and in the decreasing of quality and life time (6), verifying that the tobacco use it is responsible for 42% of all COPD cases (7) World Health Organization (2012). Regarding to the COPD incidence of 19% in continuous smokers patients, 4.5% in ex-smokers and 4% in patients that never smoke (8) we conclude that smoking cessation should always be highly recommended since the decline in lung function decreases significantly (6).

In COPD often occurs a significant airway obstruction and destruction of lung parenchyma even before the patient has this perception. Over and over again patients already have a 50% reduction in the forced expiratory volume in the first second ($FEV_{1)}$ before looking for health information and care (9). This situation occurs due to the high number of alveoli that don´t use gas exchange. Consequently, we may lose a substantial percentage of those wells without any apparent symptoms. For this reason we recommend a meticulous investigation of symptoms associated to COPD, since the patient can devalue them for not being present or even for self-limitation of mobilization (10) Direção-Geral da Saúde(2011d).

The COPD diagnosis should be done in the presence of: (11) Direção-Geral da Saúde(2013):

- Chronic and progressive respiratory symptoms (cough, sputum, dyspnea, fatigue and wheezing with physical activity),
- Exposure to risk factors (tobacco, dust and inhaled gas),
- Airflow obstruction demonstrated by spirometric changes (relative FEV_1/ FVC less than 70% after bronchodilation) that confirm the diagnosis of COPD in clinical context mentioned in the previous items.

An effective treatment, and depending of the disease progression, covers a variety of aspects including a multidisciplinary program of Respiratory Rehabilitation (RR). The control and treatment of this disease allows, not only improving the patients and familiars life quality, but also the rationalization of the high costs involved (10) Direção-Geral da Saúde(2011).

COPD patients frequently and unconsciously adopted a sedentary life, probably due to *stress* caused by dyspnea and fatigue during exercise. Exercise intolerance develops gradually and the patient can assign it to the normal aging developing process. The resultant physical deconditioning and the changes in the structure and function of the peripheral muscles result in more dyspnea and fatigue during exercise, leading to a more sedentary lifestyle (9).

RR interrupts this vicious cycle, especially by increasing the capacity for exercise and promote physical activity (12) and it is recommended for all patients of groups B, C or D, but essentially directed to : (11) Direção-Geral da Saúde(2013):

- Patients with severe and very severe obstruction (FEV_1 ≤ 50%);
- Patients with mild and moderate obstruction (FEV_1 ≥ 50%) but with limited exercise;
- Patients with admission for exacerbation.

Other important indications for RR are the frequent visits and hospitalizations, and poor adherence to oxygen therapy and medical treatment (13).

Meanwhile, the National Institute for Health and Clinical Exellence recommends that RR is available to all COPD patients who have had recent hospital admission for disease exacerbation. The hospital readmission decreases significantly when the patient initiates RR program even during the hospitalization for worsening or immediately after discharge in outpatient services with supervised programs for 6 weeks to 6 months (1).

A study proves that patients who received RR after exacerbation achieved an improvement in physical function and life quality. It was also demonstrated a decrease in hospitalizations and mortality rate (14).

RR Program must include multiple components with multidisciplinary interventions, adapted to the needs of each patient, where issues such as physical training, disease education and psychological and nutritional support. (1).

During the RR program should be performed teachings about inhalation techniques, energy conservation techniques and active participation in the identification and management of exacerbations. However, it is the physical training that must be assumed as an essential component to improve the general patient health status (15).

The nonexistence of this cares aimed to patients with COPD in the area covered by the Health Care Unit of Carrazeda Ansiães (HCU-CA/ Unidade de Cuidados de Saúde de Carrazeda de Ansiães) of the Local Health Unit of Northeast (LHU-NE/Unidade Local de Saúde do Nordeste) was the reason why the “COPD - Breathe Quality of Life” project was created.

This project included in the HCU-CA action plan aims to establish a therapeutic relationship and proximity to the patients that do not get specialized cares due to limitations imposed by their illness and the need of domiciliary oxygen therapy.

The relevance of this subject was felt since the beginning, so it was necessary to combine daily practice with scientific research. Consequently, we established a partnership between LHU-NE and School of Health (SoH/ Escola Superior de Saúde), Polytechnic Institute of Bragança (IPB). With this research we are producing scientific knowledge that enriches the nursing profession and improves health cares.

So, to evaluate the effects of a nursing program in RR at home patients with COPD requiring oxygen therapy it was planned and implemented a *quasi-experimental* study, with the main hypothesis: “The implementation of a nursing in respiratory rehabilitation program intervention, carried out at home in patients with COPD who do oxygen therapy translates into health gains.”

1. AIMS AND WORKING HYPOTHESES

In most cases the process of developing an investigation begins with a research issue and a general goal. After presenting the state of art, essential to frame and contextualize the subject under study, it was formulated the research question that guided the study. Considering the scientific literature that we know on this area as well the personal experience of the author, we hope to obtain empirical results that answer to the following research question: “What are the effects of a nursing program of respiratory rehabilitation, implemented at home in COPD patients requiring supplemental oxygen?

With this research our main idea was to evaluate the effects of an intervention of a nursing in respiratory rehabilitation program, carried out at home in COPD patients who do oxygeny therapy.

1.1. SPECIFIC OBJECTIVES

After the main goal formulation, we present the specific objectives of this study:

- Characterize the population in their socio-demographic variables;

- Analyze the prevalence of smoking and other risk factors for COPD in the study population;
- Check what associated pathologies were present;
- Evaluate the initial symptomatology, performance in activities of daily living (ADL's), respiratory function and life quality (among other dimensions), to implement a program of nursing in rehabilitation;
- Implement the intervention program contextualized according to planning and standards by the General Directorate of Health;
- Evaluate the effects of the intervention program in the variables under study;
- Check the relations between the variables under study identifying health gains resulted from the intervention program;
- Reassess two months after the implementation program end, checking if the intervention model continues to show positive results, particularly in the management of therapeutic regimen and other issues arising from the teachings made;
- Compare the results obtained in the various time points.

1.2. MAIN EVENT AND HYPOTHESES SECONDARY

In order to drive the study to the main purpose it was outlined the following general working hypothesis: "The implementation of a nursing in respiratory rehabilitation program intervention, carried out at home in patients with COPD who do oxygen therapy translates into health gains."

The following seven secondary hypotheses were outlined:

H1 - There are significant differences in the observed values for hand strength between the beginning and end of the intervention program

H2 -There is a significant difference in mean values for SpO_2 between the beginning and end of intervention program.

H3 - Averaged results of PEF vary significantly between pre and post intervention.

H4 - Average values observed for subjective dyspnea assessed by mMRC scale vary statistically significantly between the beginning and end of the intervention program.

H5 - The average LCADL scale values suffered significant alterations when the initial and final moments of respiratory rehabilitation program were compared.

H6 - The overall level of perceived health improvemes after the intervention program.

H7 - Statistically speaking there are significantly differences, in Euro Qol VAS subscale when comparing the *baseline* time with post-intervention time.

2. METHODOLOGY

2.1. DESIGN

In order to achieve the proposed objectives, we conducted a *quasi-experimental* descriptive and correlative study. The *quasi-experimental* research involves the manipulation of variables or the imposition of treatments, however without the typical characteristics of randomization and control of real group experiments (16). We also consider the research as descriptive and correlational, since it seeks to determine the characteristics of a population, describing it in some variables, or exploring and interpreting the connection between the study variables.

The study data were collected at four time points of assessment, with the aim of analyzing the effect of therapeutic interventions in a longitudinal view. We can classify it as longitudinal because it analyzes the variations in individuals over time.

2.2. POPULATION

The investigation in health sciences, except the case studies, usually involves more than one individual, in order to compare results in different situations or subjects, or analysis of the variability in bio-psycho-social phenomena. Our study also focused on a group of individuals. The geographical scope of the research was Carrazeda de Ansiães. The study population was obtained from a non-random manner by identifying all patients that met the following criteria:

- COPD diagnosed, since clinically stable;
- Needs of domiciliary oxygen therapy.

In the area covered by the HCU-CA 15 patients with these inclusion criteria were acknowledged. All patients that presented any contraindications for the participation in RR programs were excluded. Nevertheless, none of the patients presented contraindications and all agreed to participate in the investigation, after being informed of the objectives. As a result, the study sample coincides with the total population of subjects with COPD, making domiciliary oxygen therapy in the geographical context of the research.

2.3. VARIABLES

Independent Variables

- Age;
- Gender;
- Education;
- Professional Status;
- Years of diagnosed COPD;
- Years of Treatment with oxygen;

- Number of hours prescribed in oxygen therapy;
- Oxygen administration source;
- Associated pathologies;
- Smoking habits;
- Tobacco (Units Pack Year);
- Other risk factors for COPD;
- Prescribed therapy, including the use of inhalers;
- Spirometry values, including FEV_1 and GOLD classification of COPD.

Dependent Variables

- Technique inhalation;
- Strength of left and right hands;
- Blood Pressure (Bp);
- Heart Rate (HR);
- Body Mass Index (BMI);
- $SpO_{2;}$
- Expiratory Flow;
- Evaluation stair mMRC;
- Evaluation of LCADL;
- Evaluation Scale Euro Qol,

2.4. INSTRUMENTS

Regarding to the methods and research instruments we used secondary data and primary data.

The secondary data were obtained by consulting personal medical records, but only the information relevant to the study, as can be consulted in annex I.

The primary data is referred to all other information related to the patients in study. That information were collected by data collection instruments which contained the assessment of weight and height to calculate the BMI, Blood Pressure (TA) and Heart Rate (HR), SpO_2 and PEF as well as LCADL, mMRC and Euro Qol scales recommended by the Direção-Geral da Saúde(17) (11).

LCADL evaluates the impact of dyspnea in several ADL's performed by the patient so as to measure its limitation. This questionnaire consists in 15 items that are separated into 4 areas: personal care, household care, recreation and physical activity. To each item is given a score from 0 to 5, where higher values indicate greater limitations in ADL's due to dyspnea (18). It can get a partial score of each domain (19) or use a global assessment of the scale with a maximum score of 75 points (18).

The mMRC implementation scale, that assesses the sensation of dyspnea in a widespread way, the patient chooses the value that over approaches its dyspnea sensation. These values range in a scale from 0 to 4. As the value approaches to 4 that means the increase of dyspnea reported by the patient, of which a score ≥ 2 is considered high (11).

Euro Qol consists in 5 dimensions that classify "the state of health today": mobility, personal care, usual activities, pain / discomfort and anxiety / depression. Each of these dimensions is divided into 3 levels: 1 - no problems, 2 - some problems, 3 - extreme problems. The patient must choose for each dimension the level that best suits itself. After analyzing, these issues give a patient profile where 243 different health states are possible. Each health state is referenced via a 5 digit code. So the code 11111 indicates that the patient doesn´t have any health problems. By the way, code 11223 indicates that the patient has no problems in mobility and personal care but has some problems in performing their daily activities, according to a moderate pain and is extremely anxious or depressed (20).

A sixth question is suggested by General Directorate of Health, in which the patient must compare "my general level of health over the past 12 months" with "my state of health today", where 1 corresponds to "better", 2 corresponds to " equal "and 3 corresponds to" worse "(17).

In the end of the questionnaire it is presented a visual analog scale (VAS Euro Qol) ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). The patient is recommended to select the value that best define his heath state (21).

2.4.1. Material

To develop this project we used the following material: scale (TANITA®), stadiometer (Seca®) measuring apparatus of Blood Pressure and Heart Rate (Omron®), portable oximetry (M-Pulse Impact®) a peak flow meter for each patient (Micro Peak®), 1kg dumbbells for upper and lower limbs, canes heating, dynamometer to evaluate the hand´s strength (Squeeze®) and *kits* with placebo inhalers for demonstrations.

It was also used other materials available in patients' home like water bottles filled with sand instead of dumbbells , bats that patients adapted to broomsticks, cushions and furniture such as beds and chairs.

2.5. METHODS

In January 2013, after the attribution research bursary from the Fundacion Mapfre, it began the implementation.

The team responsible elaborated the instrument of data collection and defined procedures for the intervention implementation.

After the patients' identification, they were contacted by telephone and subsequently were made house calls in which the objectives and procedures of the project were

explained to them. All agreed to participate by signing the informed consent (Annex II).

Patients were subject to an initial assessment (M0), followed by an evaluation before the intervention*(Mbaseline*).Between these two time points was due a period of two months without any intervention from us. After assessing M*baseline* 15 RR sessions were held with a biweekly frequency, after which the patients were assessed again (M1). After 2 months of the intervention ending were made a new assessment (M2). All RR sessions and time points were made by the same specialized nurse in rehabilitation.

As a matter of work organization from the HCU-CA the patients were divided into 4 groups according to the geographical proximity of their homes, with ratings and activities of the various groups occurred in different time periods, with a gap of 2 months.

At all time points the patient weight and height were reviewed in order to calculate BMI, BP, HR, SpO_2 were and PEF subjected. Were implemented the mentioned scales. Since the study population has a very low level of education it was necessary for the researcher to read and explain the issues and then noting patient's reply.

During the period that RR sessions occurred it was also evaluated the SpO_2 (in the beginning and in the end of each session) and PEF (in the end of each session)

Over the 15 RR sessions at home were taught and trained the various components described below:

- Respiratory rehabilitation (abdominal breathing, exhaling with pursed lips, hemidiaphragm retraining and breathing exercises global) cough and forced expiration techniques and rest and relaxation as explained in more detailed in Chapter 4, in the first part of the investigation;
- Management and adherence to the therapeutic regimen, including dose and plan of medications, management of associated pathologies, carry out prescribing oxygen therapy, equipment maintenance and verification of the inhalation technique. Latter, was asked to each patient to simulate an inhalation. After the verification of the technique used it was made an explanation of the mistakes occurred and an explanation or demonstration of the correct technique. This teaching was repeated as many times as deemed necessary for the patient learn and perform the inhalation technique correctly;
- Energy conservation techniques in accordance with the physical limitations of the patient and those imposed by architectural barriers from your home. At any time possible was advised changes in the household in order to facilitate the performance in their home;
- Physical exercise as the muscle building workout for the upper and lower limbs. In the days of house calls, the patients performed this workout with 1kg dumbbells. In the remaining days of the week they were encouraged to keep the exercises with the use of water bottles fulfilled with sand. The patients were also encouraged to perform daily walks inside or outside home, according to the physical capability. An information brochure was distributed (annex III) to all patients with examples of some exercises recommended by the manual "Learn to Live with COPD" (22);
- Control of risk factors and exacerbating factors such as smoking, smoke from the fireplace and the importance of vaccination and identification of signs and symptoms of exacerbation.

All teachings were made, when possible, in the presence of the service provider in order to him be an active part in the disease managing.

At the end of RR program patients were encouraged to keep the exercises program and techniques that were taught.

2.6. STATISTICAL PROCEDURES

After collecting the information it was launched in a file previously created using SPSS *(StatisticalPackage for Social*Sciences), version20, where it was made a computer processing and data processing. We also use the *software* Microsoft Office Excel 2007 available for Windows Vista.

For the data presentation and analysis were used descriptive and inferential statistics. Qualitative variables were presented taking into account their absolute and relative frequencies, and quantitative variables were characterized using measures of central tendency and dispersion measures. In inferential analysis, the search for superior statistical rigor, we have privileged the nonparametric tests, due to the low N, and they do not require normality in the distributions of the variables under study.

3. RESULTS

In this chapter we report the findings of the research arising from the statistical treatment. Following the general structure of the data collection instrument, we first characterized the sample under study in clinical and sociodemographic variables, based primarily on descriptive statistics. Afterwards we presented the analysis stemming from inferential statistics. In order to facilitate their reading and analysis, the results are presented in tables and graphs accompanied by short descriptions that bring to light the most relevant aspects. In a later chapter the results are discussed in light of the state of the art, and the theoretical foundation held.

3.1. CHARACTERIZATION OF THE POPULATION

Sex, educational level, employment status and provenance

As seen in Table 1, the 15 participants in this study were 12 men (80%) and only three were female (20%). The majority presented the primary qualifications (73.3%), the remaining illiterate (26.7%). All individuals were rural. Also all patients were retired, although 4 of them are still in a group usually active (under 65).

Age

With a range of 38, the age of the patients ranged from 50 (younger) up to 88 years (older). The average age was around 70 years (70.20 ± 12.03) (Table 2).

Table 1. Characterization of the study population in the variables: gender, education, employment status and provenance

	N	%
Sex		
Male	12	80
Female	3	20
Education status		
Iliterate	4	26,7
Primary school	11	73,3
Provenance		
Rural	14	93.3
Urban	1	6.7
Professional status		
Retired	15	100,0
Workers	-	-

Time with COPD diagnosed

As shown in Table 3, people with COPD have, on average, the pathology 15.27 years ago diagnosed. In one case the disease was newly diagnosed (2 years ago), and three patients have COPD for 31 years (maximum value obtained for the variable.)

Our results for the age and time variables reflect the chronic nature and progressive pathology, since our patients were mainly elderly, and a quarter of the population had the disease diagnosed for over 24 years. Figure 1

Table 2. Descriptive statistics obtained for the age variable

	Value	Standard error
Mean	70,20	3,11
Median	73,00	
Variance	144,60	
Standard deviation	12.03	
Minimum	50	
Maximum	88	

Table 3. Descriptive results for the question "How long do you have COPD diagnosed?"

	Value
Mean	15,27
Median	11
Variance	104,92
Standard deviation	10,24
Percentile25	6
Percentile50	11
Percentile75	24
Minimum	2
Maximum	31

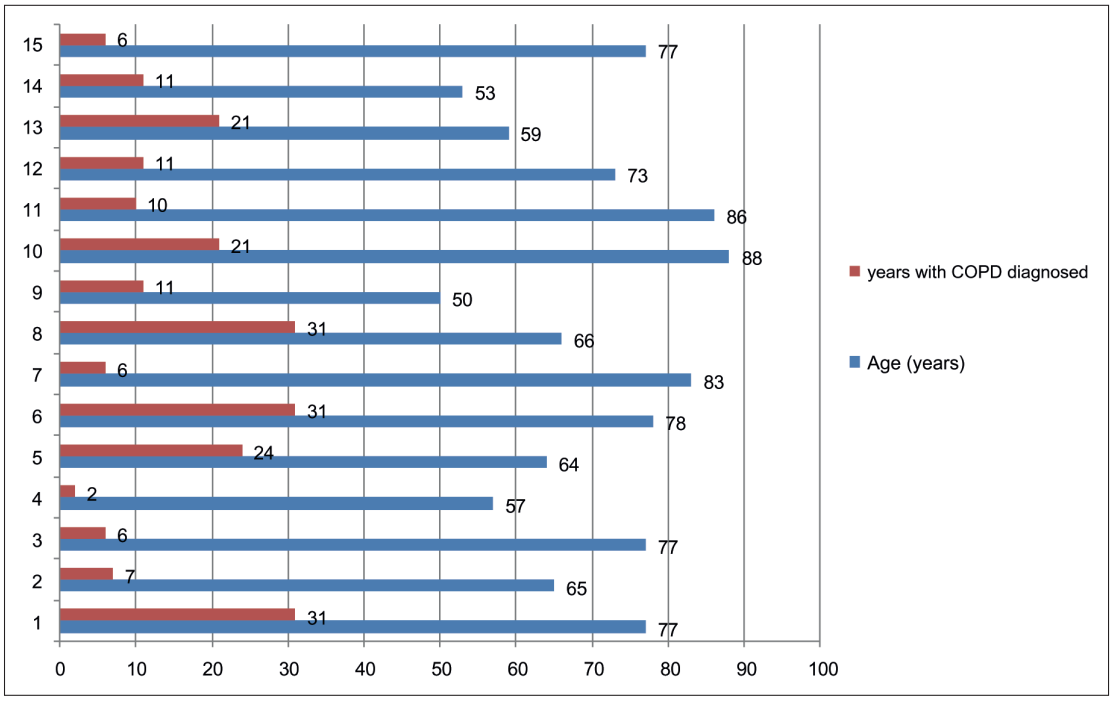

Figure 1. Case studies in accordance with age and COPD diagnosed time

distributed the 15 cases subject to study and intervention according to these two quantitative variables.

Forced expiratory volume in the first second - GOLD Classification

Table 4 presents patients distributed according to the severity of COPD according to GOLD classification.

It was found that 3 patients (20%) had moderate disease state in accordance with the GOLD classification. In severe condition, were found the majority of patients (53.3%), and finally 4 patients (26.7%) were classified in very severe condition. Note that no participant had pathology in mild stage.

Domiciliary oxygen therapy

On average we found that the patients execute domiciliary oxygen therapy for 7 years. We obtained a relatively high value of the standard deviation given the full breadth of the distribution, suggesting a high variability of observations. Indeed, two patients perform domiciliary oxygen therapy only two years ago, while a patient carry out this treatment over 16 years (Table 5).

Table 4. Values for forced expiratory volume in the first second and the respective GOLD classification

	N	%	
Forced expiratory volume in one second (FEV_1)			GOLD classification
27	1	6,7	Very severe (N=4; 26,7%)
28	1	6,7	
31	1	6,7	
38	1	6,7	
40	2	13,3	Severe (N=8; 53,3%)
41	2	13,3	
43	2	13,3	
46	1	6,7	
49	1	6,7	
57	1	6,7	Moderate (N=3; 20%)
59	1	6,7	
70	1	6,7	
Total	15	100,0	

Table 5. Descriptive for the variable "Time of oxygen therapy, in years"

	Value
Mean	7,27
Median	7
Variance	15,93
Standard deviation	3,99
Minimum	2
Maximum	16

The distribution of the variables "years with COPD diagnosed" and "years with oxygen" were compared using graphical representations (chart spider and scatter diagram - Figure 2) and a nonparametric correlation test (Spearman's rho). We noticed that the spider chart in the bigger timelines with COPD diagnosed, correspond roughly, to times of prolonged oxygen therapy. The scatter plot shows a similar profile distribution, which as we increase the values of the variable "years with COPD

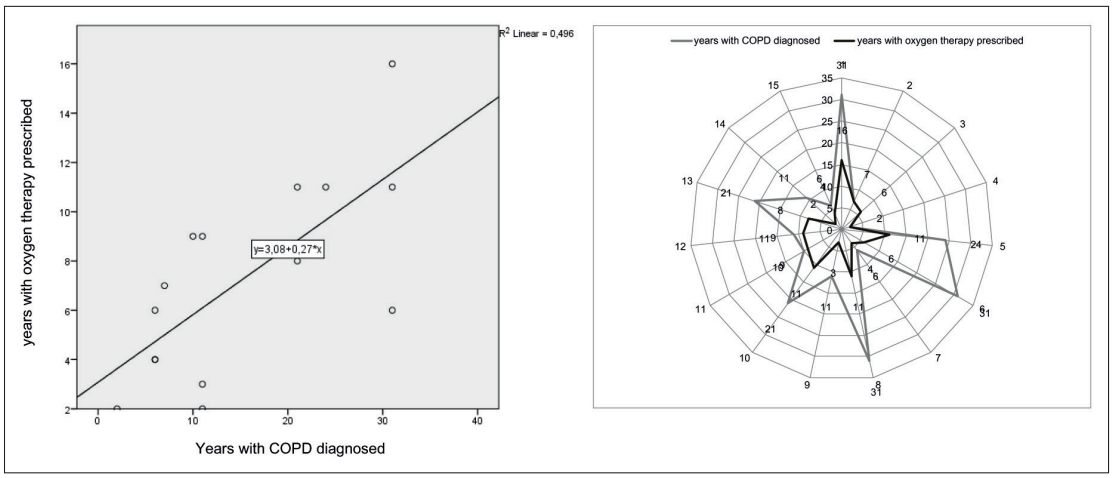

Figure 2. Comparative graphical representation of the variables "Years of COPD" and "Years with domiciliary oxygen therapy"

diagnosed" also increase the data obtained for the variable *"years with oxygen"*. The hypotheses test checked that variables are positively correlated with each other and the patients who make oxygen for long time are also the ones that have the disease for long time. (rs = 0.659 ** p = 0.008, N = 15).

Regarding to oxygen sources used for the patients in study, and according to Table 6, we conclude that the oxygen concentrator is the device more used (N = 11) followed by liquid oxygen in combination with oxygen concentrator (N = 2) and oxygen gas cylinder (N =2).

We have found that performing 16 hours of oxygen therapy is the most common treatment (N = 9), and four cases make supplemental oxygen 24 hours a day. By analyzing the data file it was found that the four cases that make oxygen for 24 hours, two of them, do it for oxygen gas cylinder and two by hub.

Smoking and other risk factors

Six of the patients who participated in the study are ex-smokers (40%) and males, in the study population exists three active smokers, also male. Three individuals reported other risk factors for the pathology development, as they worked in construction (N = 1), road construction (N = 1) or in coal mines (N = 1) (Table 7).

Subsequently the nine patients with the risk factor of smoking were classified according to TPUY (tobacco-packet unit year) formula that combines the number of years of smoking with the number of cigarettes smoked. It was found that all nine patients obtained different TPUY values in range from 40 to 180 points. We obtained a median of 90 points, for an average of 100.22 and a standard deviation of 47.59 (Figure 3).

GOLD Age Classification according patients age and tobacco-packet unit year (TPUY)

As we saw were with COPD in very serious condition 4 patients, 8 patients in critical condition and in a moderate state 3 patients.

To better characterize the patients study we used the severity given by GOLD classification (Table 8) and we crossed this variable with the mean values of age and average values for tobacco-packet unit year (A), to the 9 patients with the presence of smoking as a risk factor.

Table 6. Types of oxygen supplies systems for the patients use and hours of daily treatment

	N	%
Types of oxygen supplies systems		
Oxygen concentrator	11	73,3
Liquid oxygen + Oxygen concentrator	2	13,3
Compressed-oxygen system	2	13,3
Hours of daily oxygeny therapy		
16 hours	9	60
18 hours	2	13,3
24 hours	4	26,7

Table 7. Smoking and other risk factors for COPD in the study population

	N	%
Smoking status		
Current	3	20,0
Ex-smoker	6	40,0
Never Smoked	6	40,0
Exposure to other risk factors		
Yes	4	26,7
No	11	73,3

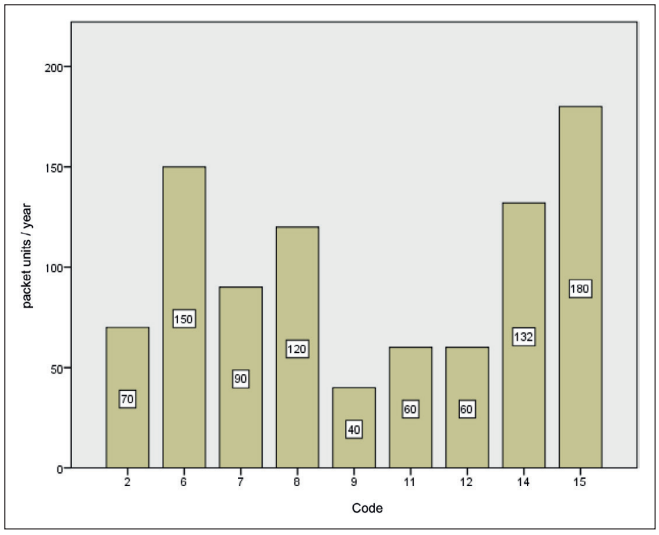

Figure 3. Graphical representation obtained for the variable "packet units / year"

Table 8. Mean values for the variables: Patients age and TPUY (tobacco-packet unit year), according to the severity of the condition given by the GOLD classification

Classification GOLD	Age		Pack-year	
	N	Mean	N	Mean
Moderate	3	77,67 ± 5,03	2	75,0 ± 21,21
Severe	8	69,38 ± 14,81	4	95,50 ± 53,67
Very severe	4	66,25 ± 8,22	2	123,33 ± 55,07
Total	15	70,20 ± 12,03	7	100,22 ± 47,60

We conclude that the severity of the condition doesn´t appear to be associated with the patients age. The patients with a rating in the moderate stage presenting a higher mean age (77.67 ± 5.03).

Regarding "tobacco-packet unit year" it was noticed that the higher mean scores on TPUY classification correspond to a disease in higher stage.

The presence of associated pathologies

The overwhelming majority of the patients (N = 12) had pathologies associated with COPD. In these cases, we find prevalence of multi-pathologies. The most significant pathologies are cardiovascular (n= 9), followed by metabolic disorders (n = 3) and muscle (n = 3). Only one patient has submitted another respiratory disease associated with COPD (Table 9).

Table 9. Presence of pathologies associated with COPD and discrimination of various pathologies

Comorbilidies	N
Yes	12
No	3
TOTAL	15
Cardiovascular	9
Metabolic	3
Respiratory	1
Gastrointestinal	1
Liver disease	2
Kidney disease	1
Musculoskeletal	3
TOTAL	20*

* Total number of pathologies higher then N due to multi pathologies present in 12 patients who answer to the question.

Use of inhalers

As Table 10 indicates, most users perform inhalation therapy (n = 14).

Table 10. Use of inhalers in the individuals studied

	N	%
Use inhalers	14	93,3
Don´t use inhalers	1	6,7
Total	15	100,0

3.2. DIFFERENT EVALUATION MOMENTS

Inhalation technique

Table 11 and Figure 4 show the results for the variables related to inhalation technique points.

Table 11. Results concerning the inhalation technique in various evaluation stages

	M0*		*Mbaseline**		M1*		M2*	
	Yes	No	Yes	No	Yes	No	Yes	No
Preparing inhaler	14	-	14	-	14	-	14	-
Breathe out before inhalation	2	12	2	12	14	-	13	1
Inhalation	13	1	13	1	14	-	14	-
Hold breath	-	14	-	14	13	1	6	8

* In absolute frequencies taking into account the patients who used inhalers (N=14)

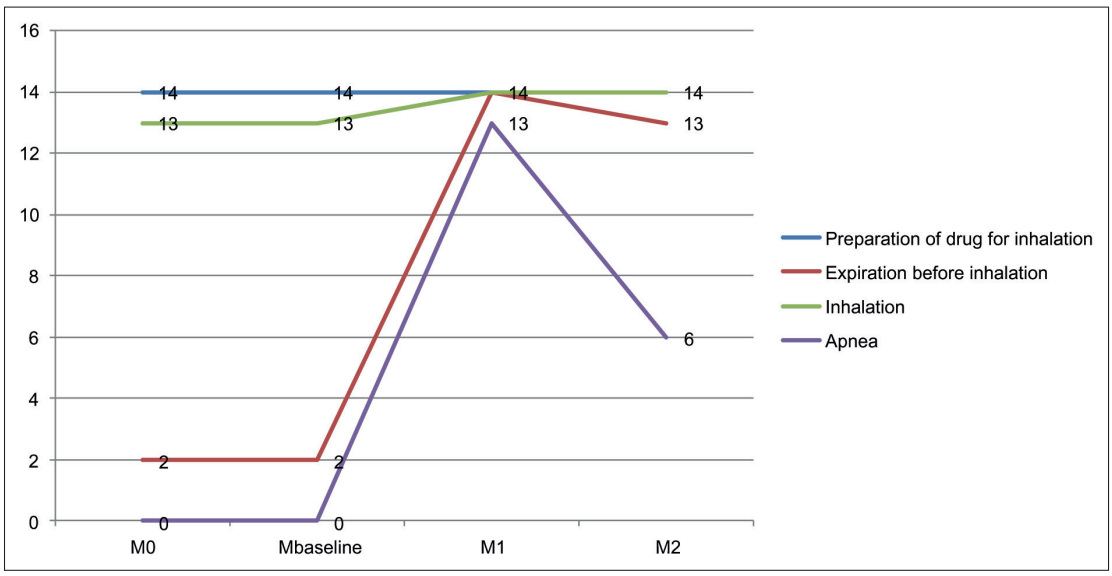

Figure 4. Graphical representation the rehabilitation program gains regarding to the inhalation technique

We found that the device preparation for the inhalation was properly taken by all patients who used inhalers at all time.

The pre-inhalation exhalation was not performed for 12 patients, both in the first assessment point as the *baseline* time. In this item, we managed with our intervention that all of the study patients who use inhalers (N = 14) had correctly applied the technique, as denoted in the graphical representation (Figure 4). But after two months of the rehabilitation program ending we found that one patient, once again, performed incorrectly this phase of inhalation.

The set of procedures for the inhalation drug (put the device in the mouth with lips sealed tight around the mouthpiece and perform steady and deep breaths through the device) in pre-teaching was not done with the most appropriate manner by only 1 of the 14 patients who used inhalers. And completed our intervention we found that these procedures were assimilated.

Finally also in the period of apnea after inhalation that no patient performed in the pre-intervention periods yielded gains worthy of record.

Additional Reviews

The Table 12 exposes the means, standard deviation and presented patients profile with COPD in other clinical variables that we evaluated at different times of the fieldwork, particularly under the right and left hands, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), HR, BMI, SpO_2 and PEF.

Regarding to SPB, DBP and BMI, it was not observed significant changes in their average over the different time values. The mean values of DBP for the patients in the study, roughly met within normal parameters. Comparing BMI average in all time points is slightly above of the reference values for a normal weight. Is compounded by the minimum (15.88kg/m^2) and maximum (35.0kg/m^2) found for this variable.

The strength of the right and left hands was one of the variables which had statistically significant changes. On the strength of the right hand were observed changes in mean values between M*baseline* and evaluation (M1) immediately after the intervention (13.67 ± 1.88 and 14.73 ± 1.67 respectively) program for statistical significance by the non-parametric Wilcoxon (Z = -3.035, *p*= 0.002). Between M1 and the time to review 2 months after the intervention (M2) it was also observed changes in average values (14.73 ± 1.67 and 14.33 ± 1.84 respectively, Z = -2121, *p*= 0.034). The strength of the left hand showed similar changes to those seen in the strength of the right hand, between M*baseline* and M1and between M1 and M2 as can be seen in Table 12.

Regarding to the HR were observed a statistically significant decrease (Z = -2.335, *p*= 0.02) when the moments M*baseline* and M1 (77.0 ± 6.47 and 74.47 ± 6.12) were compared.

Concerning the SpO_2, and is denoted as in Table 12, were observed an increase in mean values between the moments *baseline* and evaluation M1 92.20 ± 1.78 *versus* 97.4 ± 1.12), with statistical significance (Z = -3.33, *p*= 0.001). Two months after the intervention (M2) we noticed a decrease in the mean SpO_2 compared to M1 (95.80 ± 1.42 vs. 97.4 ± 1.12), with statistical significance (Z = -3.247, *p*= 0.001). Very similar conclusions were obtained

Table 12. Means and standard deviations obtained for the different evaluations in other clinical variables

	M0	Mbaseline	M1	M2	
Right handgrip strength (Kg/f)	13,6±2,13	13,67±1,88	14,73±1,67	14,33±1,84	α; Ώ
Left handgrip strength (Kg/f)	12,73±2,12	12,93±1,98	13,93±1,62	13,47±1,89	ά; ώ
SBP (mmHg)	138,33 ± 17,89	136,13 ± 9,68	134,87 ± 8,38	135,07 ± 8,15	¥
DBP (mmHg)	73,6 ± 8,04	73,47 ± 5,63	71,87 ± 4,24	72,80 ± 4,50	¥
HR (bat/min)	77,33 ± 7,61	77,0 ± 6,47	74,47 ± 6,12	73,20 ± 3,55	ε
BMI (kg/m^2)	26,50 ± 6,20	26,33 ± 6,22	26,01 ± 5,90	25,93 ± 5,88	¥
SpO_2 (%)	91,73 ±1,94	92,20 ± 1,78	97,4 ± 1,12	95,80 ± 1,42	Ψ; λ
PEF (L/min)	198,67 ± 73,28	164,0 ± 69,78	290,67 ± 141,50	271,33 ± 138,82	£; ß

α = statistically significant changes in the values of the right hand strength between Mbaseline and M1 (Z = -3.035 , p = 0.002) ;
Ώ = statistically significant changes in the values of the of right hand strength between M1 and M2
(Z = -2121 , p = 0.034) ;
ά = statistically significant changes in the values of the strength of the left hand between Mbaseline and M1 (Z = -3.035 , p = 0.002) ;
ώ = statistically significant changes in the values of the left hand strength between M1 and M2
(Z = -2121 , p = 0.034) ;
ε = statistically significant changes in HR values between Mbaseline and M1 (Z = -2.335 , p = 0.02) ;
¥ = No significant differences between time points using the Wilcoxon test ;
Ψ = statistically significant changes in SpO2 values between Mbaseline and M1 (Z = -3.330 , p = 0.001) ;
λ = statistically significant changes in the values of SpO2 between M1 and M2 (Z = -3.247 , p = 0.001) ;
£ = significant changes in the values of PEF between Mbaseline and M1 (Z = -3.412 , p = 0.001) ;
ß = significant values of PEF between M1 and M2 (Z = -3.332 , p = 0.001) Amendments.

in the results for the mean expiratory flow measured by peak flow meter. We observed a significant improvement (Z = -3.412, *p*= 0.001) in mean PEF parameters between the time *baseline* and post-intervention (164.0 ± 69.78*versus* 290.67 ± 141.50) with subsequent decreased (271.33 ± 138.82) in the assessment two months after finishing the RR program (Z = -3.332, *p*= 0.001).

Dyspnea subjective

The Table 13 and the Figure 5 presents the patients classified according to the dyspnea degree presented in the mMRC. We found that there were no changes worthy of note in the group from time zero (M0) up to the start of the intervention *(Mbaseline*), on the other hand, and as is denoted in the graphical representation, there have been improvements in the reporting of subjective dyspnea ended two months of intervention (M1).

The Figure 6 shows the variations related to the averages of dyspnea questionnaire (mMRC) during the various evaluation stages. We found that all patients had an average of 3 ± 0.756 points in the first review of dyspnea sensations (M0) as too the valuation M*baseline.*

Comparing the average scores of dyspnea questionnaire at *baseline* time and after two months of the intervention (M1) of the nursing rehabilitation program we found that they decreased statistically significantly (z = -2.236, *p*= 0.025) between the two time points (3 ± 0.756 vs. 2.40 ± 0.910), Two months after the end of the intervention (M2) were observed values of dyspnea sensation identical to M1 moment limitation.

Table 13. Patients distributed across the various evaluations and according to the degree of dyspnea (mMRC)

	M0		M*baseline*		M1		M2	
	N	%	N	%	N	%	N	%
I only get breathless with strenuous exercise (Grade 0)	0	0	0	0	2	13,3	2	13,3
I walk slower than people of the same age on the level because of breathlessness, or I have to stop for breath when walking on my own pace on the level (Grade 2)	4	26,7	4	26,7	7	46,7	7	46,7
I stop for breath after walking about 100 meters or after a few minutes on the level (Grade 3)	7	46,6	7	46,6	4	26,7	4	26,7
I am too breathless to leave the house or I am breathless when dressing or undressing (Grade 4)	4	26,7	4	26,7	2	13,3	2	13,3
Total	15	100,0	15	100,0	15	100,0	15	100,0

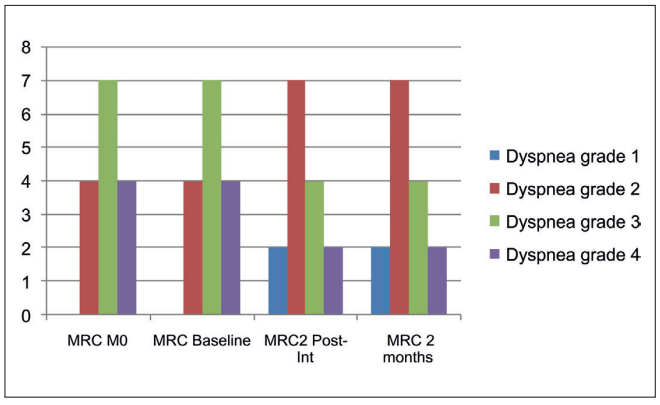

Figure 5. Users spread by degrees of dyspnea MRCDQ

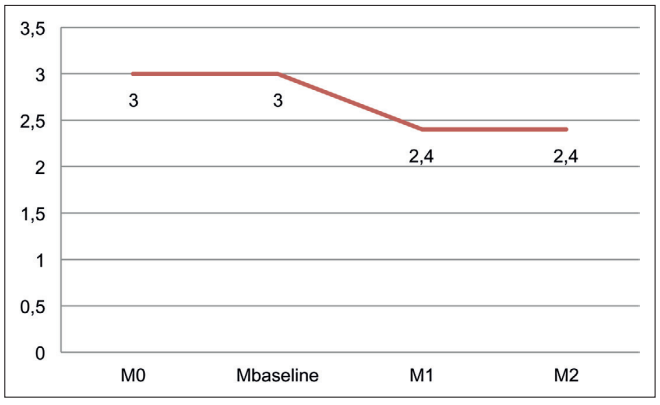

Figure 6. Averages MRCDQ in various evaluation stages

Evaluation of the performance in daily living activities

To evaluate the dyspnea limitation during the performance of ADL's over time we applied the LCADL scale, according to the recommendations of the Direção-Geral da Saúde(2009)

The scale was applied four times, 1- the first moment (M0) two months before the intervention; 2- at the time immediately before the start of the intervention program *(Mbaseline*); 3- after the intervention program (M1); 4 - two months after the nursing rehabilitation program has finished (M2).

Table 14 presents descriptive statistics referring the four observations made.

The internal consistency of LCADL was assessed by analysis of intraclass correlation coefficients (Cronbach's alpha α) in various stages of evaluation. We found that the four dimensions that make up the scale are strongly correlated in the various time points (Table 15).

Table 16 compares the means and standard deviations obtained for the average of the first LCADL observations. As we can see from this table, the recorded differences were not statistically significant by the non-parametric Wilcoxon test.

Comparing the averages observed in LCADL in the beginning of the intervention and those obtained at the end of respiratory rehabilitation program (Table 17) we found that these dropped, suggesting a significant improvement to the performance of ADL's statistically speaking in hypothesis test (z = -3.414, *p*= 0.001).

Comparing post-intervention reviews with 2 months after the intervention (Table 18) we found that the average scale change significantly(*p*= 0.017).

Health Status / Quality of Life

The variable health status / life quality was assessed using the questionnaire *Euro*Qol, Portuguese version published by the Direção-Geral da Saúde(17).

The respective statistical data treatment and analysis was conducted in accordance with the recommendations of the EuroQol Group. (20)

In Table 19 the patients are distributed across the various levels of severity and multiple dimensions scales. Analyzing the data in a descriptive way, as suggested by the EuroQol Group, we found that according to the mobility factor, and comparing the moments M*baseline* and M1, the health gains resulting from our intervention are only visible in three patients.

There was no change over the RR program in the following dimensions: personal cares, usual activities and pain / discomfort.

How is denoted in Table 19 the major gains were made in the dimension anxiety / depression where five patients who transitioned to level 1 (Do not be anxious or depressed)

Table 14. Descriptive statistics obtained for LCADL in the four time points

	M0	M*baseline*	M1	M2
N	15	15	15	15
Minimum	16,00	17,00	13,00	13,00
Maximum	50,00	50,00	39,00	41,00
Mean	34,00	34,33	26,47	27,53
DP	9,07	9,07	7,99	7,86

Table 15. Cronbach coefficient, confidence intervals and p values for the 4 LCADL dimensions applied in various evaluation stages.

Domain	α	IC95%	p
Personal care	0,96	0,92 - 0,99	0,000
Leisure activities	0,95	0,89 - 0,98	0,000
Household activities	0,99	0,99 – 1,00	0,000
Physical activities	0,96	0,92 – 0,99	0,000
Total	0,98	0,96 – 0,99	0,000

Table 16. Comparison of means in LCADL in M0 and Mbaseline points

	M0	M*baseline*	Value *p*
LCADL means	34,00 ± 9,01	34,33 ± 9,07	0,357

Table 17. Averages in LCADL between Mbaseline and M1 (post-intervention)

	M*baseline*	M1 (post-intervention)	Value *p*
LCADL means	34,33 ± 9,07	26,47 ± 7,99	0,001

Table 18. Comparing the means between the LCADL moments M1 (post-intervention) and M2 (2 months after intervention)

	M1 (Pós-intervenção)	M2 (2 Meses após intervenção)	Value *p*
LCADL means	26,47 ± 7,99	27,53 ± 7,86	0,017

Table 19. Absolute frequencies founded in different evaluations for various levels of the Euro Qol dimensions

		M0 (N)	M*baseline* (N)	M1 (N)	M2 (N)
Mobility	Level 1	-	1	4	4
	Level 2	15	14	11	11
	Level 3	-	-	-	-
Self-care	Level 1	2	2	4	4
	Level 2	10	10	10	10
	Level 3	3	3	1	1
Usual activities	Level 1	1	1	2	2
	Level 2	10	10	9	9
	Level 3	4	4	4	4
Pain/Discomfort	Level 1	7	6	8	7
	Level 2	8	9	7	8
	Level 3	-	-	-	-
Anxiety/ Depression	Level 1	7	7	12	12
	Level 2	7	7	3	3
	Level 3	1	1	-	-

When asked about their health level during the past 12 months and comparing the current health status, it was found that 13 patients reported improvements in their health status between moments M*baseline* and M1. Comparing M1 and M2 (2 months after the intervention of nursing in rehabilitation) moments there was no changes in the view of their health status (Table 20).

In the Table 21 we compare the obtained descriptive for this issue over several evaluation periods, which differences in mean were analyzed by the Wilcoxon test hypotheses. We found that only between the period *baseline* and post-intervention those differences were significant ($z = -3.542$, $p = 0.000$).

Table 22 presents the means and standard deviations of the visual analogue Euro Qol VAS subscale, for the four observations performed.

The confidence intervals at 95% for the average of the Euro Qol VAS, particularly comparing the period *baseline* to the post-intervention period, when non-overlapping indicate a statistically significant difference of the same,

Table 20. Absolute frequencies found in different evaluations on the comparison of the general level of health over the past 12 months, with the current state of health

		M0 (N)	M*baseline* (N)	M1 (N)	M2 (N)
General level of health over the past 12 months	Better	-	-	13	13
	Equal	7	8	2	2
	Worse	8	7	-	-

Table 21. Means obtained in the subscale comparing the general level of health over the past 12 months, with the current health state

	M0	M*baseline*	M1	M2
Mean	2,53	2,47	1,13	1,13
DP	0,52	0,525	0,35	0,35
N	15	15	15	15

Table 22. Means and standard deviations obtained by users in Euro Qol VAS

EQ VAS	M0	M*baseline*	M1	M2
Mean	40,00	40,67	58,00	58,00
DP	5,35	5,94	6,76	6,76
N	15	15	15	15

between these moments, which was confirmed with the Wilcoxon test for paired samples (z = -3508, *p*= 0.000) and can be analyzed in Figure 7.

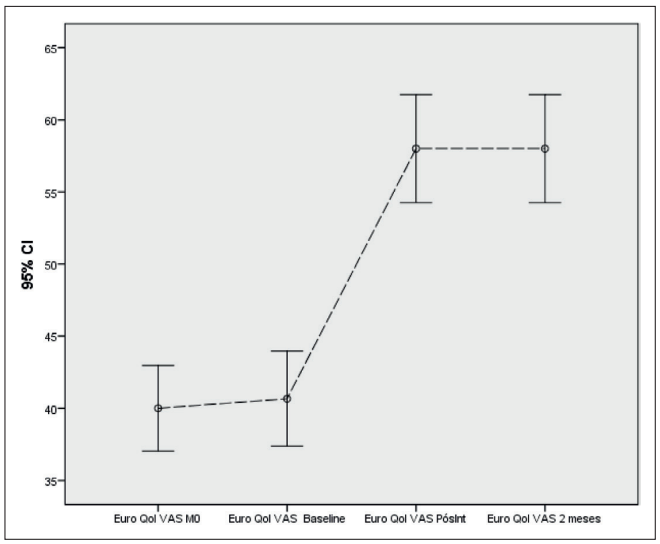

Figure 7. Means graphical representation and respective confidence intervals in Euro Qol VAS

4. DISCUSSION

This chapter includes the discussion of the results in the confrontation between the data presented in the previous chapter and the theoretical presented in the theoretical framework in order to meet the assumptions made by us.

GENDER, EDUCATIONAL LEVEL, EMPLOYMENT STATUS AND PROVENANCE

In this population we found a predominance of males (80%). In Portugal during the year 2010, 66% of admissions for COPD were males (23). The author claims that in 2008 the worldwide prevalence of this condition is slightly higher in men, with a total of 53.5% of annual deaths. It was predictably a greater discrepancy between the two genders. However, this approach results due to a change in smoking among women.

Lower education levels of the patients and their rural origin was an initial obstacle to the application of the scales as too the difficulty or even impossibility of reading and understanding the scales. Other authors also had a considerable number of illiterates (N = 13) in a total of 31 patients studied (24). In our study, this difficulty was outpaced, and the researcher opted to do a detailed explanation of the parameters under evaluation in order to facilitate the understanding and patient's response.

All patients in the study population were already retired. Rodriguez Gonzalez-Moro *et* al. It was observed in their sample that COPD patients had high levels of absenteeism due to illness and those who were in more severe stages of the disease were in permanent inactivity (19).

AGES

The age range of our population (38 years) was also found in another study (25) where they found a wide age group with COPD patients. Regarding to mean age (70.20 ± 12.03) stood next to other studies: Simon *et*al. (18), in their sample of 39 patients they had a mean age of 66 ± 7.9 years; Rizzi *et*al.(2), in their comparative study between COPD patients who benefit from conventional care and those who were subjected to a program of respiratory rehabilitation at home, studied 217 patients with a mean age of 68 ± 10 years, in turn, Oga *et al.* (26) had a mean age of 69 ± 7 years in 150 patients with COPD who were part of the sample of their study.

TIME OF COPD DIAGNOSED AND GOLD CLASSIFICATION

COPD is a chronic and progressive disease; it is expected to have a long period of evolution and an increase in the disease severity with advancing age (19), (23). In the population that we studied, older patients were not those with higher severity of the condition, which leads us to argue that age in our population was not an aggravating factor for COPD.

DOMICILIARY OXYGEN THERAPY

The oxygen therapy continuous or semi-continuous (between 15 to 24 hours per day) brings benefits in terms of mortality control either to correct severe hypoxemia in COPD patients (27). Given the progressive and irreversible changes that occur in the lung throughout life of the COPD patient, oxygen therapy is often a need for these patients (28). This has also been found in our population, we obtained a positive correlation between the variables "years of diagnosed COPD" and "years of oxygen."

Despite the need of 24 hours oxygen therapy observed in 4 of the patients in the study, only 2 of this therapy had as a supply source the liquid oxygen as concentrator oxygen supplement. This limits severely the patient's ambulation outside home. However, this reality will be due to those recommended by the Direção-Geral da Saúde(29) for prescribing this source of oxygen criteria: patients with daily walking out of home or clients needing high throughput of oxygen (greater than 4L / min).

SMOKING AND OTHER RISK FACTORS

The story of smoking recorded in our population is slightly lower than other studies with COPD patients. One study in 2009 with COPD patients reported in their sample 70% of ex-smokers and 24% of active smokers (19). Another study among several countries shows that 83% of COPD patients were smokers in China, while other countries

(Brazil, Germany, Turkey, United States and the United Kingdom) the average of smokers was about 59% (25).

Such differences in smoking habits of our population compared with others may be due to the spread in smoking among women in recent years, a situation which is not confirmed in the cases studied by us since we have only two female's patients, with advanced ages and non-smokers throughout life.

Nevertheless, smoking habits proved in our population a factor to take into account in the severity of the pathology because it has been found that the more severe stages of disease were associated with higher consumption of tobacco.

Occupational exposures with low representation as a risk factor for COPD development were observed in the cases that we studied and that it is also reported by Rodriguez Gonzalez-Moro *et*al. with only 18% of their sample referring associated risk to the labor factors (19)

THE OF ASSOCIATED DISEASES

COPD causes many changes not only in the lung but also on extra pulmonary level, causing multiple consequences such as cardiovascular diseases, metabolic and muscle- disorders (23). This reality was also denoted in our patients because they have multiple pathologies associated to COPD.

INHALATION THERAPY

Inhalation therapy has many vantages for the COPD patient, including reduced side effects and rapid and located effects comparing with other therapeutic options. (30)

To understand why patients don´t fulfill the prescription of this treatment was conducted a research with 600 patients. Therefore, the total number of patients studied, concluded that 20% did not meet the requirement for the inhalers because they do not think that helped them breathe better, 19% of users often forgot to administrate the product but 15% reported not to fulfill the requirement due to the high cost of inhalers. (31)

In another study to assess the correct implementation of the technique for using inhalers in asthma or COPD users with these concluded that the 120 users studied, 94.2% (113 users) committed at least one error when using the inhaler device. Therefore, only 7 users correctly performed all steps to use the inhaler. (32)

In the population intervened by the nursing rehabilitation program, no one of the 14 patients who performed the inhalation therapy had properly executed the inhalation technique. Although they knew properly how to prepare and inhale the drug, frequent mistakes were detected in the following steps: prolonged exhalation before the inhalation, nozzle properly placed in the mouth and deep inspiration during inhalation and apnea about 10 seconds after inhalation. However, after the training with practical demonstration of the correct technique, we observed that were changes in the implementation of inhalation by the patients.

Capstick & Clifton (30) reported that recent studies show that 25% of the patients with prescribed inhalers had never received instruction to use it correctly. They also state that training often shows succeed. Despite that other authors reported that patients respond that they know how to use the inhalation device, which can lead the health professionals to believe in this statement and consequently not to show how to perform the right method. (32)

The same authors report studies which were evaluated 93 COPD or asthma patients who initiated inhalation therapy. It was found 10 days after the first demonstration that only 48.4% of the patients performed correctly the inhalation technique.

Therefore it is recommended that the inhalation technique is frequently reassessed since some patients may be unable to perform it properly even after various demonstrations. Moreover, despite being learned by the patients, the technique can become inadequate in long terms. (33)

This has also occurred in our study population, where in after 2 months of the intervention ending were identified a several number of errors in the performing inhalation technique. To rise above these constraints were adopted various strategies to improve the use of inhalation therapy. The patients that had more difficulty in learning we invited them to see another patient auto administrating the medication. Specifically a patient that reduced the ventilatory volumes could not executed the inhalation technique correctly, was referred to the family doctor and it was proposed a therapeutic adjustment.

ADDITIONAL REVIEWS

Changes in BMI are often associated with decreasing of physical activity and poor nutrition by the COPD patient; sometimes these aspects are important in the prognosis of the COPD patients (15). If on one hand a low BMI is a dreadful prognosis for muscle weakness, on the other hand a revealing BMI obesity compromises the ventilation conditions (12).

Mean BMI values in the cases that we studied are similar to those found by Lahaije *et al.* (26.5 ± 5.4 kg / $m^{2)}$(34). However were obtained extreme values, both related to obesity and to slimness. Patients with higher BMI values were already in nutritional counseling or had already had in previous circumstances, however without reducing their weight. The patient who had more severe slimness refused this type of support.

The changes in the population subject to intervention for HR are not reported in other scientific studies. We attribute those changes to the standard error of the device used for the evaluation process, so we believe that those changes should not be valued.

Rehabilitation programs for COPD patients often involve training of the lower limbs. However, these patients often refer dyspnea in activities involving the upper limbs. Thus, the training of the upper limbs should be permanently included through cycle ergometers of arms, dumbbells or elastic bands, because it was demonstrated clinically significant effects in increasing the arm resistance (35).

In our intervened population it was observed with the nursing rehabilitation program a statistically significant increase on the strength of the hand, between the moments *baseline and* post-intervention. We can also argue that upper limbs training had a beneficial effect in the patients.

Besides the consequences previously mentioned to the heart and lung level on the values of SpO_2 <92%, some authors also warn to the importance of maintaining oxygen levels above this reference value, under the risk of seeing the consequences on cognitive performance (36) level. The techniques of respiratory rehabilitation are important for controlling the sensation of dyspnea, reduce respiratory effort and promote gas exchange improving the oxygen concentration in the blood (9).

In a study with 32 COPD patients, 16 of them were submitted to a pulmonary rehabilitation program at home and the rest were part of the control group. On the intervened group there were favorable changes but were not statistically significant both in relation to the PaO_2 or regarding to SpO_2. In relation to $PaCO_2$ were detected statistically significant changes in the group that was subjected to pulmonary rehabilitation. As a result, the authors concluded that breathing exercises and training of the upper limbs, as part of the pulmonary rehabilitation program, provide the decreasing of $PaCO_2$ (37).

With the intervention of nursing rehabilitation throughout the RR program our patients had considerably improved SpO_2. We can argue that the teaching / training undertaken during this program, which included in the study as described above breathing techniques and training of the upper limbs, had a favorable effect on the health of our patients. However, we also found that 2 months after our intervention these values had decreased again. Once completed our intervention this may be due to the patients had not maintained or had reduced the frequency of the techniques taught.

Same kind of teaching and training also had a significant impact on PEF measured by peak flow meter. We found an increase in PEF with statistical significance between the beginning and the end of the intervention on nursing rehabilitation, but here the values decreased two months after the programs end.

The expiratory flow is directly influenced by the strength of the muscles involved in the pulmonary ventilation and the training of the same may potentiate the rise of PEF. The lower or higher workouts when associated with the breathing exercises had a significantly improving on ventilatory parameters and performance of daily exercises. (38) In one study involving respiratory and physical training for 6 months in 10 COPD patients were significant improvements in the assessment of the expiratory flow. These same authors reported that these changes are due to the positive effects of the training program which participants were submitted (39).

In another study, which involved 80 healthy participants aged between 17 and 20 years, PEF evaluations were conducted in two distinct stages: the pre and post intervention moments. The intervention consisted in subjecting one group to a 16 weeks aerobic exercise plan. The researchers concluded that there were significant changes in the values of PEF on the intervened group when comparing the two time points, which were not the case in the control group. Consequently, these authors concluded that exist a direct relationship between aerobic workout and improving lung function. They also recommend that this type of training should be implemented in COPD patients (40).

The benefit of physical exercise in RR programs has been demonstrated in other studies based on various reviews. In the patients intervened by us were visible the health benefits observed by the rating scales implemented.

Regarding the assessment carried out with mMRC also other studies that involved rehabilitation programs have shown that this type of intervention reduces the sensation of dyspnea in COPD patients subjected to the intervention of a domiciliary rehabilitation program (37) (41) (42).

The ADL´s evaluation proves to be of extreme importance in these patients because of the limitations imposed by chronic disease. One study showed a strong correlation between the limitation in the performance of ADL's and the BODE index calculated by BMI, FEV_1, dyspnea sensation and functional capacity (18). As in our population, also other studies reported statistically significant changes resulting from the ADL's performance evaluation through LCADL on patients that were subject to the rehabilitation program compared with the control group. It is recognized the importance of implementing upper limbs exercises in rehabilitation programs for COPD patients as promoters of improvement in ADL's performance (42) (41).

A relationship between the severity of COPD and the decreasing of life quality on these patient it is already a fact proven by several studies ((43);. (44) Other authors state that the quality of life of patients is particularly affected with COPD from stage III or IV by the GOLD (45) classification. This reality also was found in our population, in which various limitations were reported in assessing 5 dimensions of life quality as measured by the Euro-Qol. Note that after our interventions improvements were described by the patients, in the following items: anxiety / depression. In the analysis of the Euro Qol VAS were also observed improvements but in this case with statistical significance. These results are confirmed by other studies in which we observed a significant increase in the life quality of the patients subjected to rehabilitation programs. (46)

In 2003, Hernandez *et* al. conducted a study in which they compared a group of COPD patients subject to a rehabilitation program at home carried out by specialized nurses and another group with similar characteristics but which were not subjected to any rehabilitation program. The results obtained clearly demonstrates the benefits of domiciliary rehabilitation programs when compared with the control group: reduction in the number and days of hospitalizations due to exacerbation; significant changes in quality of life, high level of patient satisfaction, a positive impact on knowledge and disease management by patients. Moreover, the average total cost of domiciliary rehabilitation program was around only 62% of the total cost needed with patients in the control group (47) treatments.

There are also several studies reported where it is demonstrated the effectiveness and usefulness of respiratory rehabilitation program, like: performance of physical exercise, sensation of dyspnea and quality of life, psychological benefits, cost-effectiveness and reduced the use of health services (35)

Another study involving COPD patients who were subjected to a domiciliary rehabilitation program with a fortnightly supervision has shown that this has not translated into significant improvements in pulmonary function variables and physical ability. However it proved to be important for maintaining the clinical stability of the patients (48).

5. CONCLUSIONS

Based on other studies above described and comparing the results obtained with our intervention we consider that all secondary hypotheses that were formulated for us were accepted in this study. All the variables consisted in these hypotheses (strength of right and left hands, SpO_2, PEF, MRCDQ, LCADL and Euro Qol) suffered statistically significant changes in the program of domiciliary nursing rehabilitation, based on the comparison between the evaluation moments M*baseline* and M1. It is important to remember again that between time points M0 and M*baseline,* although they may have some changes, these were not statistically representative. In relation to the time interval M1 - M2, after the intervention of nursing rehabilitation, it was found that in comparing these two time points regarding SpO_2 and PEF held a decrease of their values with statistical significance. Considering the other study variables between M1 and M2 it was verified a variability of results. We can speculate about these results assuming that some patients have maintained the practice of exercises and techniques that were taught and as such will have maintained or improved their condition. However, others probably abandoned or reduced their practice towards the end of the rehabilitation program and consequently were a decrease of the health gains achieved during the RR program.

Finalized our study we make some reflections on limitations and suggestions for potential investigations.

Other reviews conducted by us are suggested by the General Directorate of Health. The 6 minutes test walk test, often mentioned in the bibliography, it is definitely important to realize the patient functional capacity. However the program test was not viable because it was developed entirely at the patient´s home.

The spirometry is also mentioned by several authors as critical to the COPD patient evaluation. In this case, which were not part of the investigator competencies perform spirometry, we would have to seek the assistance of other professionals.

Given to the reality of the health services available in the area covered by the HCU-CA we quickly noticed that this would delay the implementation of the RR program. We would also like to underline that favorable effects of a RR program not always have repercussions on spirometry values. In consequence we believe that available with other supplies we could implement this program without compromising its reliability.

For the assessment of the COPD patients life quality could have been used other questionnaires. However due to their complexity, and taking into account the population characteristics we opted for the Euro Qol that is more simple.

We recommend the study replication in larger populations and the control of other variables , including cognitive and emotional state of the patients . Also the use of inhalers and adherence to oxygen therapy are variables that need more attention in future studies.

According to the recommendations of the Direção-Geral da Saúde the RR team should be multidisciplinary, with various professionals involved. This program requires a high level of resources and costs. In our study, only the direct intervention of the nurse specialized in nursing rehabilitation (with other professionals) we could obtain health gains with a program of simple structure and low cost.

Being the nurse specialized a highly qualified professional in rehabilitation nursing, who designs, implements and monitors specialized cares , it is important to mentioned that with this type of program at home can be established a therapeutic relationship and proximity that meets the patient needs.

Despite the small size of our population it is important to note that all patients of the area covered by the HCU-CA with criteria for inclusion in this project were the target of our intervention with obvious benefits for them.

Consequently we judge to obtained consistent results to affirm that this program was effective nursing rehabilitation in the variables under study for COPD patients.

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7. ANNEX I – DATA COLLECTION INSTRUMENT

DADOS A RECOLHER NO PROCESSO CLÍNICO

1- Nome _____

2- Sexo ☐ Masculino ☐ Feminino

3- Idade _____anos

4- Anos de DPOC diagnosticada _____

5- FEV_1 _____

6- Classificação GOLD _____

7- Anos de oxigenoterapia _____

8- Horas diárias de oxigenoterapia _____

9- Fonte de administração de oxigénio _____

10- Hábitos tabágicos Fumador ☐ Ex-fumador ☐ Não fumador ☐

Anos de tabagismo _____ Número de cigarros por dia _____

11- Outros fatores de risco _____

12- Patologias associadas _____

13- Inaladores Sim ☐ Não ☐

Quais _____

DADOS A RECOLHER JUNTO DO UTENTE

14- Escolaridade _____

15- Proveniência Rural Urbana

16- Situação Profissional Ativo Reformado

17- Técnica inalatória

Preparação do medicamento	☐ Correta	☐ Incorreta
Expiração antes da inalação	☐ Correta	☐ Incorreta
Inspiração profunda para inalação	☐ Correta	☐ Incorreta
Apneia após inalação	☐ Correta	☐ Incorreta

18- TA _____/_____

19- FC _____

20- Peso _____

21- Altura _____

22- IMC _____

23- Força da mão direita _____

24- Força da mão esquerda _____

25- SpO_2 _____

26- Fluxo expiratório _____

QUESTIONÁRIO PARA AVALIAÇÃO DO GRAU DE DISPNEIA, ADAPTADO DA VERSÃO MODIFICADA DO MEDICAL RESEARCH COUNCIL DYSPNOEA QUESTIONNAIRE (MMRC)

Assinale com uma cruz (assim x) o quadrado correspondente à afirmação que melhor descreve a sua sensação de falta de ar.

GRAU 0 Sem problemas de falta de ar expeto em caso de exercício intenso. *"Só sinto falta de ar em caso de exercício intenso".*	☐
GRAU 1 Falta de folego em caso de pressa ou ao percorrer um piso ligeiramente inclinado. *"Fico com falta de ar ao apressar-me ou ao percorrer um piso ligeiramente inclinado".*	☐
GRAU 2 Andar mais devagar que as restantes pessoas devido a falta de fôlego, ou necessidade de parar para respirar quando ando no meu passo normal. *"Eu ando mais devagar que as restantes pessoas devido à falta de ar, ou tenho de parar para respirar quando ando no meu passo normal".*	☐
GRAU 3 Paragens para respirar de 100 em 100 metros ou após andar alguns minutos seguidos. *"Eu paro para respirar depois de andar 100 metros ou passados alguns minutos".*	☐
GRAU 4 Demasiado cansado ou sem fôlego para sair de casa, vestir ou despir. *"Estou sem fôlego para sair de casa".*	☐

ESCALA LONDON CHEST ACTIVITY OF DAILY LIVING (LCADL)

Instruções de preenchimento:

Por favor, leia o questionário cuidadosamente e **escreva o número** correspondente à frase que melhor expressa a sua atitude face às várias atividades a seguir descritas. Este questionário é feito para descobrir se há atividades que já não pode fazer por causa da sua falta de ar, e quão sem ar fica ao fazer as coisas que ainda pode fazer.

0 – Eu não faria de forma alguma (se não faz a atividade porque ela não lhe é importante, ou nunca fez essa atividade).

1 – Eu não fico com falta de ar (se a atividade é fácil para si)

2 – Eu fico moderadamente com falta de ar (se a atividade lhe causa um pouco de falta de ar)

3 – Eu fico com muita falta de ar (se a atividade lhe causa muita falta de ar)

4 – Eu não posso mais fazer isso (se deixou de fazer atividade por causa de falta de ar e não tem mais ninguém para a fazer para si)

5 – Eu preciso que outra pessoa faça isso (se alguém faz isso por si ou a ajuda porque sente muita falta de ar, por exemplo: alguém faz compras por si)

Por favor, diga-nos o quanto de falta de ar tem sentido estes últimos dias enquanto faz as seguintes atividades:

Cuidado Pessoal	
Enxugar-se	
Vestir a parte superior do tronco	
Calçar sapatos/meias	
Lavar a cabeça	

Cuidado Doméstico	
Fazer a cama	
Mudar os lençóis da cama	
Lavar janelas/cortinas	
Limpeza/limpar o pó	
Lavar a louça	
Usar o aspirador/varrer	

Laser	
Andar em casa	
Sair socialmente	
Falar	

Atividade Física	
Subir escadas	
Inclinar-se	

EURO QOL

Instruções de preenchimento:

Assinale com uma cruz (assim x), um quadrado de cada um dos seguintes grupos, indicando qual das afirmações descreve melhor **o seu estado de saúde de hoje**:

Mobilidade		
Não tenho problemas em andar	☐	1
Tenho alguns problemas em andar	☐	2
Tenho de estar na cama	☐	3
Cuidados pessoais		
Não tenho problemas em cuidar de mim	☐	1
Tenho alguns problemas em lavar-me e vestir-me	☐	2
Sou incapaz de me lavar ou vestir sozinho/a	☐	3
Atividades habituais (ex.: trabalho, estudos, atividades domésticas, atividades em família ou de lazer)		
Não tenho problemas em desempenhar as minhas atividades habituais	☐	1
Tenho alguns problemas em desempenhar as minhas atividades habituais	☐	2
Sou incapaz de desempenhar as minhas atividades habituais	☐	3
Dor/Mal-Estar		
Não tenho dores ou mal-estar	☐	1
Tenho dores ou mal-estar moderados	☐	2
Tenho dores ou mal-estar extremos	☐	3
Ansiedade/Depressão		
Não estou ansioso/a ou deprimido/a	☐	1
Estou moderadamente ansioso/a ou deprimido/a	☐	2
Estou extremamente ansioso/a ou deprimido/a	☐	3

Comparado com o meu nível geral de saúde durante os últimos 12meses, o meu estado de saúde hoje é:		
Melhor	☐	1
Igual	☐	2
Pior	☐	3

Gostaríamos que indicasse nesta escala qual é hoje, na sua opinião, o seu estado de saúde.

O melhor estado de saúde imaginável

100	
9	0
8	0
7	0
6	0
5	0
4	0
3	0
2	0
1	0
0	

O pior estado de saúde imaginável

Obrigada pela sua colaboração

8. ANNEX II – INFORMED CONSENT

Consentimento Informado, Livre e Esclarecido para participação em investigação

de acordo com a Declaração de Helsínquia[1] e a Convenção de Oviedo[2]

Por favor, leia com atenção a seguinte informação. Se achar que algo está incorreto ou que não está claro, não hesite em solicitar mais informações. Se concorda com a proposta que lhe foi feita, queira assinar este documento.

Título do estudo: DPOC – Respire Qualidade de Vida: Implementação de um Programa de Reabilitação Respiratória Domiciliária

Enquadramento: Projeto desenvolvido na Unidade de Cuidados na Comunidade de Carrazeda de Ansiães (UCC) – Unidade Local de Saúde do Nordeste, com a colaboração da Fundácion Mapfre.

Explicação do estudo: Este projeto é desenvolvido pelos Enfermeira Sónia Alexandra Claro Casado, André Filipe Morais Pinto Novo, Leonel São Romão Preto e Sofia Margarida Bernardo Lopes Morais. São abrangidos 15 utentes com DPOC diagnosticada, com necessidade de oxigenoterapia domiciliária. São efetuadas 15 sessões de reabilitação respiratória no domicílio onde são ensinados/treinados exercícios respiratórios, gestão do regime terapêutico, técnicas de conservação de energia e fortalecimento muscular, com uma frequência de 2 sessões por semana. São também efetuados ensinos sobre fatores de risco, fatores exacerbantes e eliminação de barreiras arquitetónicas. Todos os ensinos são efetuados na presença do prestador de cuidados. A todos os utentes são feitas avaliações bimestrais com as escalas London Chest Activity of Daily Living (LCADL), Medical Research Council Dyspnea Questionnaire (mMRC) e Euro Qol, bem como Índice de Massa Corporal, Tensão Arterial e Frequência Cardíaca e força das mãos direita e esquerda. Durante o período em que decorrem as sessões de reabilitação respiratória é também avaliada a saturação periférica de oxigénio e o volume expiratório, com recurso ao peak flow meter.

Condições e financiamento: Não haverá lugar a qualquer pagamento ou contrapartida aos participantes no projeto. A participação no mesmo é voluntária, não sofrendo o utente qualquer prejuízo em termos assistenciais no caso de não ter interesse em integrar o projeto.

Este projeto foi aprovado pela Comissão de Ética da Unidade Local de Saúde do Nordeste.

Confidencialidade e anonimato: Toda a informação recolhida é confidencial e tem como objetivo exclusivo o desenvolvimento do projeto já referidos.

Grata pela sua colaboração

Sónia Alexandra Claro Casado
Enfermeira Especialista em Enfermagem de Reabilitação, a desempenhar funções na Unidade de Cuidados na Comunidade de Carrazeda de Ansiães – Unidade Local de Saúde do Nordeste
Tlm: 925 800 861
Email: sonia.casado@cscansiaes.min-saude.pt

Assinatura: _____

-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-o-

Declaro ter lido e compreendido este documento, bem como as informações verbais que me foram fornecidas pela pessoa que acima assina. Foi-me garantida a possibilidade de, em qualquer altura, recusar participar neste estudo sem qualquer tipo de consequências. Desta forma, aceito participar neste estudo e permito a utilização dos dados que de forma voluntária forneço, confiando em que apenas serão utilizados para esta investigação e nas garantias de confidencialidade e anonimato que me são dadas pela investigadora.

1 http://portal.arsnorte.min-saude.pt/portal/page/portal/ARSNorte/Comiss%C3%A3o%20de%20%C3%89tica/Ficheiros/Declaracao_Helsinquia_2008.pdf

2 http://dre.pt/pdf1sdip/2001/01/002A00/00140036.pdf

Nome: _____

Assinatura: _____ Data: …… /…… /……..

SE NÃO FOR O PRÓPRIO A ASSINAR POR IDADE OU INCAPACIDADE

(se o menor tiver discernimento deve também assinar em cima, se consentir)

Nome: …

BI/CD Nº: ..... Data ou Validade ….. /..… /……..

Grau de parentesco ou tipo de representação: .....

Assinatura …

Este documento é composto de 2 páginas e feito em duplicado:

uma via para os investigadores, outra para a pessoa que consente

9. ANNEX III – OPINION OF THE ETHICS COMMITTEE

ULSNE

Exma. Sra.
Enf.ª Sónia Alexandra Claro Casado
Centro de Saúde de Carrazeda de Ansiães
Av. Eng. Camilo de Mendonça
5140 – 073 Carrazeda de Ansiães

Sua Referência	Sua Comunicação de	Nossa Referência	Data
		Pº IND A/E - 3	07/02/2013

Assunto: Parecer da Comissão de Ética

Reunião dia 06/02/2013

A Comissão de Ética da ULS Nordeste EPE, na sequência do pedido para emitir parecer para o desenvolvimento do projecto "**DPOC** " – **Respire qualidade de Vida** " informa V. Ex.ª que nada tem a obstar do ponto de vista ético, desde que seja salvaguardada a identidade dos utentes.

Com os melhores cumprimentos,

A Presidente da Comissão Ética da ULS Nordeste, EPE

Joaquina Baltazar

Dra. Joaquina Baltazar

10. ANNEX IV – LEAFLET ON THERAPEUTIC EXERCISES

Cuide de si

- **Reserve 30 minutos por dia para praticar exercício físico.**
- **Faça caminhadas diárias.**
- **Comece por distâncias curtas e vá aumentando progressivamente.**
- **Repouse sempre que sentir a sua falta de ar a aumentar.**
- **Controle a sua respiração: inspire pelo nariz e expire pela boca com os lábios semicerrados.**
- **O tempo que demora a expirar deve ser o dobro do tempo da inspiração.**

UCC
CARRAZEDA DE ANSIÃES

FUNDACIÓN MAPFRE

ULSNE

ipb INSTITUTO POLITÉCNICO DE BRAGANÇA
Escola Superior de Saúde

Contactos:
Sónia Casado
Enfermeira Especialista em Enfermagem de Reabilitação

Tlm: 925 800 861
Tlf: 278 610 050

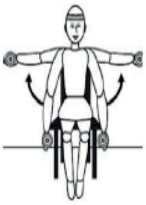
DPOC
Respire Qualidade de Vida

EXERCÍCIOS TERAPÊUTICOS

Exercícios de Fortalecimento Muscular

1. Levante um peso à altura dos ombros expirando. Volte à posição de partida, (braços para baixo) inspirando.

2. Levante um peso à altura dos ombros pelo lado (abrindo os braços) e expirando. Volte à posição de partida, inspirando.

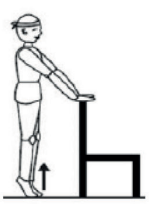


3. Dobre os cotovelos, levando o peso ao ombro, expirando. Volte à posição de partida, inspirando.

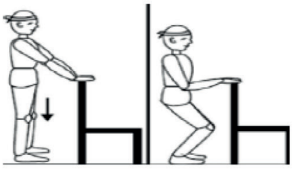
4. Dobre os cotovelos e cruze os braços expirando. Volte à posição de partida Inspirando.

5. Estique um joelho expirando. Volte lentamente a pousar o pé no chão inspirando.

6. Coloque-se em bicos dos pés expirando.
Inspirando volte a pousar os calcanhares no chão.



7. De pé, dobre os joelhos expirando. Volte a esticar os joelhos inspirando.



8. De pé , levante a perna para o lado expirando. Volte a pousá-la ao lado da outra inspirando.

Lembre-se:
deve sempre expirar quando está a fazer esforço.

11. POSSIBILITIES OF CONTINUATION OF DESIGN AND CLINICAL APPLICATION

We checked with the completion of this project which is noticeably favorable results obtained in the study population.

Despite the difficulties already mentioned above and the relatively small budget, we noted also that the program is simple in implementation and execution.

Thus, it is of interest of the ULSNE and School of Health of Bragança to keep the project implementation in this study population, as well as extend it to other care units within the Community, in particular Bragança, Mirandela and Macedo de Cavaleiros.

12. PUBLICATIONS OF THE PROJECT

Part or parts of this memory were presented at the following events:

Casado, Sónia; Novo, André; Preto, Leonel; Morais, Sofia (2013) – **DPOC – Respire Qualidade de Vida: Rede de Cuidados Domiciliários em Pacientes com DPOC**. In 2ºVENTS Escola Superior de Tecnologia da Saúde do Porto. Porto

Casado, Sónia; Novo, André; Preto, Leonel; Morais, Sofia (2013) – **DPOC – Respire Qualidade de Vida: Implementação de um Programa de Enfermagem de Reabilitação Domiciliária**. In 3ºEncontro de Outono Saúde e Comunidade. Vila Real

Casado, Sónia; Novo, André; Preto, Leonel; Morais, Sofia (2013) – **DPOC – Respire Qualidade de Vida: apresentação do projeto à comunidade**. In Comemorações do Dia Mundial da Doença Pulmonar Obstrutiva Crónica. Bragança

Casado, Sónia; Novo, André; Preto, Leonel; Morais, Sofia (2013) – **DPOC – Respire Qualidade de Vida: Intervenção do Enfermeiro de Reabilitação junto do utente com DPOC no domicílio.** In Congresso Internacional de Enfermagem de Reabilitação. Vila Nova de Gaia