Impact of Implementing a COPD Discharge Care Bundle on Adult COPD Patients' Outcomes

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Abstract

Background:Chronic obstructive pulmonary disease (COPD) represents 10% of annual emergency hospital admissions. Approximately 33% of patients experience readmission within 28 days of discharge, as the discharge care bundle influences COPD readmission rates, emergency department (ED) visits, mortality, costs, and the overall process of care. **Aim**: The objective of this study is to assess the effects of implementing a COPD discharge care bundle on the outcomes of adult COPD patients. **Design**: This research utilized a quasi-experimental design. **Settings**: The study was carried out in the chest department and outpatient clinics at Sohag University Hospital. **Sample**: A convenient sample of 100 adult COPD patients was selected from the designated settings. This included 50 patients in the non-bundle group to evaluate their discharge instructions. In contrast, 50 patients in the bundle group received guidance on the components of the bundle before discharge and were monitored through phone calls on the 30th, 60th, and 90th days post-discharge to assess readmission rates, outcomes, and adherence to the bundle. **Tools for data collection:** Tool 1: A structured interview questionnaire, which comprised two sections: Part 1: Patient demographic information and Part II: Clinical characteristics; and Tool II: COPD assessment test. **Results**: The findings of this study indicated that the implementation of the COPD discharge bundle ensured that all patients in the bundle group were educated on the following: (1) medication list, (2) follow-up schedule, (3) inhaler technique, (4) smoking cessation, and (5) pulmonary rehabilitation. Conversely, patients in the non-bundle group received instructions solely on medications and follow-up schedules, along with a varying number of instructions regarding other COPD interventions. Statistical analysis revealed a significant difference in the readmission rates at the 30-day follow-up. Those who received the COPD discharge bundle exhibited a greater likelihood of avoiding readmission within 30 days, as indicated by relative risk. **Conclusion**: Implementing a COPD discharge care bundle has a positive effect on adult COPD patients' outcomes. **Recommendation**s: It is recommended to use a COPD discharge bundle in a hospital setting to ensure that all patients will have uniform instructions on interventions that can decrease the number of readmissions, especially after 30 days.

Keywords: Adult COPD patients, Discharge care bundle, outcomes.

Introduction:

Chronic obstructive pulmonary disease (COPD) is a disease characterized by persistent and progressive airflow limitation. It is one of the top causes of morbidity and mortality worldwide. According to the World Health Organization (WHO), COPD ranks fifth in leading causes of death and is projected to rank fourth in the leading causes of death among middle and low-income countries by the year 2030. Likewise, it is expected to be the 7th leading cause of disability-adjusted life years (Mathers, C. D. & Loncar, 2023).

An international study that included the Philippines as one of its sample sites showed that Manila was one of the top three cities with a high burden of COPD, having more samples with COPD Global Initiative for Chronic Obstructive Lung Disease (GOLD) class II. A prevalence study done on the burden of COPD in a rural setting in the Philippines showed similar results (Idolor, 2021). The most common risk factor in developing COPD, especially in high-income countries is current smoking and total smoking load measured in pack years. Increasing age and the male gender are also seen as factors for more severe COPD GOLD classification. The inability to perform activities of daily living is also identified as an independent risk factor for early and late mortality aside from these risk factors. Moreover, the severity of functional impairment increases the rate of re-admission. Comorbidities such as heart failure, diabetes, and liver and renal failure also increase in-hospital and post-discharge mortality (Steer, 2020).

Some interventions including smoking cessation, inhaler technique, pulmonary rehabilitation, education on medication, and follow-up have been studied to have an impact on the management of COPD patients. As such, previous studies have observed that these interventions collectively improved COPD outcomes if incorporated into a discharge bundle (Hopkinson, 2021).

In order to improve care procedures to the highest levels of reliability and, consequently, improve outcomes, the Institute for Healthcare Improvement came up with the idea of care bundles. A care bundle is a collection of clinical

interventions or acts supported by evidence that, when consistently implemented, enhance patient outcomes. In collaboration with NHS Improvement, the British Thoracic Society (BTS) created admission and discharge care packages for COPD (Baker et al., 2023).

The discharge care bundle was created to lower readmissions, whereas the admission care bundle seeks to lower length of stay and in-hospital mortality. Prior to this study, early UK pilots indicated potential advantages of care packages for COPD and other illnesses. According to a single-site assessment of COPD admission care bundles, the emergency department (ED) provided better treatment. Discharge bundles have been the subject of additional research including a systematic review, which has suggested a decrease in readmissions while emphasizing that little is known about how care bundles affect care procedures and outcomes (Shah, 2022).

Significance of the study:

Chronic obstructive pulmonary disease is a chronic lung disease indicated by the obstruction of the airway progressively leading to morbidity or death with cough, dyspnea, and phlegm production (Decker et al., 2019). Data from WHO show that the number of deaths and severe pain felt by patients with COPD in the world reached 64 million and is estimated to be the third death cause in 2020(WHO, 2023). To control the pain and number of deaths of patients with COPD, there needs to be an evaluation of the patient's health status as COPD is incurable and can only be controlled (Jones et al., 2021). Hence, the study was conducted to evaluate the impact of implementing a COPD discharge care bundle on adult COPD patients' outcomes.

Aim of the study:

The study aimed to evaluate the impact of implementing a COPD discharge care bundle on adult COPD patients' outcomes.

Research Hypotheses:

For adult COPD patients who will receive a COPD discharge care bundle; their outcomes will improve in the bundle group than in the non-bundle group.

Subjects and Methods:

Research design:

A Quasi-experimental research design was used in this study.

Setting:

This study was conducted at the chest department and Outpatient clinics at Sohag University Hospital.

Subjects

A convenient sample of 100 adult COPD patients was recruited from the previously selected settings. It included 50 patients in the non-bundle group to examine their discharge instructions. Conversely, 50 patients enrolled in the bundle group were instructed on the components of the bundle before discharge and were followed up through phone calls on the 30th, 60th, and 90th day post-discharge to check for readmission rates and outcomes, as well as compliance with the bundle.

Tools of data collection:

Tool 1: A structured interviewing questionnaire:

It was developed by the researchers after reviewing the national and international related literature **(Hopkinson, et al., 2021; Steer, et al., 2020).** This tool consisted of two parts:

Part I: Patient demographic data (i.e., age, sex)

Part II: Clinical characteristic (i.e., smoking history, concomitant respiratory infection, inhaler use, and co-morbidities); (3) discharge instructions (i.e., advice on smoking cessation, correct inhaler technique, introduction to pulmonary rehabilitation and written home medications, and follow-up instructions); (4) compliance rates; and, (5) readmission outcomes (i.e., rate of readmission, rate of invasive or non-invasive mechanical ventilation).

Tool II: COPD assessment test:

The category of therapy outcomes is divided into four groups, including successful therapy (CAT scores <10), moderately successful CAT 10–19), less successful (CAT scores 20–30), and unsuccessful (CAT score >30). Also, it consisted of eight items: cough, phlegm, chest tightness, breathlessness going up hills/stairs, activity limitations at home, confidence leaving home, sleep, and energy.[16]. The content of the CAT questionnaire depicts the symptom recovery and life quality of patients with COPD after receiving therapy for a minimum of four weeks. This questionnaire was adopted from **CAT Development Steering Group 2012**, and the validation test has been done as well (total item correlation: 0.25, *r* count: >0.8, and Cronbach α reliability: >0.600).

The procedure of data collection:

Preparatory phase:

It included reviewing current and past available literature and theoretical knowledge of various aspects of the study using the booklet, articles, internet, periodicals, and magazines to develop the data collection tools.

Administrative design:

Administrative permission was obtained through an issued letter from the Faculty of Nursing to the directors of the previously selected setting to achieve this study and obtain permission for data collection.

Content validity

To assess the content validity, an evaluation was performed to ensure that the tools aligned with the study's objectives. This evaluation was conducted by a panel of five experts from various academic professors from the Medical-Surgical Nursing department. The experts examined the tools for factors such as objectivity, comprehensiveness, clarity, relevance, simplicity, and applicability; no changes were made. Ultimately, the final version of the tools was created.

Tools reliability

The reliability of the proposed tools was evaluated statistically using the Cronbach alpha test on the total items, which assessed the internal consistency of the questionnaire. The results indicated a reliability coefficient of 0.90 for part 2 of the first tool and 0.93 for the second tool.

Pilot study

A pilot study was carried out on 10% of the sample (10 adult COPD patients) to observe the clarity and testing of the feasibility of the research process needed for modifications to develop the final form of the tools. Adult COPD patients involved in the pilot study were included in the study.

Administrative and Ethical Considerations

Approval was secured from the relevant authorities at Sohag University Hospital through a formal letter from the Faculty of Nursing at Sohag University to facilitate the data collection process. The Research Ethics Committee at the Faculty of Nursing, Sohag University, approved the study. Oral consent was obtained from each adult COPD patient after explaining the study's purpose, along with assurances regarding data privacy and confidentiality. Nurses were informed they could withdraw from the study at any point without any obligations.

Fieldwork:

- The researchers visited the previously selected settings two days/ a week from 9 am to 1 pm.
- They met the patients and explained the aim of the study after introducing themselves to the participants. Data were collected within six months, The study was carried out from November 2023 until the end of April 2024.

The collection of data was done through three phases:

I- Assessment phase:

In this phase, the researchers collected data from both groups (bundle group & non- bundle group). It begins with the patient structured interview questionnaire which includes (demographic characteristics and Clinical characteristics (i.e., smoking history, concomitant respiratory infection, inhaler use, and co-morbidities); (3) discharge instructions (i.e., advice on smoking cessation, correct inhaler technique, introduction to pulmonary rehabilitation and written home medications, and follow-up instructions); (4) compliance rates; and, (5) readmission outcomes (i.e., rate of readmission, rate of invasive or non-invasive mechanical ventilation). The time needed for completing this questionnaire was about (25-35 minutes) for each patient.

II- Planning phase:

- During this phase, the researchers explained to patients the benefits of implementing a COPD discharge care bundle.
- COPD discharge care bundle were designed based on an analysis of the actual educational patients in the pretest. The content of the instructional booklet was written in simple Arabic language and consistent with the related literature based on their level of understanding.
- The researchers obtained patients' telephone numbers from each patient.
- The contents of COPD discharge care bundle instructions were represented through(Booklet, videos, and illustrative pictures)

III- Implementation phase:

Non-bundle Group

A retrospective chart review was conducted on patients who did not receive the bundle. Demographic information was collected. Discharge instructions were examined to determine if patients received guidance on inhaler technique, home medications, smoking cessation, follow-up, and pulmonary rehabilitation. Data on emergency room visits and readmission outcomes (including the rate of readmission and the use of invasive or non-invasive mechanical ventilation) at the same institution were gathered for 30, 60, and 90 days following the initial discharge.

Bundle Group

For the bundle group, a COPD discharge bundle was implemented prior to discharge. The bundle referenced in this paper is adapted from the research conducted by Hopkinson et al. (2021). Two nurse educators were trained and oriented on the elements of the COPD discharge bundle:

1. Advise on smoking cessation - a brief overview of the negative effects of smoking and the advantages of quitting;
2. Correct inhaler technique - instructions on the proper use of the prescribed inhaler according to the instruction leaflet for each medication, followed by a return demonstration;
3. Introduction to pulmonary rehabilitation - an overview of the benefits of pulmonary rehabilitation for COPD patients;
4. Written home medications - a list of home medications provided to the patient upon discharge; and
5. CAT outcomes that reflect improvements in patients' health status through questions addressing cough, phlegm, chest tightness, breathlessness when ascending hills/stairs, activity limitations at home, confidence in leaving home, sleep quality, and energy levels.
6. Written follow-up - a list detailing the date and the doctor's clinic number for the next outpatient follow-up.
7. A written list of home medications and a follow-up schedule were also provided before discharge.

IV- (Evaluation phase):

Subjects were followed up through telephone calls 30, 60, and 90 days after discharge to inquire about ER visits, readmissions (in the same or other institutions), compliance with inhaler regimen, smoking cessation, and pulmonary rehabilitation using the same tools that were used in the pre-test.

Statistical design:

It was performed using SPSS. Quantitative variables were summarized as mean and standard deviation, while qualitative variables were tabulated as frequency and percentage. Comparison of baseline characteristics between the COPD discharge bundle and the non-bundle group were analyzed using an independent t-test for quantitative variables, and Fisher's exact test for qualitative variables. The association between outcomes and the use of the COPD Discharge bundle was analyzed using logistic regression. The level of significance was set at 5%.

Results:

Table 1: Indicates that a total of 100 subjects were initially recruited for the study, with no patients dropping out. The final analysis included 50 patients in the non-bundle group and 50 in the bundle group. The baseline characteristics were comparable between those who received the COPD bundle and those who did not. The mean age in the non-bundle group was 58.22 years, while the mean age in the COPD bundle group was 59.33 years. In the non-bundle group, 82% were male; 92% of the subjects had a pulmonary infection, and 90% were using inhalers. Additionally, 14% of individuals in the non-bundle group had bronchiectasis. In the bundle group, 76% were male; 84% had an infection, 12% had bronchiectasis, and 96% were using inhalers. The subjects in the non-bundle group had an average of 32 (SD 24.44) smoking pack years, whereas those in the bundle group had approximately 34 (SD 20.63) smoking pack years. The average number of years since quitting smoking in the non-bundle group was over 17 years (SD 11.22), compared to more than 14 (14.88) years for the COPD bundle group.

Table 2: Illustrates that all individuals in the non-bundle group received instructions regarding their medication list and follow-up as part of the hospital protocol. There was no documentation of instruction on inhaler technique, while 6% were introduced to pulmonary rehabilitation. Conversely, all individuals who received the COPD bundle were instructed on inhaler technique, medication list, follow-up, smoking cessation (for those who still smoke), and pulmonary rehabilitation. Furthermore, Table 2 indicates that the Chi-Square test revealed significant differences between the two comparison groups in the proportion of patients who received specific instructions on inhaler techniques, smoking cessation, and pulmonary rehabilitation ($p < 0.000$).

Table 3a: Demonstrates a statistically significant difference in the admission rates for the COPD bundle group at the 30-day follow-up. Subjects who received the COPD discharge bundle experienced no readmissions after 30 days, in contrast to 20% of those who did not receive the bundle, who were readmitted within the same timeframe. The relative risk of avoiding readmission within 30 days is greater for those who received the COPD bundle compared to those who did not ($p = 0.042$). Additionally, there were no subjects in the bundle group who required invasive or non-invasive ventilation

within 30 days post-discharge. Moreover, all individuals in the bundle group consistently used their inhalers and attended follow-up appointments after 30 days. Among the participants who were still smoking at the time of the study, 12% ceased smoking following the intervention, and 4% opted for pulmonary rehabilitation.

Table 3b: Indicates that although not statistically significant, there is a noticeable trend of increased admissions and mechanical ventilation rates within 60 and 90 days for those who did not receive the bundle. The relative risk for admission within 60 days stands at 2 for the non-bundle group. Conversely, the relative risk for avoiding admission within 90 days is 2 for those in the bundle group. At the 60-day follow-up, there were no subjects requiring mechanical ventilation in the bundle group, while 4% of the non-bundle group was mechanically ventilated. Furthermore, 10% of those admitted in the non-bundle group were placed on non-invasive ventilation, compared to only 2% in the bundle group.

Table 3c: Demonstrates that individuals who were part of the COPD bundle were monitored to assess their hospital admissions and adherence to the prescribed interventions. There was a reduction in inhaler usage from 100% after the 30th day to 86% and 72% after 60 and 90 days, respectively. A notable decline was observed in the number of patients attending follow-up appointments after 30 days when compared to 60 days ($p = 0.041$), and also between 30 days and 90 days ($p = 0.000$).

Table 4: Indicates that despite these findings, no significant correlation was found between inhaler usage and readmissions, nor between the frequency of follow-ups and readmissions at any of the follow-up intervals. However, a significant relationship was identified between pulmonary rehabilitation and readmissions (RR: 14.49; CI 3.807, 55.225, $p= 0.013$).

The data presented in **Table 5** clarifies that the CAT scores of 100 participants indicate an overall state of symptom recovery. The average CAT score for each symptom is recorded as 1 and 0, suggesting that the therapeutic results, including symptom recovery for patients with COPD, show some positive outcomes. Additionally, 37.82% of respondents reported experiencing breathlessness when ascending a hill or a single flight of stairs, which corresponds to a CAT score of 3.

Table 1: Personal Characteristics of the adult COPD patients

Items	Non-Bundle group Mean (SD) / %	Bundle group Mean (SD) / %	P-value
Age	58.22 (1.44)	59.33 (1.24)	0.312
Pack Years	32.44 (24.44)	34.64 (20.63)	0.002
Years stopped	17.68 (11.22)	14.65 (14.88)	0.008
Gender			< 0.000
Male	82 %	76 %	
Female	18 %	24 %	
Infection	92 %	84%	< 0.000
Co-Morbidity			< 0.000
Bronchiectasis	14%	12 %	
PTB	18 %	8 %	
OSA	0	4 %	
None/Others	70 %	78 %	
Inhaler Use	90 %	96 %	< 0.000

Table 2. Comparison between the non-bundle and bundle groups receiving COPD discharge care bundle instructions

	Non-Bundle	Bundle group	p-value
Inhaler Technique	0 %	100 %	< 0.000
List of Medication	100 %	100 %	-
Follow Up	100 %	100 %	-
Smoking Cessation			< 0.000
Yes	0 %	24 %	
No	20 %	0 %	
No Data/Not applicable	80%	76 %	
Pulmonary Rehab	6 %	100 %	< 0.000

Table 3a. Comparison of Outcomes after 30 days between the non-bundle and bundle groups receiving COPD discharge care bundle **instructions**

Outcomes after 30 days	**Non-Bundle group %**	**Bundle group %**	**p-value**
Admission			0.042
Yes	20 %	0 %	
No	80 %	100 %	
Inhaler Use	-	100 %	-
Follow Up	-	100 %	-
Smoking Cessation			-
Yes	-	12 %	
No	-	10 %	
Not Applicable	100 %	78 %	
Pulmonary Rehab	-	4 %	-
MV	-	-	-
NIV	-	-	-

Table 3b. Comparison of Outcomes after 60 days between the non-bundle and bundle groups receiving COPD discharge care bundle **instructions**

Outcomes after 60 days	**Non-Bundle group %**	**Bundle group %**	**P- value**
Admission			0.091
Yes	30 %	14 %	
No	70 %	86 %	
Inhaler Use			-
Yes	8 %	86 %	
No	-	8%	
No Data	94 %	6%	
Follow Up			-
Yes	-	64	
No	4%	36	
No Data	96%	-	
Smoking Cessation			-
Yes	-	12	
No	-	10	
No Data	100 %	78	
Pulmonary Rehab			-
Yes	4%	6	
No	-	90	
No Data	96%	4	
MV			-
Yes	4 %	-	
No	24 %	12%	
No Data	72%	88 %	
NIV			1.000
Yes	10 %	2%	
No	20 %	10%	
No Data	70 %	88	

Table 3c. Comparison of Outcomes after 90 days between the non-bundle and bundle groups receiving COPD discharge care **bundle instructions**

Outcomes after 90 days	Non-Bundle group %	Bundle group %	P-value
Admission			1.000
Yes	10 %	8 %	
No	90 %	80 %	
No Data	0%	12 %	
Inhaler Use			-
Yes	-	72 %	
No	-	8 %	
No Data	100 %	20 %	
Follow Up			-
Yes	-	42%	
No	-	46%	
No Data	100 %	12 %	
Smoking Cessation			-
Yes	-	8 %	
No	-	6%	
No Data	100 %	86 %	
Pulmonary Rehab			-
Yes	-	16 %	
No	-	72%	
No Data	100%	12 %	
MV			-
Yes	-	-	
No	4%	6 %	
No Data	96 %	94 %	
NIV			-
Yes	-	-	
No	4	6	
No Data	96	94	

Table 4. Association of Predictor Variables and Admission of patients with COPD Bundle group

Variables	30 Days	60 Days	90 Days
Admission	0 %	12 %	6 %
	p-value/Cramer's V (Risk Ratios, Confidence Interval)		
Inhaler Use	-	1.000 / 0.131 (*RR=1.17, CI=1.003-1.37)	1.000 / 0.109 (*RR=1.100, CI=0.96-1.25
Follow Up	-	1.000 / 0.098 (OR=1.94, CI=0.178-21.119 RR=1.8, CI=0.210-15.407)	1.000 / 0.020 (OR=1.17, CI=0.66-20.72, RR=1.15, CI=0.080-16.67
Smoking Cessation	-	-	-
Pulmonary Rehab	-	0.013 / 0.682 (RR=14.5, CI=3.81-55.23)	0.026 / 0.595 (*RR=1.67, CI=0.81-3.41)
MV	-	-	-
NIV	-	-	-

Table 5: Distribution of CAT score percentage based on the symptom felt by the patient in the bundle groups receiving COPD discharge care bundle instructions

Statement of CAT (symptom)	Bundle group
Cough continuously	37.76 (1)
Phlegm (mucus) is all over the chest.	37.22 (1)
It feels really tight in the chest.	43.65 (0)
Experience dyspnea while climbing a hill or a single flight of stairs.	37.80 (3)
Limited activities due to a lung ailment that makes it difficult to leave the house	41.56 (0)
Difficult to leave the house	53.77 (0)
Inability to sleep due to a lung condition	32.88 (1)

***The higher the CAT score, the more severe the COPD patient's symptoms are: scores 1–5**

Discussion:

In order to improve care procedures to the highest levels of reliability and, consequently, improve outcomes, the Institute for Healthcare Improvement came up with the idea of care bundles. A care bundle is a collection of clinical interventions or acts supported by evidence that, when consistently implemented, enhance patient outcomes. COPD admission and discharge care bundles were created by NHS Improvement and the British Thoracic Society (BTS). According to Calvert et al. (2024), the discharge care bundle was created to lower readmissions, whereas the admission care bundle attempts to lower duration of stay and in-hospital mortality.

According to Laverty et al. (2022), in order to improve outcomes, care bundles must satisfy three requirements: the target outcome must be responsive to changes and sensitive to the components of the bundle; the care bundles must be implemented consistently to guarantee that the majority of patients receive care that is led by the bundle; and the use of the care bundle must increase process reliability. Therefore, the study sought to evaluate the impact of implementing a COPD discharge care bundle on adult COPD patients' outcomes.

This study also illustrates that there was a significant decrease in the rate of readmissions following 30 days of discharge when the COPD discharge bundle was implemented. From the researchers' point of view, it confirmed the positive effect of implementing COPD discharge care on adult COPD patients' outcomes. This outcome can have an enormous impact on COPD patients since mortality among these patients can be as high after the first hospitalization, and exacerbations usually re-occur within eight weeks with re-hospitalization rates. Also, this result is supported by Baker et al., (2023) who found the same result. Different studies show that there is a high rate of re-admissions for COPD patients. Readmission after 30 days post-index admission for COPD patients is as high. The risk of further readmissions per year increases after at least one readmission for COPD.[6] Furthermore, lack of proper education and coordination with the patient regarding his or her medication and follow-up are other factors that increase readmissions (Shah, 2022).

This type of discharge instructions is also adopted in other institutions in other countries and observed similar results. In the United States, one re- port showed that providing a bundle of medical intervention, which includes: a) parting patient education on the disease and prognosis, b) providing a checklist of evidenced-based management, and c) continuing close follow-up via phone calls and out-patient visits, decreased 30-day readmission rate of patients with chronic diseases such as COPD in different institutions (Shah, 2022).

Additionally, Krishnan, (2021) recommended that a COPD bundle be included in patient-centered hospital readmissions reduction programs. In another paper, two European countries that employed usual care—like the instructions given to the control group in this paper, as opposed to the discharge bundle, were observed. The usual care consisted dis-discharge from the attending physician with home medications and regular outpatient follow-up. This was compared vis-à-vis an integrated care group which included an orientation on self-management of the disease, non-pharmacologic technique, and assessment of the patient's inhaler technique as well as regular follow-up via phone call to reinforce the intervention. Also, the result is in the same line with Casas, (2023) who found when compared with usual care, integrated care that is started before discharge of patients

admitted for COPD exacerbation resulted in a lower rate of readmission.

Findings of the current study revealed that there was a significant decrease in the rate of readmissions after 30 days, there was no noted significant decrease in the rate of readmissions between the control and bundle groups after 60 and 90 days. From the researchers' point of view, it reflected the success of implementing COPD discharge care in adult COPD patients' outcomes. This may be due to the time frame and number of subjects recruited in this study. A trial that tracked COPD patients who were given intensive discharge instructions versus those who were not given a similar study conducted by **Krishnan, (2021**) showed that there was a decrease in hospitalizations among the intervention group after a one-year follow-up. A longer follow-up thus may reveal more significant results.

Compliance with inhaler use and follow-ups decreased over time as seen in the results. From the researchers' point of view, it confirmed the study achieved its aim after implementing COPD discharge care for adult COPD patients. This may be the result of patients feeling better after the first 30 days after discharge and the first follow-up. While there was no noted significant association between inhaler use and admission rate in this study, Dudvarsi, (2022) reported that patients who underwent a seven-step discharge instruction during three visits had markedly improved inhaler technique, decreased respiratory symptoms and nighttime symptoms, and had better control of their disease. In the same way, while there was no note of a significant association between follow-up and admission rate in this study, another paper done by Baker et al., (2023) showed that outpatient follow-up within 30 days after discharge decreases the rate of readmission. The finding of no association in inhaler use, follow-up, and read-mission may be due to the specific study design, wherein the two (2) groups were not simultaneously followed up and the control group had no compliance study.

Results of the current study revealed that there was low compliance with pulmonary rehabilitation in this study. Reasons for patients vary from not being advised by their physicians, to inconvenience and doing alternative self-exercises. The same statistics were also observed by Morso, (2019) where there was low referral to pulmonary rehabilitation by attending physicians, and patients had reservations regarding the pulmonary rehabilitation program because of their perception that they will not be able to tolerate the physical rigors required by the said program. The authors also noted that pulmonary rehabilitation was tolerable among patients with severe COPD and among those who were discharged within two weeks after being admitted due to an exacerbation.

Relating these findings to our present study, the significant association between pulmonary rehabilitation and readmission may likely be explained by disease severity, the more severe the disease, the higher the rate of readmission, and the increased need for pulmonary rehabilitation to improve physical conditioning.

The data presented in **this study** that the CAT scores of 100 participants indicate an overall state of symptom recovery and suggest that the therapeutic results, including symptom recovery for patients with COPD, show some positive outcomes. Additionally, a score of 3 respondents reported experiencing breathlessness when ascending a hill or a single flight of stairs, which corresponds to a CAT score of 3.

According to the overall therapy outcome measuring results utilizing CAT, about 60% of COPD patients have a therapy that is somewhat successful. According to earlier studies (Chetta & Olivieri, 2022), CAT is a useful tool for determining the medical effectiveness of managing or avoiding COPD, with or without exacerbations. Patients' symptom recovery during treatment is used to gauge the effectiveness of therapy for COPD patients using the CAT questionnaire. Accordingly, CAT may be regarded as a straightforward instrument for determining exacerbation risk improvement and prevention (Lee et al., 2024).

According to Williams et al. (2024), the use of maintenance therapy is linked to a decrease in the frequency of exacerbations as well as improvements in dyspnea and lung function repairs. Therapeutic outcomes in this study are correlated with both acute and maintenance therapy ($P < 0.05$). According to Decker et al. (2019), this will therefore affect the effectiveness of treatment for individuals with COPD in both pulmonary function tests and CAT assessment.

As a result, CAT scores will be a good substitute for lung function tests, particularly for people

who cannot afford them (Zhou et al., 2018). In this study, the degree of severity is assessed using GOLD in the form of subjective information on the symptoms that participants experienced (Decker et al., 2019). Similar findings were seen in 161 COPD patients who completed the CAT questionnaire and received observation for 11–12 days, which resulted to significant changes ($P < 0.001$) in CAT scores and a reduction in symptoms (Tu et al., 2024).

The CAT is a verified and standardized questionnaire used to track the results of therapy. According to Jones et al. (2019), CAT results demonstrate the improvement in patients' health status through question items such as cough, phlegm, chest tightness, dyspnea when climbing stairs or hills, activity limits at home, confidence when leaving the house, sleep, and energy. The CAT questionnaire's results show that respondents primarily experience the breathlessness when climbing stairs or slopes when taking medicine. Previous research highlights this problem (Elhefny et al., 2024), showing that most patients with COPD have poor health and chronic symptoms (breathlessness when climbing stairs or hills) due to irreversible lung function impairment. The symptoms include a tight feeling in the chest, limiting activities at home, are seen to be less experienced by the respondents of this research. They tend to have routine hospital visits during treatment, and more than half of the patients are well-controlled through the administered medication.

Finally, the aim of the study was achieved by using the COPD discharge bundle in our local setting can help improve patient outcomes through a decrease in hospital readmission. With proper discharge instructions, patients can maximize the use of their medications and understand the importance of non-medical interventions in helping them have a more stable course. These can greatly decrease patients' expenses as well as improve QOL.

Conclusion:

Considering the results of the present investigation, it can be said that implementing a COPD discharge care bundle has a positive effect on adult COPD patients' outcomes.

Recommendations:

Based on the findings of the current study, the following recommendations are proposed:

- It is recommended to use a COPD discharge bundle in a hospital setting to ensure that all patients will have uniform instructions on interventions that can decrease the number of readmissions, especially after 30 days.
- It is recommended that discharge instructions to COPD patients through a bundle be institutionalized and standardized.
- It is advised to repeat the study in a more varied sample to guarantee a suitable representation of the community under investigation and to carry out the research in various contexts to generalize the findings.

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