Assessment of Cardiovascular Events in Patients with Severe COPD Exacerbations

COPD

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Background

- Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disease characterised by persistent airflow obstruction and symptoms including dyspnoea, chronic cough, sputum production and wheezing.[1]
- Patients with COPD periodically experience an acute worsening of symptoms, known as exacerbations, which may require extra medications, supplemental oxygen or hospitalisations, leading to increased healthcare visits.[2]
- COPD exacerbations are linked to cardiovascular events (CVEs) during and after hospitalisations,[3,4] yet real-world data on CVE occurrences are limited.

✔ Objective

- To assess the prevalence of cardiovascular events in patients hospitalised because of severe COPD exacerbations.

💡 Conclusions

- In this real-world evidence study, prior cardiovascular disease (CVD) was observed in approximately 40% of patients with COPD experiencing severe exacerbations. CVEs were more prevalent in patients with prior CVD (16.7%) during the index severe COPD exacerbations. Additionally, approximately 10% of patients without a prior history of CVD experienced a CVE during their hospitalisation for a COPD exacerbations.
  - Administrative claims data collected for payment may misrepresent diagnoses and treatments due to coding errors and non-adherence.
- These findings highlight the need for comprehensive cardiovascular assessments in severe COPD cases, regardless of CVD history.

METHODS & RESULTS

Data source

- This retrospective, observational study utilised administrative claims data from the Healthcare Integrated Research Database (HIRD®) (Carelon Research, Wilmington, DE, USA).
- Individual-level urbanisation data was obtained by linking the county of residence to the 2013 National Center for Health Statistics urban–rural classification scheme.
- The social determinants of health (SDoH) data file included selected neighbourhood-level SDoH indicators derived from the 2019 American Community Survey.

Study population

- Adult patients (≥ 40 years) with a severe COPD exacerbation, defined as an inpatient hospitalisation with a primary diagnosis indicating a) COPD or b) respiratory failure or pneumonia, and a non-primary diagnosis code indicating COPD (**Figure 1**).
- The index date was defined as the admission date of the first COPD hospitalisation during the study intake period (1 October 2016 and 31 January 2024).
- Patients with evidence of ≥2 diagnoses of any of the conditions including pulmonary tuberculosis, sarcoidosis, cystic fibrosis, lung diseases, respiratory system diseases, pleural diseases, respiratory cancer, or asthma in the year prior to the index date were excluded.
- Patients were required to have continuous enrolment with commercial or Medicare Advantage insurance coverage for at least 365 days prior to the index date.

Figure 1. Study design
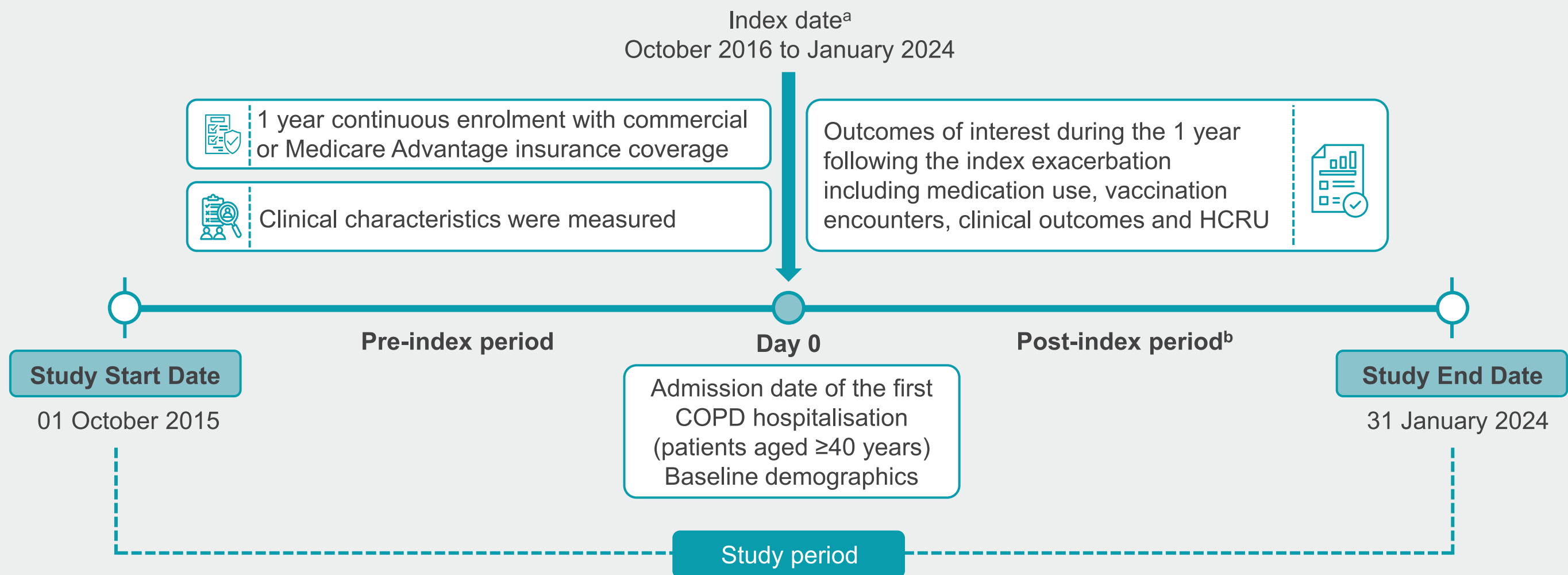
[a]The index date was defined as the admission date of the first COPD hospitalisation during the study intake period (1 October 2016 to 31 January 2024).
[b]The post-index period was the time between the index event and the end of the study analysis.
COPD, chronic obstructive pulmonary disease; HCRU, healthcare resource utilisation.

Outcomes

- The outcomes included CVEs (myocardial infarction, angina or ischaemic stroke) during the index COPD exacerbation. Additionally, patients were stratified by evidence of cardiovascular disease (CVD) in the year prior to the index date.

Statistical analysis

- The analysis was performed by utilising administrative claims data contained in the HIRD; frequency and percentage were presented for categorical variables. Centrality measures like means and medians, along with variance measures such as standard deviations (SD) and interquartile ranges (IQR), were presented for continuous measures.

RESULTS

- Of the 48,702 patients included in the study, 19,494 (40.0%) had evidence of CVD prior to their first severe COPD exacerbation.
- Patients with prior CVD had a mean (SD) age of 72.5 (10.8) years, with 46.6% female patients. In contrast, those without prior CVD were younger, with a mean (SD) age of 67.1 (11.5) years and 55.4% female patients.
- Common comorbidities of interest included hypertension (88.9% and 40.9% for patients with prior CVD and 60.3% and 24.3% for those without, respectively) in the year prior to the index exacerbation.
- Patients with prior CVD had a higher Quan-Charlson Comorbidity Index (mean [SD], 2.8 [2.1]) than those without prior CVD (mean [SD], 1.5 [1.7]) (**Table 1**).

Table 1. Baseline demographic and clinical characteristics of patients with and without prior CVD

	Prior CVD evidence N = 19,494	No prior CVD evidence N = 29,208
Age, years, mean (SD) (years)	72.5 (10.8)	67.1 (11.5)
Female, n (%)	9,085 (46.6)	16,172 (55.4)
Male, n (%)	10,409 (53.4)	13,035 (44.6)
Race/ethnicity		
White NH, n (%)	14,428 (74.0)	21,076 (72.2)
Hispanic or Latino, n (%)	536 (2.7)	912 (3.1)
Black or African American NH, n (%)	1,094 (5.6)	1,702 (5.8)
Others[1] NH, n (%)	273 (1.4)	456 (1.6)
Unknown, n (%)	3,163 (16.2)	5,062 (17.3)
Clinical characteristics		
Quan–Charlson Comorbidity Index, mean (SD)	2.8 (2.1)	1.5 (1.7)
Number of patients with one or more diagnoses of interest		
Anxiety, n (%)	4,699 (24.1)	6,119 (20.9)
Cardiovascular disease, n (%)	19,494 (100)	0 (0)
Chronic kidney disease, n (%)	5,371 (27.6)	3,229 (11.1)
Depression, n (%)	4,663 (23.9)	5,549 (19.0)
Diabetes (type 1 or 2), n (%)	7,972 (40.9)	7,095 (24.3)
Heart failure, n (%)	7,311 (37.5)	2,852 (9.8)
Hypertension, n (%)	17,328 (88.9)	17,601 (60.3)
Non-respiratory cancers, n (%)	3,355 (17.2)	3,129 (10.7)
Osteoarthritis, n (%)	6,094 (31.3)	6,236 (21.4)
Peripheral vascular disease, n (%)	9,347 (47.9)	2,669 (9.1)
Prostate disorders, n (%)	2,847 (14.6)	2,122 (7.3)
Spirometry testing encounter, n (%)	2,895 (14.9)	2,870 (9.8)

[1]Includes Asian NH, Native Hawaiian or Other Pacific Islander NH, American Indian or Alaska Native NH, and individuals self-identified as 'other'.
CVD, cardiovascular disease; N/n, number; NH, non-Hispanic; SD, standard deviation.

- In patients with prior CVD, 16.4% lived in an area with a socioeconomic status (SES) index score in the highest quartile and 27.2% lived in areas in the lowest quartile. Similarly, 27.8% of patients without prior CVD had SES scores in the lowest quartile and 14.7% in the highest quartile (**Figure 2**).

### Figure 2. SDoH in those with or without prior CVD at the census block level
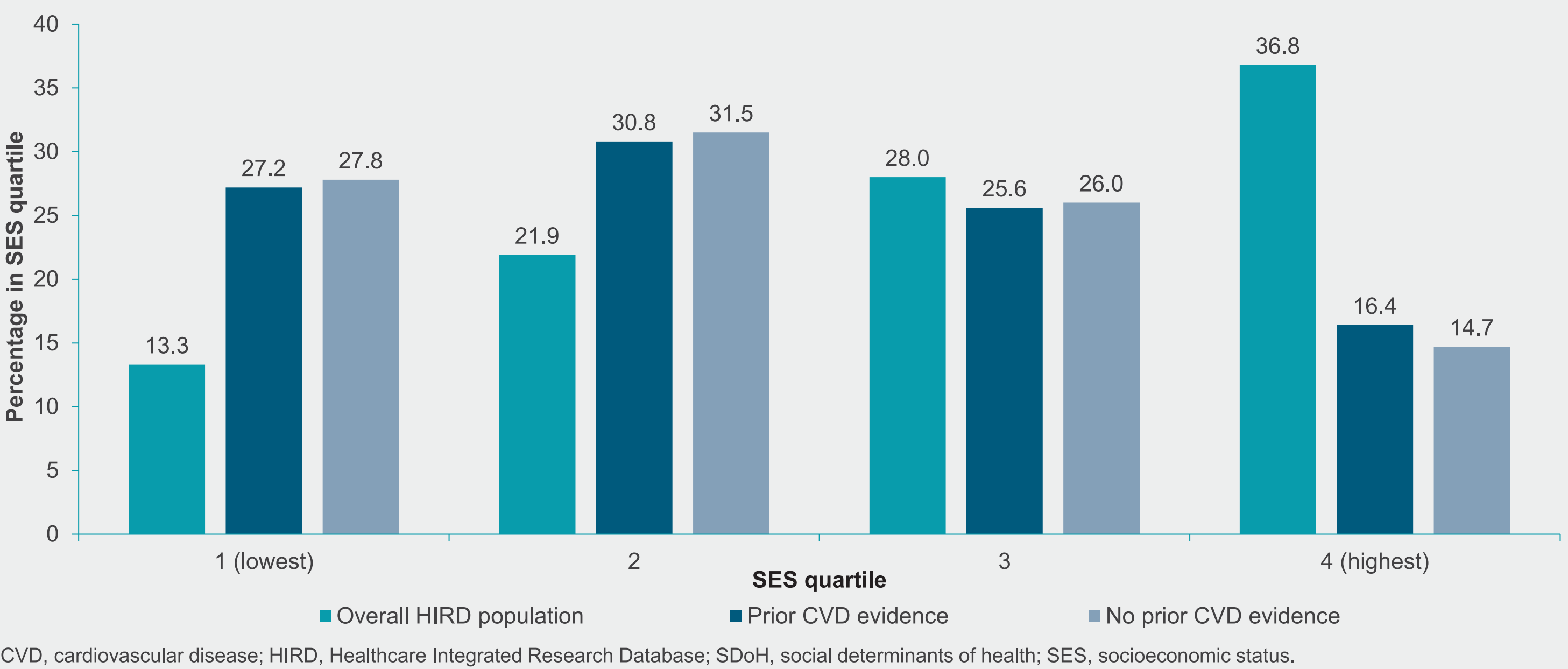
CVD, cardiovascular disease; HIRD, Healthcare Integrated Research Database; SDoH, social determinants of health; SES, socioeconomic status.

CVEs in patients with or without prior CVD

- In patients with evidence of prior CVD, 16.7% (n = 3,254) experienced a CVE during their index severe COPD exacerbation. In contrast, 9.7% (n = 2,840) of patients without prior evidence of CVD experienced a CVE.
- In the year following the index exacerbations, in a subset of the population with at least one year of continuous enrolment following the index exacerbation, 30.2% of patients with prior CVD had a CVE. In patients without prior evidence of CVD, 10.9% had a CVE following the initial exacerbation (**Figure 3**).
- Within a year following an exacerbation, death occurred in 22.8% (n = 4,438) and 15.6% (n = 4,542) of patients with and without prior CVD, respectively (**Figure 3**).

Figure 3. Patients with a CVE and death in those with or without prior CVD
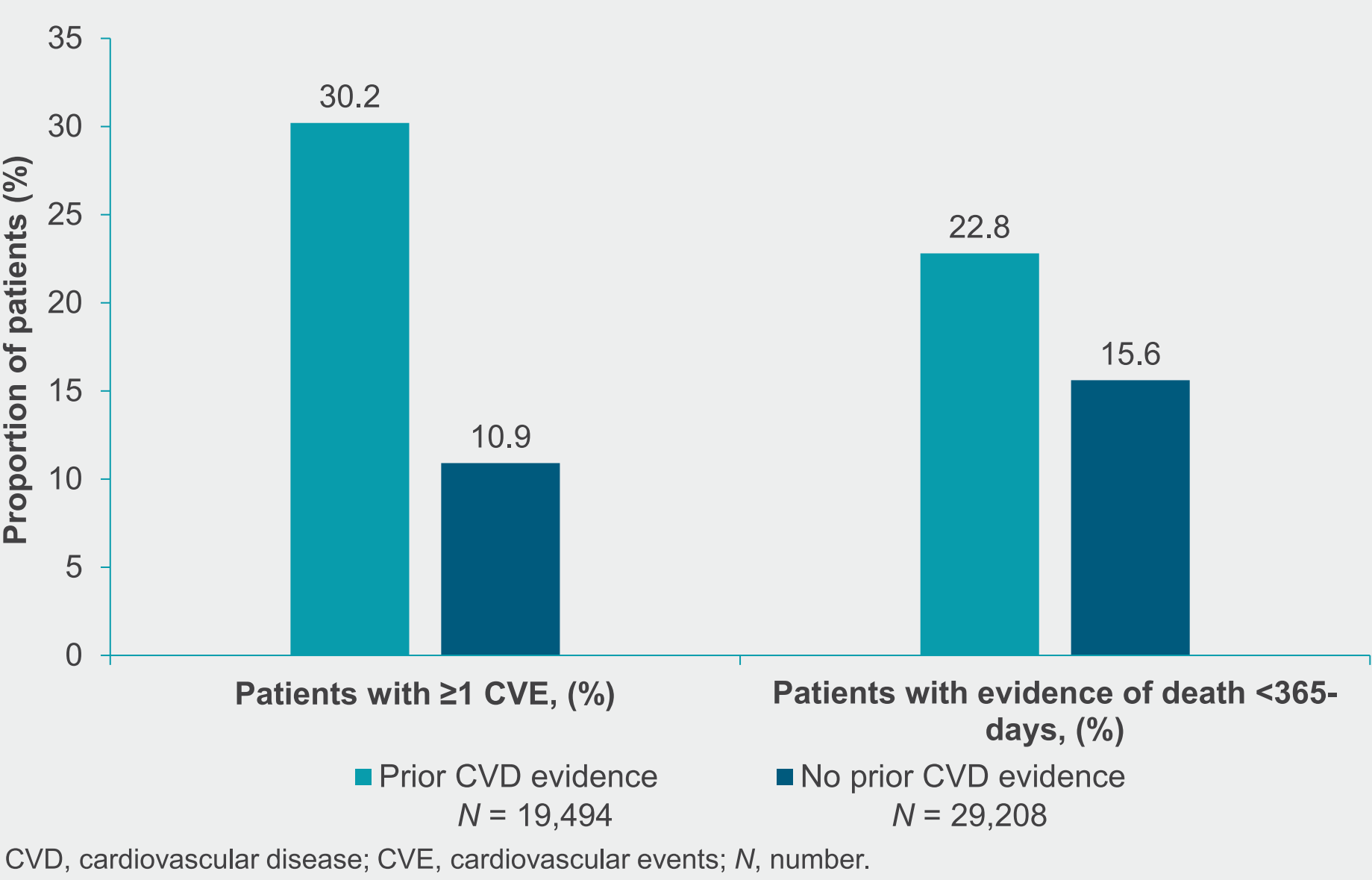
CVD, cardiovascular disease; CVE, cardiovascular events; N, number.

Healthcare resource utilisation (HCRU) in patients with or without prior CVD

- For all-cause utilisation, in patients with at least 1-year continuous enrolment following index exacerbation, for all cause utilization, COPD with prior CVD had an inpatient cost of $2,420 versus compared to $1,741 for those without CVD, and the COPD-related inpatient cost was $1,805 for patients with prior CVD versus $1,357 for those without CVD (**Table 2**).
- Therapies and HCRU for 1 year following the index exacerbation are provided in **Table 2**.

Table 2. Therapies and HCRU for 1 year following the index exacerbation, stratified by evidence of prior CVD

	Prior CVD evidence n = 11,939	No prior CVD evidence n = 18,187
Presence of therapies of interest and number of fills for those with at least 1 patient with ≥1		
ICS fill, n (%)	819 (6.9)	1,264 (7.0)
Influenza vaccine encounter, n (%)	5,376 (45.0)	7,864 (43.2)
LABA fill, n (%)	188 (1.6)	244 (1.3)
LAMA fill, n (%)	1,845 (15.5)	2,969 (16.3)
Macrolide antibiotics fill, n (%)	2,881 (24.1)	4,508 (24.8)
Oral corticosteroids fill, n (%)	5,371 (45.0)	8,490 (46.7)
Oxygen therapy fill, n (%)	5,111 (42.8)	7,877 (43.3)
Pneumococcal vaccine encounter, n (%)	1,534 (12.8)	2,768 (15.2)
Roflumilast fill, n (%)	214 (1.8)	300 (1.6)
SABA fill, n (%)	5,860 (49.1)	9,813 (54.0)
SAMA fill, n (%)	365 (3.1)	508 (2.8)
Combination maintenance therapies for those with at least 1 patient with ≥1		
LABA and LAMA fill, n (%)	1,001 (8.4)	1,649 (9.1)
LABA, LAMA and ICS fill, n (%)	2,119 (17.7)	3,608 (19.8)
LABA and ICS fill, n (%)	3,350 (28.1)	5,863 (32.2)
SABA and SAMA fill, n (%)	3,163 (26.5)	4,673 (25.7)
Healthcare utilisation costs		
All-cause utilisation and costs		
Patients with ≥1 inpatient encounters excluding the index event, n (%)	8,388 (82.3)	11,475 (69.3)
Inpatient encounter, excluding the index event, mean (SD) ($)	2,420 (6,957)	1,741 (5,300)
Outpatient encounter, mean (SD) ($)	1,460 (3,533)	1,189 (3,264)
ER encounter, mean (SD) ($)	162 (2,770)	102 (2,881)
Skilled nursing facility encounter, mean (SD) ($)	142 (499)	90 (475)
COPD-related utilisation and costs		
Patients with ≥1 inpatient encounters excluding the index event, n (%)	7,314 (71.8)	9,963 (60.2)
Inpatient encounter, excluding the index event, mean (SD) ($)	1,805 (5,035)	1,357 (4,588)
Outpatient encounter, mean (SD) ($)	312 (1,310)	267 (1,099)
ER encounter, mean (SD) ($)	106 (369)	76 (282)
Skilled nursing facility encounter, mean (SD) ($)	74 (336)	49 (347)

CVD, cardiovascular disease; COPD, chronic obstructive pulmonary disease; ER, emergency room; ICS, inhaled corticosteroid; HCRU, healthcare resource utilisation; LABA, long-acting beta agonist; LAMA, long-acting muscarinic antagonist; N/n, number; SABA, short-acting beta agonist; SAMA, short-acting muscarinic antagonist; SD, standard deviation.

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