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Asmaa Ali Mohammed Mahmoud

asmaamohammed78@mans.edu.eg

Mansoura University, El Dakhlia, Egypt

Doaa Abd Elhameed Abd Elmawla

Mansoura University, El Dakhlia, Egypt

Soad Hassan Abd Elhameed

Mansoura University, El Dakhlia, Egypt

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Effect of Implementing Clinical Pathway on Pulmonary Function Parameters and Dyspnea Level among Elderly Patients with Chronic Obstructive Pulmonary Disease

Asmaa Ali Mohammed Mahmoud[1], Doaa Abd Elhameed Abd Elmawla[2], Soad Hassan Abd Elhameed [3,4]

[1] Lecturer, *Gerontological Nursing, Faculty of Nursing, Mansoura University, El Dakhlia, Egypt. Email:asmaamohammed78@mans.edu.eg*

[2] Assistant Professor, *Gerontological Nursing, Faculty of Nursing, Mansoura University, El Dakhlia, Egypt*

[3]Professor, *Gerontological Nursing, Faculty of Nursing, Mansoura University, El Dakhlia, Egypt*

[4]Acting Dean of the Faculty of Nursing, of New Mansoura University, Department of Community Health Nursing, Faculty of Nursing, New Mansoura University, New Mansoura, El Dakhlia, Egypt.

Abstract

Background: The aged population is disproportionately affected by chronic obstructive pulmonary disease (COPD), which significantly impairs lung function, causes dyspnea, and raises morbidity and death rates. Clinical pathways eliminate redundancy by employing a consistent approach to clinical management, promote the use of evidence-based practice, and enhance clinical practices by lowering risk and variance in healthcare delivery. **Goal:** Assess the impact of a clinical pathway on the degree of dyspnea and lung function metrics in older adults with chronic obstructive pulmonary disease. **Research design:** The study used a quasi-experimental design. **Method:** The purposeful sample consisted of sixty-two elderly COPD patients who visited the chest medicine department of Mansoura University Hospital. The participants were divided evenly into two groups: the control group (n=31), which received only standard care, and the research group (n=31), which received therapeutic route protocol. **Results:** Forced Expiratory Volume in 1 second (FEV1) was statistically significant between the two groups (P=0.02), and Forced Expiratory Volume in 1 second / Forced Vital Capacity (FEV1/FVC) was statistically significant between the two groups (P=0.001). Patients in the study group had significantly improved pulmonary function parameters when compared to the control group. At discharge, patients in the study group reported considerably less dyspnea than those in the control group (means of 4.22±1.05 and 6.00±1.36, respectively). **In conclusion**, clinical pathways are useful instruments for enhancing dyspnea and pulmonary function metrics in older individuals with chronic obstructive pulmonary disease. It is

suggested that in order to improve the quality of treatment, healthcare providers be trained on the clinical route in place of the traditional nursing care plan.

Keywords: Chronic obstructive pulmonary disease, Clinical pathway, Elderly patients, pulmonary function, dyspnea level

Introduction

The respiratory disorder known as chronic obstructive pulmonary disease (COPD) is characterized by persistent airflow restriction and inflammation of the airways. Millions of people worldwide are impacted, and it presents serious problems for people, healthcare systems, and society at large. An estimated 174 million people worldwide suffer from COPD[1]. Approximately 17.4 million Americans—7.3 million men and 10.1 million women—are affected. COPD is the fourth most common cause of death and chronic disease morbidity and mortality, accounting for about 120,000 deaths in the United States and 3.2 million globally each year [2].

According to the Global Initiative for Chronic Obstructive Lung Disease, the prevalence of COPD among high-risk persons in Egypt was estimated to be approximately 10% [3]. COPD is an increasingly important health issue in Egypt. Breathlessness during physical activity and a persistent cough, which can be dry or productive, are the main symptoms of chronic obstructive pulmonary disease (COPD). In mild to moderate cases, dyspnea may not be apparent, although it usually gets worse over time. Years before exertional dyspnea, cough and phlegm frequently manifest. Chest tightness and wheeze are other symptoms. Patients may also experience anorexia, weight loss, and increased fatigue in severe phases [4].

The main symptom that prevents patients with advanced COPD from exercising is dyspnea, which frequently results in activity avoidance and subsequent muscle deconditioning, which decreases the threshold at which they experience dyspnea during exertion [5]. Chronic dyspnea is linked to lower health-related quality of life, higher mortality, and decreased physical activity [6].

Globally, chronic obstructive lung disease, or COPD, poses serious societal and economic problems due to its greater use of healthcare resources, higher medical costs, and lower productivity [7]. COPD causes impairment, lowers quality of life, lowers productivity, raises hospital admissions, and contributes to early mortality in addition to imposing substantial financial expenditures [8].

A popular and useful test for assessing lung function is spirometry. It is crucial for tracking patients' respiratory health, identifying lung disorders, and assessing their eligibility for different medical procedures. After a deep intake, the test measures the amount of air that is forcefully released at certain intervals during a full exhale [9].

In order to address the complexities of COPD, a comprehensive and multidisciplinary approach is required. Clinical pathways are now essential instruments in the delivery of healthcare because they provide an organized framework for evaluating, diagnosing, treating, and continuing care for COPD patients. To improve patient care, encourage consistency, and improve results, these pathways integrate best practices and evidence-based principles [10].

To improve care in different healthcare settings and guaranty that patients receive timely and suitable medications at every stage of the disease, a clinical pathway for COPD is being developed. In order to reduce symptoms and stop the course of the disease, this route relies on long-term management techniques such medicine, immunizations, pulmonary rehabilitation, and smoking cessation programs [11,12].

This study aim was to:

Measure the effect of implementing a clinical pathway on pulmonary function parameters and dyspnea level among elderly patients with chronic obstructive pulmonary disease.

Research hypotheses:

1. Elderly individuals with COPD adhering to a clinical pathway will demonstrate superior pulmonary function metrics compared to those undergoing conventional hospital care.
2. Elderly individuals with COPD who engage in a clinical pathway will exhibit enhanced dyspnea levels relative to those receiving conventional hospital care.

Design of Study:

This research employed a quasi-experimental approach (study-control). The research framework was suitable for investigating the effects of a clinical pathway on the treatment results of elderly patients with chronic obstructive pulmonary disease.

Setting:

This research was conducted in the chest disorders department of Mansoura University Hospital. The structure comprised three rooms on a single level, each containing ten beds, beside three intensive care units, each equipped with six beds. Furthermore, it contained a chamber equipped with apparatus for assessing pulmonary function tests and another section for evaluating sleep problems.

Study sample:

A purposive sample was constituted by sixty-two elderly patients participating in the aforementioned environment. The participants were evenly distributed into two groups, comprising 31 individuals in both the experimental and control cohorts. The selections of the groups were made according to the subsequent criteria:

Eligibility requirements:

1. Individuals of both genders aged 60 years and above.
2. Hospitalized in the chest medicine department following a diagnosis of COPD, adhering to the GOLD recommendations established in 2022.
3. Possess the ability to speak clearly and agree to participate in the research.

Exclusion parameters:

1. Elderly individuals with concomitant respiratory ailments or associated complications, including unstable angina or heart failure, are not included.
2. Elderly individuals with COPD who engaged in alternative nursing care initiatives.

Determination of Sample Size

DSS research was employed to determine the sample size (https://www.DSSresearch.com/calculating-sample-size-using-percentage). The incidence of severe dyspnea at discharge was 16.7% in the cohort utilizing the clinical pathway, compared to 40.0% in the control cohort, with an alpha error of 5% (95% significant) and a beta error of 10% (study power of 90%). The determined sample size is 62.

In accordance with the aforementioned study parameters. The elderly patients were allocated randomly into experimental and control cohorts by block randomization. The investigator employed a block size of 4, resulting in equitable pairings of 2 A's for the experimental group and 2 B's for the control group. The subjects will be computed as 6 (AABB, BBAA, ABAB, BABA, ABBA, and BAAB). Blocks were selected at random to establish the allocation of all participants.

Tools

Three tools were utilized in this study to collect the data:

Tool I: Structured Interview Sheet for Health and Demographic Data

To collect foundational data from the study subjects, the investigator developed this three-part instrument, which is grounded in a review of relevant literature:

Section 1: Demographic details: age, sex, educational attainment, marital condition, employment status before to retirement, and sources of income.

Section 2: Medical Health History encompasses details regarding previous chronic illnesses, current medication regimens, admission and discharge dates, duration of hospitalization, prior hospitalizations, frequency of hospital admissions over the past year, and exposure history to illness risk factors including dust, smoke, air pollution, and chemical vapors.

Tool II: Pulmonary Function Tests

The obstructive ventilatory impairment was evaluated utilizing it. Spirometry was employed to assess the outcomes of several examinations, encompassing Forced Vital Capacity (FVC), Forced Expiratory Volume in the First Second (FEV1), and the FEV1/FVC ratio, which evaluates the two parameters together. It assesses the patient's ability to inhale and exhale air, along with the efficiency and rapidity of air expulsion from the lungs. The spirometer is an exceptionally valid and dependable instrument for evaluating pulmonary function[14,15].

The pulmonary function test's parameters[14,15]:

Spirometer test	Normal	Abnormal	
A. Forced Expiratory Volume in first second (FEV1) B. Forced Vital Capacity (FVC)	Equivalent to or over than 80%	Mild	70-79%
		Moderate	60-69%
		sever	> 60%
C. (FEV1/ FVC)	Equivalent to or over than 70%	Mild	60-69%
		Moderate	50-59%
		sever	Less than 50%

Tool III: Modified Borg Dyspnea Scale

In 1982, Borg constructed this tool to measure the extent of dyspnea upon admission and discharge in relation to submaximal exercise and treatment. This scale consists of twelve items and ten rating scales, where zero signifies no dyspnea; 0.5 reflects very, very slight (just perceptible); 1 indicates very slight; 2 denotes slight; 3 represents moderate; 4 is somewhat severe; 5 and 6 are categorized as severe; 7 and 8 are very

severe; 9 signifies very, very severe (almost maximal); and 10 indicates maximal dyspnea. According to Mohammed et al. (2016), it was translated into Arabic and proved to be valid and reliable (r=0.94)[17].

Protocol of the clinical pathway

This procedure was taken from the Grey Bruce Health Network (2011) and changed with the collaborative pathway team's consent[18]. The following made up the pathway:

Section I : COPD Admission Order Set (Orders that are pre-printed):

Upon the admission of a patient with COPD, these commands were initiated immediately in the inpatient unit.

Section II : Clinical Pathway of COPD

The clinical pathway for COPD was established to last five days. The process consisted of two phases: phase one endured for over two days, while phase two extended for nearly three days. The patient will be ready to advance to the subsequent stage if the objectives outlined at the beginning of the document are achieved. A staff member recorded initial responsibilities and shift details in the column as either completed or marked as not implemented, initialing if not applicable to the patient. Personnel finalized the discharge criteria document at every phase, recording any met criteria and providing their initials and date.

Section III : Pathway of the Patient

An in-depth explanation was offered by the researcher to the patients concerning their forthcoming experiences in the hospital, covering the period from admission to discharge.

Section IV : Educational Materials for Patient (booklet of COPD)

The booklet was developed in Arabic, derived from the researcher's evaluation of COPD patients' requirements and a review of pertinent literature, incorporating contemporary findings and expert comments.

COPD booklet content

Segment of Theoretical Material: The theoretical section encompassed the following subjects: a summary of the disease, the anatomy and physiology of the respiratory system, age-related alterations impacting the respiratory system, the

definition of COPD, its classifications and phases, etiological factors, clinical signs and symptoms, and an atypical presentation in the elderly. Additional subjects addressed encompassed consequences, elements that may intensify symptoms (COPD exacerbation), recommendations for reducing or evading exposure to those elements, diagnosis, management, diet, and prevention.

- **The practical segment** encompassed the utilization of inhalers, the practice of coughing and breathing techniques, as well as airway clearance methods.

Section V : COPD observational Checklist

It was obtained from Fadila (2012)[19] for evaluating patients' practices concerning symptom alleviation and quality of life subsequent to the implementation of a treatment pathway, encompassing the following:

Breathing exercise (Diaphragmatic and Pursed lip breathing): was employed to evaluate respiratory challenges and enhance breathing techniques.

Inhalation methods: were utilized to assess the proficiency of COPD sufferers in employing a metered-dose or dry powder inhaler containing a capsule.

Techniques for airway clearance (Coughing and respiratory exercises): These methods were employed to assess the patient's capacity to expel secretions from the airways, representing the most efficient approach to mitigate infection risk for those with COPD.

Scoring system

The evaluation of each checklist item utilized a 3-point scale from 0 to 2, with "0" signifying that the skill was not performed, "1" denoting that the skill was partially executed, and "2" representing that the skill was fully accomplished. Every method received a rating, culminating in an aggregate score of 62. The overall score allocation consisted of 18 points for breathing retraining exercises (8 points for pursed lip breathing and 10 points for diaphragmatic breathing), 10 points for airway clearance techniques, and 34 points for inhaler usage (16 points for metered dose inhalers and 18 points for dry powder inhalers).[19]

Validity of the research instruments:

The data collecting instruments were examined by a panel of five experts in the domains of medical surgical nursing and gerontological nursing to guaranty their appropriateness and content validity. The necessary changes were implemented.

pilot study:

Prior to beginning data collecting, a pilot research including 10% of the study sample was conducted to evaluate and determine the feasibility, application, clarity, relevance, and amount of time required for data collection. The appropriate adjustments were made as a result. The study sample will not include any elderly patients who were part of the pilot study.

pilot research:

A pilot study including 10% of the study population was carried out before data collection started in order to assess and ascertain the viability, application, clarity, relevance, and time needed for data collection. As a result, the necessary modifications were made. Elderly patients who participated in the pilot trial will not be included in the study sample.

Ethical Considerations

The Mansoura University Faculty of Nursing's Research Ethics Committee granted ethicalion (Ref. No. 0483). Each participant in the study gave their oral agreement after being fully informed about the purpose, nature, risks, and benefits of the research. Confidentiality of the information gathered and the study subjects' privacy were guaranteed, and it was utilized exclusively for that purpose. Every elderly patient received assurances that their participation in the trial is entirely voluntary and that they can leave at any time without facing any negative consequences.

Procedure for Data Acquisition:

Phase I: initial stage of preparation:

- The Faculty of Nursing at Mansoura University formally approved the study and the interviews with the elderly patients at the selected public hospital.
- A formal correspondence detailing the study's objectives and the schedule for data gathering was dispatched, along with approval from the director of Mansoura University Hospital.
- The head of the chest department at Mansoura University Hospital authorized the execution of the study and the collection of data.

- Following a thorough examination of relevant literature, the investigator developed Tool I (the Structured Interview Sheet for Health and Demographic Data).
- The investigator in this investigation employed the Arabic edition of instrument III, the COPD Assessment Test. The dependability was assured using the r coefficient (r=0.94).
- The investigator developed the COPD pamphlet, which consists of two segments (educational and practical), employing simple Arabic and photographic assistance. Concerning the development of the instructional management booklet, the theoretical material encompassed subjects such as the definition of chronic obstructive pulmonary disease and the identification of its possible causes, along with additional disease-related information. The instructional brochure addressed several pragmatic subjects like the use of inhalers, the execution of breathing and coughing exercises, and the application of airway clearance methods.

Phase II: Implementation phase:

• The actual fieldwork took place between early September 2022 and late March 2023. Three days per week, the researchers have worked the morning shift from 9:00 a.m. to 1:00 p.m. in the study settings.

• In order to determine the proportion of recently admitted patients with chronic obstructive pulmonary disease, the researcher spoke with the relevant physicians and nursing supervisors in the department of chest diseases. Following that, patients who met the inclusion criteria were randomized, with 31 matched patients in each group, to either the study group or the control group based on when they arrived at the chest department.

• After explaining the aim of the study to each older adult patient, the researchers met them one-on-one, built rapport with them, and got their verbal consent to be recruited in the study.

• In order to complete the socio-demographic and medical data, medical records were reviewed. The required data were filled in by direct observation (barrel-shaped chest, accessory muscle use) and physical examination (measured respiratory rate and SPO2, listening to chest sound).

Each elderly patient in both the study and the control groups was interviewed individually at the beginning of the proposed program in order to collect baseline data using tool I (Demographic and Health-Related Data Structured Interview Sheet), tool II (pulmonary function test), and tool III (Modified Borg Dyspnea Scale).

- Clinical Pathway protocol was implemented on the study group, and an observational teaching checklist was carried out to ensure adherence of elderly patients.
- Following the collection of baseline data, the researcher met with the elderly patients under study. Following that, the researcher organized six instructional sessions, three times a week for two weeks, lasting between thirty and forty-five minutes each.
- Every session started with a recap of the previous one, followed by an explanation of the objectives of the current one, and concluded with a time for open discussion.
- The researchers employed basic audio-visual resources, including a laptop PowerPoint presentation, an illustrated guide, and films, to facilitate idea transmission and sustain the engagement of older adults during sessions.
- The elderly patients' phone numbers, which will be used to follow up and inquire about their adherence to these procedures.
- The control group received conventional hospital care which include nursing assessment ,medication administration and oxygen therapy if needed .

Phase II: Execution stage:

- The fieldwork was conducted from early September 2022 to late March 2023. The researchers have conducted their morning shift from 9:00 a.m. to 1:00 p.m. in the study environments three days a week. To ascertain the percentage of newly admitted patients diagnosed with chronic obstructive pulmonary disease, the investigator consulted with the pertinent physicians and nursing supervisors in the chest diseases department. Subsequently, patients fulfilling the inclusion criteria were randomized, with 31 equivalent individuals assigned to each group, either the study group or the control group, according to their arrival time at the chest department.
- Following the elucidation of the study's objective to each elderly participant, the researchers engaged in individual meetings, established rapport, and obtained their verbal assent for recruitment into the study.

• To finalize the socio-demographic and medical information, medical records were examined. The necessary information was obtained through direct observation (barrel-shaped thorax, utilization of auxiliary muscles) and physical assessment (recorded breathing rate and SPO2, auscultation of lung sounds).

Every elderly participant in both the experimental and control cohorts was interviewed separately at the onset of the designated program to gather baseline information utilizing instrument I (Demographic and Health-Related Data Structured Interview Sheet), instrument II (pulmonary function assessment), and instrument III (Modified Borg Dyspnea Scale). The Clinical Pathway methodology was executed for the study group, and an observational teaching checklist was utilized to guaranty compliance among elderly patients.

• After gathering baseline data, the researcher convened with the elderly patients involved in the study. Subsequently, the investigator arranged six educational sessions, occurring thrice weekly over a fortnight, with durations ranging from thirty to forty-five minutes each. Each session commenced with a summary of the preceding one, proceeded with an elucidation of the current session's goals, and closed with an opportunity for open dialog. The researchers employed basic audio-visual resources, including a PowerPoint presentation on a laptop, an illustrated booklet, and films, to facilitate idea transmission and sustain the engagement of older adults during sessions.

• The contact numbers of the elderly patients, which will be utilized to monitor and assess their compliance with these protocols. The control group was administered standard hospital treatment.

Phase III : Evaluation Stage :

`This stage entailed evaluating the admission and discharge outcomes of the patients for their pulmonary function parameters and dyspnea level across the two cohorts.

Quantitative examination:

The research employed SPSS Version 22 for data analysis, utilizing the arithmetic mean and standard deviation for quantitatively normal data. The data were characterized and summarized by enumeration and percentage. Pearson's chi-square

test, Monte Carlo exact test, Fisher's exact test, Student's t-test, the marginal homogeneity test, McNemar's test, and paired sample t-test were employed to assess disparities among independent groups. Visual representations of data were created using Microsoft Excel and SPSS, with statistical significance established at $p<0.05$.

Results:

Table 1 demonstrated that the age spectrum of elderly patients in the study cohort spanned from 60 to 80 years, whereas the control group comprised persons aged 60 to 76 years. The research cohort consisted of a greater percentage of males. Within the study cohort, 51.6% were wed, in contrast to 64.5% in the control cohort. The illiteracy rates were 58.1% for the research group and 67.7% for the control group. In general, there were no notable disparities in demographic traits between the two cohorts, with around two-thirds of both groups living in rural regions. Furthermore, the majority of elderly participants in the research had other comorbidities.

Table 2 indicated that 29.0% of the pathway cohort and 25.8% of the non-pathway cohort had COPD for a duration of one to less than three years, whereas 61.3% of the pathway cohort and 51.6% of the non-pathway cohort had COPD for more than three years. In the previous year, 71.0% of the pathway cohort and 67.7% of the non-pathway cohort experienced hospital admissions.

Table 3 demonstrated that every patient in both the CP and non-CP cohorts reported having dyspnea, with coughing and respiratory difficulties being the primary manifestations of COPD in older individuals across both groups. The CP cohort indicated a sleep disturbance prevalence of 77.4%, whereas the non-CP cohort had a rate of 71.0%. Fatigue was observed in 74.2% of the CP cohort, whereas it was present in 61.3% of the non-CP cohort; wheeze was documented in 67.7% of the CP cohort and 83.9% of the non-CP cohort. No statistically significant disparities in current complaints were seen between the two groups ($P > 0.05$).

Table 4 shows the differences between the lung function test outcomes of the study and control cohorts at both admission and discharge. At the time of admission, most patients exhibited a Forced Expiratory Volume in 1 second (FEV1) ranging from 30% to 50%, signifying severe COPD, with 67.7% in the study cohort and 48.4% in the

control cohort; this disparity lacked statistical significance. Upon discharge, FEV1 levels increased to between 50% and 80% (denoting moderate severity) for 51.6% of the study cohort and 54.8% of the control cohort, revealing a statistically significant difference (P=0.02). Moreover, upon admission, 90.3% of the study cohort and 93.5% of the control cohort exhibited a FEV1/FVC , signifying moderate severity. Upon discharge, this ratio improved (signifying low severity) for 74.2% of the study cohort in contrast to 32.3% of the control cohort, demonstrating a statistically significant difference (P=0.001).

Table 5 demonstrated a markedly significant disparity ($p < 0.001$) in dyspnea scores at discharge between the two cohorts. In the experimental cohort, over fifty percent of the subjects demonstrated the most severe dyspnea upon entry, however after discharge, one-third experienced a low degree of dyspnea. A statistically significant alteration in the dyspnea levels of the study cohort was seen from admission to discharge ($p < 0.001$). Conversely, within the control group, 29.0% of patients indicated a moderately severe degree of dyspnea after discharge, while 41.9% experienced the highest level at admission.

Figure (1) illustrates the relationship between forced expiratory volume in 1 second (FEV1) and the severity of dyspnea in the study cohort following the application of the clinical pathway. This illustration indicates a statistically significant negative association between forced expiratory volume in 1 second (FEV1) and the severity of dyspnea in the study cohort following the introduction of the therapeutic pathway ($r = -0.303$).

Figure (2) illustrates the relationship between forced expiratory volume in one second/forced vital capacity (FEV1/FVC) and the severity of dyspnea in the study cohort following the execution of the clinical pathway. This illustration indicates a moderate statistical inverse association between forced expiratory volume in 1 second/forced vital capacity (FEV1/FVC) and the severity of dyspnea in the study cohort following the application of the therapeutic pathway ($r = -0.437$).

Table (1): Demographic and health-related data of the studied elderly patients with COPD in the study and control groups

Demographic data	Study group		Control group		Test of significance
	No (31)	(%)	No (31)	(%)	
Age					
60 to less than 65	17	54.8	12	38.7	$\chi2 = 2.178$ (0.326)
65 to less than 70	7	22.6	12	38.7	
more than 70	7	22.6	7	22.6	
Mean ± SD	66.64±6.35		66.48±5.05		
Sex					
Male	17	54.8	23	74.2	$\chi2 = 2.536$ (0.111)
Female	14	45.2	8	25.8	
Marital status					
Single	0	0.0	2	6.5	MC = 4.244 (0.236)
Married	16	51.6	20	64.5	
Widow	13	41.9	7	22.6	
Divorced	2	6.5	2	6.5	
Educational level					
Illiterate	18	58.1	21	67.7	$\chi2 =0.655$ (0.721)
Read and write	7	22.6	5	16.1	
Secondary	6	19.4	5	16.1	
Occupation before retirement					
Work	17	54.8	23	74.2	$\chi2 = 2.536$ (0.111)
Don't work	14	45.2	8	25.8	
Current work					
Yes	2	6.5	0	0.0	$\chi2 = 2.067$ (0.151)
No	29	93.5	31	100.0	
Residence					
Rural	20	64.5	18	58.1	$\chi2 = 0.272$ (0.602)
Urban	11	35.5	13	41.9	
Income					
Not enough	21	67.7	23	74.2	$\chi2 = 0.313$ (0.576)
Enough	10	32.3	8	25.8	
Living condition					
Alone	5	16.1	7	22.6	$\chi2 = 0.166$ (0.684)
With family	21	67.7	17	54.8	
With one of children	5	16.1	7	22.6	
Presence of comorbidity					
Yes	19	61.3	18	58.1	$\chi2 = 0.067$ (0.796)
No	12	38.7	13	41.9	

(*) Statistically significant at p ≤0.05, χ^2 = chi square, MC: Monte Carlo test

Table (2): The number of hospital admissions and the duration of COPD for the elderly patients in pathway and non-pathway groups throughout the course of the previous year

Medical history	Pathway group		Non-pathway group		Test of significance
	No (31)	(%)	No (31)	(%)	
Duration of the disease					
less than 1 year	3	9.7	7	22.6	$\chi2$ = 1.916 (0.384)
from1 year to less than 3 years	9	29.0	8	25.8	
more than 3 years	19	61.3	16	51.6	
Previous admission to hospital					
Yes	22	71.0	21	67.7	$\chi2$ = 0.076 (0.783)
No	9	29.0	10	32.3	
Number of previous hospitalization in last year					
Once	11	50.0	12	57.1	$\chi2$ = 1.831 (0.400)
Twice	9	40.9	5	23.8	
Third	2	9.1	4	19.0	

(*) Statistically significant at p ≤0.05, χ^2 = chi square, t: student t test

Table (3): The current complaints of the elderly COPD patients under study in both the intervention and control groups.

Medical history	Intervention group		Control group		Test of significance
	No (31)	(%)	No (31)	(%)	
Symptoms of COPD					
Difficulty of breathing	31	100.0	31	100.0	----
Cough	31	100.0	31	100.0	----
Fatigue	23	74.2	19	61.3	$\chi 2 = 1.181$ (0.277)
Wheezes	21	67.7	26	83.9	$\chi 2 = 2.199$ (0.138)
Loss of appetite	11	35.5	7	22.6	$\chi 2 = 1.253$ (0.263)
Weight loss	6	19.4	8	25.8	$\chi 2 = 0.369$ (0.544)
Anxiety	19	61.3	14	45.2	$\chi 2 = 1.620$ (0.203)
Sleep disturbance	24	77.4	22	71.0	$\chi 2 = 0.337$ (0.562)
Sexual dysfunction	6	19.4	4	12.9	FT=0.477 (0.731)
Chest pain	10	32.3	13	41.9	$\chi 2 = 0.622$ (0.403)

(*) Statistically significant at $p \leq 0.05$, χ^2 = chi square, FE: Fisher Exact test

Table (4):Comparison between study and control groups of pulmonary function test on admission and discharge

Pulmonary function test	Study group				Control group				Test of significance	
	On admission		On discharge		On admission		On discharge		(p)[a]	(p)[b]
	N	%	N	%	N	%	N	%		
FEV1										
More than 80%	0	0.0	12	38.7	0	0.0	4	12.9	MC=3.229 (0.199)	MC=7.800 (0.02)*
50-80%	1	3.2	16	51.6	4	12.9	17	54.8		
30-50%	21	67.7	3	9.7	15	48.4	10	32.3		
Less than 30%	9	29.0	0	0.0	12	38.7	0	0.0		
(p)[1]	MH=101.00 (<0.001)**				MH=95.00 (<0.001)**					
FEV1/FVC										
Mild	3	9.7	23	74.2	2	6.5	10	32.3	FE=0.218 (0.641)	FE=10.949 (0.001)**
Moderate	28	90.3	8	25.8	29	93.5	21	67.7		
(p)[1]	McN=18.050 (<0.001)**				McN=6.125 (0.008)**					

(*) Statistically significant at p ≤0.05, MC: Monte Carlo test, FE: Fisher Exact test, MH=Marginal homogeneity test, McN=McNemar's test

(p)[1]: Comparing before (on admission) and after (on discharge) in each group

(p)[a]: Comparing the study and control group before clinical pathway implementation

(p)[b]: Comparing the study and control group after clinical pathway implementation

FEV1= Forced expiratory volume in 1 second, **FEV1/FVC** = Forced expiratory volume in 1 second / forced vital capacity

Table (5): Comparison between study and control groups regarding dyspnea severity on admission and discharge

Dyspnea severity	Study group				Control group				Test of significance	
	On admission		On discharge		On admission		On discharge		(p)[a]	(p)[b]
	N	%	N	%	N	%	N	%		
Nothing at all	0	0.0	0	0.0	0	0.0	0	0.0		
Very, very slight (just noticeable)	0	0.0	1	3.2	0	0.0	0	0.0		
Very slight	0	0.0	7	22.6	0	0.0	0	0.0		
Slight	0	0.0	11	35.5	0	0.0	4	12.9		
Moderate	0	0.0	8	25.8	0	0.0	8	25.8		
Somewhat severe	0	0.0	4	12.9	0	0.0	9	29.0		
Severe	0	0.0	0	0.0	0	0.0	6	19.4		
Very severe	4	12.9	0	0.0	7	22.6	2	6.5		
Very, very severe (almost maximal)	10	32.3	0	0.0	11	35.5	2	6.5		
Maximal	17	54.8	0	0.0	13	41.9	0	0.0		
Mean ± SD	9.41±0.71		4.22±1.05		9.19±0.79		6.00±1.36		t=1.174	t= 5.722
t- test (P)[1]	29.493(<0.001)**				12.696(<0.001)**				(0.245)	(<0.001)**

Paired –sample t-test (p) [1]: Comparing before (on admission) and after (on discharge) in each group
Student t-test (p) [a]: Comparing the study and control group before clinical pathway implementation
Student t-test (p) [b]: Comparing the study and control group after clinical pathway implementation
*significant at p≤0.05

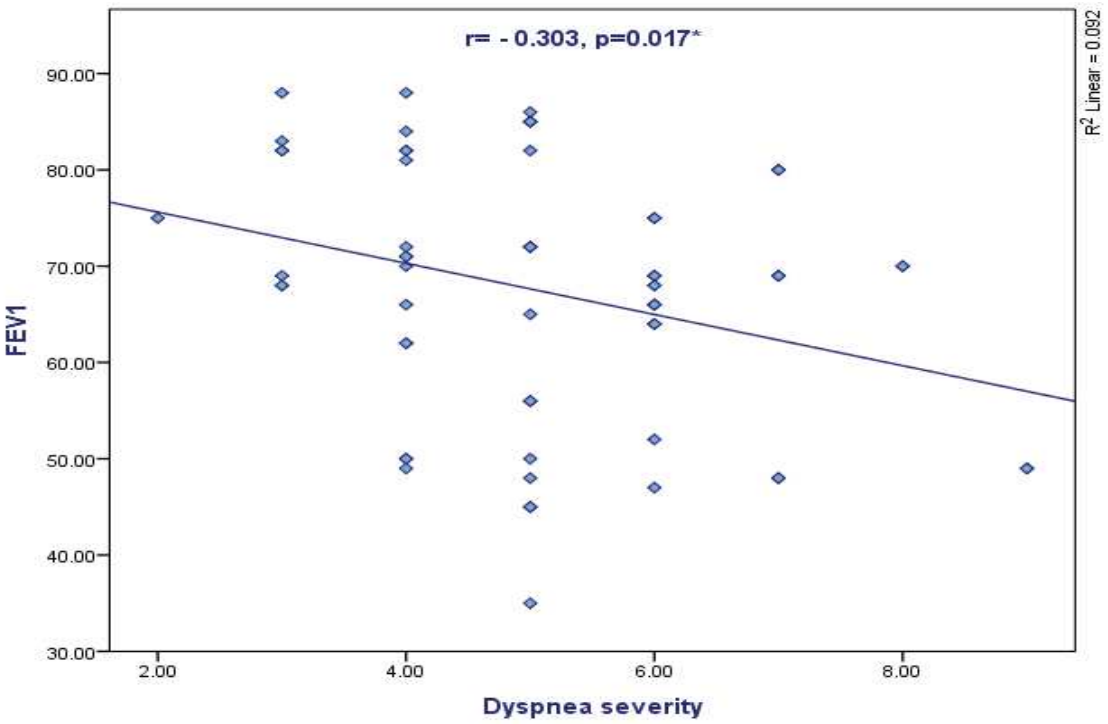


Figure (1): Correlation between Forced expiratory volume in 1 second (FEV1) and dyspnea severity in the study group after implementation of clinical pathway

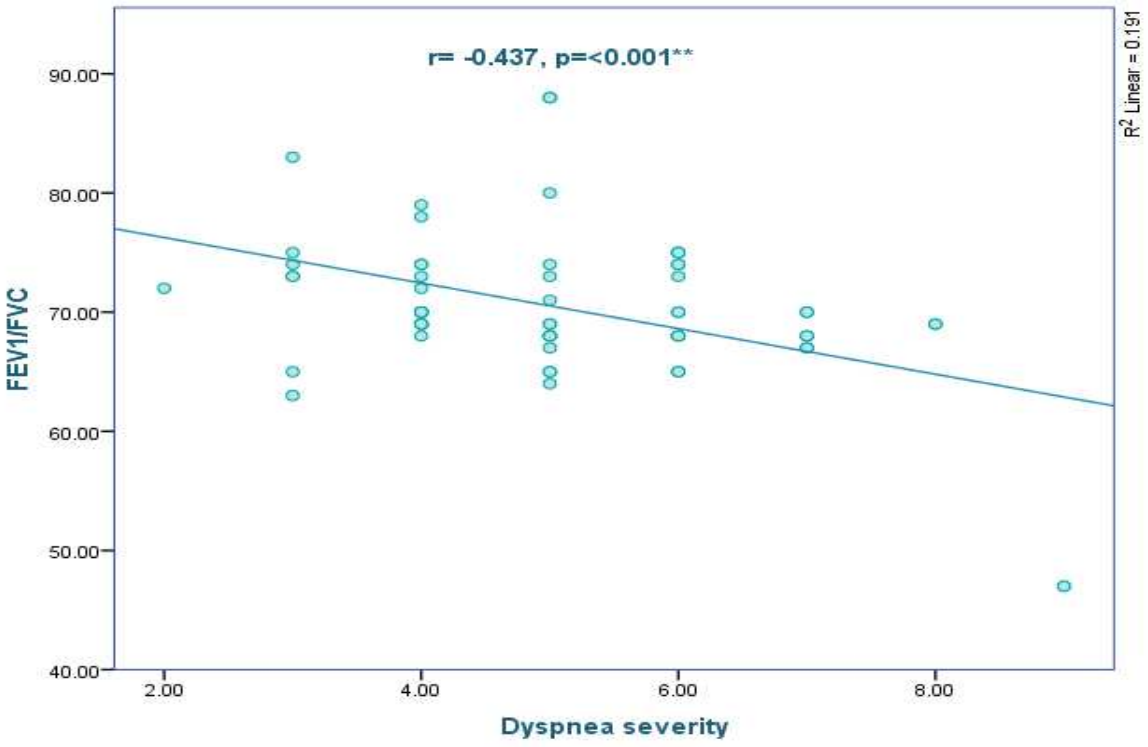


Figure (2): Correlation between Forced expiratory volume in 1 second / forced vital capacity (FEV1/FVC) and dyspnea severity in the study group after implementation of clinical pathway

Discussion

Chronic obstructive pulmonary disease (COPD) is a predominant contributor to persistent health issues and fatalities globally, now positioned as one of the three foremost reasons of death, with 90% of instances occurring in low- and middle-income nations. A clinical pathway is a collaborative management instrument grounded in empirical methods that delineates and improves the diverse responsibilities undertaken by healthcare practitioners in patient treatment. This methodology seeks to enhance patient results and elevate satisfaction levels for both personnel and patients[21].

The aim of this research was to assess the impact of a clinical pathway on the pulmonary function parameters and dyspnea level of older adults with chronic obstructive pulmonary disease (COPD). The study encompassed sixty-two elderly individuals diagnosed with COPD, who were randomly allocated into two equal cohorts. One cohort received conventional treatment, whereas the other cohort engaged in a therapeutic pathway initiative aimed at treating COPD.

The demographic examination of this research showed no notable disparities in sociodemographic traits between the two cohorts, suggesting a uniform population. This discovery corresponds with the outcomes presented by Abd-Elwanees et al, who also observed no significant disparities in age, gender, or other demographic and baseline factors between the clinical pathway (CP) and non-CP cohorts[22].

The mean age of the elderly patients in this research was 66.64±6.35 years, whereas the control cohort had a mean age of 66.48±5.05 years. This resemblance can be ascribed to the impact of aging on the respiratory system, a notable risk factor for chronic pulmonary conditions like COPD. In a like manner, Karn et al indicated that the mean age of participants in their Egyptian research was 64 years[23]. Furthermore, research conducted by Elsayed et al revealed that more than two-thirds of the subjects were aged between 60 and 75[24]. The present research suggests that males experience more severe consequences from COPD compared to females, perhaps owing to heightened exposure to risk elements such as tobacco use and environmental pollutants. These results align with studies performed in Portugal by Ricardo et al[25] and in Egypt by Badway et al[26]. Conversely, research conducted in Sweden yielded varied findings.

Regarding the length of COPD among the study subjects, over fifty percent had received a diagnosis of the condition for more than three years. This discovery corresponds with research carried out in Egypt by Hamad et al[28]. Furthermore, research conducted by Castelino et al. in Manipal revealed that 71.4% of respondents indicated a diagnosis of COPD lasting between one to five years[29]. Nonetheless, these findings diverge with those of Mohsen et al., who reported that 47.4% of their subjects had experienced COPD for over a decade[30].

Individuals diagnosed with COPD demonstrated markedly elevated occurrences of respiratory symptoms such as cough, sputum production, wheezing, and dyspnea, in contrast to individuals without COPD[31]. This corresponds with the findings of the current study, which recognized cough and respiratory challenges as the predominant symptoms in older COPD patients across both cohorts. These findings align with research performed in Tanzania by Walker et al[32], in Spain by Miravitlles & Ribera[33], and in Egypt by Elsayed et al[24].

In the present research, the researcher established a clinical pathway for the management of elderly individuals suffering from COPD. The findings, especially regarding pulmonary function indicators and dyspnea intensity, of individuals in the clinical pathway group (CP group) were evaluated against those in the conventional pulmonary care group (non-CP group). Initially, both groups demonstrated equivalent access to medication, pulmonary services, and unit provisions.

O'Donnell et al recognized dyspnea as the predominant symptom of COPD, which can severely reduce quality of life, cause substantial disability, and elevate morbidity. Consequently, mitigating dyspnea is a primary goal in the management of COPD. In this context, the present research revealed no notable disparity in dyspnea scores between the experimental and control cohorts upon admission, suggesting a degree of uniformity between the groups. This discovery aligns with the study performed by Abd-Elwanees et al[22].

The findings of the present investigation demonstrated that individuals in both cohorts exhibited markedly lower dyspnea scores upon discharge. At the outset, more than half of the participants (54.8%) indicated experiencing severe dyspnea, although upon discharge, this figure diminished to one-third (35.5%) who reported merely mild dyspnea. Conversely, 41.9% of the control cohort experienced severe dyspnea upon

admission, which diminished to 29.0% indicating a fairly severe level at discharge. Significantly, the average dyspnea score for the experimental group was markedly lower than that of the control group, indicating a more substantial improvement in the experimental group ($P > 0.001$).

The enhancement in dyspnea scores observed in the study cohort (clinical pathway group) can be ascribed to their organized navigation along a clinical pathway, which includes a methodical strategy, evidence-based practices, and prompt treatment provision. Furthermore, clinical pathways prioritize patient education concerning COPD management, empowering individuals to engage actively in their treatment. Conversely, the enhancement observed in the control group may be associated with conventional unit care and administered pharmaceuticals. These results align with the research undertaken by Hamad et al in Egypt[28], as well as Mohamed et al., both of whom observed statistically significant variations in dyspnea levels among COPD patients prior to and following the introduction of the COPD treatment program[34].

Concerning the pulmonary function test as a measure of clinical results, The pulmonary function test outcomes revealed that at the time of admission, the Forced Expiratory Volume in 1 second (FEV1) for the majority of patients varied between 30% and 50%, signifying severe COPD, with 67.7% in the study cohort and 48.4% in the control cohort. The disparity between the groups was not statistically meaningful. At the time of discharge, FEV1 increased to a range of 50% to 80%, signifying mild COPD severity, with 51.6% in the experimental group and 54.8% in the control group. This disparity was statistically meaningful ($P=0.02$).

The research revealed that at the time of admission, the ratio of Forced Expiratory Volume in 1 second to Forced Vital Capacity (FEV1/FVC) ,showed signifying mild COPD in 90.3% of the study cohort and 93.5% of the control cohort. Upon discharge, FEV1/FVC improved (signifying mild COPD) for 74.2% of the study cohort, in contrast to merely 32.3% of the control cohort. The disparities between the two cohorts at discharge were statistically significant ($P=0.001$). The findings indicate that the adoption of the clinical pathway markedly improved pulmonary function metrics (FEV1 and FEV1/FVC) in the study cohort, favorably influencing clinical outcomes for COPD patients.

This outcome aligns with the findings of Nishimura et al in Japan, which indicated that spirometry conducted before to discharge had a FEV1/FVC ratio over 70%[35]. In a comparable study, Heyden-Lopez & Munoz-Rojas discovered statistically significant enhancements in respiratory function ($p < 0.001$) among participants following their involvement in the program conducted in Spain. This outcome contrasts with the findings of Fatima et al in Pakistan, who determined that the P-value for FEV1/FVC at baseline is 0.96 and the P-value after 20 days is 0.085, indicating no enhancement in FEV1/FVC and FEV1 following the program[37].

The research identified an inverse statistical relationship between Forced Expiratory Volume in 1 second (FEV1) and the severity of dyspnea in the study cohort following the application of the therapeutic pathway ($r=-0.303$). This indicates that people with reduced FEV1 measurements are likely to suffer from more intense dyspnea sensations. FEV1, an assessment of pulmonary performance, denotes the volume of air an individual can forcibly expel in one second, where diminished values signify impaired lung function and heightened respiratory challenges. The clinical approach probably encompassed strategies designed to enhance pulmonary function and alleviate dyspnea symptoms.

The research identified a notable inverse relationship between the FEV1/FVC ratio and the degree of dyspnea following the application of a therapeutic approach ($r=-0.437$). This indicates that diminished lung capacity is associated with heightened dyspnea. The clinical approach might have encompassed therapies that enhanced pulmonary function, potentially elucidating the decrease in dyspnea intensity.

The results correspond with research conducted by Muller et al., which established a relationship between pulmonary function and dyspnea, indicating that dyspnea was associated with FVC and FEV1/FVC[38]. Furthermore, Patel's research demonstrated a direct relationship between pulmonary function assessments and dyspnea[39]. Additionally, research conducted by Miller et al indicated a notable association between lung volume parameters (FEV1/FVC and FEV1) and dyspnea ($p < 0.001$)[40].

The results of the current study confirmed the research hypothesis, indicating that individuals adhering to the clinical pathway shown greater enhancements in their pulmonary function metrics and dyspnea levels compared to those receiving conventional therapy.

Conclusion: The results showed that the clinical pathway is a useful tool for enhancing COPD patients' pulmonary function parameters and dyspnea level.

Recommendations

Based on the findings of this study, the following recommendations are suggested:

- Incorporating the COPD clinical pathway into the plan of care of elderly COPD patients to substitute the traditional nursing care plan for enhanced care quality.
- Nurses should be urged to work in parallel with other medical professionals to use the clinical pathway to offer patients with COPD complete, comprehensive treatment.
- Implementing a training program for healthcare providers on the clinical pathway to replace the conventional nursing care plan for better quality of care.

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In light of the results of this research, the ensuing recommendations are proposed:

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Abbreviations:

COPD	Chronic Obstructive Pulmonary Disease
GOLD	Global Initiative for Chronic Obstructive Lung Disease
ERD	European Respiratory Disease
CP	Clinical pathways
FEV1	Forced Expiratory Volume in 1 s
FVC	Forced Vital Capacity

Gratitude Expressions

The paper's authors express their gratitude to the participants for their engagement in this research.

Code availability

All authors are requested to make sure that all data and materials as well as software application or custom code support their published claims and comply with field standards.

Contributions of the authors

Each author has played a role in the conceptualization and structuring of the study. AAM: Carry out the intervention. DAA and AAM: data acquisition, data evaluation, interpretation, and manuscript formulation; SHA and AAM: designing the intervention, drafting and refining the manuscript; Each author examined the manuscript drafts, offered suggestions and improvements, and approved the completed manuscript.

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Accessibility of data and resources

The quantitative datasets employed and examined in this research can be obtained from the relevant author upon a reasonable request.

Statements

Endorsement of ethical protocols and consent to engage

All techniques were carried out in adherence to relevant norms and legislation. The Research Ethics Committee of the nursing faculty of Mansoura University provided ethical permission (Reference No. P. 0483). Informed consent was secured from every participant in this investigation.

Authorization for dissemination

Not relevant.

Conflicting interests

The writers assert that there are no conflicting interests.

Declearation

During the preparation of this manuscript, the author used QuillBot (https://quillbot.com/paraphrasing-tool) to assist with paraphrasing and improving the clarity and readability of selected passages. The author critically reviewed and revised the resulting text, verified its accuracy, and assumes full responsibility for the originality, accuracy, and integrity of the final manuscript.

Corresponding author:

Asmaa Ali Mohammed Mahmoud

Email:asmaamohammed78@mans.edu.eg

Lecturer, Gerontological Nursing, Faculty of Nursing, Mansoura University, El Dakhlia, Egypt.

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