Original Paper

Obstructive Ventilatory Dysfunctions-Functional Assessment and Rehabilitation Program

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ABSTRACT: Background. Obstructive ventilatory dysfunctions have an increased incidence, and through functional assessment determined by the International Classification of Functioning, Disability and Health (ICF), appropriate treatment can be established. Aims. The objectives of our research are represented by the application of respiratory rehabilitation sessions according to the ICF in patients with obstructive ventilatory dysfunctions-with COPD or asthma, using a unique, international language and the evaluation of the results obtained before and after completion pulmonary rehabilitation. Methods. We conducted a randomized prospective study between November 2022-April 2023, which included 84 patients diagnosed with obstructive ventilatory dysfunctions and who performed respiratory rehabilitation. They were divided into two categories: category 1-C1 which included 43 patients with Chronic Obstructive Pulmonary Disease-COPD and category 2-C2 which included 41 patients diagnosed with asthma. The rehabilitation program lasted 8 weeks, with exercises performed from Monday to Friday, with a weekend break. Respiratory rehabilitation consisted of physical therapy, inspiratory and expiratory muscle training (IEMT), proper nutrition, and psychotherapy. Results. At the end of the program, most of the patients showed improvements in the ICF qualifiers, a fact that supported us that respiratory recovery is one of the basic therapies of patients with obstructive ventilatory dysfunctions. Conclusions. The ICF allows the application of a personalized respiratory rehabilitation program. The ICF qualifiers are used for the functional assessment of patients and allow they to be included in individualized medical rehabilitation programs.

KEYWORDS: *Respiratory rehabilitation, ICF, obstructive ventilatory dysfunctions.*

Introduction

Obstructive ventilatory dysfunctions are chronic lung diseases represented by chronic obstructive pulmonary disease (COPD) and the other pathology known as with a continuously increasing incidence [1].

The symptoms of the two lung diseases are common: dyspnea, fatigue, wheezing, chest constriction, but with differences regarding the cough-the productive cough predominates in COPD, and the dry cough in asthma [2].

Depending on the severity of each disease, these symptoms affect people's daily lives and become a burden to those around them. [3].

The major difference between COPD and asthma is the fact that the obstruction objectiveized after spirometry through the value between Forced Expiratory Volume and Forced Vital Capacity (FEV1/FVC) <70% is irreversible in chronic obstructive pulmonary disease and reversible in asthma after the administration of a short-acting beta2-agonist [4].

It is essential to prevent exacerbations through an effective control of obstructive ventilatory dysfunctions and this is ensured through the collaboration of a multidisciplinary team [5].

Because obstructive pulmonary diseases can affect the daily life of patients, there is a classification system that uses a unique language through codes to functionally assess patients [6].

This is the International Classification of Functioning, Disability and Health (ICF) according to the World Health Organization (WHO), and aims for all medical specialists to have access to this unique way of use [7].

t is desired to implement the ICF as widely as possible worldwide for patients with obstructive pulmonary diseases in order to achieve the most suitable type of treatment [8].

There are basic sets specific to obstructive pulmonary diseases that analyze the functions and structures of the body, as well as the way of carrying out daily activities [9].

In this way, patients have the opportunity to be properly evaluated, creating a specific patient profile that includes information about limitations in performing daily activities and the action of environmental factors [10].

The comprehensive ICF Core Set for Obstructive Pulmonary Dysfunction (OPD)

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includes 19 codes in the category-body functions, 24 codes assigned to the category-activities and participation, 23 codes assigned to the category-environmental factors and 5 codes assigned to the category-body structures [11].

The treatment of obstructive ventilatory dysfunctions consists of drug therapy represented in particular by inhalation medication, the removal of risk factors and belonging to a respiratory rehabilitation program [12].

Respiratory rehabilitation is an important part of their treatment, as it improves exercise capacity and quality of life, relieves symptoms and combats muscle weakness [13].

The most recent specific guidelines for COPD and asthma, Global Initiative for Chronic Obstructive Lung Diseases-GOLD [14], respectively Global Initiative for Asthma-GINA [15] claim that the recovery program is only a fragment of the multidisciplinary therapy in these diseases. Ever since 2013, announcements from the American Thoracic Society (ATS) and European Respiratory Society (ERS) mentioned that it is necessary to implement respiratory rehabilitation in obstructive pulmonary diseases, because there were numerous evidences in the specialized literature that proved the benefits brought by them [16].

In order to use the most appropriate respiratory rehabilitation program, specific to each patient, it is necessary to use the ICF. That is why the first step when taking into account a patient with chronic lung diseases is to carry out an appropriate staging according to the 4 categories included in the ICF [17].

Because COPD and asthma are chronic lung diseases, disability can set in as it progresses, so it is very important to measure invalidity, which is done through the ICF [18].

The classification system currently used has the ability to determine the app ly of the rehabilitation program necessary to achieve control of the disease by decreasing the number of exacerbations, stopping or preventing disability and improving respiratory function [19].

The validation of the advantages obtained following the inclusion in the pulmonary rehabilitation program determined its use in as many medical institutions as possible around the world [20].

The use of the ICF according to disease stages is essential, because depending on the scores obtained from the framing, respiratory rehabilitation is different and requires a complex, individualized program [21].

Aims

The objectives of our research are represented by the application of respiratory rehabilitation sessions according to the ICF in patients with obstructive ventilatory dysfunctions-with COPD or asthma, using a unique, international language and the evaluation of the results obtained before and after completion pulmonary rehabilitation.

Material and Methods

This study was authorized by the Ethics Committee of ″Victor Babeș″ Clinical Hospital of Infectious Diseases and Pneumopthisiology, Craiova, România-No. 9468/04.07.2022 and was managed in accordance with the Declaration of Helsinki of the World Medical Association. All patients were informed about the study in which they were going to be enrolled and about the protection of personal data. All participants signed the informed consent. Patients had the possibility to withdraw from the study when they wanted for various reasons or when their health condition no longer allowed them.

Research protocol

We conducted a randomized prospective study between November 2022-April 2023, which included 84 patients diagnosed with obstructive ventilatory dysfunctions. They were divided into two categories: category 1-C1 which included 43 patients with COPD and category 2-C2 which included 41 patients diagnosed with asthma. The research included patients hospitalized in the Pulmonology Department-″Victor Babeș″ Clinical Hospital of Infectious Diseases and Pneumophthisiology in Craiova for the recent diagnosis or exacerbations of COPD or asthma, and the rehabilitation program was carried out both during the hospitalization period, later being referred to the Department of Physical Medicine and Rehabilitation-″Filantropia″ Municipal Clinical Hospital in Craiova for a period of 8 weeks.

Criteria for inclusion in the study:

- patients should have a well-documented diagnosis of obstructive ventilatory dysfunctions, according to the guidelines in force;
- patients over 18 years old;
- patients who strictly follow drug therapies;
- compliant patients in order to comply with the program established within the medical rehabilitation.

Criteria for exclusion in the study:

- pregnant women;
- patients with psychiatric conditions;

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- patients with severe cardiovascular and neurological diseases;
- patients with osteoarticular diseases that do not allow them to perform physical exercises;
- patients with asthma/COPD overlap.

The rehabilitation program lasted 8 weeks, with exercises performed from Monday to Friday, with a weekend break. The span of a session was approximately 30 minutes, but it increased progressively depending on the tolerability of each individual. Respiratory rehabilitation consisted of physical therapy, inspiratory and expiratory muscle training (IEMT), proper nutrition, and psychotherapy. We functionally assessed patients both at study entry and at the end of the respiratory rehabilitation program.

From the ICF, we chose a few categories from each specific component for the evaluation of subjects with COPD and asthma in our research (Figure 1) [10].

To describe the health status of each individual, the ICF uses several qualifiers as exemple:

- 8, 9-qualifiers that cannot be specified or applied;
- 0-patient without disability;
- 1, 2, 3, 4-patients with increasing impairment, where 1 is mildest and 4 is complete disability [10,22];

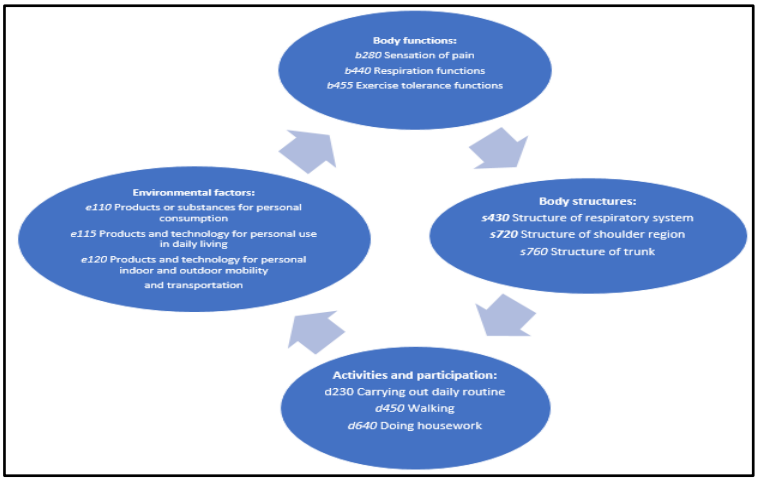

Figure 1. Comprehensive ICF Core Set for Obstructive Pulmonary Diseases [10].

Applied tests and statistical methods

We performed a thorough history for all patients and performed a comprehensive objective examination. Afterwards, we applied according to the 4 ICF components, the most important 3 categories

- body functions (b280 Sensation of pain, b440 Respiration functions, b455 Exercise tolerance functions),
- body structures (s430 Structure of respiratory system, s720 Structure of shoulder region, s760 Structure of trunk),
- activities and participation (d230 Carrying out daily routine, d450 Walking, d640 Doing housework),
- environmental factors (e110 Products or substances for personal consumption, e115 Products and technology for personal use in daily living, e120 Products and technology for personal indoor and outdoor mobility and transportation).

From the 4 components, we chose the most representative assessments for patients with obstructive ventilatory dysfunctions, for which we also used some association tools, for example the six-minute walk test (6MWT) corresponded to b455 (exercise tolerance functions) and d450 walking and the assessment of respiratory function by spirometry corresponded to b440 respiratory functions and b430 structures of respiratory system**.**

The four categories were quantified, pre and post-rehabilitation. The qualifiers used were evaluated as numbers for each group. In our research, we considered important the percentage value of each qualifier for the functional profile represented by b455-exercise tolerance functions, b440-respiratory functions, b430-structures of respiratory system and d450-walking.

We performed 6MWT (with wireless system-BTS G-WALK/BTS G-SENSOR 2) and spirometries (using SPIROLAB 3 spirometer) for all patients at admission and at the end of recovery sessions after 8 weeks.

The statistics performed in our research was with the Data Analysis Module of the Microsoft Excel mode and statistical associations using the

Fischer test. In this statistical test-P value of less than 0.05 is considered statistically significant. We have exemplified the results obtained in diagrams and in the form of images recorded after using the spirometer and the six-minute walk test.

Characteristics of the studied groups

The gender of the patients was divided as follows: in the C1 category-29 of them (67%) are male and 14 of them (33%) are female, and in C2-18 of them (44%) are male and 23 of them (56%) are female. The environment of origin involved was distributed: in C1, rural patients predominated-23 (53%) of the 43 patients with COPD, compared to 20 patients (47%) from the urban environment, and in C2, urban patients predominated-22 (54%) of the 41 patients with asthma, compared to 19 (46%) patients belonging to the rural environment.

Results

We divided the patients into the following categories according to the ages present in the study: 18-39 years, 40-69 years and over 70 years. Thus, in the first group, 18-39 years, there were 15 patients from C2 and none with COPD, mean from C1. Most patients in both groups were in the 40-69 age range, 26 patients with COPD and 17 patients with asthma.

In the over 70 age group, C1 patients predominated-17 of the 43 patients, compared to C2 which included 9 of the 41 patients (Figure 2).

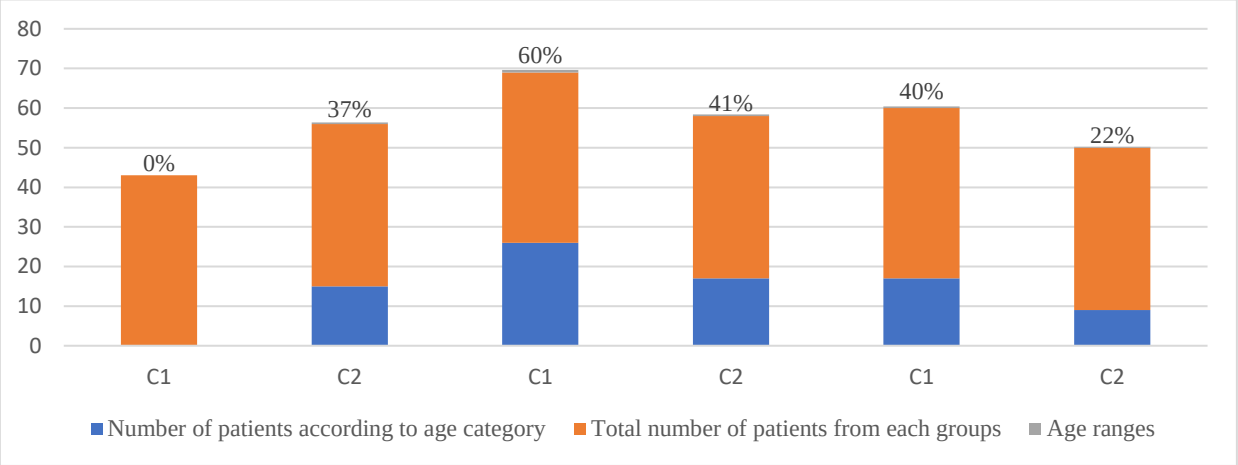

Figure 2. Distribution by age ranges.

After using the qualifiers according to the ICF, we obtained the following general forms of the disease in the 2 categories: in the case of patients with COPD, in C1 we found 5% of patients with the qualifier 0, 9% of patients with the qualifier 1, 28% of patients with the qualifier 2, 37% of patients with qualifier 3 and 21% of patients with qualifier 4 (Figure 3).

Unlike C1, patients with asthma-from C2 had lower qualifiers, so that 20% of the 41 patients had qualifier 0, 37% had qualifier 1, 22% of them qualifier 2, 17% of patients had the qualifier 3 and only 5% of them had the qualifier 3 (Figure 4).

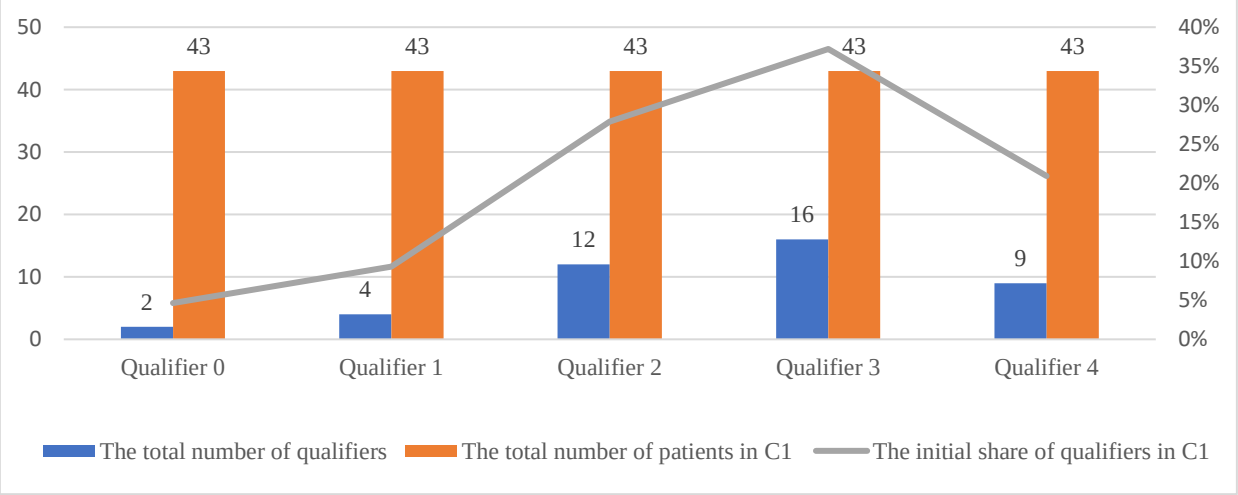

Figure 3. Initial ICF Qualifiers in group C1-COPD.

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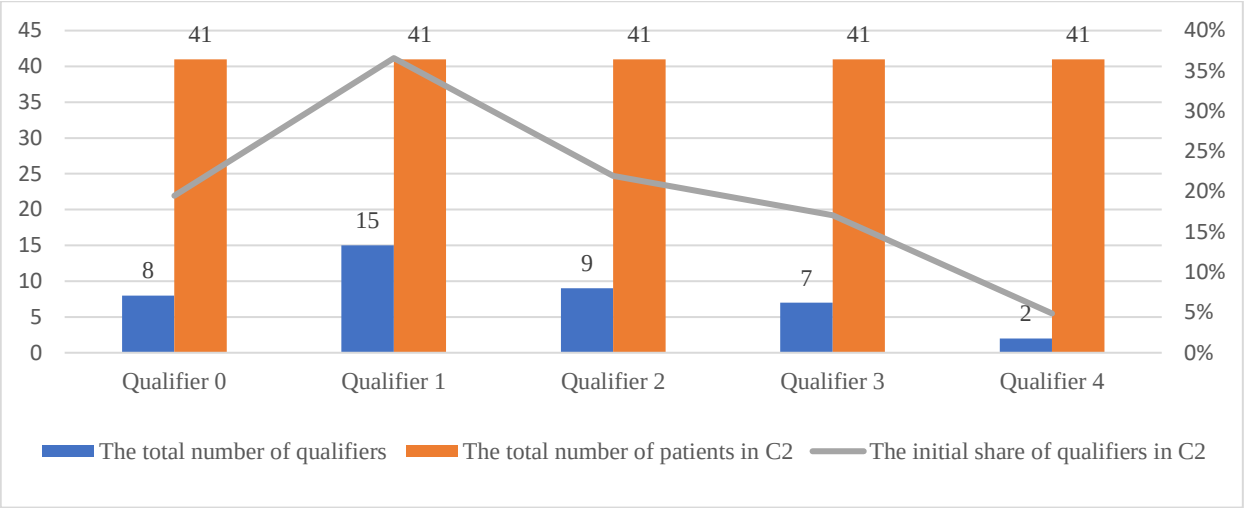

Figure 4. Initial ICF Qualifiers in group C2-ASTHMA.

At the end of the 8 weeks, most of the patients showed improvements in the ICF qualifiers, a fact that supported us that respiratory recovery is one of the basic therapies of patients with obstructive ventilatory dysfunctions.

We noticed the improvement of the six-minute walking test in both C1 and C2 patients at the end of the rehabilitation sessions.

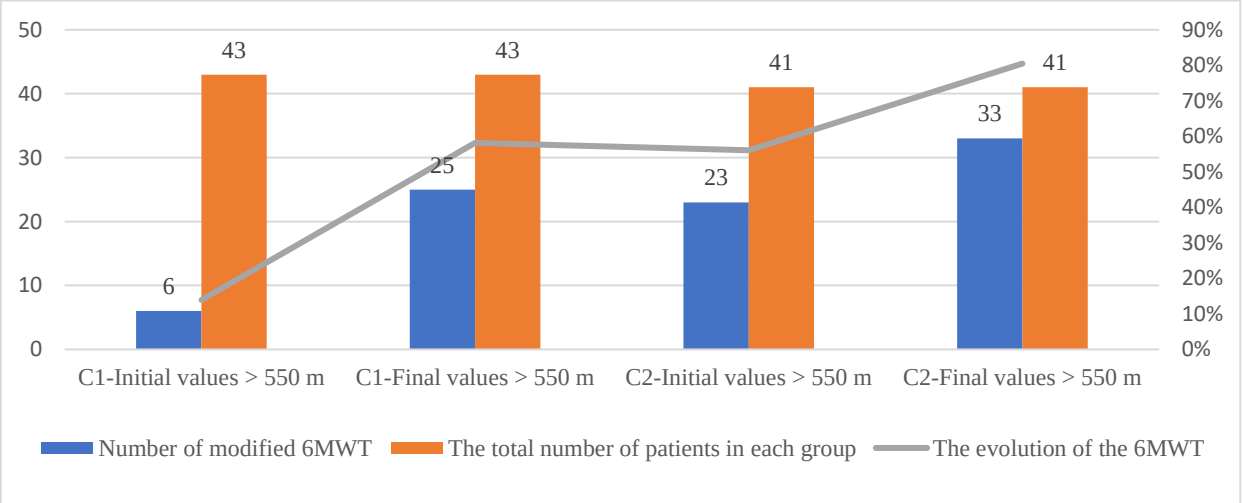

Figure 5. 6MWT in the 2 groups before and after the respiratory rehabilitation program.

We evaluated patients with normal 6MWT values. In the initial group C1 only 14% of patients showed normal values (>550 meters), later at the end of the respiratory rehabilitation program we determined that 58% of patients had adequate test values. In the C2 group, the better values were objective from the beginning, so that 56% of the patients managed to walk more than 550 meters, but after the 8 weeks of medical rehabilitation, an increase was also noted in this group, as 80% of the patients had optimal values (Figure 5).

In group C1, the initial global average value was 308 meters, and the final global average value was 610 meters. In group C2, the initial global average value was 403 meters, and the final global average value was 720 meters. An example would be a patient from group C1, from the age range over 70 years, with qualifier 3, who initially presented a subnormal value of the 6MWT (Figure 6), and at the end of the program, this value became optimal (Figure 7), and the qualifier drops to the value of 1.

DATE OF BIRTH: 03/11/1952 **WEIGHT:** 97 Kg **HEIGHT:** 146 cm **GENDER:** F

Six Minutes Walking Test

Parameters	Value		Units
Analysis Duration	5:55		min:sec
Walking distance	208.4		m
Paths	9		
Rests	0		
Parameters	**Value**	**Normal Value**	**Units**
General Symmetry Index	92.3		

Percentage duration of paths

Figure 6. Initial 6MWT-Abnormal value in a patient from group C1 from the collection of the ˝Filantropia˝ Municipal Clinical Hospital of Craiova.

DATE OF BIRTH: 03/11/1952 **WEIGHT:** 97 Kg **HEIGHT:** 146 cm **GENDER:** F

Six Minutes Walking Test

Parameters	Value		Units
Analysis Duration	5:59		min:sec
Walking distance	382.0		m
Paths	20		
Rests	0		
Parameters	**Value**	**Normal Value**	**Units**
General Symmetry Index	96.2		

Percentage duration of paths

Figure 7. Final 6MWT-Normal value in a patient from group C1 from the collection of the ˝Filantropia˝ Municipal Clinical Hospital of Craiova.

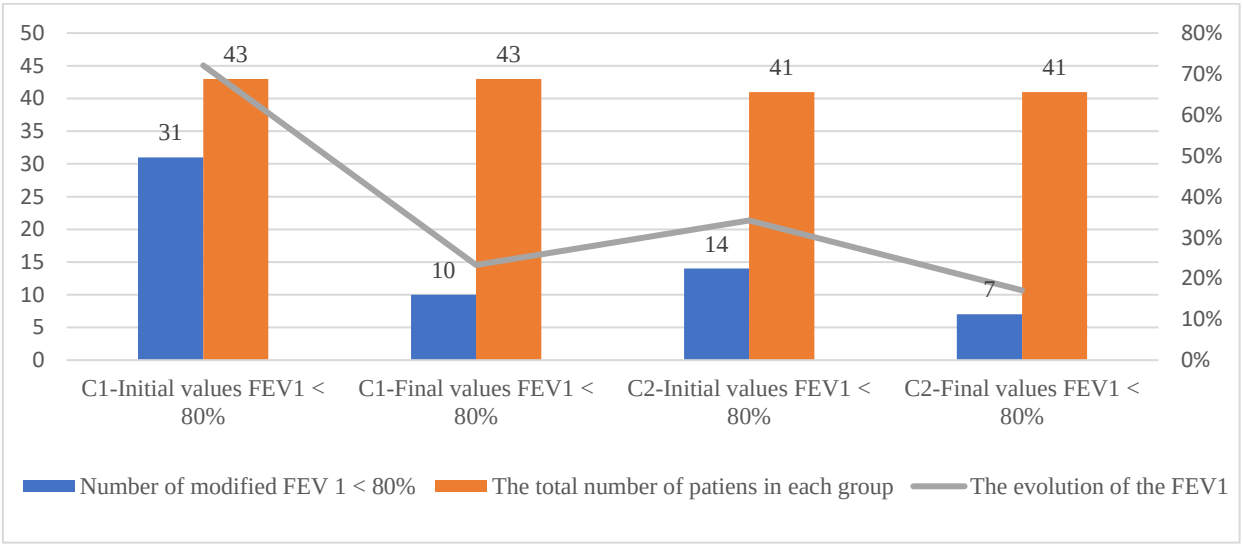

Figure 8. FEV 1 improvement after the respiratory rehabilitation program in the 2 groups.

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To evaluate the effectiveness of the rehabilitation program in patients according to the ICF qualifiers, we also used spirometry of all patients included in the study. For patients with obstructive ventilatory dysfunction, we analyzed the FEV1 parameter. In the initial C1 group, there were 72% with FEV1 less than 80%, and after the rehabilitation sessions, only 23% of patients remained with FEV1 <80%.

In group C2, FEV1 was changed in fewer patients, so that initially 34% of them had FEV1 less than 80%, but at the end of the program only 17% remained with FEV1 below 80% (Figure 8).

The initial global average FEV1 value in the C1 group was 59%, and the final average FEV1 value was 98%. In group C2 the initial global average FEV1 value was 70%, and the final global average FEV1 value was 100%.

After completing the respiratory rehabilitation program, a significant improvement was observed in the values of the qualifiers in both C1 (Figure 9) and C2 (Figure 10).

After the rehabilitation program, all patients who had an initial qualifier of 1, turned to a qualifier of 0, and patients with qualifiers of 2, 3 or 4 dropped at least one level lower. Only 9% of patients in C1 and 2% of patients in C2 remained qualifier 4, suggesting the benefit of this therapy. Severe qualifiers 3, respectively 4-the complete problem correlated significantly statistically with patients diagnosed with COPD-C1, compared to patients with asthma-C2, where P has a value equal to 0.0389. But there was no significant distinction betwixt the 2 lots in relation to the severe qualifiers after the application of the respiratory rehabilitation program, because both categories of patients responded approximately similarly, with the P value equal to 0.2467.

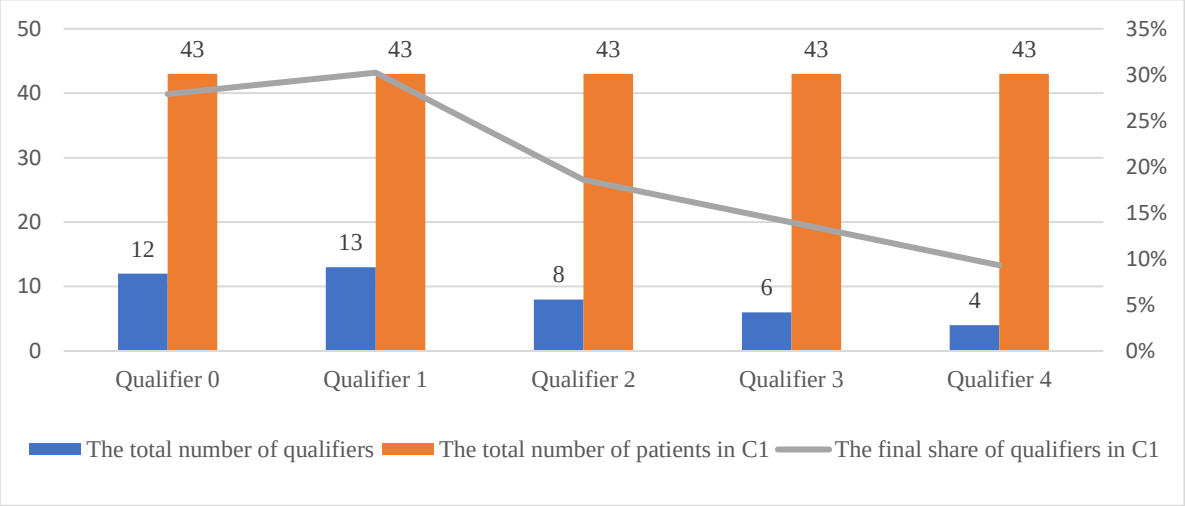

Figure 9. Final ICF Qualifiers in group C1-COPD.

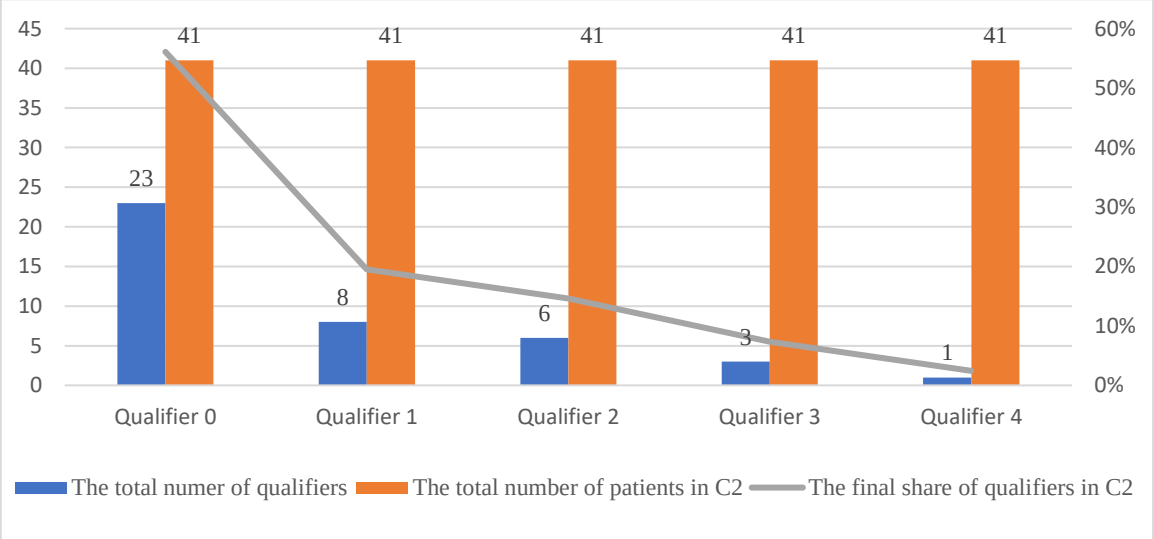

Figure 10. Final ICF Qualifiers in group C2-ASTHMA.

Discussion

It has long been known that respiratory rehabilitation is a standardized, effective therapy with a high impact on the treatment and evolution of obstructive ventilatory dysfunctions [23], but less integrated into medical conduct is the use of the ICF to provide an individualized program based on the specific needs of each patient with COPD or asthma.

Studies for ICF language in the assessment and monitoring of patients with respiratory dysfunction have been developed over the past decade, although the classification has been implemented since 2000.

For this reason, the originality of our study lies in the fact that we want to integrate the use of ICF in all patients with COPD or asthma before inclusion in a pulmonary rehabilitation program.

In the Romanian literature, there are no similar studies to which we can refer our results.

This classification is intended to assess each patient's problem in a targeted manner and to aid in early recovery.

Our intention is also supported by a cross-sectional study conducted in China between October 2019-March 2022 that enrolled 237 COPD patients in which the ICF was used as a tool, and it was proven that patients have various recovery needs based on body function and activity participation-ICF components [24].

Our research wants to support patients with obstructive ventilatory dysfunctions, to be able to re-adapt to social life, without disabilities.

At the same time, we wanted to facilitate the transfer knowledge, experience and innovative practices in this field contributing to achieving a European dimension for our country and to start a complex pulmonary rehabilitation program for patients with obstructive ventilatory dysfunctions and disabilities.

The satisfactory use of the ICF for chronic lung diseases has been validated in the literature, as also noted in a study that included 76 physicians from 44 countries who provided 1330 responses to this set and who considered that the ICF is a useful tool [25].

Another study conducted in the Chinese population that included 100 patients with chronic lung diseases argued that the use of ICF before inclusion in the rehabilitation program is justified because patients may have different needs depending on the severity of the diseases [26].

As we also demonstrated that after the pulmonary rehabilitation program the majority of the qualifiers improved significantly, a study carried out between January 2019-August 2019 in Italy that included 2066 patients diagnosed with COPD, demonstrated that regardless of whether the patients were hospitalized or treated at home, statistically significantly reduced the value of higher ICF qualifiers with a P value lower than 0.001 at the end of the respiratory rehabilitation sessions [26].

The importance of using the ICF was also demonstrated in patients with asthma, so that in a study conducted in Brazil on 35 patients, the use of the ICF proved relevant to guide the evaluation, treatment and monitoring of patients with asthma [27].

Another important aspect of our research is the fact that we chose three categories from the four components of the ICF, the most representative for COPD or asthma, which had as objective correspondents the 6MWT and spirometry.

Instead, there are not many researches in the review about this, however, a study conducted in Canada in 2022 that included 96 patients diagnosed with COPD demonstrated improvements in FEV1 and the 6MWT and the decrease of specific ICF qualifications after the individualized rehabilitation program, these being findings like as our research [28].

New research managed in 2023 in Brazil that included 57 patients with asthma concluded that the ICF qualifiers can classify functional capacity limitation according to the Incremental Shuttle Walk Test (ISWT) [29], not with the 6MWT that we used in our research.

Limits of the current study were represented by few patients enrolled; the fat that we considered only 3 categories from the 4 components of the ICF set for the respiratory patient; existence of a minority of studies in the literature to date, regarding the integration of ICF in patients with obstructive ventilatory dysfunctions.

Conclusions

The ICF allows the practice of a personalized respiratory rehabilitation program.

In conclusion, we want to integrate in as many clinics in our country the use of ICF for patients with obstructive ventilatory dysfunctions, due to the fact that it presents a unique, universal language with multiple benefits for patients.

The ICF qualifiers are used for the functional assessment of patients and allow they to be included in individualized medical rehabilitation programs.

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Respiratory rehabilitation remains the basic therapy in the management of patients with obstructive ventilatory dysfunctions-COPD or asthma.

Conflict of interests

None to declare.

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