

INTRODUCTION

By 2020, chronic obstructive pulmonary disease (COPD) is projected to become the third leading cause of death worldwide [1]. In Sweden, the prevalence of COPD is considered to be between 4-6%, representing approximately 500,000 patients [2, 3]. Treatment of COPD concentrates on prevention of exacerbations, as it is an important measure of disease severity in terms of negative impact on disease progression, length of recovery time, health resource utilization (HRU), overall morbidity and mortality.

AIM

The aim of this registry-based study was to describe the burden of COPD patients in Sweden in terms of exacerbations, HRU, medication use and comorbidities.

METHODS

Patients with a COPD (ICD-10 code J44) or chronic bronchitis (CB; ICD-10 J41 and J42) diagnosis at age of ≥ 40 years on 1.7.2009 were identified from national databases in Sweden (9.4 million inhabitants). Patients were followed until 1.7.2010 or death. Severe exacerbations were defined as hospitalizations due to respiratory disease, and HRU was measured by all-cause hospitalizations and secondary care out-patient visits. Severe COPD patients (yes/no) were identified as those with at least two severe exacerbations during the previous year and ongoing usage of ICS+LABA and/or LAMA at baseline.

Data from the Centre for Epidemiology at the Swedish National Board of Health and Welfare, linked to the Swedish Prescribed Drug Register (filled prescriptions), the Swedish Hospital Discharge Register, the Swedish Hospital Out-Patient Register, the Swedish Death Register and the Swedish Cancer Register were utilized. The social security numbers of identified patients were replaced with study identification numbers at the Swedish National Board of Health and Welfare prior to data processing.

The crude and adjusted relative ratios for severe exacerbations and HRU together with the 95% confidence intervals were calculated during follow-up for the severe COPD status (yes/no) using a Poisson regression model. The adjusted model included gender, age, years since diagnosis and Charlson comorbidity index (CCI) [4, 5] at baseline.

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Table 1: COPD/CB patient characteristics and history of comorbidities at baseline ¹

	Female N=47,487 (53.6%)	Male N=41,061 (46.4%)	p-value (female vs. male)	Total patients (N=88,548)
Age (years, mean \pm SD)	71.9 \pm 11.1	72.3 \pm 10.5	<0.001	72.1 \pm 10.8
Time since COPD/CB diagnose (years, mean \pm SD)	4.5 \pm 3.2	4.3 \pm 3.2	<0.001	4.4 \pm 3.2
Cardiovascular disease N(%)	18,430 (38.8%)	20,575 (50.1%)	<0.001	39,005 (44.0%)
Hypertension N(%)	18,519 (39.0%)	16,069 (39.1%)	0.683	34,588 (39.1%)
Asthma N(%)	11,782 (24.8%)	7,593 (18.5%)	<0.001	19,375 (21.9%)
Any malignancy N(%)	8,209 (17.3%)	8,325 (20.3%)	<0.001	16,534 (18.7%)
Diabetes N(%)	7,294 (15.4%)	8,012 (19.5%)	<0.001	15,306 (17.3%)
Cerebrovascular disease N(%)	6,248 (13.2%)	6,785 (16.5%)	<0.001	13,033 (14.7%)
Mood disorders N(%)	4,818 (10.1%)	2,526 (6.2%)	<0.001	7,344 (8.3%)
Osteoporosis N(%)	4,688 (9.9%)	845 (2.1%)	<0.001	5,533 (6.2%)
Pneumonia/influenza N(%) ²	3,102 (6.5%)	3,141 (7.6%)	<0.001	6,243 (7.1%)
Renal disease N(%)	1,304 (2.7%)	2,074 (5.1%)	<0.001	3,378 (3.8%)

Abbreviation: SD, standard deviation

¹ Baseline medical conditions were defined based on ICD-10 diagnosis codes from inpatient hospitalizations since 1.1.1998, and out-patient secondary care visits since 1.1.2001.

² Pneumonia/influenza is evaluated during one year prior to baseline only.

Table 2: Distribution of number of hospitalizations, secondary care visits and medication use related to potential exacerbations in COPD/CB patients (N=88,548) during one year prior to baseline

	Female (N=47487)	Male (N=41061)	p-value (female vs. male)	Total patients N=88548
N of all cause hospitalizations events (mean \pm SD)	0.97 \pm 1.78	1.08 \pm 1.98	<0.001	1.02 \pm 1.88
0	58.0%	56.4%		57.3%
1-2	29.7%	29.6%		29.6%
3-5	9.5%	10.5%		10.0%
>5	2.8%	3.4%		3.1%
N of secondary care out-patient visits (mean \pm SD)	2.82 \pm 5.28	3.01 \pm 7.45	<0.001	2.91 \pm 6.38
0 (%)	28.6%	28.8%		28.7%
1-2 (%)	34.4%	34.0%		34.2%
3-5 (%)	22.5%	22.7%		22.6%
>5 (%)	14.5%	14.6%		14.6%
N of respiratory hospitalizations (mean \pm SD)	0.27 \pm 0.89	0.27 \pm 0.87	0.273	0.27 \pm 0.88
0 (%)	84.7%	84.9%		84.8%
1-2 (%)	12.8%	12.6%		12.7%
3-5 (%)	2.0%	2.1%		2.1%
>5 (%)	0.5%	0.4%		0.5%
N of systemic corticosteroid purchases (mean \pm SD)	1.28 \pm 4.19	0.99 \pm 3.34	<0.001	1.15 \pm 3.82
0 (%)	67.7%	72.9%		70.1%
1-2 (%)	18.8%	15.9%		17.5%
3-5 (%)	8.7%	7.4%		8.1%
>5 (%)	4.8%	3.8%		4.4%
N of systemic antibiotic purchases (mean \pm SD)	1.60 \pm 2.90	1.24 \pm 2.34	<0.001	1.44 \pm 2.66
0 (%)	43.9%	50.7%		47.0%
1-2 (%)	35.9%	33.8%		34.9%
3-5 (%)	14.3%	11.5%		13.0%
>5 (%)	5.9%	4.0%		5.0%

Figure 1: Charlson comorbidity index (CCI) distribution stratified by the number of hospitalizations

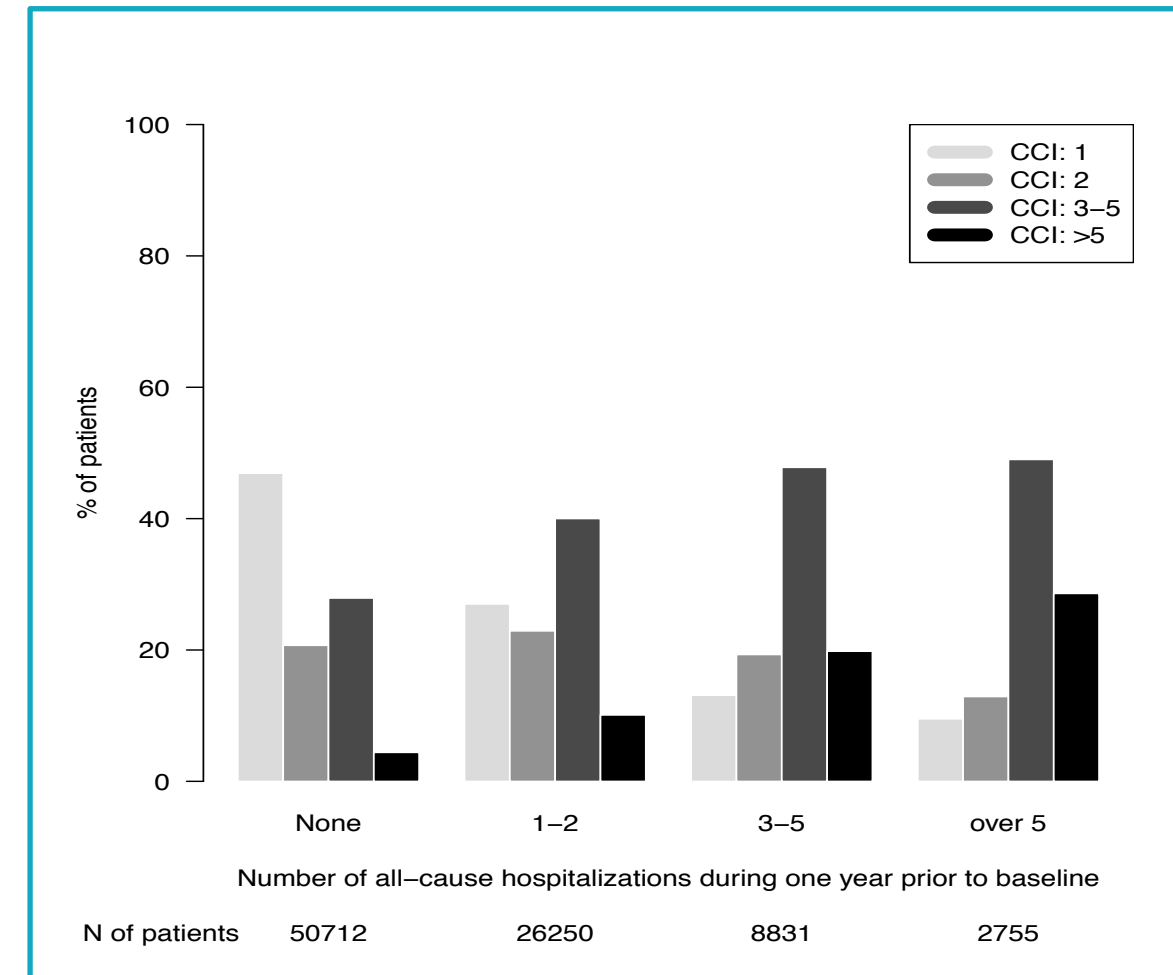


Table 3: Medication during the year before baseline in COPD/CB patients

	Total Patients (N=88,548)
COPD medication ¹ N(%)	
SAMA	1,930 (2.2%)
SABA	2,256 (2.5%)
SAMA+SABA	613 (0.7%)
ICS only	6,071 (6.9%)
LAMA only	5,191 (5.9%)
LABA only	1,229 (1.4%)
ICS+LABA	2,094 (2.4%)
ICS+LABA	21,919 (24.8%)
LAMA+LABA	803 (0.9%)
ICS+LABA+LABA	21,750 (24.6%)
No COPD medication N(%)	24,692 (27.9%)
Other medications N(%)	
Beta blockers	32,805 (37.0%)
ACE inhibitors	25,066 (28.3%)
Calcium blockers	19,231 (21.7%)
Angiotensin-receptor blockers	11,353 (12.8%)
Statins	27,432 (31.0%)

Abbreviations: SAMA, inhaled short-acting muscarinic antagonist; SABA, inhaled short-acting beta-2-agonist; ICS, inhaled glucocorticoids; LAMA, long-acting muscarinic antagonist; LABA, long-acting beta agonist; ACE, angiotensin-converting enzyme

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Table 4: Severe exacerbations and healthcare resource utilization stratified by the severe COPD patient status

Severe COPD patient ¹	N of patients	Person years	N of events	Crude rates (95% CI)	Crude RR (95% CI)	Adjusted ² RR (95% CI)
Severe exacerbations						
Yes	3,057	2,522	5,293	2.10 (2.04; 2.16)	9.43 (9.15; 9.72)	8.28 (8.02; 8.54)
No	85,491	80,274	17,863	0.22 (0.22; 0.23)	1.00	1.00
Healthcare resource utilization						
Yes	3,057	2,522	18,976	7.52 (7.42; 7.63)	1.95 (1.92; 1.97)	1.82 (1.79; 1.84)
No	85,491	80,274	310,523	3.87 (3.85; 3.88)	1.00	1.00

Abbreviation: RR, relative ratio

¹ Defined as previous history of severe exacerbations (≥ 2 within 1 year), and current medication use of ICS+LABA and/or LAMA

² Adjusted for gender, age, years since diagnosis and Charlson comorbidity index

RESULTS

In total 88,548 patients (mean age 72 years, 54% females) were identified with COPD/CB (Table 1). The mean duration of disease for all patients was 4.4 years (Table 1). The most common co-morbidities were cardiovascular disease (including coronary artery disease, congestive heart failure, atrial fibrillation and myocardial infarction), hypertension, pneumonia/influenza, and asthma (Table 1). In total, 42.7% of the COPD/CB patients had at least one hospitalization, 71.3% at least one secondary care out-patient visit, and 15.2% had at least one respiratory-related hospitalization within one year prior to baseline (Table 2). Patients with a higher number of hospitalizations during one year prior to baseline have a higher comorbidity burden measured by CCI values (Figure 1). Of the COPD/CB patients, 29.9% had at least one purchase of systemic corticosteroids and 53.0% systemic antibiotics (Table 2). Of all 27.9% had no COPD medications, 51.8% had ICS therapy with LABA and/or LAMA, and 5.4% only rescue medications (Table 3). More than one third of the patients used a beta-blocker (Table 3). Of all patients 3057 (3.5%) were classified as severe COPD patients. This status of being a severe COPD patient predicted a 8.3-fold adjusted increase in the severe exacerbation rate and 1.8-fold increase in the adjusted HRU rate during the following year (Table 4).

CONCLUSIONS

Patients with severe COPD continue to experience significantly increased rate of severe exacerbations and HRU during one-year follow-up than the patients with less severe disease. Among COPD patients there was a high prevalence of cardiovascular and cerebrovascular disease. Patients with severe COPD would benefit from novel treatments aimed to reduce further exacerbations.

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