Research Article

Assessment of length of hospital stays of patients with acute exacerbations of chronic obstructive pulmonary disease

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Abstract

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is prone to acute exacerbations which may lead to enhanced morbidity and mortality**.** Information on the time course and recovery from COPD exacerbation is important in standardizing the length of treatment, in planning appropriate follow up and decreasing loss of working days of the patient. **Material and Methods:** It was a prospective study (observational) which included all patients with Acute Exacerbation of COPD (AECOPD) admitted to the Department of Pulmonary Medicine, People's College of Medical Sciences & RC, Bhopal, over a period of 1 year 6 months. **Results:** In this study we observed the mean length of stay (LOS) of patients with AECOPD was 9.53±3.4 days. There was no significant difference in length of stay between patients in different age groups. The LOS varied significantly between different GOLD stages. The patient who had a history of admission for twice or more in the past 1 year had a greater mean LOS as compared to patient with just one or no hospitalisation in the past. **Conclusion:** The patient who had a history of admission for twice or more in the past 1 year had a greater mean LOS as compared to patient with just one or no hospitalisation in the past.

Keywords: Chronic Obstructive Pulmonary Disease (COPD), Exacerbation, Length of Stay (LOS), Re-hospitalisation.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is prone to acute exacerbations which may lead to enhanced morbidity and mortality [1]. Information on the time course and recovery from exacerbation is important in standardizing the length of treatment, in planning appropriate follow up and decreasing loss of working days of the patient. However, there is little information available on the time course of these changes, whether prior to onset or during recovery from exacerbations [2]. The exacerbations especially in patients with moderate to severe COPD may show prolonged symptomatic effects. Indeed exacerbations are the common cause of hospital admission in COPD, often after failed initial therapy [3, 4, 5, 6]. In reviewing the data available on exacerbations in COPD and the factors affecting the length of hospital stay, one soon realizes the limited amount of scientific data that are available on this important topic. Since the period after acute exacerbation is prolonged due to various factors and patients and their relatives want to know what will be the length of hospital stay, this study was done to answer this and if possible, in future to find out ways to reduce it.

Possible ways of minimising prolonged hospitalisation could include a control visit one month after discharge, increased physical activity and rehabilitation [7, 8, 9].

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Material and Methods

Study Population: All Patients with Acute Exacerbation of COPD (AECOPD) admitted to the Department of Pulmonary Medicine, People's College of Medical Sciences & RC, Bhopal, over a period of 1 year 6 months (November 2013 to April 2015) that fulfil the study criteria. It was a prospective study (observational) with a sample size of 53.

Procedure for Sampling: At the onset of exacerbation, patients were admitted in the ward. A detailed history was taken with the aim of finding out the cause of exacerbation as well as to rule out alternative disease as the cause of deterioration in symptoms. GOLD Severity Staging was done during stable state of the patients during their initial visit to the pulmonary medicine OPD [10]. Patients were treated according to a fixed protocol that includes oxygen therapy, ventilator support (if needed), bronchodilators, oral/i.v corticosteroids, oral/i.v antibiotics, theophylline and adjunct therapies [10].

Sample selection and data collection: The medical records and discharge cards of all included patients were manually reviewed. Demographic, clinical and administrative data on the index admission were extracted. Demographic data included age, sex, and marital status. Clinical data included smoking status, medications, result of blood test including arterial blood gas, duration of COPD, FEV_1%, oxygen saturation, and GOLD Staging. The administrative data included length of stay (LOS) in days, number of admissions due to acute exacerbation of COPD during 12 months before and 12 months after the index admission, or to the date of death, if applicable.

We also extracted the value of the forced expiratory volume in 1 second (FEV_1) determined at the time closest to that of the admission, LOS, number of COPD-related admissions during the previous 12 months before the current admission. A COPD-related admission was defined by discharge diagnoses from previous admissions using the same criteria as for the current admission.

End Points: The primary endpoint was length of stay. The secondary endpoints were effect of age on length of stay (LOS), effect of severity of COPD on Length of Stay (LOS) and effect of previous hospitalisation on Length of Stay (LOS).

Inclusion Criteria

1. Patients presenting and admitted with a diagnosis of acute exacerbation of COPD by admitting team, complaining of an acute change of symptoms (baseline dyspnea, cough and/or sputum production) that is beyond normal day to day variation [10].
2. Patients with a stable COPD status on discharge which was concluded from the records of the physician in charge.
3. Male or Female aged between 18-85 years.

Exclusion Criteria:

1. Active or suspected malignancy, terminal disease not likely to survive 6 weeks.
2. Disease modifying drugs; e.g. gold, sulphasalazine, cyclosporine, oral maintenance corticosteroids (>5mg/day).
3. Concurrent/Concomitant reason for admission or for worsening COPD symptoms –e.g. heart failure, myocardial infarction.
4. Patients with active pulmonary tuberculosis.
5. Moderate to severe renal failure.

Criteria for discharge: [10]

- Able to use long acting bronchodilators, either beta-agonists and/or antiholinergics with or without inhaled corticosteroids.
- Inhaled short-acting beta-agonist therapy is required no more frequently than every 4hrs.
- Patient, if previously ambulatory, is able to walk across room.
- Patient is able to eat and sleep without frequently awakening by dyspnea.
- Patient has been clinically stable for 12-24 hrs.
- Arterial blood gases have been stable for 12-24 hrs.
- Patient (or home caregiver) fully understands correct use of medications.
- Patient, family, and physician are confident that the patient can manage successfully at home.

Statistical Analysis:

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons. Quantitative variables were compared using mean values and qualitative variables using proportions. Significance level was fixed at $P \leq 0.05$.

Results

The study included all patients with a discharge diagnosis of COPD from November 2013 until April 2015. Based on the International Statistical Classification of Disease and Related Health Problems, 10th Revision (ICD-10), we included both patients with COPD (J43 or J44) as the main diagnosis, and patients with respiratory failure (J96) or pneumonia (J12–J18) as the main diagnosis and COPD (J43 or J44) as a secondary diagnosis [11]. 79 patients met these inclusion and exclusion criteria from all hospital admissions in the Pulmonary Medicine department of the hospital during the study period. 26 patients were excluded in further analysis. Final analysis was done on 53 patients.

Table 1: Characteristics of the patients with acute exacerbation of COPD

Total no. of patient, n	53	
Age in years, mean	63.11 ± 10	
Male sex, %	94.3	
Length of Hospital Stay, days; Median	9.53 ± 3.4; 9	
Exacerbations per year	2.13 (0.94 – 3.32)	
	No. of patients (n)	**Percentage of total no. of patients**
COPD severity (GOLD), n (%)		
I: Mild	9	17%
II: Moderate	18	33.9%
III: Severe	14	26.4%
IV: Very Severe	12	22.7%
Lifestyle		
Current Smoker	47	88.7%
Ex-Smoker	5	9.4%
Non-Smoker	1	1.9%
Pack-years, mean	48.94±24.5	

General Characteristics: Results were expressed using means ± standard deviations. The mean length of stay (LOS) was 9.53±3.4 days, with a median of 9 days (Table 1). Mean age at admission was 63.1 ± 10 years. The majority of patients (94.3%) were men. 17% of patients demonstrated GOLD stage I, 33.9%; Gold stage II, 26.4%; GOLD Stage III and 22.7%; GOLD Stage IV disease.

88.7% of patients were current smokers, 9.4% were ex-smoker and only 1.9% patients were non-smoker. The mean pack years were 48.94±24.5.

Table 2: Mean length of stay (LOS) in different age group

Factors		**Length of Stay (LOS)**		**ANOVA 'F' Value**	**p Value**
Age Groups	**n (%)**	**Mean**	**SD**		
40-59	16 (30.1)	9.75	3.32	2.407	0.062(NS)
60-69	16 (30.1)	9.94	3.838		
70-79	18 (33.9)	9.50	2.936		
80 & Above	3* (5.7)	6.33	2.309		

***3 patients took early discharge against medical advice**

Age Group: (Table 2)
The minimum age was 40 and the maximum age was 82 years. The highest proportion of the admissions (34%) was for patients aged between 70 and 79 years while the lowest (5.7%) was for patients aged 80 years & above. There was no significant difference in length of stay between patients in different age groups. The LOS for age group 40-59 yrs, 60-69

yrs, 70-79 yr and 80 yrs & above were 9.75±3.3 days, 9.94±3.8 days, 9.50±2.93 days and 6.33±2.3 days respectively, with a p value of 0.062.

Table 3: Characteristics of patients according to GOLD staging

Characteristics	Stage I (n=9)	Stage II (n=18)	Stage III (n=14)	Stage IV (n=12)	p Value
Age (years), mean (SD)	67.4±8.5	67.6±8.9	68.1±8.0	64.0±8.6	0.154
PaO_2 (mmHg)	62.1±10.9	56.5±10.8	52.9±9.5	50.3±7.6	<0.001
$PaCO_2$ (mmHg)	39.8±4.3	43.4±4.8	53.8±5.4	57.2±5.2	<0.001
LOS	10.56 ± 4.09	7.50 ± 2.12	9.29 ± 2.05	12.08 ± 3.98	<0.001

COPD Severity: (Table 3)
The LOS varied significantly between different GOLD stages. Stage I had a mean LOS of 10.56 ± 4 days, Stage II had a mean LOS of 7.50 ± 2 days, Stage III had a mean LOS of 9.29 ± 2 days and Stage IV had a mean LOS of 12.08 ± 3.9 days, with a p value of 0.001 which was highly significant. The mean pO2 significantly decreased from Stage I (mild) to Stage IV (Very Severe) and there was significant increase in the mean pCO2 from Stage I(mild) to Stage IV (Very Severe).

Table 4: Mean length of stay (LOS) according to previous hospitalization

Previous Hospitalisation					
Factors		**Length of Stay (LOS)**		**Anova 'F' Value**	**P Value**
	n (%)	**Mean**	**SD**		
Two or more/year	14 (26.4)	9.98	3.837	**32.33**	**0.001 (HS)**
One/year	28 (52.8)	8.43	3.292		
No Hospitalization	11 (20.7)	6.23	3.446		

Previous Hospitalisation: (Table 4)
There were 53 admissions (mean age of 63.11±10 years) included in the present study. 14(26.4%) patients had a history of two or more hospitalisation in past 1 year, 28(52.8%) patients were admitted once in past 1 year due to exacerbation of COPD and 11(207%) had no history of past admission due to COPD. The patient who had a history of admission for twice or more in the past 1 year had a greater mean LOS as compared to patient with just one or no hospitalisation in the past. (Mean LOS= 9.98 days vs 8.43 days vs. 6.23 days, p value= 0.001).

Discussion

The purpose of this study was to describe the outcomes of patients with AECOPD in terms of hospital length of stay (LOS) and to evaluate factors associated with prolonged LOS for AECOPD. These factors included disease severity and previous hospitalisation status.

1. Length of Stay (LOS): In our observational study, the mean LOS of patients admitted with AECOPD was 9.5 ± 3.4 days with a median of 9 days. Mushlin et al. in 1991 conducted first study to determine the necessary length of stay for patients admitted to the hospital with an exacerbation of chronic pulmonary disease. They found out the medically required length of stay for patients with an exacerbation of chronic pulmonary disease to be between 6 and 7 days, on average [12]. A similar study was done in 1997 by Gary k Kong et al. in which they found the mean hospital length of stay in COPD patient with exacerbation was 6.5 days (SD, 4.8) [13]. Recently, Yin Wang (2013) in his study found Mean length of stay (LOS) to be 8.9±9.7 days, with a median of 6.0 days [14]. Currently there is no established standard for LOS in COPD exacerbation. This might be due to the heterogeneity of patients admitted and the complexity of the disease. Over the past two decades, the trend of LOS has decreased internationally [15, 16, 17]. Despite this reduction, the most commonly reported mean or median LOS is still 6-10 days, and thus, more than the "necessary" 6 days as indicated by Mushlin et al. in 1991 [12,18,19,20]. According to previous findings, efforts to cut down the duration of inpatient episodes may result in a 'revolving door' phenomenon , i.e. patients discharged too early

are readmitted sooner [21]. The risk of admission due to exacerbation of COPD was greatest among the patients who had had more than three inpatient episodes within the past year [22].

2. Age Groups: In this study there was no significant difference in length of stay between patients in different age groups. The LOS for age group 40-59 yrs, 60-69 yrs, 70-79 yr and 80 yrs & above were 9.75±3.3 days, 9.94±3.8 days, 9.50±2.93 days and 6.33±2.3 days respectively, with a p value of 0.062. The decreased LOS (6.3days) in patients aged 80 years & above was probably because all 3 patients got discharged against medical advice. The literature also indicates that LOS tended to increase with age [23, 24]. This may be because they might have been in poorer functional states and these were not accounted for in our study [25]. This can, for example, be attributed to older patients being more fragile, having more comorbidities, or more severe COPD exacerbations and higher pCO_2. Therefore, age by itself was no longer significantly related to pro longed LOS, and the age effect was probably captured by the other variables.

3. Severity of COPD: In our study the LOS varied significantly between different GOLD stages and it consistently increased from Gold stage II to GOLD Stage IV. Stage I had a mean LOS of 10.56 ± 4 days, Stage II had a mean LOS of 7.50 ± 2 days, Stage III had a mean LOS of 9.29 ± 2 days and Stage IV had a mean LOS of 12.08 ± 3.9 days, with a P value of 0.001 which was highly. As the study group was dominated by patients with moderate, severe and very severe disease, whereas patients with mild COPD (GOLD stage I) required admission to hospital due to COPD exacerbation, when a larger number of comorbidities existed. This leads to the assumption that comorbidities were a very important factor influencing the necessity of hospital treatment in COPD exacerbations in this group of patients. This observation is consistent with the GOLD recommendations as well as the guidelines of the Polish Society of Lung Diseases according to which, major co-morbidities were one of the reasons of necessary hospital treatment in case of COPD exacerbation [10, 26].

4. Previous Hospitalisation: In our study group, patient who had a history of admission for twice or more in the past 1 year had a prolonged mean LOS as compared to patient with just one or no hospitalisation in the past. Suissa in 2012 stated in his study that previous admissions were considered to be a significant factor in worsening disease and possibly in prolonging the LOS of subsequent admissions but Timothy et al. did a similar study and found that the time to recovery within hospital from a COPD exacerbation was not related to the number of previous admissions of a patient [27, 28].

Conclusion

The study included 53 patients of acute exacerbation of COPD. The mean length of hospital stay (LOS) was 9.53±3.4 days. More severe stage of the disease and history of previous hospitalisation, is associated with prolonged hospital stay. The reasons for prolonged LOS are probably multidimensional, and future studies should focus on both patient- and non-patient-related factors. Both age and LOS in this population were comparable to those in previous larger studies from other countries, which may support the external validity of our sample.

Limitations: Local practice guidelines, hospital resources, and the organization of care may influence LOS. The number of variables in the analyses was limited; hence, potentially important predictors might have been missed. Finally, the study population was recruited from a single university hospital in Bhopal, which served as a primary hospital for a geographically defined area of the city. Therefore, the external validity of our results might be limited.

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