



Short communication

Overweight is a predictor of long-term survival in hospitalised patients with exacerbations of COPD



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ARTICLE INFO

Article history:

Received 1 June 2015

Received in revised form

17 April 2016

Accepted 16 May 2016

Available online 17 May 2016

Keywords:

COPD

Exacerbations

Mortality

Survival

ABSTRACT

Background: Although hospitalisations due to an exacerbation of chronic obstructive pulmonary disease (COPD) are associated with increased risk of mortality, there is little information on long-term survival after severe COPD exacerbations.

Methods: The 5-year and 8-year overall survival after hospitalisation due to a COPD exacerbation was explored. In addition, potential predictors of survival were analysed.

Results: The 57 patients with COPD included in this analysis had a median age of 70 years, a median smoking history of 30 pack years and a median forced expiratory volume in the first second (FEV₁) of 41.6% predicted at the time of COPD exacerbation. The majority of the patients had either normal weight (body mass index, BMI 18.5–24.99 kg/m²: 42%) or overweight (BMI ≥ 25 kg/m²: 54%). The 5-year overall survival after exacerbation was 54%, the 8-year overall survival 42%. The presence of cardiac comorbidities, a FEV₁ <50% predicted, an age >70 years and a BMI <25 kg/m², but not smoking history or current smoking, were associated with decreased overall survival. Multivariate regression analysis revealed that only BMI, age and FEV₁ were independent predictors of long-term survival. Overweight patients (BMI ≥ 25 kg/m²) had a substantially higher 5-year overall survival (74%) than patients with a BMI < 25 kg/m² (31%).

Conclusion: Nearly half of the patients hospitalised due to an exacerbation of COPD die within 5 years after the event. Overweight is a positive predictor of long-term survival in these patients.

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1. Introduction

Hospitalisations due to an exacerbation of chronic obstructive pulmonary disease (COPD) are associated with increased risk of mortality [1]. Mortality peaks in the first week after hospital admission and drops gradually in the following months [2]. Several studies analysed short-term mortality after severe exacerbations of COPD, with follow-ups of up to 4.8 years after the event [3,4]. However, there is currently no study assessing long-term survival for more than 5 years after severe COPD exacerbations. It was the aim of this analysis, therefore, to explore long-term overall survival for a period of more than 5 years among patients hospitalised with COPD exacerbations. We hypothesised that there might be specific characteristics of the patients predicting long-term survival after a

severe COPD exacerbation.

2. Methods

The primary outcome of the study was overall survival 5 and 8 years after a COPD exacerbation requiring hospitalisation. Secondary outcomes were predictors of survival in this patient group. Records of patients hospitalised for COPD exacerbations in 2005 in the Department of Pneumology of the University of Rostock were analysed. Inclusion criteria were:

1. hospitalisation primarily due to an exacerbation of the COPD.
2. a spirometry performed during the hospital stay, showing a FEV₁/FVC ratio <70%.
3. availability of information on the smoking history at the time of the exacerbation. In addition, availability of the survival status 8 years after the exacerbation. In case of death, data on the exact date of death would be collected.

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Exclusion criteria were:

1. any ongoing or newly diagnosed malignant disorder at the time of the exacerbation.
2. any history of other major chronic respiratory diseases including asthma
3. evidence for pneumonia or infections of other organs during the exacerbation.
4. intubation and/or need for transfer to the intensive care unit during the exacerbation.

The survival status or date of death of the patients was determined by contacting the family physician or the patients themselves. Overweight (body mass index, BMI: ≥ 25 kg/m²), normal weight (BMI: 18.5 kg/m²–24.99 kg/m²) and underweight (BMI: <18.5 kg/m²) were defined according to the world health organization (WHO) classification. Statistical analysis was performed using SPSS Statistics (Version 20, IBM, Armonk, NY, USA). Analysis of overall survival (OS) was performed using Kaplan-Meier log-rank tests, simultaneous effects of the parameters on survival were tested using Cox regression analysis.

3. Results

A total of 57 patients fulfilled the inclusion and exclusion criteria and were included in this analysis. Patient characteristics are shown in Table 1. Of the 57 COPD patients, 31 (54%) had a body mass index of 25 kg/m² or higher (overweight), and 24 patients (42%) a body mass index between 18.5 kg/m² and 24.99 kg/m² (normal weight). Only 2 patients had a body mass index of less than 18.5 kg/m² (underweight). In the total group, the 5-year OS was 54%, the 8-year OS 42% (Fig. 1A). Smoking history of at least 30 pack years ($p = 0.31$) or current smoking status ($p = 0.086$) at the time of exacerbation had no impact on OS. In contrast, presence of cardiac comorbidities ($p = 0.021$), body mass index (BMI) <25 kg/m² (Fig. 1B), FEV₁ $<50\%$ predicted (Fig. 1C) and age >70 years (Fig. 1D) at the time of exacerbation were associated with decreased OS. Multivariate cox regression analysis revealed that only age ($p = 0.006$), FEV₁% predicted ($p = 0.027$) and BMI ($p = 0.017$), but not the presence of cardiac comorbidities ($p = 0.05$), were independent predictors of long-term survival. Patients with a BMI ≥ 25 kg/m² showed a substantially higher 5-year and 8-year OS

than patients with a BMI <25 kg/m² (Table 2).

4. Discussion

This study is the first to analyse long-term mortality (>5 years) after hospitalisation due to an exacerbation of COPD. We show that nearly half of the patients (46%) hospitalised due to an exacerbation of COPD die within 5 years after the event. The 8-year mortality after COPD exacerbation was 58%. These results extend previously published mortality rates after severe COPD exacerbations of 12% after 1 year, 25% after 2 years and 32% after 3 years [4].

Our analysis suggests that overweight is an independent predictor of long-term survival after severe COPD exacerbations. Only 2 patients had underweight (BMI <18.5 kg/m²) in our study: the majority had either normal weight (42%) or overweight (54%). Therefore, it is unlikely that underweight was driving our observation (underweight and malnutrition are well-established mortality and exacerbation risk factors in COPD [5,6]). The study by Schols and colleagues retrospectively analysing 400 patients with stable COPD showed that survival was significantly decreased in normal weight patients as compared with overweight patients [7]. Overweight patients (BMI >25 kg/m²) hospitalised due to COPD exacerbations have a lower all-cause in-hospital mortality than patients with a BMI <25 kg/m² [8]. In addition, the report by Lainscak and colleagues studying patients with COPD (mean age: 70 years) during a median follow-up of 3.26 years (maximum follow-up: 4.76 years) after hospitalisation due to a COPD exacerbation showed that a BMI >25 kg/m² was independently predictive of better survival [4]. Our study, which is the first to analyse survival for more than 5 years after a severe COPD exacerbation, extends and confirms these data by showing that overweight patients hospitalised due to COPD exacerbations have a substantially lower long-term all-cause mortality than patients with normal weight. Thus, there is now accumulating evidence that overweight predicts a lower mortality in patients hospitalised due to COPD exacerbations. This is in clear contrast to data from a general population of white adults showing that overweight is associated with increased mortality [9]. Therefore, further studies are warranted to understand the possible protective role of overweight in patients with COPD exacerbations. For instance, it will be of interest whether a weight gain (e.g. by nutritional therapy) can modify mortality following COPD exacerbations [7].

Table 1

Patient characteristics. The left column shows median values [minimum...maximum] and the total number of patients treated with long-acting beta-agonists (LABA), long-acting muscarinic antagonists (LAMA), inhaled corticosteroids (ICS), long term oxygen therapy (LTOT) or non-invasive ventilation (NIV). The right column shows mean values (\pm standard deviation) for numerical parameters and percentages for the nominal parameters.

	Patients with COPD	
	n = 57	
	Medians and total numbers	Means and percentages
Age (years)	70.0 [43...91]	69.2 \pm 10.6
Pack years	30 [0...100]	30.3 \pm 20.3
Body mass Index (kg/m ²)	25.5 [16.5...37.5]	26.2 \pm 5.3
FEV ₁ (ml)	1070 [400...2900]	1184 \pm 538
FEV ₁ % pred. (%)	41.6 [18.5...85.0]	43.7 \pm 17.0
FEV ₁ % FVC (%)	48 [24...70]	49.5 \pm 11.5
Gender (male/female)	42/15	74%/26%
Current smoking (yes/no)	16/39	28%/72%
BMI ≥ 25 kg/m ² (yes/no)	31/26	54%/46%
LABA (yes/no)	54/3	95%/5%
LAMA (yes/no)	49/8	86%/14%
ICS (yes/no)	30/27	53%/47%
LTOT (yes/no)	5/52	9%/91%
NIV (yes/no)	0/57	0%/100%

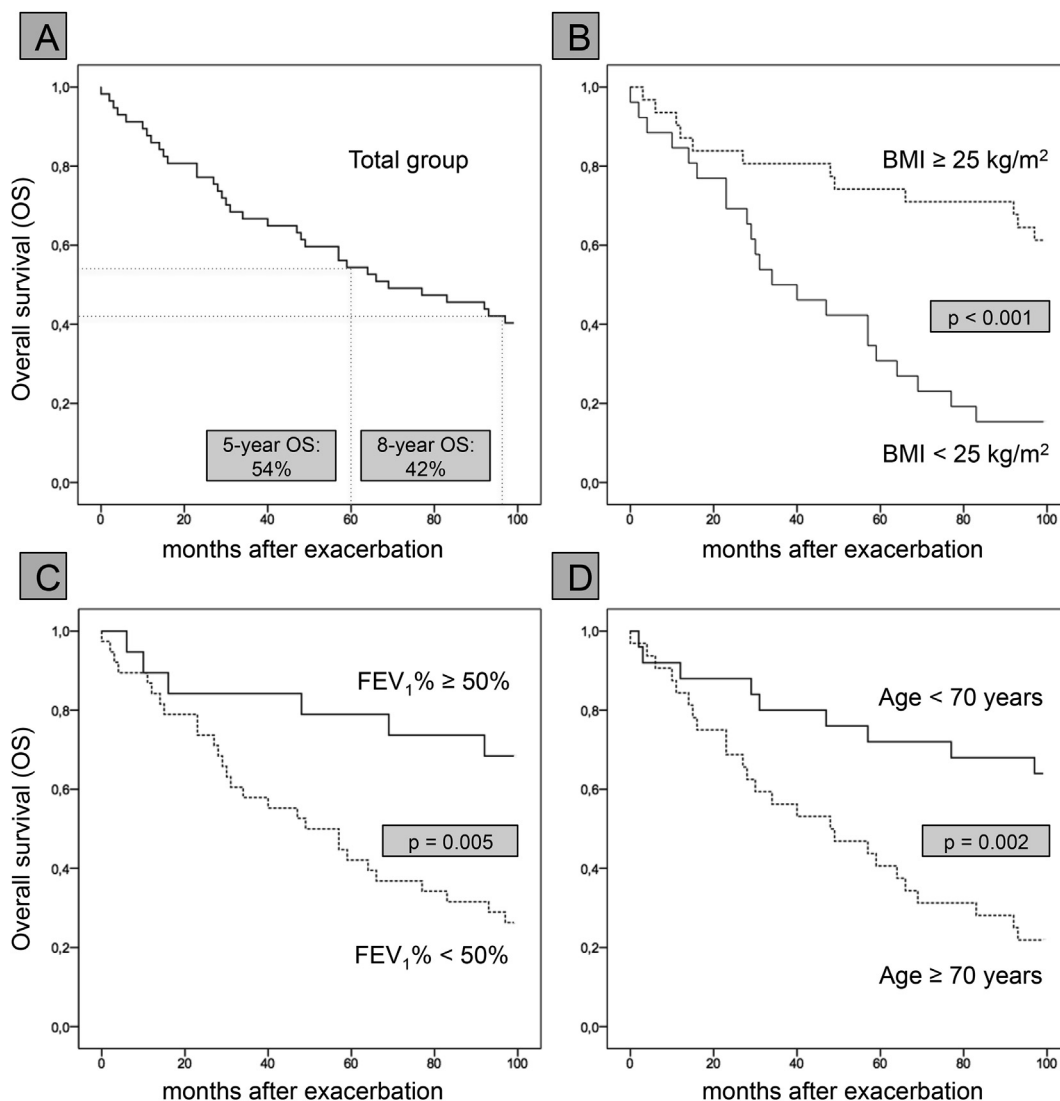


Fig. 1. Long-term survival after hospitalised exacerbations of COPD. Shown is the overall survival (OS) of the total group of patients hospitalised for COPD exacerbations ($n = 57$) (A), and the subgroup analyses according to the body mass index (B), the Forced expiratory volume in the first second (FEV_1) in % of the predicted value (C) and the age (D) of the patients during the event. The p-values for the comparison of survival between subgroups (Kaplan-Meier log-rank test) are given in the graphs B-D.

Table 2

Survival in relation to specific patient characteristics. Shown are the absolute and percentage numbers of patients surviving for 60 months (5 years) and 96 months (8 years) of all COPD patients when adjusting for different clinical parameters. FEV_1 denotes Forced expiratory volume in the first second (% of predicted value). ICS denotes inhaled corticosteroid. BMI denotes body mass index.

All patients	5-year overall survival		8-year overall survival	
	31/57 (54%)		24/57 (42%)	
	Yes	No	Yes	No
Male gender	22/42 (52%)	9/15 (60%)	15/42 (36%)	9/15 (60%)
Therapy with ICS	16/30 (53%)	15/27 (56%)	12/30 (40%)	12/27 (44%)
Current smoking	12/16 (75%)	19/39 (49%)	9/16 (56%)	15/39 (38%)
>30 Pack years	12/25 (48%)	19/30 (63%)	9/25 (36%)	15/30 (50%)
BMI < 25 kg/m [2]	8/26 (31%)	23/31 (74%)	4/26 (15%)	20/31 (65%)
Age <70 years	18/25 (72%)	13/32 (41%)	17/25 (68%)	7/32 (22%)
FEV_1 <50% predicted	16/38 (42%)	15/19 (79%)	11/38 (29%)	13/19 (68%)
Presence of cardiac comorbidities	15/33 (45%)	16/24 (67%)	10/33 (30%)	14/24 (58%)

Competing interests

None.

Funding

This study was funded by the University of Rostock.

Contributorship statement

SF screened and analysed the patient records at the University of Rostock, and collected the data. PS, JCV and ML designed and supervised the study, analysed the data and wrote the manuscript draft. ML is responsible for the overall content as guarantor.

Acknowledgement

None.

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