Brief Summary of Findings on the Association Between Underlying COPD and Severe COVID-19 Outcomes

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Brief Summary of Findings on the Association Between COPD and Severe COVID-19 Outcomes

Overall, 89 studies were retrieved that report data on COPD and severe COVID-19 outcomes including mortality, intensive care unit (ICU) admission, intubation, ventilation, hospitalization, and readmission. All studies were rated as having a moderate to low threat to internal validity except for one study (Gottlieb 2020).

- COPD: Data indicate underlying COPD is associated with an increased risk of mortality,[1-65] ICU admission,[3-5,7-9,14,29,42,58,62,65-74] intubation,[62,65,69,73,75] ventilation,[42,73,76,77] hospitalization, [3,9,14,18,29,35,41,43,60,64,66,68,74,75,78-82] and readmission.[83]
    - COPD determined by lung function test: A sub-analysis of three studies[8,13,42] included in the primary analysis suggests that underlying COPD diagnosed using lung function test is associated with an increase in mortality, but the magnitude of association was smaller than what is seen in the primary analysis. Data were insufficient[8,42] to determine an association between ICU admission or ventilation and COPD in COVID-19 patients.
- Chronic bronchitis: Data from one study[38] suggest chronic bronchitis may be associated with an increased risk of mortality; however, one study is insufficient to draw conclusions.
- Emphysema: Data from one study[5] suggest emphysema may be associated with an increased risk of mortality and ICU admission; however, one study is insufficient to draw conclusions.
- Severity: Data from one study[84] suggest severe COPD is associated with an increased risk of ICU admission, ventilation, and hospitalization; however, one study is insufficient to draw conclusions. Data from three studies[84-86] were inconsistent and inconclusive on the association between COPD severity and mortality. Moreover, each study defined severity differently.
- Risk Markers: Data from one study[52] are insufficient to determine the impact of age on mortality among COVID-19 patients with underlying COPD. Data from five studies[28,41,52,81,87] are inconclusive on the association between sex, race, or ethnicity and severe COVID-19 outcomes among persons with underlying COPD.
- COPD Treatment: Data from two studies[13,84] suggest COPD treatment is associated with a decrease in mortality among COVID-19 patients with underlying COPD. Data from one study[84] suggest COPD treatment is associated with an increase in the outcomes of ICU admission, ventilation, and hospitalization among COVID-19 patients with underlying COPD; however, one study is insufficient to draw conclusions. These studies use inhaled corticosteroid (ICS) treatment as the exposure measure.

A. Methods

The aim of this review is to identify and synthesize the best available evidence to answer the question: ”what is the association between COPD and severe COVID-19?” This evidence will be used to update the Centers for Disease Control and Prevention (CDC) website on underlying conditions and enable the creation of a provider-specific website with more rigorous information.

The methods for assessment of the association between underlying conditions or risk factors and severe COVID-19 are outlined in the webpage, https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/systematic-review-process.html. These methods were established in May 2021 and are used for conditions and risk factors where CDC conducted the review.

Below are methodologic highlights and additional methods unique to this review. For more information, please visit https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/systematic-review-process.html.

A.1. Literature Search

A list of search terms was developed to identify the literature most relevant to the population, exposure, comparator, and outcome (PECO) question. Clinical experts and library scientists were consulted to develop a robust list of search terms. These terms were then incorporated into search strategies, and these searches were performed in OVID using the COVID-19 filter from the end of the previous literature search (December 2020). The detailed search strategies for identifying primary literature and the search results are provided in the Appendix. Subject matter experts supplemented the literature search results by recommending relevant references published before December 2020. References were included if retrieved by the chronic lung disease literature search and reported exposures and outcomes relevant to this review.

A.2. Study Selection

Titles and abstracts from references were screened by dual review (M.C., A.H., J.H., J.K.K., M.M., C.O., D.O.S., K.T.R., T.R., C.N.S., E.C.S., or M.W.).

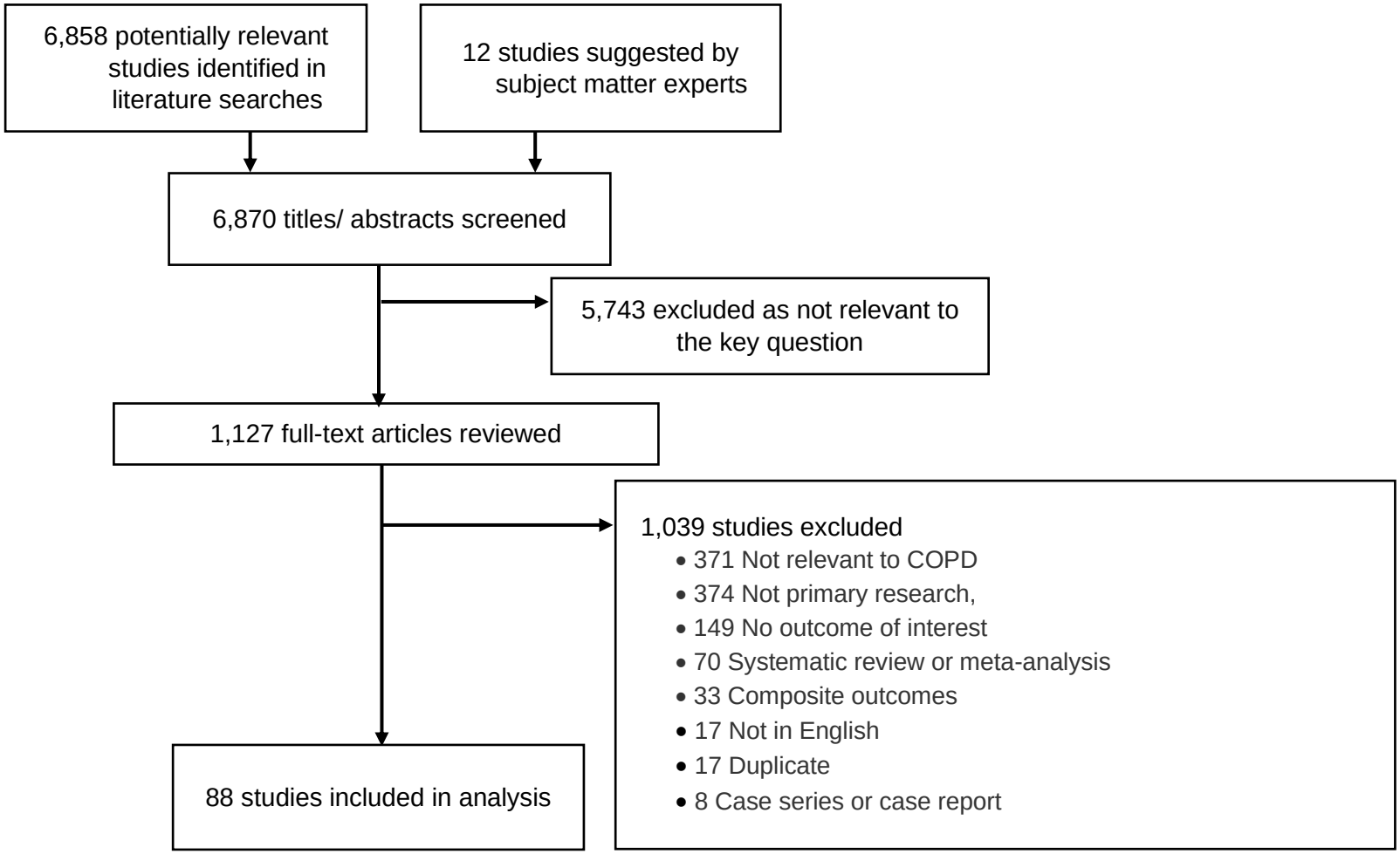
Full-text articles were retrieved if they were:

1. Relevant to the PECO question;
2. Primary research, and
3. Written in English.

Part B presents the full list of exclusion criteria. The full texts of selected articles were then screened by two independent reviewers, and disagreements were resolved by discussion (M.C., J.H., J.K.K., C.O., D.O.S., T.R., C.N.S., E.C.S., or M.W.).

After the full-text screening was complete, a bibliography of the articles selected for inclusion was vetted with subject matter experts (D.W., J.M., G.S., and K.D.). Additional studies suggested by the subject matter experts were screened for inclusion as described above. The results of the study selection process are depicted in Figure 1.

Figure 1. Results of the Study Selection Process



A.3. Data Extraction and Synthesis

Methodologic data and results pertaining to relevant outcomes from the studies meeting inclusion criteria were extracted into standardized evidence tables. Data and analyses were extracted as presented in the studies. For the purposes of this review:

- Confidence intervals were defined as "wide" if they were within the upper tertile of the range of confidence interval widths.
- Any determination of association based on measures of association was made based on the following rule of thumb:
    - Measures of association greater than 1.1 were defined as "suggestive" or "indicative" of an increase in risk, regardless of confidence interval or statistical significance.
    - Measures of association between 0.9 and 1.1 were defined as "suggestive" or "indicative" of no difference, and confidence intervals must have crossed the null
    - Measures of association less than 0.9 were defined as "suggestive" or "indicative" of a decrease in risk, regardless of confidence interval or statistical significance
    - If the overall direction of evidence was consistent, a Bayesian approach was taken to aggregating the evidence and determining the strength of association.
- Statistical significance was defined as $p \leq 0.05$.

A.4. Internal Validity Assessment

The internal validity associated with each study was assessed using scales developed by the Division of Healthcare Quality Promotion and scores were recorded in the evidence tables. Part B includes the questions used to assess the quality of each study design. The strength, magnitude, precision, consistency, and applicability of results were assessed for all comparators. The overall confidence in the evidence base is reported in the aggregation tables in Part B.

A.5. Reviewing and Finalizing the Systematic Review

Draft findings, aggregation tables, and evidence tables, were presented to CDC subject matter experts for review and input. Following further revisions, the summary will be published on the CDC website.

B. Systematic Literature Review Results

B.1. Search Strategies and Results

Table 1. Chronic Lung Disease search conducted December 3, 2021

#	Search History
1	chronic lung disease
2	respiratory system disease*
3	reactive airway disease*
4	emphysema
5	chronic bronchitis
6	COPD
7	Chronic obstructive pulmonary disease
8	Asthma *
9	allergic asthma
10	irritant asthma
11	Interstitial lung disease
12	Pulmonary fibrosis
13	idiopathic pulmonary fibrosis
14	nonspecific interstitial pneumonitis
15	hypersensitivity pneumonitis
16	sarcoidosis
17	pneumoconiosis
18	asbestosis
19	coal workers pneumoconiosis
20	silicosis
21	bronchiectasis
22	cystic fibrosis
23	pulmonary vascular disease
24	pulmonary hypertension
25	bronchopulmonary dysplasia
26	bronchiolitis obliterans
27	asthma*
28	reactive airway disease*

#	Search History
29	CF
30	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31	Limit 30 to covid-19
32	(202012* or 2021*).dt
33	(202012* or 2021*).dc
34	32 or 33
35	31 and 34
36	Deduplicate

B.2. Study Inclusion and Exclusion Criteria

Inclusion Criteria: Studies were included at the title and abstract screen if they:

- were relevant to the key question "what is the association between chronic lung disease and severe COVID-19?";
  - Studies deemed not relevant included those that reported autopsy results, and examined lung transplant, cancer, or immunocompromised populations;
- were primary research;
- were written in English (can be seen as [language] in title); and
- examined humans only.

Exclusion Criteria: Studies were excluded at full text review if they:

- did not answer the key question "what is the association between COPD and severe COVID-19?";
- were not available as full-text;
- were not available in English;
- were not primary research articles that underwent the peer-review process including
  - conference abstracts, posters, letters to the editor, or reply letters;
  - systematic reviews, narrative reviews, or meta-analyses;
- reported only composite outcome measures for "severe COVID-19"; and
- did not report an adjusted results; and
- reported data from the same population as examined in another study (in these cases, the study with the larger study population or longer study period was maintained in the analysis).

B.3. Evidence Review: COPD and Severe COVID-19

B.3.a. Strength & Direction of Evidence

Table 2. The Association between COPD and Severe COVID-19 Outcomes

Outcome	Results
Mortality	The evidence from sixty-five studies[1-65] indicates that COPD is associated with an increase in mortality in COVID-19 patients. All sixty-five studies[1-65] were found to have a moderate threat to internal validity . • Strength of Association: Sixty-three studies reported adjusted measures of association ranging from aHR 0.167 (95% CI: NR) to aHR 16.58 (95% CI: 3.1-88.7). • Precision of Association: Of the sixty-one studies reporting confidence intervals, twenty-two studies reported confidence intervals that included the null. • Consistency of Association: The evidence is consistent in the direction of increased mortality. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Fifty-two studies (N=16,906,657) [forty-five cohort studies,[3-5,8,9,12,14,16,19,21-31,33,34,37-40,44,46-55,57,59-64] four case-control studies,[1,7,13,35] one case series study,[65] one cross-sectional study,[56] and one modeling study][20] indicate or suggest that underlying COPD or chronic bronchitis is associated with an increase in mortality in patients with COVID-19 and report adjusted measures of association ranging from aOR 1.11 (95% CI: 0.73-1.69) to aHR 16.58 (95% CI: 3.1-88.7). One cohort study[38] (N=1,075) reported an increase in the adjusted hazard of underlying chronic bronchitis among COVID-19 patients who died compared to those who survived [aHR: 2.19 (95% CI: 1.53-3.15), p=0.03]. o Nineteen studies[7,8,13,19,20,25,27,33,35,39,40,47,48,50,56,57,59,61,64] reported wide confidence intervals and eleven studies[8,14,16,24,34,50,59,61,62,64,65] reported confidence intervals that included the null. One cohort study[38] reported a low number of patients with chronic bronchitis and four studies[25,33,39,64] reported a low number of patients with COPD. • Eight studies (N=1,150,927), seven cohort studies[2,17,18,36,41,42] and one ecological study,[45] reported adjusted measures of association ranging from aOR 0.92 (95% CI: 0.8-1.04) to aOR 1.09 (95% CI: 0.86-1.38), suggesting no association between underlying COPD and mortality in patients with COVID-19 and one cohort study[5] suggested no association between underlying emphysema and mortality in patients with COVID-19 [aOR: 1.01 (95% CI: 0.83-1.22), p=NR]. One ecological study[45] reported no association between US county-level COVID-19 case fatality rates and county-level, age adjusted mortality due to COPD.. o Six studies[2,5,36,41,42,45] reported confidence intervals that included the null, and one study[2] reported a wide confidence interval.

Outcome	Results
	• Six studies (N=9,107), three cohort studies,[6,15,58] one case-control study,[10] one cross-sectional study,[43] and one modeling study,[32] reported adjusted measures of association ranging from aHR 0.17 (95% CI: NR) to aHR 0.85 (95% CI: 0.43-1.67), suggesting a protective association between underlying COPD and mortality in patients with COVID-19. o All these studies reported confidence intervals that include the null, and one study[43] reported a wide confidence interval. One study[6] did not report a confidence interval and one study[15] only included patients living in nursing homes, further decreasing confidence in these results. One modeling study[32] reported that the multivariate model explained 38% of the variability in mortality; however, COPD's association with mortality was counterintuitively negative and the confidence interval was wide.
ICU Admission	The evidence from twenty-one studies[3-5,7-9,14,29,42,58,62,65-74] is inconsistent and inconclusive on the association between ICU admission and COPD in COVID-19 patients. Twenty studies[3-5,7-9,14,29,42,58,62,65-67,69-74] were found to have a moderate threat to internal validity, and one study[68]) was found to have a high threat to internal validity. • Strength of Association: Twenty-one studies reported adjusted measures of association ranging from aOR 0.22 (95% CI: 0.03-1.67) to aOR 31.8 (95% CI: 2.21-457.65). • Precision of Association: Of the twenty-one studies reporting confidence intervals, eight were wide, and thirteen studies reported confidence intervals that include the null. • Consistency of Association: The evidence is inconsistent in the direction of increased ICU admission. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Thirteen studies (N=755,719), nine cohort studies,[5,9,29,42,62,69,70,72,74] three case-control studies,[7,66,68] and one case series study,[65] reported adjusted measures of association ranging from aOR 1.12 (95% CI: 0.94-1.34) to aOR 31.8 (95% CI: 2.21-457.7), suggesting that underlying COPD is associated with an increase in ICU admission in patients with COVID-19, and one cohort study[4,5] also suggested no association between underlying emphysema and mortality in patients with COVID-19. Five studies[5,42,66,69,70] (N= 632,396) reporting data indicating that underlying COPD is associated with an increase in ICU admission in patients with COVID-19 reported an increased odds remained after adjustment for covariates. One cohort study[5] (N=89,530) reporting an odds ratio suggesting that underlying emphysema is associated with an increase in ICU admission in patients with COVID-19 reported an increased association remained after adjustment for obesity, diabetes, hypertension, heart failure, atherosclerotic heart disease, sex, and age as a continuous variable [aOR: 1.83 (95% CI: 1.56-2.16), p=NR]. o Six studies[7,62,68,70,72,74] reported wide confidence intervals and six studies[9,29,42,66,68,74] reported confidence intervals that include the null, decreasing confidence in these results. One study (Hu 2020) reported a low number of patients with COPD.

Outcome	Results
	• Two cohort studies[4,8] (N=4,682) reported no association between ICU admission and underlying COPD among COVID-19 patients. ▪ One study[4] (N=4,086) reported an adjusted measure of association suggesting no association between underlying COPD and ICU admission among COVID-19 patients when adjusting for age group, gender, and comorbidities [aOR: 1.1 (95% CI: 0.78-1.65), p=not significant]. ▪ One study[8] (N=596) reported an adjusted measure of association suggesting no association between underlying COPD and the odds of ICU admission in patients with COVID-19 after adjusting for age, gender, asthma, and obesity [aOR: 0.94 (95% CI: 0.39-2.2), p=0.89]. • Six cohort studies[3,14,58,67,71,73] (N=8,282,419) reported adjusted measures of association ranging from aOR 0.22 (95% CI: 0.03-1.67) to aHR 0.89 (95% CI: 0.68-1.17), suggesting a protective association between underlying COPD and ICU admission in patients with COVID-19. o Five studies[3,14,58,67,71] reported confidence intervals that include the null and one study (Fayol 2021) reported a wide confidence interval and a low number of patients with COPD, decreasing confidence in these results.
Intubation	The evidence from five studies[62,65,69,73,75] indicates that COPD is associated with an increase in intubation in COVID-19 patients. All five studies[62,65,69,73,75] were found to have a moderate threat to internal validity. • Strength of Association: Five studies reported adjusted measures of association ranging from aOR 0.61 (95% CI: 0.47-0.81) to aOR 2.21 (95% CI: 1.75-2.78). • Precision of Association: Of the five studies reporting confidence intervals, one study reported a wide confidence interval and one study reported a confidence interval that includes the null. • Consistency of Association: The evidence is consistent in the direction of increased intubation. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Four studies (N=218,777), three cohort studies[62,69,75] and one case series,[65] reported adjusted measures of association ranging from aOR 1.12 (95% CI: 0.96-1.31) to aOR 2.21 (95% CI: 1.75-2.78), suggesting that underlying COPD is associated with an increase in intubation in patients with COVID-19. One cohort study[69] (N=39,420) reported an odds ratio suggesting that underlying COPD is associated with an increase in intubation in patients with COVID-19 and noted that an increased association remained after adjustment for age, sex, and other systemic comorbidities. o One study[62] reported a wide confidence interval, and one study[75] reported a confidence interval that includes the null. • One cohort study[73] (N=17,122) suggests that underlying COPD is associated with a decrease in intubation among COVID-19 patients.

Outcome	Results
	▪ One study[73] (N=17,122) reporting an adjusted measures of association suggesting that underlying COPD is associated with a decrease in intubation in patients with COVID-19 reported a decreased association remained after adjustment for variables with a significance of <0.1 in the univariate analyses, age, and sex [aOR: 0.61 (95% CI: 0.47-0.81), p=0.001].
Ventilation	The evidence from four studies[42,73,76,77] indicates that COPD is associated with an increase in ventilation in COVID-19 patients. All four studies[42,73,76,77] were found to have a moderate threat to internal validity. • Strength of Association: Four studies reported adjusted measures of association ranging from aOR 1.26 (95% CI: 1.04-1.53) to aOR 1.9 (95% CI: NR). • Precision of Association: Of the four studies reporting confidence intervals, two were wide, and one study reported a confidence interval that includes the null. • Consistency of Association: The evidence is consistent in the direction of increased ventilation. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Four studies (N=20,946), three cohort studies[42,73,77] and one cross-sectional study,[76] reported adjusted measures of association ranging from aOR 1.26 (95% CI: 1.04-1.53) to aOR 1.9 (95% CI: NR), suggesting that underlying COPD is associated with an increase in ventilation in patients with COVID-19. Three studies[42,73,76] (N=2,863) reporting odds ratios suggesting that underlying COPD is associated with an increase in ventilation in patients with COVID-19 reported an increased association remained after adjustment for covariates. o One study[76] did not report confidence intervals, two studies[42,77] reported wide confidence intervals, and one study[42] reported a confidence interval that includes the null. Three studies (Jacobs, Marron, Song) defined ventilation as mechanical ventilation, while the other[73] included high-flow nasal cannula in addition to noninvasive mechanical ventilation.
Hospitalization	The evidence from nineteen studies[3,9,14,18,29,35,41,43,60,64,66,68,74,75,78-82] indicates that COPD is associated with an increase in hospitalization in COVID-19 patients. Eighteen studies[3,9,14,18,29,35,41,43,60,64,66,74,75,78-82] were found to have a moderate threat to internal validity and one[68] had a high threat to internal validity. • Strength of Association: Nineteen studies reported adjusted measures of association ranging from aRR 0.9 (95% CI: 0.7-1.4) to aOR 2.71 (95% CI: 2.49-2.94). • Precision of Association: Of the nineteen studies reporting confidence intervals, seven studies reported wide confidence intervals and eight studies reported confidence intervals that include the null. • Consistency of Association: The evidence is consistent in the direction of increased hospitalization. • Applicability of Association: The populations and settings were directly applicable to the question.

Outcome	Results
	Summary of Evidence: • Seventeen studies (N=10,326,048), twelve cohort studies,[3,9,14,18,29,41,60,74,75,79,81,82] one cross-sectional study,[43] and one modeling study,[78] reported adjusted measures of association ranging from aOR 1.19 (95% CI: 1.17-1.21) to aOR 2.71 (95% CI: 2.49-2.94), suggesting that underlying COPD is associated with an increase in hospitalization in patients with COVID-19. Three studies[3,35,82] (N=8,466,520) reporting odds or hazard ratios suggesting that underlying COPD is associated with an increase in hospitalization in patients with COVID-19 reported an increased association remained after adjustment for covariates. ○ Six studies[35,43,68,74,79,81] reported wide confidence intervals and six studies[60,74] reported confidence intervals that include the null, decreasing confidence in these results. • Two cohort studies[64,80] (N=6,302) reported adjusted measures of association suggesting no association between underlying COPD and hospitalization among COVID-19 patients. ▪ One study[80] (N=5,416) reported no association between underlying COPD and hospitalization among COVID-19 patients when adjusting for age, sex, and race/ethnicity [aRR: 0.9 (95% CI: 0.7-1.4), p=NR]. The study reported a confidence interval that included the null, decreasing confidence in the findings. ▪ One study[64] (N=886) reported no association between underlying COPD and hospitalization among COVID-19 patients when adjusting for time from local outbreak, state, date of infection diagnosis, age, sex, comorbidities, and nursing home residency [aOR: 0.973 (95% CI: 0.145-6.548), p=NR]. The study reported a wide confidence interval that included the null and a low number of patients with COPD, decreasing confidence in the findings.
Non-Elective Readmission	The evidence is inconclusive on the association between non-elective readmission and underlying COPD among COVID-19 patients. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[83] (N=7,137) suggests COPD is associated with an increase in non-elective readmission among COVID-19 patients. ▪ One cohort study[83] (N=7,137) reported an adjusted measure of association suggesting that underlying COPD is associated with an increase in non-elective readmission among patients with COVID-19 when adjusting for age, Charlson Comorbidity Index score, diabetes, COPD, asthma, solid neoplasia, hypertension, dementia, duration of symptoms before admission, hemoglobin level and platelet count at admission, ground-glass infiltrate at admission, acute cardiac injury, acute kidney failure, and glucocorticoid treatment [aOR: 1.84 (95% CI: 1.26-2.69), p=0.002]. The study reported a wide confidence interval, decreasing confidence in the findings.

Table 3. The Association between COPD Diagnosed Using Lung Function Tests and Severe COVID-19 Outcomes

Outcome	Results
Mortality	The evidence from three studies[8,13,42]) is inconsistent and inconclusive on the association between mortality and underlying COPD among COVID-19 patients. All three studies[8,13,42] were found to have a moderate threat to internal validity. • Strength of Association: Three studies reported adjusted measures of association ranging from aHR 1 (95% CI: 0.5-2.1) to aOR 2.8 (95% CI: 1.5-5.3). • Precision of Association: Two studies reported wide confidence intervals and two studies reported confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Three cohort studies[8,13,42] (N=2,373) reported data that were inconsistent and inconclusive on the association between underlying COPD and mortality among COVID-19 patients. ▪ One cohort study[8] (N=596) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting an increased association between underlying COPD and the odds of mortality among COVID-19 patients after adjusting for age, gender, asthma, cardiopathy, and immunosuppressive disease. This study reported a wide confidence interval that included the null, decreasing confidence in these results. ▪ One cohort study[13] (N=1,200) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting an increased association between underlying COPD and the odds of mortality among COVID-19 patients after adjusting for age, gender, and other comorbidities. This study reported a wide confidence interval, decreasing confidence in these results. ▪ One cohort study[42] (N=577) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting no association between underlying COPD and the hazard of mortality in patients with COVID-19 after adjusting for age, chronic kidney disease, malignancy, oxygen support via low-flow nasal cannula, oxygen support via high-flow nasal cannula. This study reported a confidence interval that includes the null, decreasing confidence in these results.
ICU Admission	The evidence from two studies[8,42] is inconsistent and inconclusive on the association between ICU admission and underlying COPD among COVID-19 patients. Both studies[8,42] were found to have a moderate threat to internal validity.

Outcome	Results
	• Strength of Association: Two studies reported adjusted measures of association aOR 0.94 (95% CI: 0.39-2.2) and aHR 1.39 (95% CI: 0.86-2.25). • Precision of Association: Of the two studies reporting confidence intervals, both reported confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Two cohort studies[8,42] (N=1,173) reported data that were inconsistent and inconclusive on the association underlying COPD and ICU admission among COVID-19 patients. ▪ One study[42] (N=577) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting an increased association between underlying COPD and the odds of ICU admission in patients with COVID-19 after adjusting for age, serum Cr, ALC<1.0 K/mm3, coronary artery disease, congestive heart failure, and hypertension. This study reported a confidence interval that includes the null, decreasing confidence in the results. ▪ One study[8] (N=596) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting no association between underlying COPD and the odds of ICU admission in patients with COVID-19 after adjusting for age, gender, asthma, and obesity. This study reported a confidence interval that includes the null, decreasing confidence in the results.
Ventilation	The evidence is inconclusive on the association between underlying COPD and ventilation among COVID-19 patients. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[42] (N=577) suggested COPD is associated with an increase in ventilation among COVID-19 patients. ▪ One study[42] (N=577) used lung function tests to ascertain COPD and reported an adjusted measure of association suggesting an increased association between underlying COPD and the hazard of mechanical ventilation in patients with COVID-19 after adjusting for age, oxygen support, active smoking, former smoking, coronary artery disease, congestive heart failure, and hypertension. This study reported a confidence interval that includes the null, decreasing confidence in the results.

Table 4. Severity of Underlying COPD Examined for Association with Severe COVID-19 Outcomes

Outcome	Results
Mortality	The evidence from three studies[84-86] is inconsistent and inconclusive on the association between mortality and severity of underlying COPD among COVID-19 patients. All three studies[84-86] were found to have a moderate threat to internal validity. • Strength of Association: Three studies reported adjusted measures of association ranging from aOR 0.69 (95% CI: 0.33-1.5) to aOR 3.06 (95% CI: 1.14-8.2). • Precision of Association: Of the three studies reporting confidence intervals, two studies reported wide confidence intervals and all three studies reported confidence intervals that include the null. • Consistency of Association: Results are inconsistent. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • One cohort study[85] (N=4,066) reported an adjusted measure of association suggesting that severe COPD is associated with an increased odds of mortality among COVID-19 patients compared to COVID-19 patients without COPD. ▪ One study[85] (N=4,066) reported an increase in the adjusted odds of mortality among those with severe COPD compared with no COPD [aOR: 3.06 (95% CI: 1.14-8.2), p=0.026], and no association among those with mild COPD compared to no COPD [aOR: 1.1 (95% CI: 0.42-2.89), p=0.851] when adjusting for age, sex, income, obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, CCI scores, number of NSAIDs used, number of steroids used, hypertension, and asthma. Severe COPD was defined as having a history of systemic corticosteroid use within the previous two years and mild COPD was defined as no history of systemic corticosteroid use within the previous two years. This study reported a wide confidence interval. • Two cohort studies[84,86] (N=5,898) reported adjusted measures of association suggesting a decrease in mortality among patients with severe COPD and COVID-19. ▪ One study[86] (N=4,610), which defined severe COPD as two or more COPD exacerbations and prescription of ICS, LABA, and LAMA, PDE-4 inhibitors, or low-dose macrolides during the study period, reported a decreased odds of mortality when comparing patients with severe COPD to patients with non-severe COPD after adjustment for age, sex, severity of COPD, medication possession ratio, and number of exacerbations [aOR: 0.82 (95% CI: 0.19-3.39), p=NR]; however, this study reported a wide confidence interval that included the null. ▪ One study[84] (N=1,288), which defined severe COPD as oral corticosteroid use in the prior year and non-severe COPD as no oral corticosteroid use in the prior year, reported a decreased odds of mortality when comparing patients with severe COPD to patients with non-severe COPD after adjustment for gender, race, age, smoking status, comorbidities,

Outcome	Results
	and month of COVID positivity [aOR: 0.69 (95% CI: 0.33-1.5), p=NR]; however, this study reported a confidence interval that included the null.
ICU Admission	The evidence is inconclusive on the association between ICU admission and severe COPD among COVID-19 patients. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) reported an adjusted measure of association suggesting that severe COPD is associated with an increased odds of ICU admission among COVID-19 patients compared to COVID-19 patients with non-severe COPD. ▪ One cohort study[84] (N=1,288), which defined severe COPD as oral corticosteroid use in the prior year and non-severe COPD as no oral corticosteroid use in the prior year, reported an increased odds of ICU admission when comparing patients with severe COPD to patients with non-severe COPD after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID positivity [aOR: 1.52 (95% CI: 0.92-2.64), p=NR]. However, the study reported a confidence interval that included the null.
Ventilation	The evidence is inconclusive on the association between ventilation and severe COPD among COVID-19 patients. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) reported an adjusted measure of association suggesting that severe COPD is associated with an increased odds of mechanical ventilation among COVID-19 patients compared to COVID-19 patients with non-severe COPD. ▪ One cohort study[84] (N=1,288), which defined severe COPD as oral corticosteroid use in the prior year and non-severe COPD as no oral corticosteroid use in the prior year, reported an increased odds of mechanical ventilation when comparing patients with severe COPD to patients with non-severe COPD after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID positivity [aOR: 2.1 (95% CI: 0.91-5.77), p=NR]. However, the confidence intervals were wide and included the null, decreasing confidence in these results.
Hospitalization	The evidence is inconclusive on the association between hospitalization and severe COPD among COVID-19 patients. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) reported an adjusted measure of association suggesting that severe COPD is associated with an increased odds of hospitalization among COVID-19 patients compared to COVID-19 patients with non-severe COPD. ▪ One cohort study[84] (N=1,288), which defined severe COPD as oral corticosteroid use in the prior year and non-severe COPD as no oral corticosteroid use in the prior year, reported an increased odds of hospitalization when comparing

Outcome	Results
	patients with severe COPD to patients with non-severe COPD adjustment for gender, race, age, smoking status, comorbidities, and month of COVID positivity [aOR: 1.54 (95% CI: 1.1-2.19), p=NR].

Table 5. The Association between COPD Risk Factors or Risk Markers and Severe COVID-19 Outcomes

Outcome	Results
Mortality	The evidence from two studies is suggestive of a higher risk of mortality among females with COPD than males with COPD[28,52] among COVID-19 patients with underlying COPD. The evidence from one study is insufficient to determine an association between mortality and age[52] or race or ethnicity[41] among COVID-19 patients with underlying COPD. All three studies[28,41,52] were found to have a moderate threat to internal validity. • Strength of Association: Three studies reported adjusted measures of association ranging from aOR 0.85 (95% CI: 0.43-1.59) to aOR 5.74 (95% CI: 5.09-6.49). • Precision of Association: Of the three studies reporting confidence intervals, one study reported wide confidence intervals and one study reported confidence intervals that include the null. • Consistency of Association: The evidence is consistent for sex. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • One cohort study[52] (N=31,526) reported data suggesting an increase in mortality with increasing age among COVID-19 patients with underlying COPD. ▪ One cohort study[52] (N=31,526) reported an increased adjusted odds of mortality among COVID-19 patients aged 65-79 years with underlying COPD compared to patients aged 40-69 years [aOR: 2.44 (95% CI: 2.19-2.71), p<0.0001]. This study reported the adjusted odds of mortality more than doubled when comparing patients aged ≥ 80 years to patients 40-64 years, suggesting an increase in mortality with increasing age among COVID-19 patients with underlying COPD [aOR: 5.74 (95% CI: 5.09-6.49), p<0.0001]. This study excluded patients under 40 years old. • Two cohort studies[28,52] (N=6,983,966) reported data suggesting an increase in mortality among female COVID-19 patients with underlying COPD when compared to male COVID-19 patients with underlying COPD. ▪ One cohort study[28] (N=6,952,440) reported data suggesting COPD is associated with a slightly greater adjusted hazard of mortality among female COVID-19 patients [aHR: 1.31 (95% CI: 1.19-1.44), p=NR] than among male COVID-19 patients [aHR: 1.22 (95% CI: 1.12-1.33), p=NR] when adjusting for race/ethnicity, age, body mass index, and other comorbidities in unvaccinated patients with a SARS-CoV-2 positive test.

Outcome	Results
	▪ One cohort study[52] (N=31,526) reported data suggesting COPD is associated with an increased adjusted odds of mortality among female COVID-19 patients with COPD [aOR 1.62 (95% CI 1.36 – 1.95), p = NR] but not male patients with COPD [aOR 1.14 (95% CI 0.97 – 1.34) p = NR]. This study adjusted for unclear clinical and demographic factors and excluded patients under 40 years old. • One cohort study[41] (N=11,930) was insufficient to determine an association between mortality and ethnicity in patients with COPD and COVID-19. ▪ One study[41] (N=11,930) reported data suggesting the adjusted odds of mortality was greatest for non-Hispanic-Asian COVID-19 patients with underlying COPD [aOR: 1.45 (95% CI: 0.66-3.1), p=0.348]; however, this study reported wide, overlapping confidence intervals that included the null, reducing confidence in these results and suggesting no conclusion on the association between mortality and ethnicity.
ICU Admission	The evidence is inconclusive on the association between ICU admission and race or ethnicity among COVID-19 patients with underlying COPD. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[87] (N=5,190) was insufficient to determine an association between mortality and ethnicity in patients with COPD and COVID-19. ▪ One cohort study[87] (N=5,190) reported data suggesting a decrease in the odds of ICU admission for Latinx [aOR: 0.31 (95% CI: 0.13-0.73), p=statistically significant] and Black [aOR: 0.83 (95% CI: 0.28-2.42), p=NR] COVID-19 patients with COPD when adjusting for age, gender, baseline comorbidities, and socioeconomic status. This study also reported data suggesting no association between being White [aOR: 1.03 (95% CI: 0.61-1.75), p=NR] and ICU admission among COVID-19 patients with underlying COPD when adjusting for age, gender, baseline comorbidities, and socioeconomic status. The study reported a wide confidence interval that included the null, decreasing confidence in the data.
Hospitalization	The evidence from four studies[28,41,81,87] is inconsistent and inconclusive on the association between hospitalization and race or ethnicity among COVID-19 patients with COPD. All four studies[28,41,81,87] were found to have a moderate threat to internal validity. • Strength of Association: Four studies reported adjusted measures of association ranging from aOR 0.59 (95% CI: 0.28-1.28) to aOR 4.34 (95% CI: 2.42-7.77). • Precision of Association: Of the four studies reporting confidence intervals, two studies reported wide confidence intervals and two studies reported confidence intervals that include the null. • Consistency of Association: The evidence is inconsistent. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence:

Outcome	Results
	• Two cohort studies[28,81] (N=6,958,152) examining hospitalization, reported the adjusted measures of association for underlying COPD in women is greater than the adjusted measure of association among men or the general population. ▪ One cohort study[81] (N=5,712) reported an adjusted measure of association suggesting COPD is associated with an increased hazard of hospitalization among female COVID-19 patients when adjusting for age and race/ethnicity [aOR: 4.34 (95% CI: 2.42-7.77), p≤0.001]. This measure of association is higher than what is seen in the overall population [aOR: 2.59 (95% CI: 1.67-4.02), p≤0.001]. ▪ One cohort study[28] (N=6,952,440) reported data suggesting COPD is associated with a slightly greater adjusted hazard of hospitalization among female COVID-19 patients [aHR: 1.24 (95% CI: 1.10-1.40), p=NR] than among male COVID-19 patients [aHR: 1.18 (95% CI: 1.06-1.33), p=NR] when adjusting for race/ethnicity, age, body mass index, and other comorbidities in unvaccinated patients with a SARS-CoV-2 positive test. • Three cohort studies[41,81,87] (N=22,832) reported data that were inconsistent and inconclusive on the association between hospitalization and ethnicity among COVID-19 people with underlying COPD. ▪ One cohort study[87] (N=5,190) reported data suggesting the adjusted odds of hospitalization was higher for White COVID-19 people [aOR1: 1.20 (95% CI: 0.86-1.67), p=NR] than for Black [aOR1: 1.05 (95% CI: 0.55-1.99), p=NR]; or Latinx people [aOR1: 1.06 (95% CI: 0.65-1.73), p=NR] when adjusting for age, gender, baseline comorbidities, racial and ethnic background, and socioeconomic status. However, this study reported wide, overlapping confidence intervals that included the null, reducing confidence in these results. ▪ One cohort study[81] (N=5,712) reported data suggesting the adjusted odds of hospitalization was similar in magnitude for Black [aOR: 2.53 (95% CI: 1.24-5.16), p≤ 0.05] and White [aOR: 2.49 (95% CI: 1.38-4.49), p≤0.05] people with COVID-19 and underlying COPD; however, this study reported wide, overlapping confidence intervals, reducing confidence in these results. ▪ One cohort study[41] (N=11,930) reported data on people with COVID-19 and COPD suggesting the adjusted odds of hospitalization was higher for non-Hispanic-Asian people [aOR: 3 (95% CI: 0.55-26.6), p=0.26] than it was for non-Hispanic-Black [aOR: 1.89 (95% CI: 0.77-4.74), p=0.17], non-Hispanic-White [aOR: 2.7 (95% CI: 1.28-5.71), p=0.009], or Hispanic [aOR: 0.59 (95% CI: 0.28-1.28), p=0.17] people when adjusting for age, sex, race/ethnicity, clinical characteristics, BMI, smoking status, neighborhood deprivation index, hospital site, and insurance type. This study reported wide, overlapping confidence intervals that included the null, reducing confidence in these results.

Table 6. Treatment for Underlying COPD Examined for Association with Severe COVID-19 Outcomes

Health Condition	Results
Mortality	The evidence from two studies[13,84] suggests that inhaled corticosteroid (ICS) treatment may be associated with a decrease in mortality among COVID-19 patients with underlying COPD. Both studies[13,84] were found to have a moderate threat to internal validity. • Strength of Association: Two studies reported adjusted measures of association aOR 0.75 (95% CI: 0.24-2.33) and aOR 0.8 (95% CI: 0.43-1.49). • Precision of Association: Of the two studies reporting confidence intervals, one study reported a wide confidence interval and both studies reported confidence intervals that include the null. • Consistency of Association: The evidence is consistent in the direction of decreased mortality. • Applicability of Association: The populations and settings were directly applicable to the question. Summary of Evidence: • Two cohort studies[13,84] (N=2,488) reported adjusted measures of association suggesting that ICS treatment for COPD is associated with a decrease in the odds of mortality among COVID-19 patients with underlying COPD. ▪ One cohort study[84] (N=1,288) suggested no association between ICS treatment and the odds of mortality among COVID-19 patients with underlying COPD. However, after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID-19 positivity, the study suggested a decrease in the odds of mortality [aOR: 0.8 (95% CI: 0.43-1.49), p=NR]. The confidence interval included the null, decreasing confidence in these results. ▪ One cohort study[13] (N=1,200) reported an adjusted measure of association suggesting that ICS treatment for COPD is associated with a decrease in the odds of mortality among COVID-19 patients with underlying COPD after adjustment for age, gender, and other comorbidities [aOR: 0.75 (95% CI: 0.24-2.33), p=0.619]. However, this study reported a wide confidence interval that included the null.
ICU Admission	The evidence is inconclusive on the association between ICU admission and ICS treatment among COVID-19 patients with underlying COPD. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) suggests ICS treatment is associated with an increase in ICU admission among COVID-19 patients with underlying COPD. ▪ One cohort study[84] (N=1,288) reported that ICS treatment is associated with an increase in the odds of ICU admission among COVID-19 patients with underlying COPD after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID-19 positivity [aOR: 1.31 (95% CI: 0.82-2.1), p=NR]. However, the confidence intervals included the null, decreasing confidence in these results.

Health Condition	Results
Ventilation	The evidence is inconclusive on the association between ventilation and ICS treatment among COVID-19 patients with underlying COPD. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) suggests ICS treatment is associated with an increase in mechanical ventilation among COVID-19 patients with underlying COPD. ▪ One cohort study[84] (N=1,288) reported data suggesting that ICS treatment is associated with an increase in the odds of mechanical ventilation among COVID-19 patients with underlying COPD after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID-19 positivity [aOR: 1.65 (95% CI: 0.69-4.02), p=NR]. However, the confidence intervals were wide and included the null, decreasing confidence in these results.
Hospitalization	The evidence is inconclusive on the association between hospitalization and ICS treatment among COVID-19 patients with underlying COPD. Aggregation indices cannot be measured with only one study which was found to have a moderate threat to internal validity. • One cohort study[84] (N=1,288) suggests ICS treatment is associated with an increase in hospitalization among COVID-19 patients with underlying COPD. ▪ One cohort study[84] (N=1,288) reported data suggesting that ICS treatment is associated with an increase in the odds of hospitalization among COVID-19 patients with underlying COPD after adjustment for gender, race, age, smoking status, comorbidities, and month of COVID-19 positivity [aOR: 1.12 (95% CI: 0.9-1.38), p=NR]. However, the confidence intervals included the null, decreasing confidence in these results.

B.3.b. Extracted Evidence

Table 7. Extracted Studies Reporting the Association between COPD and Severe COVID-19 Outcomes

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Ahlstrom[1] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CS	**Population:** N=9905n=1981 patients N=7924 age and sex matched controls **Setting:** ICU	**Medical Condition, n/N (%):** COPD: 75/1981 (3.8%) **Control/Comparison group, n/N (%):** *For mortality outcomes:* No COPD: 1906/1981 (96.2%) *For ICU admission outcomes:*	**Medical Condition(s):** *COPD:* ICD-10 code J41.x-J44.x reported in medical record in preceding 5 years unless stated otherwise **Severity Measure(s**): NR **Clinical marker:** NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio for combined comorbidities and medications model* *aOR: Multivariable Logistic Regression for combined comorbidities and medications model* *Mortality, n/N (%):* COPD:

Study	Population and Setting	Intervention	Definitions	Outcomes
Study design: Case-control **Study Objective:** To explore the role of relevant comorbidities and medications in relation to the risk of ICU admission and mortality. **IVA Score:** 25 (moderate)	**Location:** Sweden **Study dates:** March 6 - May 27, 2020 **Inclusion criteria:** All Swedish general ICUs report ICU cases to the Swedish Intensive Care Registry (SIR) and all coronavirus infected ICU patients to the SIRs sub registry, the Influenza and Virus Infection Registry (SIRI). The reporting of COVID-19 mandates a positive PCR test to SARS-CoV-2. Cases had at least one COVID-19 registration in the SIRI until data acquisition on May 27, 2020. Four age- and sex-matched controls per patient were drawn from the Population Statistics. Age matching was performed as close to ICU admission	No COPD: 146/7924 (1.8%)	**Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* died in ICU *ICU admission:* COVID-19 patients admitted to ICU *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• aHR: 1.74 (95% CI: 1.05-2.88), p=0.032 • Died: 19/346 (5.5%) • Alive: 37/1198 (3.1%) • p=0.048 *ICU admission:* COPD: • aOR: 1.32 (95% CI: 0.96-1.82), p=0.091 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	as possible, based on the participants age on January 31, 2020. Cases could not become controls and controls could not be selected twice. **Exclusion criteria:** Aged <18 years or the absence of a Swedish personal identification number.			
Author: Arslan[2] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To investigate the broad range of factors related to fatality rate in COVID-19 cases. **IVA Score:** 23 (Moderate)	**Population:** N=767 **Setting:** Covid clinics of a training and research hospital **Location:** Turkey **Study dates:** March 18 – May 15, 2020 **Inclusion criteria:** All the patients referred for COVID-19 disease (verified by RT-PCR or having relevant anamnesis, clinical symptoms and signs of typical pulmonary CT imaging even if RT-	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 43/767 (5.6%) **Control/Comparison group, n/N (%):** No COPD: 724/767 (94.4%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included: NR* *Mortality, n/N (%):* COPD: • aOR: 0.972 (95% CI: 0.32-3.03); p=0.972 • Non-survived: 12/59 (20.3%) • Survived: 31/708 (4.4%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	PCR is negative) and hospitalized in the Covid Clinics of the study hospital. **Exclusion criteria:** NR			
Author: Aveyard[3] _ENREF_1 **Year:** 2021 **Data Extractor:** TR **Reviewer:** DOS **Study design:** Retrospective cohort study **Study Objective:** To assess whether chronic lung disease or use of inhaled corticosteroids (ICS) affects the risk of contracting severe COVID-19. **IVA Score:** 23 (moderate)	**Population:** N= 8,256,161 **Setting:** 1,205 general practices **Location:** England, UK **Study dates:** January 24, 2020-April 30, 2020 **Inclusion criteria:** All patients aged 20 years and older registered with one of the 1,205 general practices in England contributing to the QResearch database (version 44, uploaded March 23, 2020) were included in this population cohort study. Data were linked to Public Health England's database of SARS-	**Medical Condition, n/N (%):** COPD: 193,520/8,256,161 (2.3%) **Control/Comparison group, n/N (%):** COPD: 8,062,641/8,256,161 (97.7%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* confirmed or suspected COVID-19 (ICD-10 codes U07.1 and U07.2) on the death certificate, including deaths in and out of hospital *ICU admission: a*dmission to an ICU with severe COVID-19 (ICD-10 code U07.1 or U07.2) in Intensive Care National Audit and Research Centre (ICNARC) records *Intubation:* NR *Ventilation:* NR *Hospitalization:* positive test for SARS-CoV-2 and appearing in the Hospital Episode Statistics dataset as an in-patient within 30 days of that test or having an International Classification of Diseases (ICD)-10 code U07.1 for confirmed COVID-19 or U07.2 for suspected COVID-19 *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio for all other respiratory diseases, ethnicity, socioeconomic status, region of England, body-mass index, smoking status, non-smoking-related illness (hypertension, type 1 diabetes, chronic liver disease, chronic neurological disease) and smoking-related illness (coronary heart disease, stroke, atrial fibrillation, type 2 diabetes, chronic kidney disease)* *HR: Hazard Ratio* *Mortality, n/N (%):* COPD: • aHR: 1.54 (95% CI: 1.42-1.67) • HR: 6.66 (95% CI: 6.19-7.18) • COPD: 811/193,520 (0.4%) *ICU admission, n/N (%):* COPD: • aHR: 0.89 (95% CI: 0.68-1.17) • HR: 1.68 (95% CI: 1.29-2.18) • COPD: 59/193,520 (<0.1%) *Hospitalization, n/N (%):* COPD: • aHR: 1.54 (95% CI: 1.45-1.63) • HR: 5.09 (95% CI: 4.83-5.36) • COPD: 1,555/193,520 (0.8%) **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	CoV-2 testing and English hospital admissions, ICU admissions, and deaths for COVID-19. **Exclusion criteria:** NR			**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NA **Long-term Sequelae:** NR
Author: Beatty[4] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To characterize the epidemiology of COVID-19 hospitalized patients in wave 1 of the COVID-19 pandemic in Ireland and identify factors independently associated with adverse outcomes, specifically long length of stay, ICU admission and in hospital mortality. **IVA Score:** COPD: 23 (moderate)	**Population:** N=4,086 **Setting:** All public acute hospitals **Location:** Ireland **Study dates:** February 29 – July 31, 2020 **Inclusion criteria:** Hospital Inpatient Enquiry (HIPE) record national dataset, including COVID-19 discharge episodes admitted during the study dates; COVID-19-related discharge were defined by the presence of ICD-10-AM codes U07.1, B34.2, or B97.2.	**Medical Condition, n/N (%):** COPD: 338/4,086 (8.3%) **Control/Comparison group, n/N (%):** No COPD: 3,748/4,086 (91.7%)	**Medical Condition(s):** COPD: ICD-10 codes J44.1-J44.9 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in hospital mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions:* NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; adjusted for age group, gender, and comorbidities* *Mortality, n/N (%):* COPD • aOR: 1.5 (95% CI: 1.16-2.01), p=0.002 *ICU Admission, n/N (%):* COPD • aOR: 1.1 (95% CI: 0.78-1.65), p=not significant **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Records with admission dates prior to the date of Ireland's first confirmed case of COVID-19 (February 29, 2020) and records with an admission date between July 31 and August 10, 2020.			
Author: Beltramo[5] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To describe and compare chronic respiratory diseases (CRD) in hospitalized patients suffering from COVID-19 or influenza (2018-2019 season), and to describe and compare respiratory complications for COVID-19 patients with CRD to COVID-19 patients without CRD and to influenza patients.	**Population:** N= 89,530 COVID-19 patients **Setting:** Public and private hospitals **Location:** France **Study dates:** COVID-19 cohort: March 1 - April 30, 2020 **Inclusion criteria:** For the COVID-19 cohort, all patients hospitalized for COVID-19 during the study dates were included and identified by the primary, related or associated diagnoses by the ICD-10 codes	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 4866/89,530 (5.44%) Emphysema: 1426/89,530 (1.59%) **Control/Comparison group, n/N (%):** No CRD: 75179/89530 (84.0%)	**Medical Condition(s):** *COPD*: ICD-10 J40, J41, J42, J44 *Emphysema*: ICD-10 J43, J982 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy, n/N (%):** NR **Outcome Definitions:** *Mortality:* in-hospital mortality during hospitalization *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** none	**Severe COVID-19:** *aOR: Adjusted odds ratio; adjusted for obesity, diabetes, hypertension, heart failure, atherosclerotic heart disease, sex, and age as a continuous variable OR: Odds ratio* *Mortality, n/N (%):* COPD: • aOR: 1.14 (95% CI: 1.06-1.22) • OR: 1.72 (95% CI: 1.61-1.84) • COPD: 1229/4886 (25.3%) • No CRD: 11222/75179 (14.93%) • p<0.05 Emphysema: • aOR: 1.01 (95% CI: 0.83-1.22) • OR: 1.18 (95% CI: 0.99-1.42) • Emphysema: 312/1426 (21.8%) • No CRD: 11222/75179 (14.93%) *ICU admission, n/N (%):* COPD: • aOR: 1.16 (95% CI: 1.07-1.26) • OR: 1.47 (95% CI: 1.37-1.58) • COPD: 986/4866 (20.6%) • No CRD: 12119/75179 (16.12%)

Study	Population and Setting	Intervention	Definitions	Outcomes
IVA Score: 23 (moderate)	U0710, U0711, U0712, U0714 or U0715, regardless of their age. Data obtained from the national Programme de Medicalisation des Systemes d'Information (PMSI) database. **Exclusion criteria:** NR			• p<0.05 Emphysema: • aOR: 1.83 (95% CI: 1.56-2.16) • OR: 2.09 (95% CI: 1.78-2.45) • Emphysema: 405/1426 (28.4%) • No CRD: 12119/75179 (16.12%) • p<0.05 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Bergman[66] **Year:** 2021 **Data Extractor:** DOS **Reviewer**: CS **Study design:** Case-control **Study Objective:** To investigate the importance of potential medical and demographic risk factors for COVID-19 diagnosis, hospitalization (with or without ICU admission), and subsequent all-cause	**Population:** N=502,656 **Setting:** Nationwide registries **Location:** Sweden **Study dates:** Up to mid-September 2020 **Inclusion criteria:** All cases of COVID-19 confirmed in Sweden until mid-September 2020. Reporting confirmed cases to is required by law. Control population	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 2,168/68,575 (3.2%) **Control/Comparison group, n/N (%):** COPD: 13,133/434,081 (3.0%)	**Medical Condition(s):** *COPD:* ICD9/10 J20, J40-J44, 491, 492 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* All-cause mortality until October 1, 2020 *ICU admission:* ICU hospitalization for confirmed COVID-19 (ICD-10 U071) *Intubation:* NR *Ventilation:* NR *Hospitalization:* non-ICU hospitalization with confirmed COVID-19 (ICD-10 U071) *Non-elective readmissions*: NR	**Severe COVID-19:** *aHR: Adjusted hazard ratio; cox regression; model included demographic variables, comorbidities, and prescription medications: Adjusted hazard ratio; cox regression; model included demographic variables, comorbidities, and prescription medications* *HR: Unadjusted hazard ratio* *aOR: Adjusted odds ratio; multinomial logistic regression; model included demographic variables, comorbidities, and prescription medications: Adjusted odds ratio; multinomial logistic regression; model included demographic variables, comorbidities, and prescription medications* *OR: Unadjusted odds ratio; univariable logistic regression* *ICU admission, n/N (%):* COPD: • aOR: 1.12 (95% CI: 0.94-1.34) • OR: 2.33 (95% CI: 1.99-2.73) • ICU admission: 169/2494 (6.8%)

Study	Population and Setting	Intervention	Definitions	Outcomes
mortality during the first wave of COVID-19. **IVA Score:** 25 (moderate)	comprised of random sample of 5 non-diagnosed individuals for each COVID-19 case. Each control was residing in Sweden on January 1, 2020, and was alive on January 31, 2020. **Exclusion criteria:** Persons were excluded if they had missing data on at least one of the included variables.		**Comments:** None	*Hospitalization, n/N (%):* COPD: • aOR: 1.37 (95% CI: 1.28-1.47) • OR: 4.21 (95% CI: 3.98-4.45) • Hospitalized: 1,578/13,589 (11.6%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Boari[6] **Year:** 2020 **Data Extractor:** DOS **Reviewer:** MW **Study design:** Retrospective design **Study Objective:** To simultaneously assess several potential predictors of outcome (comorbidity, previous and in-hospital treatment, Brixia score) in a relatively large population of patients	**Population:** N=258 **Setting:** Tertiary health-care center designated as a COVID-19 hub by health authorities **Location:** Italy **Study dates:** February 28 - April 3, 2020 All surviving patients were re-evaluated after discharge in July-August 2020 **Inclusion criteria:**	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 35/258 (13.6%) **Control/Comparison group, n/N (%):** No COPD: 223/258 (86.4%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Authors note: majority of patients admitted underwent standard therapy	**Severe COVID-19:** *aHR: Multivariable Cox proportional hazard model; model included age, COPD, previous treatment with ACE inhibitors, and previous treatment with steroids* *Mortality, n/N (%):* COPD: • aHR: 0.167; p=0.003 • Dead: 15/65 (23.1%) • Alive: 20/193 (10.4%) • p<0.001 • Kaplan-Meier Log Rank: p=0.004 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with interstitial pneumonia and respiratory failure due to SARS-CoV-2 related infection. Brixia score) in a relatively large population of patients with interstitial pneumonia and respiratory failure due to SARS-CoV-2 related infection. **IVA Score:** 23 (moderate)	Patients consecutively admitted to the Medicine ward during study period meeting the following criteria: 1) confirmed COVID-19 infection as determined by a positive RT-PCR assay of a specimen collected on a nasopharyngeal swab; 2) bilateral pulmonary interstitial opacities on chest imaging that were not fully explained by congestive heart failure or other forms of volume overload; 3) and an acute respiratory distress syndrome, showing at least one of the following conditions: respiratory rate ≥30 breaths min, SpO_2 ≤93% while breathing ambient air, or PaO_2/FiO_2 ≤300 mmHg.		(hydroxychloroquine 400 mg daily, lopinavir 800 mg daily plus ritonavir 200 mg per day).	**Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients with critical respiratory syndrome requiring mechanical or invasive ventilation at admission to Medical ward.			
Author: Caliskan[7] **Year:** 2020 **Data Extractor:** MW **Reviewer:** CS **Study design:** Case-control **Study Objective:** To explore the prevalence of smoking rates and comorbidities and evaluate the relationship between them and disease severity and mortality in inpatients with COVID-19. **IVA Score:** 23 (moderate)	**Population:** N= 813 n= 565 COVID-19+ n= 248 COVID-19- **Setting:** Research hospital **Location:** Turkey **Study dates:** March 15-May 10, 2020 **Inclusion criteria:** Adult patients (≥18 years old) diagnosed with COVID-19 by polymerase chain reaction (PCR) and whose COVID-19 diagnosis was based on clinical, laboratory, and radiological findings, especially with chest	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 37/565 (6.5%) **Control/Comparison group, n/N (%):** No COPD: 528/565 (93.4%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression* *Mortality, n/N (%):* COPD • aOR: 3.213 (95% CI: 1.224-8.431), p=0.018 • Non-survivors: 25/75 (33.3%) • Survivors: 12/490 (2.4%) • p<0.0001 *ICU Admission, n/N (%):* COPD • aOR: 2.775 (95% CI: 1.128-6.829), p=0.026 • ICU: 25/91 (27.5%) • Clinic: 12/474 (2.5%) • p<0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	computed tomography findings, despite COVID-19 PCR negativity. Non-COVID-19 patients who were hospitalized in the department of pulmonology due to diseases other than COVID-19 were included as the control group. **Exclusion criteria:** NR			
Author: Calmes[8] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JH/CNS **Study Design:** Cohort **Study Objective:** To determine if patients with asthma or chronic obstructive pulmonary disease (COPD) are at risk of experiencing an ICU admission and death as compared with nonobstructive patients. **IVA Score:** COPD: 24 (Moderate)	**Population:** N=596 **Setting:** University hospital **Location:** Belgium **Study dates:** March 18 – April 17, 2020 **Inclusion criteria:** Adult patients who were hospitalized between the study dates for COVID-19 which was confirmed by nasopharyngeal swab RT-PCR test, who had asthma, COPD, or no	**Medical Condition, n/N (%):** COPD: 46/596 (7.7%) **Control/Comparison group, n/N (%):** No history of obstructive pulmonary disease: 493/596 (82.7%)	**Medical Condition(s):** *COPD:* Diagnosis was done by a pulmonologist according to lung function tests, bronchodilation test, and methacholine concentration provoking a 20% fall in FEV1 if necessary **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* amongst hospitalized patients *ICU admission:* amongst hospitalized patients *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression (model included: age, gender, asthma, COPD, cardiopathy, and immunosuppressive disease)* *aOR2: Multivariable Logistic Regression (model included: age, gender, asthma, COPD, obesity)* *aOR3: Multivariable Logistic Regression (model included: age and gender)* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* COPD: • aOR1: 1.6 (95% CI: 0.80-3.3), p=0.18 • aOR3: 1.9 (95% CI: 0.95-3.8), p=0.071 • OR: 3.6 (95% CI: 1.9-6.9), p<0.0001 • COPD: 16/46 (34.8%) • No obstruction: 67/493 (13.6%) *ICU admission, n/N (%)* COPD: • aOR2: 0.94 (95% CI: 0.39-2.2), p=0.89 • aOR3: 1.1 (95% CI: 0.52-2.5), p=0.74 • OR: 1.4 (95% CI: 0.67-3.1), p=0.34

Study	Population and Setting	Intervention	Definitions	Outcomes
	obstruction present before COVID-19 diagnosis. **Exclusion criteria:** NR		**Comments:** None	• COPD: 9/46 (19.6%) • No obstruction: 69/493 (14.0%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Castilla[9] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To evaluate sociodemographic characteristics, chronic conditions and health-related variables as independent risk factors for confirmed infection, hospitalization, intensive care unit admission, and death from SARS-CoV-2 in the second epidemic surge. **IVA Score:**	**Population:** N = 643,757 COVID-19+ = 35,387 **Setting:** Community **Location:** Spain **Study dates:** July – December 2020 **Inclusion criteria:** People covered by the Navarre Health Service at least from July 2019, as well as children born in Navarre after this date. Confirmed COVID-19 cases were defined as patients who tested	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 1404/35,387 (4.0%) **Control/Comparison group, n/N (%):** No COPD: 33,983/35,387 (96.0%)	**Medical Condition(s):** *Asthma:* ND *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Deaths from SARS-CoV-2 infection during follow-up period of 30 days after infection diagnosis *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* Hospitalizations from SARS-CoV-2 infection during follow-up period of 30 days after diagnosis *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR1: Fully adjusted Relative Risk (model included sex, age, nursing home resident, healthcare worker, place of birth, place of residence, income level, smoking status, hospitalization in prior year, and comorbid conditions)* *aRR2: Relative Risk adjusted for age and sex* *Mortality, n/N (%):* *COPD:* • aRR1: 1.47 (95%CI: 1.12–1.91); p=0.005 • aRR2: 1.58 (95%CI: 1.22–2.05); p=0.001 • COPD: 69/1404 (4.9%) • No COPD: 397/33,983 (1.2%) *ICU admission, n/N (%):* *COPD:* • aRR1: 1.22 (95%CI: 0.78–1.92); p=0.386 • aRR2: 1.14 (95%CI: 0.73–1.78); p=0.559 • COPD: 22/1404 (1.6%) • No COPD: 224/33,983 (0.6%) *Hospitalization, n/N (%):* *COPD:*

Study	Population and Setting	Intervention	Definitions	Outcomes
COPD: 23 (Moderate)	positive for SARS-CoV-2 by real-time RT-PCR or antigen test in a respiratory tract sample. **Exclusion criteria:** People who had been confirmed for SARS-CoV-2 infection before July 2020, not covered by the health service, and were residing in the region <12 months.			• aRR1: 1.30 (95%CI: 1.11–1.51); p=0.001 • aRR2: 1.29 (95%CI: 1.11–1.50); p=0.001 • COPD: 195/1404 (13.9%) • No COPD: 1,885/33,983 (5.5%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Choi[10] **Year:** 2020 **Data Extractor:** JKK **Reviewer:** JH **Study Design:** Case-control **Study Objective:** To evaluate the potential benefits and harms associated with the use of inhaled corticosteroids (ICS) or other drugs for respiratory diseases among a large sample of individuals with and without COVID-19 who had detailed information	**Population:** N=7,341 **Setting:** Nationwide records for individuals in the Korean Health Insurance Review and Assessment (HIRA) database **Location:** Korea **Study dates:** January 2017 – May 15, 2020 **Inclusion criteria:** All individuals ≥18 years old and identified as	**Medical Condition, n/N (%):** COPD: 678/7,341 (9.2%) **Control/Comparison group, n/N (%):** No COPD: 6,663/7,341 (90.8%)	**Medical Condition(s):** *COPD*: diagnostic codes J41-J44 and the presence of at least one drug treatment for respiratory disease or oral corticosteroid (OCS) treatment for ≥30 days within 1 year before the index date; patients who fulfilled criteria for both COPD and asthma were classified as COPD cases **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *Inhaled Corticosteroids (ICS)*: users were defined as individuals with continued drug use for ≥30 days during the 1-year period before index date; nonusers were defined as individuals who had never received drugs or had received them for <30 days during the 1-year	**Severe COVID-19:** *aOR1: Multivariate Logistic Regression; adjusted for age, sex, region, Charlson Comorbidity Index, hospital type, conventional oxygen therapy, and high flow nasal cannula* *aOR2: Multivariate Logistic Regression; adjusted for age, sex, region, Charlson Comorbidity Index, and hospital type* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* COPD • aOR1: 0.83 (95% CI: 0.55-1.26), p=0.39 • aOR2: 0.95 (95% CI: 0.65-1.39), p=0.78 • OR: 3.78 (95% CI: 2.78-5.13), p<0.001 • Deceased: 60/678 (8.8%) • Survived: 618/678 (91.2%) **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
regarding comorbidities and prior medication exposures. **IVA Score:** COPD: 23 (moderate)	confirmed COVID-19 cases based on positive nasopharyngeal swab specimens that were tested using real-time RT-PCR assays. **Exclusion criteria:** NR		period before the index date; all doses for ICS were converted to fluticasone equivalents and the cumulative ICS dose was calculated during the 1-year period before the index date; all prescribed and dispensed medications were identified using Anatomical Therapeutic Chemical codes and HIRA general name codes **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* ECMO *Ventilation:* mechanical ventilation; high flow nasal cannula; conventional oxygen therapy *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Treatment/ Associated Therapy:** NA **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ciardullo[11] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To evaluate the impact of pre-existing diabetes on in-hospital mortality in patients admitted for COVID-19. **IVA Score:** 23 (Moderate)	**Population:** N=373 **Setting:** Community based hospital designated to treat patients with COVID-19 **Location:** Italy **Study dates:** February 22 – May 15, 2020 **Inclusion criteria:** All patients aged ≥ 18 years who were	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 39/373 (10.5%) **Control/Comparison group, n/N (%):** No COPD: 334/373 (89.5%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital death during study period *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *aRR1: adjusted relative risk (model included age, gender, comorbidities, and laboratory exams)* *aRR2: adjusted relative risk (model included age, gender, and comorbidities)* *Mortality, n/N (%):* COPD: • aRR1: 1.82 (95%CI: 1.13–2.35); p=0.019 • aRR2: 1.45 (95%CI: 0.94–1.95); p=0.084 • Deceased: 24/142 (16.9%) • Discharged: 15/231 (6.5%) • p=0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	admitted within the study dates and experienced either in-hospital death or discharge. COVID-19 cases were defined according to a positive result on real-time RT_PCR of nasopharyngeal or oropharyngeal swab specimens and/or clinically by the presence of typical signs and symptoms, exposure to known affective individuals, and radiographic findings consistent with interstitial pneumonia. **Exclusion criteria:** NR		**Comments:** Percentages reported in Table 1 are incorrect and were recalculated by review team.	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Corradini[12] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort	**Population:** N= 3,044 **Setting:** IMUs at 41 large tertiary referral hospital **Location:** Italy **Study dates:**	**Medical Condition, n/N (%):** COPD: 155/1,505 (10.3%) **Control/Comparison group, n/N (%):** No COPD: 1,350/1,505 (89.7%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital death	**Severe COVID-19:** *aOR: adjusted odds ratio (model included cerebrovascular disease, cardiovascular disease, chronic heart failure, atrial fibrillation, hyperlipidemia, COPD, chronic kidney disease, dementia, and in-hospital mortality)* *OR: Univariate Logistic Regression* *Mortality, n/N (%):* COPD: • aOR (95% CI): 1.17 (1.04-1.98), p=0.048

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To examine demographics, comorbidities, organ dysfunction, treatment, and outcomes in patients with COVID-19 admitted to and managed in Internal Medicine Units (IMUs). **IVA Score:** 20 (Moderate)	February 3 – May 8, 2020 **Inclusion criteria:** Adults ≥ 18 years with detection of SARS-CoV-2 nucleic acid by RT-PCR test via nasopharyngeal swab/ other biological specimens or an epidemiological diagnosis of COVID-19, based on typical clinical features of SARS-CoV-2 infection (cough, fever, shortness of breath, sudden onset of anosmia/ ageusia/ dysgeusia) in association with a positive serological test for SARS-CoV-2 or features compatible with COVID-19 at chest imaging (computed tomography, ultrasonography or radiography) who were admitted to participating IMU at referral		*ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• OR (95% CI): 1.23 (0.964-1.76), p=0.81 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	hospitals between study dates. **Exclusion criteria:** Patients with incomplete records after quality checks or missing data were excluded from the analysis.			
Author: Cosio[13] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Case-control **Study Objective:** To investigate the clinical characteristics and the role of therapies in consecutive patients with COPD with a respiratory-related hospital admission in Spain during the first outbreak wave of the COVID-19 pandemic and to evaluate the presence of COVID19 as a risk factor of mortality in this cohort. **IVA Score:** 24 (Moderate)	**Population:** N=2,101 N=1,200 COVID-19+ **Setting:** Four teaching hospitals **Location:** Spain **Study dates:** March 15 - April 30, 2020 **Inclusion criteria:** All cases who were admitted to hospital due to any respiratory worsening; COVID-19 was identified using a polymerase chain reaction test for SARS-CoV-2 in nasopharynx samples.	**Medical Condition, n/N (%):** COPD: 52/1,200 (4.3%) **Control/Comparison group, n/N (%):** No COPD: 1,148/1,200 (95.7%)	**Medical Condition(s):** *COPD: Diagnosed according to GOLD criteria that was confirmed by postbronchodilator airflow limitation (FEV1/FVC <0.7) using forced spirometry testing* **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** *Inhaled corticosteroids:* ND **Outcome Definitions:** *Mortality:* 30-day in-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression model included age, gender, and other comorbidities* *Mortality:* COPD • aOR: 2.8 (95%CI: 1.5–5.3); p=0.002 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality:* Inhaled corticosteroids • aOR: 0.75 (95%CI: 0.24-2.33); p=0.619 **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: NR			
Author: Cummins[14] **Year:** 2021 **Data Extractor:** CS **Reviewer:** MW **Study design:** Cohort study **Study Objective:** To identify risk factors associated with increased risk of hospitalization, intensive care unit (ICU) admission and mortality in inner Northeast London (NEL) during the first UK COVID-19 wave. **IVA Score:** 23 (moderate)	**Population:** N=1781 **Setting:** Hospital **Data source:** Secondary Uses Service hospital inpatient data **Location:** England **Study dates:** February 1-June 30, 2020 **Inclusion criteria:** Patients ≥ 16years old registered with a GP practice in the North East London area (Newham, Tower Hamlets and City and Hackney) with a confirmed diagnosis of COVID-19 **Exclusion criteria:** NR	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 145/1781 (8.1%) **Control/Comparison group, n/N (%):** No COPD: 1636/1781 (91.9%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression; included model variables: demographic and socioeconomic factors as well as obesity, smoking status and the 17 individual clinical factors as covariates* *Mortality, n/N (%):* COPD: • aOR: 1.11 (95%CI: 0.73-1.69); p=0.632 • Died: 57/400 (14.2%) *ICU Admission, n/N (%):* COPD: • aOR: 0.65 (95%CI: 0.27-1.60); p=0.351 • ICU: 6/152 (3.9%) *Hospitalization, n/N (%):* COPD: • aOR: 1.35 (95%CI: 0.85-2.15); p=0.209 • Hospitalized: 114/1195 (9.5%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** ND **Risk Markers:** ND **Long-term Sequelae:** NR
Author: De Vito[15] **Year:** 2021	**Population:** N= 382; COVID-19+, N=264	**Medical Condition, n/N (%):** COPD: 57/264 (21.9%) **Control/Comparison group, n/N (%):**	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio, model included male gender, hypertension, diabetes, COPD, neurological*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: MC **Reviewer:** JH/MW **Study Design:** Cohort **Study Objective**: To evaluate the spread of SARS-CoV-2 in all people living in Italian retirement nursing homes and identify the risk factor for infection occurrence, symptoms development, and death. **IVA Score:** 22 (Moderate)	**Setting:** 63 retirement nursing homes **Location**: Italy **Study dates:** April 9 - May 31, 2020 **Inclusion criteria:** People living in nursing homes where at least one SARS- CoV-2 infected person was diagnosed with real-time PCR on a nasopharyngeal swab who require low-level support, support in some activities, or with high dependence degree. **Exclusion criteria:** NR	No COPD: 207/264 (78.4%)	**Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Death from SARS-CoV-2 infection *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*syndrome, hypokinetic disease, autonomy, fever + dyspnea, Low Molecular Weight Heparin* *HR: Hazard Ratio* *Mortality, n/N (%):* COPD: • aHR: 0.85 (95% CI: 0.43-1.67), p=0.631 • HR: 1.81 (95% CI: 1.0-3.27), p=0.051 • Died: 18/56 (32.1%) • Survived: 39/208 (18.7%) • p=0.031 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Eshrati[16] **Year**: 2020 **Data Extractor**: CS **Reviewer**: DOS **Study design:** Retrospective cohort study	**Population**: 3188 Patients **Setting**: hospitals and medical centers under the supervision of the health department of Iran University of Medical Sciences	**Medical Condition, n/N (%):** Chronic pulmonary disease (COPD): 90/3188 (2.8%) **Control/Comparison group, n/N (%):** COPD: 3098/3188 (97.2%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker**: NR **Treatment/ Associated Therapy**: NR **Outcome Definitions:** *Mortality:* ND	**Severe COVID-19:** *aHR: Adjusted hazard ratio; multivariable cox regression [HR] (95% CI)* *Mortality, n/N (%):* COPD: • aHR: 1.51 (95% CI: 0.93-2.44), p=0.088 • COPD: 18/90 (20.0%) • No COPD: 311/3098 (10.0%) • p=0.002

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: to determine the factors affecting the survival rate and risk of death in Iranian patients with COVID-19 **IVA Score**: 23 (moderate)	**Location**: Iran **Study dates:** February 22-April 19, 2020 **Inclusion criteria**: consecutive hospitalized patients with RT-PCR positive or lung CT scan confirmed COVID-19 from February 22- March 25, 2020 **Exclusion criteria**: incomplete personal data, such as failure to disclose the date of discharge or hospitalization or other information		*ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments**: None	**Severity of Condition**: NR **Duration of Condition**: NR **Treatment/ Associated Therapy**: NR **Comorbid Conditions**: NR **Risk Markers:** NR **Long-term Sequelae**: NR
Author: Estiri[17] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study design**: Prospective cohort **Study Objective:** To predict risk of mortality	**Population:** N=16709 **Setting:** Medical system consisting of 10 hospital **Location:** MA, US **Study dates:** March 3 - November 10, 2020	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 910/16709 (5.4%) **Control/Comparison group, n/N (%):** No COPD: 15799/16709 (94.6%)	**Medical Condition(s):** *COPD:* ICD9 434.x, 436, 437.x, 438.x; ICD10 I63.x, I69.x, G46.x **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:**	**Severe COVID-19:** *aOR: Adjusted odds ratio from GLM boosting model; median over 10 model iterations; model included age, history of pneumonia, type 2 diabetes mellitus with complications, heart failure, chronic kidney disease, interstitial pulmonary disease, chronic obstructive pulmonary disease, pulmonary embolism, benign prostate hypertrophy, atrial fibrillation and flutter, hypertensive urgency or emergency, coronary artery disease, gout, lung neoplasm, history of a cerebrovascular accident, abdominal aortic aneurysm, cardiomegaly, and female: Adjusted odds ratio from GLM boosting model; median over 10 model*

Study	Population and Setting	Intervention	Definitions	Outcomes
and study risk factors for death across different age groups. **IVA Score:** 24 (moderate)	**Inclusion criteria:** EHR data from patients with a confirmed case for COVID-19 (confirmed PCR test) who had at least 1 year of medical history (i.e., a 1-year time difference between the first and last medical record before the COVID-19 positive PCR test) with medical system. Included data from beginning of electronic record (as far back as January 1, 2020) up to 14 days prior to the positive COVID-19 PCR test date. **Exclusion criteria:** NR		*Mortality:* from various data sources and included mortality unrelated to visit *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*iterations; model included age, history of pneumonia, type 2 diabetes mellitus with complications, heart failure, chronic kidney disease, interstitial pulmonary disease, chronic obstructive pulmonary disease, pulmonary embolism, benign prostate hypertrophy, atrial fibrillation and flutter, hypertensive urgency or emergency, coronary artery disease, gout, lung neoplasm, history of a cerebrovascular accident, abdominal aortic aneurysm, cardiomegaly, and female* *RR: Univariate relative risk* *OR: Univariate odds ratio* *Mortality, n/N (%):* COPD: • aOR: 1.024 (IQR: 0.021): 1.024 (IQR: 0.021) • RR: 4.77 (95% CI: 4.10-5.55) • OR: 5.70 (95% CI: 4.74-6.82) • Non-survivors: 179/830 (21.6%) • Survivors: 731/15,879 (4.6%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Experton[18] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** MW	**Population:** N=1,030,893 **Setting:** NR **Location:** US	**Medical Condition, n/N (%):** COPD: 241,478/1,030,893 (23.4%) **Control/Comparison group, n/N (%):** No COPD: 789,415/1,030,893 (76.6%)	**Medical Condition(s):** *COPD*: CMS code COPD_EVER **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression including ESRD, North American native, age, prior hospitalization, race, sex, comorbidities, income, housing, dual Medicare-Medicaid, treatment, and drug use; excluded history of colorectal and endometrial cancer, acute MI between July and December 2019, ischemic heart disease, hypertension, residence in zip*

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Design: Cohort **Study Objective:** To develop a model to predict COVID-19 hospitalization and death for Medicare beneficiaries using de-identified Medicare claims to optimize COVID-19 vaccine allocation in the higher-risk Medicare population. **IVA Score:** COPD: 23 (moderate)	**Study dates:** October 1, 2019 – November 22, 2020 **Inclusion criteria:** Medicare fee-for-service (FFS) beneficiaries who since January 1, 2020 either had a COVID-19 test or a COVID-19 diagnosis (identified by ICD-10 code U071 after April 1st), or for any medical reason were hospitalized or had an emergency department, urgent care, or telehealth visit. **Exclusion criteria:** NR		**Outcome Definitions:** *Mortality:* cases who died of SARS-CoV-2 infection during COVID-19 hospitalization or within 60 days of COVID-19 diagnosis *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* requiring inpatient admission for management of COVID-19 *Non-elective readmissions*: NR **Comments:** None	*codes in top quartile of crowded/multiunit housing, and prescriptions for opioid drugs* *aOR2: Multivariable Logistic Regression including ESRD, North American native, age, prior hospitalization, race, sex, comorbidities, income, housing, dual Medicare-Medicaid, treatment, and drug use; excluded history of breast cancer in second half of 2019, prescriptions for immunosuppressive and corticosteroid drugs overlapping COVID-19 diagnosis date, hypertension, and pneumococcal vaccinations* *Mortality, n/N (%):* COPD • aOR1: 1.09 (95% CI: 1.06-1.12), p=NR *Hospitalization, n/N (%):* COPD • aOR2: 1.19 (95% CI: 1.17-1.21), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Fayol[67] **Year:** 2021 **Data Extractor:** JH **Reviewer:** CNS **Study Design:** Cohort	**Population:** N=253 **Setting:** Tertiary hospital **Location:** France **Study dates:**	**Medical Condition, n/N (%):** COPD, 9/253 (3.6%) **Control/Comparison group, n/N (%):** No COPD, 244/253 (96.4%)	**Medical Condition(s):** Asthma: ND COPD: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression model included sex and age* *ICU admission, n/N (%)* COPD • aOR: 0.31 (95% CI: 0.04 – 2.57), p=0.28 • ICU: 1/82 (1.2%) • Non-ICU: 8/171 (4.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To compare the characteristics and prognoses of patients hospitalized for COVID-19 in 2020 with patients hospitalized for influenza during the 2018-2019 season. **IVA Score:** COPD: 22 (Moderate)	March 12 – April 1, 2020 **Inclusion criteria:** Patients ≥ 18 years admitted with laboratory-confirmed COVID-19 infection by RT-PCR on nasopharyngeal or oropharyngeal swabs, bronchoalveolar lavage samples, or bronchial aspirates and further hospitalized for more than 24h owing to severe or critical pneumonia (hypoxia with an SpO2 ≤ 94%). **Exclusion criteria:** NR		**Outcome Definitions:** *Mortality:* NR *ICU admission:* patients with acute respiratory distress syndrome (ARDS) and requiring high-flow nasal oxygen therapy, non-invasive mechanical ventilation, or invasive mechanical ventilation; Direct ICU admission: requiring immediate transfer or transfer within 24 h to an ICU; Secondary ICU admission: requiring ICU admission > 24 h after their initial admission *Intubation:* NR *Ventilation:* NR *Hospitalization:* patients requiring only nasal, low-flow oxygen administration and standard medical monitoring *0Non-elective readmissions*: NR **Comments:** None	**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ferastraoaru[19] **Year:** 2021 **Data Extractor:** DOS **Reviewer**: CS **Study design:** Retrospective cohort **Study Objective:** To analyze the relationship between asthma and	**Population:** N=4558 N=2496 admitted patients **Setting:** Academic tertiary care hospital **Location:** NY, US **Study dates:** March 14 - April 27, 2020	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 350/4558 (7.7%) **Control/Comparison group, n/N (%):** No COPD: 4208/4558 (92.3%)	**Medical Condition(s):** *COPD:* ICD9/10 J44, J44.0, J44.1 **Severity Measure(s):** NR **Clinical Marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* mortality risk in admitted patients *ICU admission:* NR *Intubation:* NR	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression* adjusting for age, race, gender, and smoking status adjusting for age, race, gender, and smoking status *Mortality, n/N (%):* COPD: • aOR: 2.08 (95% CI: 1.01-4.28), p=0.04 • COPD, no asthma: n=NR/N=NR (48.3%) • No asthma or COPD: n=NR/N=NR (26.5%) • p=0.2 **Severity of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
COVID-19 by identifying the factors predisposing to inpatient admission in our asthmatic population, and by comparing the mortality risk among admitted patients with only asthma and those with other coexistent chronic conditions, which have been shown to be unique risk factors for severe complications of COVID-19. **IVA Score:** 23 (moderate)	**Inclusion criteria:** All adult patients (≥18 years old) who tested positive for SARS-CoV-2 infection by PCR at study institution during study dates were identified by a software application that stores EHR data. All patients who presented to the emergency department for COVID-19 symptoms and who had also been seen at least once in the study healthcare system within previous 10 years were included in analysis. **Exclusion criteria**: NR		*Ventilation:* NR *Hospitalization:* admission from the emergency department *Non-elective readmissions*: NR **Comments:** None	**Clinical Marker:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Fisman[20] **Year**: 2020 **Data Extractor**: CS **Reviewer**: DOS **Study design**:	**Population**: 21,922 patients **Setting**: 34 public health units using provincial public health case management data system	**Medical Condition, n/N (%):** COPD: 267/21,922 (1%) **Control/Comparison group, n/N (%):** *Calculated by ERT:* No COPD: 21,655/21,922 (98.8%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker**: NR **Treatment/ Associated Therapy**: NR	**Severe COVID-19:** *OR: Univariable logistic regression [OR] (95% CI), p-value* *aOR: Multivariable logistic regression [OR] (95% CI), logit* *Mortality, n/N (%):* COPD: • OR: 11.22 (95% CI: 8.14–15.44), p<0.001

Study	Population and Setting	Intervention	Definitions	Outcomes
Prediction modeling study **Study Objective**: to develop and validate parsimonious, sensitive, and specific prediction rules for infection-related death in individuals with COVID-19 in Ontario **IVA Score**: 24 (moderate)	**Location**: Canada **Study dates**: January 23-May 15, 2020 **Inclusion criteria**: patients within the public health case management system with laboratory-confirmed SARS-CoV-2 infection via validated nucleic acid amplification test, including RT-PCR and nucleic acid sequencing **Exclusion criteria**: NR		**Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments**: none	• aOR: 3.26 (95% CI: 1.15–9.26) **Severity of Condition**: NR **Duration of Condition**: NR **Treatment/ Associated Therapy**: NR **Comorbid Conditions**: NR **Risk Markers:** **Long-term Sequelae**: NR
Author: Gao[78] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CNS **Study Design:** Bayesian model **Study Objective:** To overcome limitations of traditional biostatistical methods by developing a Bayesian approach to	**Population:** N=8191 COVID-NET, N=2491 NY dataset, N=5700 **Setting:** Two large-scale datasets (COVID-NET and a NY dataset) collecting data from 166 hospitals **Location:** US	**Medical Condition, n/N (%):** COVID-NET: COPD: 266/2491 (10.7%) NY dataset: COPD: 287/5700 (5.0%) **Control/Comparison group, n/N (%):** COVID-NET: No COPD: 2225/2491 (89.3%) NY dataset: No COPD: 5413/5700 (95.0%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR	**Severe COVID-19:** *RR1: Estimated median risk ratio and central 95% Bayesian credible interval of hospitalization for COVID-19 patients using data from COVID-NET; used data from the CDC to estimate prevalence of comorbidities in the general US adult population* *RR2: Estimated median risk ratio and central 95% Bayesian credible interval of hospitalization for COVID-19 patients using data from the NY dataset* *Hospitalization:* COPD: • aRR1: 2.58 (95% CI: 2.08-3.19); p=NR • aRR2: 1.69 (95% CI: 1.39-2.05); p=NR **Severity of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
estimate the risk ratio of hospitalization for COVID-19 patients with comorbidities. **IVA Score:** COPD: 21 (moderate)	**Study dates:** March 1 - May 2, 2020 **Inclusion criteria:** Data was collected from two datasets, COVID-NET and a NY dataset. COVID-NET collected data from 154 acute care hospitals in 74 counties in 13 states in the US. The NY dataset was a published dataset that collected data from 12 hospitals in New York. **Exclusion criteria:** NR		**Comments:** None	**Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Garcia-Posada[79] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To describe the characteristics and clinical management of a group of hospitalized patients	**Population:** N=209 **Setting:** Private third-level clinic **Location:** Colombia **Study dates:** May – August 2020 **Inclusion criteria:** Patients had to be admitted to the	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 29/209 (13.9%) **Control/Comparison group, n/N (%):** No COPD: 180/209 (86.1%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; models adjusted for NR* *Mortality, n/N (%)* COPD: • Deceased: 17/107 (15.9%) • Alive: 12/102 (11.8%) • p=0.21 *Hospitalization:* COPD: • aOR: 2.1 (95% CI: 0.57−7.6), p=0.27 **Severity of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with SARS-CoV-2 infection in a private clinic in Colombia. **IVA Score:** COPD: 23 (Moderate)	hospital ward and meet the criteria for COVID-19 disease classified as moderate, severe, or critical. The moderate disease was one with clinical or radiological evidence of pneumonia with clinical of pneumonia (fever, cough, dyspnea, tachypnea) without signs of severe pneumonia, with SpO2 ≥ 90% in room air. Severe disease was one that demonstrated clinical evidence of pneumonia, plus one of the following findings: respiratory rate >30 breaths/min; severe shortness of breath; o SpO2 < 90% in ambient air. The critical disease was considered if it met acute respiratory distress syndrome (ARDS) criteria, sepsis, or septic shock.		*Non-elective readmissions*: NR **Comments:** None	**Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients' clinical history with the loss of clinical and demographic information more significant than 10%. Patients with a mild diagnosis of Covid-19 disease. Symptomatic patients based on the COVID-19 case definition criteria without evidence of viral pneumonia or hypoxia. Patients admitted to hospital for the treatment of diseases other than Covid-19.			
Author: Ge[21] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To examine the associations of comorbidities with mortality and disease severity in individuals	**Population:** N=167,500 **Setting:** Public health insurance network **Location:** Canada **Study dates:** January 15 - December 31, 2020	**Medical Condition, n/N (%):** COPD: 9,716/167,500 (5.8%) **Control/Comparison group, n/N (%):** No COPD: 157,784/167,500 (94.2%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* deceased within 30 days after first positive COVID-19 test *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; model included age, sex, income quantile, rural and long-term care resident* *Mortality, n/N (%):* COPD: • aHR: 1.19 (95% CI: 1.12-1.26); p<0.001 • COPD: 1,403/9,716 (14.4%) • No COPD: 3,344/157,784 (2.1%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with COVID-19 diagnosed in 2020. **IVA Score:** COPD: 24 (moderate)	**Inclusion criteria:** Individuals diagnosed with COVID-19 based on SARS-CoV-2 PCR test reported through the Ontario Laboratories Information System during the study period. **Exclusion criteria:** Individuals not eligible for the Ontario Health Insurance Plan and those who were not residents of Ontario at the beginning of the study period.		*Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Girardin[22] **Year:** 2021 **Data Extractor:** CS **Reviewer:** MW **Study design:** Cohort study **Study Objective:** To assess the relative contribution of common upper and lower airway pulmonary diseases	**Population:** N=4,210 **Setting:** Quaternary academic health network **Location:** NY, US **Study dates:** March 2-May 24, 2020	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 329/4210 (7.8%) **Control/Comparison group, n/N (%):** No COPD: 3881/4210 (92.2%)	**Medical Condition(s):** *COPD:* presence of chronic bronchitis or emphysema **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio: Adjusted Hazard Ratio* *Mortality, n/N (%):* COPD • aHR: 1.27 (95% CI: 1.02-1.58), p=0.04 • COPD: 107/329 (32.5%) • No COPD: 852/3881 (22.0%) • p=0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
(COPD, asthma and sleep apnea) in assessing likelihood of COVID-19 - related mortality independent of other medical conditions, health risks, and sociodemographic factors. **IVA Score:** 24 (moderate)	**Inclusion criteria:** Patients with a prior visit and presenting to the emergency department with COVID-19 complaints or as clinically indicated, who tested positive for COVID-19, and had age, sex, race, and ethnicity reported were included in the study. Only patients who had been discharged alive or dead were included. **Exclusion criteria:** Hospitalized patients with unknown state (alive or dead) information were excluded.		*Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Gottlieb[68] **Year:** 2020 **Data Extractor:** CO **Reviewer:** ES/DOS **Study design:** Retrospective Case-control	**Population:** N=8,673 patients **Setting:** One university hospital **Location:** Chicago, IL, USA **Study dates:** March 4,	**Medical Condition:** Chronic Obstructive Pulmonary Disease (COPD): 117/8,673 (1.3%) **Control/Comparison group:** No COPD: 8,556/8,673 (98.7%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** ND **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND	**Severe COVID-19, n/N (%):** *aOR: adjusted odds ratio; multivariable logistic regression odds ratio* *ICU Admission, n/N (%):* COPD • aOR: 1.50 (95% CI: 0.87–2.58) *Hospitalization, n/N (%):* COPD: • aOR: 1.62 (0.93–2.82) • Hospitalized: 84/1,483 (5.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: to present clinical and demographic features of patients with laboratory-confirmed COVID-19 as of June 21, 2020; secondary outcome was to identify risk factors associated with hospitalization and critical illness **IVA Score:** 16 (High)	2020-June 21, 2020 **Inclusion criteria:** all patients presenting to university hospital with COVID-19 **Exclusion criteria:** patients who were transferred from other inpatient hospitals		*Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	• No hospitalization: 33/7,190 (0.5%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Grasselli[23] **Year:** 2020 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Retrospective cohort **Study Objective:** To describe the baseline characteristics of the patients, comorbidities, concomitant treatments at the time of hospital admission, mode and setting of ventilatory support, and the association of these characteristics with time to death. **IVA Score:** 23 (moderate)	**Population:** N=3988 **Setting:** ICUs **Location:** Italy **Study dates:** February 20 - May 30, 2020 **Inclusion criteria:** All consecutive patients with confirmed SARS-CoV-2 infection admitted to one of the network ICUs from February 20 to April 22, 2020. Laboratory confirmation of SARS-CoV-2 was defined as a	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 93/3988 (2.3%) **Control/Comparison group, n/N (%):** No comorbidities: 1302/3988 (32.6%)	**Medical Condition(s):** *COPD:* medical exemptions in last 10 years (code 057), hospitalization in last 5 years with IC9 code 491, 492, 494, 496 diagnosis; medications prescribed during last year with ATC code R03* (DDD>30%) for patients ≥45 years old **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted hazard ratio; multivariable cox proportional hazards regression analysis; model includes age in years, sex, respiratory support, hypertension, hypercholesterolemia, heart disease, type 2 diabetes, malignancy, COPD, ACE inhibitor therapy, ARB therapy, statin, diuretic, PEEP at admission, FiO_2 at admission, PaO_2/FiO_2* at admission *HR: Univariate hazard ratio* *Mortality, n/N (%):* COPD: • aHR: 1.68 (95% CI: 1.28-2.19), p<0.001 • HR: 2.03 (95% CI: 1.59-2.59), p<0.001 • COPD: 67/93 (72.0%) • No comorbidities: 490/1302 (37.6%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	positive result of real-time RT-PCR assay of nasal and pharyngeal swabs and, in selected cases, confirmation with RT-PCR assay from lower respiratory tract aspirates. **Exclusion criteria:** Patients with negative findings or missing results for RT-PCR for SARS-CoV-2.			**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Guan[69] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study design:** Retrospective cohort **Study Objective:** To explore the association between chronic respiratory diseases (CRD) and the clinical outcomes of COVID-19. **IVA Score:** 23 (moderate)	**Population:** N=39, 420 **Setting:** National C OVID-19 reporting system **Location:** China **Study dates:** December 2019 - May 6, 2020 **Inclusion criteria:** All hospitalized patients had to have a diagnosis of laboratory-confirmed COVID-19. All patients had established CRD before	**Medical Condition, n/N (%):** COPD: 636/39,420 (1.6%) Bronchiectasis: 313/39,420 (0.8%) **Control/Comparison group, n/N (%):** No COPD: 38,784/39,420 (98.4%) No bronchiectasis: 39,107/39,420 (99.2%)	**Medical Condition(s):** *COPD:* physician diagnosis at hospital admission or discharge from hospital was extracted with computer software based on ICD-10 codes from EMR; all diagnoses made based on either past history documents in clinical charts or the clinical manifestations consisted with global guidelines (Global initiatives for Obstructive Lung Disease) *Bronchiectasis:* physician diagnosis (radiological with or without clinical bronchiectasis) at hospital admission or discharge from hospital was extracted with computer software based on ICD-10 codes from EMR; all diagnoses made based on either past history documents in clinical charts or the clinical manifestations consisted with global guidelines **Severity Measure(s):** NR	**Severe COVID-19:** *aOR: Adjusted odds ratio; multivariable logistic regression adjusting for age, sex, and other systemic comorbidities* *OR: Odds ratio; univariable logistic regression* *Mortality, n/N (%):* COPD: • aOR: 1.01 (95% CI: 0.80-1.27), p=0.956 • OR: 3.26 (95% CI: 2.61-4.08) • COPD: 94/636 (14.8%) • No COPD: 1959/38784 (5.1%) *ICU admission, n/N (%):* COPD: • aOR: 1.59 (95% CI: 1.29-1.96), p<0.001 • OR: 2.29 (95% CI: 1.87-2.81) • COPD: 115/636 (18.1%) • No COPD: 3404/38784 (8.8%) *Invasive ventilation, n/N (%):* COPD: • aOR: 2.21 (95% CI: 1.75-2.78), p<0.001

Study	Population and Setting	Intervention	Definitions	Outcomes
	admission. Data derived from platform of in-patient EMR authorized by National Health Commission. Since the initial outbreak, submission of EMR from individual hospitals designated for admitting patients with COVID-19 was requested by the National health Commission. **Exclusion criteria:** Patients without any information on comorbidities, clinical outcomes, age or sex data, discharge records, or admission date.		**Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death within 30 days after hospitalization *ICU admission:* admission to the intensive care unit *Intubation:* NR *Ventilation:* noninvasive ventilation, invasive mechanical ventilation, ECMO *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• OR: 4.69 (95% CI: 3.75-5.86) • COPD: 96/636 (15.1%) • No COPD: 1417/38784 (3.7%) **Severity of Condition**: NR **Duration of Condition**: NR **Treatment/ Associated Therapy**: NR **Comorbid Conditions**: *Mortality, n/N (%):* COPD & bronchiectasis: • aOR: 0.66 (95% CI: 0.2-2.22), p=0.505 • OR: 1.71 (95% CI: 0.52-5.59) • COPD & bronchiectasis: 3/35 (8.6%) • No COPD & bronchiectasis: 2050/39385 (5.2%) *ICU admission, n/N (%):* COPD & bronchiectasis: • aOR: 1.2 (95% CI: 0.46-3.11), p=0.706 • OR: 1.70 (95% CI: 0.66-4.38) • COPD & bronchiectasis: 5/35 (14.3%) • No COPD & bronchiectasis: 3514/39385 (8.9%) *Invasive ventilation, n/N (%):* COPD & bronchiectasis: • aOR: 0.38 (95% CI: 0.05-2.75), p=0.335 • OR: 0.74 (95% CI: 0.10-5.41) • COPD & bronchiectasis: 1/35 (2.9%) • No COPD & bronchiectasis: 1512/39385 (3.8%) **Risk Markers**: NR **Long-term Sequelae:** NR
Author: Gupta[24] **Year:** 2020	**Population:** N= 2,215	**Medical Condition, n/N (%):** COPD: 173/2,215 (7.8%) **Control/Comparison group, n/N (%):**	**Medical Condition(s):** *COPD*: Per chart review	**Severe COVID-19:** *aOR1: Adjusted Odds Ratio; model included age, sex, race, hypertension, diabetes, body mass index, coronary artery disease, congestive heart failure,*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: MC **Reviewer:** JH/MW **Study Design:** Cohort **Study Objective**: To assess factors associated with death and to examine interhospital variation in treatment and outcomes for patients with COVID-19. **IVA Score:** 23 (Moderate)	**Setting:** ICUs at 65 hospitals **Location**: US **Study dates:** March 4 - June 4, 2020 **Inclusion criteria:** Adult patients (≥18 years of age) with laboratory-confirmed COVID-19 (detected by nasopharyngeal or oropharyngeal swab) admitted to a participating ICU for illness related to COVID-19 between March 4 and April 4, 2020, Patients were considered to have been admitted to an ICU if they were admitted to a regular ICU or if they were in a non-ICU room that was functioning as an ICU room for surge capacity. **Exclusion criteria:** NR	No COPD: 2,042/2,215 (92.2%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Death within 28 days of ICU admission *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*chronic obstructive pulmonary disease, current smoking status, active cancer, duration of symptoms before ICU admission, and covariates assessed at ICU admission* *aOR2: Adjusted Odds Ratio in mechanically ventilated patients, model restricted to 1494 patients; model included age, sex, race, hypertension, diabetes, body mass index, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, current smoking status, active cancer, duration of symptoms before ICU admission, and covariates assessed at ICU admission* *aHR: Hazard Ratio; model included age, sex, race, hypertension, diabetes, body mass index, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, current smoking status, active cancer, duration of symptoms before ICU admission, and covariates assessed at ICU admission* *Mortality, n/N (%):* COPD: • aOR1: 1.39 (95% CI: 0.95-2.04), p=NR • aOR2: 1.69 (95% CI: 1.03-2.78), p=NR • aHR: 1.17 (95% CI: 0.93-1.48), p=NR • Dead: 87/784 (11.1%) • Alive: 86/1,431 (6.0%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Haki[25]	**Population:** N= 290	**Medical Condition, n/N (%):**	**Medical Condition(s):** *COPD:* ND	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Retrospective cohort **Study Objective**: To evaluate the neurological signs and symptoms and accompanying comorbid neurological diseases of patients who were hospitalized in wards or ICUs with a diagnosis of COVID-19. **IVA Score:** 22 (Moderate)	**Setting:** Hospital **Location:** Turkey **Study dates:** March 22 - May 22, 2020 **Inclusion criteria:** Patients older than 18 years of age who were admitted to study hospital during study period and had been diagnosed with COVID-19 by RT-PCR. **Exclusion criteria:** Patients younger than 18 years, those that were asymptomatic or had mild disease, individuals followed as outpatients, and cases with incomplete data.	Chronic obstructive pulmonary disease (COPD): 17/290 (5.86%) **Control/Comparison group, n/N (%):** No COPD: 273/290 (94.14%)1	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Hospitalized patients admitted to the ICU and died *ICU admission:* Hospitalized patients discharged from or died in the ICU *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*aOR: Multivariable Logistic Regression; model included neurological disease, sex, heart disease, COPD, platelet, C-reactive protein, and D-dimer* *Mortality, n/N (%):* COPD: • aOR: 14.35 (95% CI: 2.03-101.42), p=0.008 • Died: 7/25 (28.00%) • Survived: 10/265 (3.77%) • p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Hansen[26] **Year:** 2021 **Data Extractor:** CS **Reviewer:** DOS	**Population:** N=5104 **Setting:** Nationwide healthcare registries	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 432/5104 (8.5%) **Control/Comparison group, n/N (%):** No asthma/COPD: 4318/5104 (84.6%)	**Medical Condition(s):** *COPD:* ICD-10 code J43-44 or patients were defined as having COPD if they had filled a minimum of two prescriptions of long-acting g β-agonists or long-acting muscarinergic antagonists without concurrent use of	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; Cox proportional hazards model adjusted for age, sex, education level, and a combined covariate for cardiac disease (heart failure, atrial fibrillation or flutter, or ischaemic heart disease)a combined covariate for cardiac disease*

Study	Population and Setting	Intervention	Definitions	Outcomes
Study design: Retrospective cohort study **Study Objective:** To determine the risk of severe outcomes of COVID-19 among patients with asthma and COPD. To investigate whether eosinophilic inflammation was associated with frequency of severe outcomes of COVID-19. **IVA Score:** 24 (moderate)	**Location:** Denmark **Study dates:** February 1-July 10, 2020 **Inclusion criteria:** All patients with a COVID-19 diagnosis (ICD-10 codes B342A, B972, and B972A) registered in the Danish registers were included. **Exclusion criteria:** NR		inhaled corticosteroids within the last 12 months; patients over 60 years with use of long-acting β-agonists in combination with inhaled corticosteroids were considered as having COPD; patients diagnosed with both COPD and asthma were considered as having COPD **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death within the first 30 days *ICU admission:* admission to ICU within the first 30 days *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*(heart failure, atrial fibrillation or flutter, or ischaemic heart disease)* *Risk difference* *Age standardized risk estimates* *Mortality, n/N (%):* COPD • aHR: 1.25 (95% CI: 1.02-1.51), p=0.028 • Risk difference: 1.9% (95% CI: 0.1-3.6), p=0.035 • COPD: 141/432 (32.6%) • No asthma/COPD: 419/4318 (9.7%) *ICU admission, n/N (%):* COPD • aHR: 1.05 (95% CI: 0.76-1.46), p=0.75 • Risk difference: no differences in risk of admission to ICU compared to those without asthma or COPD • No asthma/COPD: 252/4318 (5.8%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: He[27] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort	**Population:** N=304 **Setting:** University hospital **Location:** China	**Medical Condition, n/N (%):** COPD: 21/304 (6.9%) **Control/Comparison group, n/N (%):** No COPD: 283/304 (93.1%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; model included age, sex, pre-existing comorbidities, high-sensitivity troponin I, CRP levels, N-terminal pro-B-type natriuretic peptide on admission, procalcitonin, D-dimer levels, and novel coronary pneumonia types* *HR: Hazard Ratio* *Mortality:*

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To comprehensively define clinical characteristics, laboratory results, outcomes, and management strategies of COVID-19 patients, then to find whether there is an association of myocardial injury and other biomarkers with mortality. **IVA Score:** 23 (Moderate)	**Study dates:** January 11 – March 25, 2020 **Inclusion criteria:** COVID-19 patients confirmed by RT-PCR using nasal and pharyngeal swab specimens or by anti-SARS-CoV-2 antibody assay who were admitted to university hospital during study period. **Exclusion criteria:** Cases without significant biomarkers, including Hs-TnI and creatine kinase-myocardial band (CK-MB) levels.		**Outcome Definitions:** *Mortality:* in-patient COVID-19 associated mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	COPD: • aHR: 2.43 (95% CI: 1.11-5.31); p=0.027 • HR: 2.95 (95% CI: 1.64 – 5.32); p <0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Hippisley-Cox[28] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To develop and validate two	**Population:** N=6,952,440 COVID-19+, N = NR **Setting:** 1336 practices **Location:** England **Study dates:** September 1,	**Medical Condition, n/N (%):** COPD: 199,780/6,952,440 (2.9%) Asthma: NR **Control/Comparison group, n/N (%):** No COPD: 6,752,660/6,952,440 (97.1%) Asthma: NR	**Medical Condition(s):** *COPD:* ND *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:*	**Severe COVID-19:** *aHR1: Adjusted Cox Proportional Hazard Ratio for COVID-19 related death in those with a SARS-CoV-2 positive test; model mutually adjusted and included fractional polynomial terms for age, body mass index, vaccination dose, and background infection rate at time of vaccination* *aHR2: Adjusted Cox Proportional Hazard Ratio for COVID-19 related death/hospitalization in unvaccinated patients with a SARS-CoV-2 positive test; model mutually adjusted and included fractional polynomial terms for age and body mass index*

Study	Population and Setting	Intervention	Definitions	Outcomes
new QCovid risk algorithms, based on data from the second pandemic wave in England, to identify those groups at highest risk of severe covid-19 outcomes: QCovid2 (based on unvaccinated patients) and QCovid3 (based on vaccinated patients). **IVA Score:** Asthma: 22 (moderate) COPD: 23 (moderate)	2020-June 15, 2021 **Inclusion criteria:** All adults aged 19-100 years in the QResearch database who had one or two doses of the ChAdOx1 nCoV-19 (Oxford-AstraZeneca) or BNT162b2 (Pfizer-BioNTech) vaccine between December 8, 2020 - June 15, 2021. Individuals were followed from 14 days after receiving each vaccine dose until they had the outcome of interest, died, or reached the end of the study period. The unvaccinated cohort included people aged 19-100 years and observed between September 1, 2020 - May 31, 2021, but people who were subsequently vaccinated were censored on the date of their first vaccination.		• Time to COVID-19 related death in or out of hospital as recorded on the death certification 14 days or more after vaccination, or death within 28 days of a SARS-CoV-2 infection confirmed by RT-PCR • COVID-19 related death in unvaccinated patients with a SARS-CoV-2 positive test *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospital admission with confirmed or suspected covid-19 on ICD-10 codes U071 and U072, or new hospital admission associated with a confirmed SARS-CoV-2 infection in the preceding 14 days in unvaccinated patients with a SARS-CoV-2 positive test *Non-elective readmissions*: NR **Comments:** None	*Mortality:* COPD: • aHR1: 1.40 (95% CI: 1.22-1.61), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality:* *Men:* COPD • aHR2: 1.22 (95% CI: 1.12-1.33); p=NR *Women:* COPD • aHR2: 1.31 (95% CI: 1.19-1.44), p=NR *Asthma:* *Men:* • aHR2: 0.89 (95% CI: 0.82-0.97), p=NR *Women:* • aHR: 0.98 (95% CI: 0.91-1.07), p=NR *Hospitalization, n/N (%):* *COPD:* *Men:* • aHR2: 1.18 (95% CI: 1.06-1.33), p=NR *Women:* • aHR2: 1.24 (95% CI: 1.10-1.40), p=NR *Asthma:* *Men:* • aHR2: 0.91 (95% CI: 0.85-0.98), p=NR *Women:*

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients that had a covid-19 associated hospital admission before their start of follow-up (14 days after the first or second dose of vaccination).			• aHR2: 1.08 (95% CI: 1.01-1.16), p=NR **Long-term Sequelae:** NR
Author: Hu[70] **Year:** 2020 **Data Extractor:** CS **Reviewer:** MW **Study design:** Retrospective cohort study **Study Objective:** To investigate clinical characteristics and identify risk factors for severity of coronavirus disease 2019 (COVID-19) pneumonia outside of Wuhan, China. **IVA Score:** 23 (moderate)	**Population:** N=213 **Setting:** Two medical centers that were the main treatment centers for COVID-19 in Hunan Province **Location:** China **Study dates:** January 24-March 15, 2020 **Inclusion criteria:** Inpatients with laboratory confirmed COVID-19 by RT-PCR, nucleic-acid-positive test of respiratory or blood specimens and high-throughput gene sequencing with available	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 4/213 (1.9%) **Control/Comparison group, n/N (%):** No COPD: 199/213 (98.1%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *OR: Univariable Logistic Regression* *ICU admission, n/N (%), or Median (IQR):* COPD • aOR: 31.8 (95% CI: 2.21-457.65), p=0.011 • OR: 10.61 (95% CI: 1.41-78.88), p=0.022 • ICU: 2/20 (10.0%) • Non-ICU: 2/193 (1.0%) • p=0.045 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	epidemiological, clinical, and outcome data were included. **Exclusion criteria:** NR			
Author: Huang[29] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Cohort **Study Objective**: To conduct a population-based study to assess asthma disease status and chronic obstructive pulmonary disease (COPD) in relation to COVID-19 severity. **IVA Score:** COPD: 23 (Moderate)	**Population:** N= 61,338 **Setting:** Large integrated health care system **Location**: Southern California, US **Study dates:** March 1 - August 31, 2020 **Inclusion criteria:** All adult Kaiser Permanente Southern California (KPSC) patients with a confirmed COVID-19 diagnosis within study dates. Patients were defined as COVID-19 cases if they had a positive SARS-CoV-2 PCR laboratory test or a diagnosis code for COVID-19.	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 820/61,338 (1.3%) **Control/Comparison group, n/N (%):** No asthma or COPD: 54,992/61,338 (89.7%)	**Medical Condition(s):** *COPD:* ICD-10 J43-J44; patients were defined as having COPD if they had at least 1 inpatient/emergency department code or at least 2 outpatient codes for COPD prior to COVID-19 diagnosis date; COPD history was only assessed for individuals aged 35 years and older; individuals who had both asthma and COPD were included in COPD group *Asthma:* ICD-10 J45; patients were defined as having asthma if they had at least 1 inpatient/emergency department code or at least 2 outpatient codes for asthma prior to COVID-19 diagnosis date **Severity Measure(s):** *Active asthma:* Patients with any scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to COVID-19 diagnosis *Inactive asthma:* Patients with no scheduled or unscheduled clinical visit with an asthma diagnosis code in the 12 months prior to COVID-19 diagnosis **Clinical marker:** NR **Treatment/ Associated Therapy:**	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age group, gender, race/ethnicity, income, college education, Medicaid insurance status, BMI category, smoking, and modified Charlson comorbidity score; COPD models run among individuals aged 35 and older* *aHR: Cox regression hazard ratio; COPD models run among individuals aged 35 years and older* *Mortality, n/N (%):* COPD: • aOR: 1.67 (95% CI: 1.37-2.03) • COPD: 144/820 (17.6%) • No asthma or COPD: 757/54,992 (1.4%) *ICU admission, n/N (%):* COPD: • aOR: 1.21 (95% CI: 0.87-1.68) • COPD: 49/820 (6%) • No asthma or COPD: 796/54,992 (1.4%) *Ventilation (IRS), n/N (%):* COPD: • aOR: 1.49 (95% CI: 1.16-1.92) • COPD: 118/820 (4.3%) • No asthma or COPD: 1,242/54,992 (2.3%) *Hospitalization, n/N (%):* COPD: • aOR: 1.27 (95% CI: 1.05-1.53) • COPD: 194/820 (23.7%)

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients who had asymptomatic COVID-19 diagnosis codes and negative laboratory test results within two weeks after the diagnosis. Patients were also excluded if they were nonmembers or members for less than 1 year and thus had incomplete medical data or had other/unknown gender.		*Medication use*: Patients with and without medication use in the past 12 months **Outcome Definitions:** *Mortality:* Death within 60 days of COVID-19 diagnosis *ICU admission:* ICU admission within 30 days of COVID-19 diagnosis *Intubation:* NR *Ventilation:* Intensive respiratory support, which included invasive mechanical ventilation, noninvasive ventilation, high-flow mask, or high-flow nasal cannula, within 30 days of COVID-19 diagnosis *Hospitalization:* hospitalization within 30 days of COVID-19 diagnosis *Non-elective readmissions*: NR **Comments:** None	• No asthma or COPD: 3,404/54,992 (6.2%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Iaccarino[30] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To explore the influence of hypertension, as well as treatment and comorbidities on death or survival of patients admitted to the hospital	**Population:** N=1,591 **Setting:** Emergency rooms, regular wards, and intensive care wards in 26 hospitals and centers **Location:** Italy **Study dates:** March 9 - April 9, 2020 **Inclusion criteria:**	**Medical Condition, %:** COPD: 7.7% **Control/Comparison group, %:** No COPD: 92.3%	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* exitus (death) *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included diuretics, β-Blockers, angiotensin-converting enzyme inhibitors, heart failure, coronary artery disease, chronic kidney disease, COPD, diabetes, hypertension, sex, age* *Mortality, n/N (%):* • aOR: 1.93 (95% CI: NR), p=0.011 • Non-survivors: 14.9% • Survivors: 6.7% • p=0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with a certified diagnosis of COVID-19. **IVA Score:** 22 (moderate)	Patients aged 18 to 101 years with confirmed COVID-19 by RT-PCR performed on throat swab samples. **Exclusion criteria:** Patients with incomplete data.		**Comments:** Table 3 mislabels exponentiated β-coefficients as β, however these values align with the odds ratios in Figure 2A.	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Izzy[87] **Year:** 2020 **Data Extractor:** JKK **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To examine the association between age, race and ethnicity, reported preexisting comorbidities, and the need for hospitalization and ICU admission in a large study population of COVID-19-positive patients using medical records from the largest not-for-profit health care system in Massachusetts. **IVA Score:** 23 (moderate)	**Population:** N=5,190 **Setting:** Not-for-profit health care system comprised of 12 hospitals across eastern Massachusetts **Location:** Massachusetts, US **Study dates:** February 1 – April 25, 2020 **Inclusion criteria:** All patients 18 years or older who tested positive for COVID-19 during an inpatient, outpatient, or emergency room visit during the study dates; patients were	**Medical Condition, n/N (%):** COPD: 624/5,190 (12.0%) **Control/Comparison group, n/N (%):** No COPD: 4,566/5,190 (88.0%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* admission to an ICU at any time during hospitalization *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospitalization at any time during the course of the illness *Non-elective readmissions*: NR **Comments:** Patients who were discharged home initially but admitted later were categorized as hospitalized patients.	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression including age, gender, baseline comorbidities, racial and ethnic background, and socioeconomic status (median household income)* *aOR2: Multivariable Logistic Regression including age, gender, baseline comorbidities, and racial and ethnic background* *OR: Univariable (Univariate) Logistic Regression* *Hospitalization, n/N (%):* COPD • Hospitalized: 225/1,489 (15.1%) • Not Hospitalized: 399/3,701 (10.8%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *ICU Admission (among hospitalized), n/N (%):* COPD White • aOR1: 1.03 (95% CI: 0.61-1.75), p=NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	diagnosed as infected with COVID-19 if SARS-CoV-2 RNA was detected in upper or lower respiratory specimens by nucleic acid testing (NAT) assays. **Exclusion criteria:** NR			• aOR2: 0.94 (95% CI: 0.58-1.53), p=NR • ICU Admission: 41/184 (22.3%) • No ICU Admission: 83/436 (19.0%) Latinx • aOR1: 0.31 (95% CI: 0.13-0.73), p=statistically significant • aOR2: 0.35 (95% CI: 0.15-0.81), p=statistically significant • ICU Admission: 12/182 (6.6%) • No ICU Admission: 37/288 (12.8%) African American • aOR1: 0.83 (95% CI: 0.28-2.42), p=NR • aOR2: 0.72 (95% CI: 0.25-2.05), p=NR • ICU Admission: 8/68 (11.8%) • No ICU Admission: 24/141 (17.0%) *Hospitalization, n/N (%):* COPD White • aOR1: 1.20 (95% CI: 0.86-1.67), p=NR • aOR2: 1.30 (95% CI: 0.95-1.76), p=NR • OR: 1.73 (95% CI: 1.36-2.20), p=statistically significant • Hospitalized: 124/620 (20.0%) • Not Hospitalized: 225/1,784 (12.6%) Latinx • aOR1: 1.06 (95% CI: 0.65-1.73), p=NR • aOR2: 1.06 (95% CI: 0.65-1.71), p=NR • OR: 0.95 (95% CI: 0.65-1.36), p=NR • Hospitalized: 49/470 (10.4%) • Not Hospitalized: 92/839 (11.0%) African American • aOR1: 1.05 (95% CI: 0.55-1.99), p=NR • aOR2: 1.01 (95% CI: 0.55-1.85), p=NR • OR: 1.44 (95% CI: 0.89-2.28), p=NR • Hospitalized: 32/209 (15.3%) • Not Hospitalized: 57/510 (11.2%) **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Jacobs[76] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CNS **Study Design:** Cross-sectional **Study Objective:** To assess the relationship between patient demographic characteristics and COVID-19 positivity, as well as the relationship between underlying comorbidities and severe COVID-19 illness in an urban safety-net hospital with a primarily racial/ethnic minority patient population. **IVA Score:** 23 (Moderate)	**Population:** N=14,171; COVID-19+ N=2,286 **Setting:** Private safety-net health system including a community teaching hospital/level 1 trauma center, community hospital, rehabilitation hospital, and 14 clinics **Location:** IL, US **Study dates:** March 1, 2020 – January 31, 2021 **Inclusion criteria:** All patients 18 years of age and older who were tested for COVID-19 by PCR, rapid, or IgG qualitative tests between the study dates in inpatient and outpatient locations, as well as the emergency department.	**Medical Condition, n/N (%):** COPD: 168/2,286 (7.3%) **Control/Comparison group, n/N (%):** No COPD: 2,118/2,286 (92.7%)	**Medical Condition(s):** *COPD:* ICD-10 code **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* COVID-related mechanical ventilation ordered by a physician in the electronic medical records *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression Model; model included sex, race/ethnicity, and age* *OR: Univariable (Univariate) Logistic Regression* *Ventilation:* COPD: • aOR: 1.9 (95% CI: NR); p=0.001 • OR: 2.5 (95% CI: NR); p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: NR			
Author: Jiang[31] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study design:** Retrospective cohort **Study Objective:** To define the prognostic factors associated with mortality in hospitalized patients with COVID-19 and create a biomarker-based risk score for patients' stratification and clinical decision-making. **IVA Score:** 23 (moderate)	**Population:** N=1717 derivation cohort N=188 validation cohort **Setting:** Largest teaching center in province that is one of the designated hospitals for severely or critically ill COVID-19 cases **Location:** China **Study dates:** January 1 - April 10, 2020 **Inclusion criteria:** Hospitalized adult patients (≥18 years old) who had been diagnosed with COVID-19 according to WHO interim guidance. A confirmed case of COVID-19 was defined as a positive result on RT-PCR of nasal and pharyngeal swab specimens. Only laboratory-	**Medical Condition, n/N (%):** COPD: 104/1717 (6.1%) **Control/Comparison group, n/N (%):** No COPD: 1613/1717 (93.9%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Validated prediction model performanc e using independent cohort of 188 patients. Model performed well on validation cohort.	**Severe COVID-19:** *aHR: Adjusted hazard ratio; Cox proportional hazards regression model included age, sex, COPD, AST, hs-CRP, hs-Tnl, white blood cell count, lymphocyte count, D-dimer, and procalcitonin in the derivation cohort* *HR: Univariate hazard ratio in the derivation cohort* *Mortality, n/N (%):* COPD: • aHR: 1.58 (95% CI: 1.04-2.41), p=0.034 • HR: 2.71 (95% CI: 1.81-4.07), p<0.001 • Dead: 27/201 (13.4%) • Alive: 77/1516 (5.1%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	confirmed patients were included in the final analysis. An independent cohort of patients with the same clinical characteristics at another designated hospital for COVID-19 formed the external validation cohort. **Exclusion criteria:** NR			
Author: Jung[85] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To evaluate and estimate the association between previous asthma/COPD and the susceptibility of patients to COVID-19 in a nationwide cohort and the severity and mortality of COVID-19. **IVA Score:** COPD: 23 (Moderate)	**Population:** N= 4066 **Setting:** Hospital/ residential center **Location:** Korea **Study dates:** January 1 – June 4, 2020 **Inclusion criteria:** Patients with confirmed COVID-19 via RT-PCR of nasal or pharyngeal swabs during the study dates with previously	**Medical Condition, n/N (%):** COPD: 164/4066 (4.0%) • Mild: 101/4066 (2.5%) • Severe: 63/4066 (1.6%) **Control/Comparison group, n/N (%):** No COPD: 3902/4066 (96.0%)	**Medical Condition(s):** *COPD:* Patients with unspecified chronic bronchitis (J42), emphysema (J43), other COPD (J44) (except MacLeod syndrome (J430)) with COPD-related medications **Severity Measure(s):** *Mild-asthma:* not using ICSs/LABAs + long-acting muscarinic antagonists (LAMAs), ICSs/LABAs + LTRAs, ICSs/LABAs + xanthine, nor corticosteroids for over 90 days medications within previous two years *Severe-asthma:* using ICSs/LABAs + long-acting muscarinic antagonists (LAMAs), ICSs/LABAs + LTRAs, ICSs/LABAs + xanthine, or corticosteroids for over 90 days medications within previous two years	**Severe COVID-19:** *aOR1: adjusted odds ratio (model included age, sex, income, obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, CCI scores, number of NSAIDs used, number of steroids used, hypertension, asthma, and COPD)* *aOR2: adjusted odds ratio (model included age, sex, income, obesity, smoking, alcohol consumption, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, CCI scores, number of NSAIDs used, number of steroids used, and hypertension)* **Severity of Condition:** *Mortality, n/N (%)* Mild-COPD • aOR1: 1.10 (0.42-2.89), p=0.851 • aOR2: 0.99 (0.40-2.49), p=0.989 • OR: 3.28 (95%CI: 1.61-6.67), p=0.001 • Mild-COPD: 9/101 (8.9%) • Non-COPD: 113/3902 (2.9%)

Study	Population and Setting	Intervention	Definitions	Outcomes
	diagnosed asthma/COPD. **Exclusion criteria:** NR		*Mild-COPD:* no history of using systemic corticosteroids within previous two years *Severe-COPD:* history of using systemic corticosteroids within previous two years **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *0Non-elective readmissions*: NR **Comments:** None	Severe-COPD • aOR1: 3.06 (1.14-8.20), p=0.026 • aOR2: 2.79 (1.09-7.17), p=0.033 • OR: 6.33 (95%CI: 3.14-12.76), p<0.001 • Severe-COPD: 10/63 (15.9%) • Non-COPD: 113/3902 (2.9%) **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Kandula[32] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Ecological; spatial simultaneous autoregressive model **Study Objective:** To evaluate strategies for optimal geographical allocation of COVID-19 vaccines and to determine whether health and socioeconomic indicators of a location can be used	**Population:** N= NA , population-level analysis; study size determined by infections **Setting:** Nationwide **Location:** US **Study dates:** Through December 31, 2020 **Inclusion criteria:** Both confirmed and probable cases and deaths	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): NR **Control/Comparison group, n/N (%):** No COPD: NR	**Medical Condition(s):** *COPD*: Proportion of residents 18+ years of age who report being told by a doctor/nurse/other health professional that they have COPD, emphysema, or chronic bronchitis; Behavioral Risk Factor Surveillance System **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Cumulative COVID-19 confirmed and probable deaths through December 31, 2020; per thousand residents increase in mortality per	**Severe COVID-19:** *Multivariable linear regression model adjusting for county COVID-19 case rates* *Univariate model with county-level COVID-19 mortality as outcome, adjusting for county COVID-19 case rates* *Mortality, n/N (%):* • Multivariate model: -4.681 (95% CI: -6.64, -2.72), p<0.001 • Univariate model: 4.4 (95% CI: 3-5.8), p<0.001 COPD explains 24.6% of the variability in mortality in the univariate model, adjusting for case rates. Following variable pruning to correct for collinearity, the multivariate model explained 38% of the variability in mortality, however COPD's association with mortality is counterintuitively negative. The negative association is also observed in the spatial models.

Study	Population and Setting	Intervention	Definitions	Outcomes
to model differential risk of COVID-19 mortality, and, hence, inform vaccine prioritization strategies. **IVA Score:** 20 (Moderate)	at the US county level based on Times' monitoring and analyses of news conferences, data releases, and communications with public officials. Determination of confirmed or probable was made per definitions by the Council of State and Territorial Epidemiologists. County population estimates are from the American Community Survey 2014-2018. **Exclusion criteria:** NR		thousand residents for every 1% increase in prevalence of COPD. *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Kang[33] **Year:** 2020 **Data Extractor:** CS **Reviewer:** MW **Study design:** Retrospective cohort study **Study Objective:** To investigate the prevalence, baseline	**Population:** N=118 **Setting:** single tertiary care hospital **Location:** South Korea **Study dates:** February 20-April 15, 2020 **Inclusion criteria:** Patients >19 years	**Medical Condition, n/N (%):** Chronic obstructive lung disease (COPD): 8/118 (6.8%) **Control/Comparison group, n/N (%):** No COPD: 110/118 (93.2%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; Cox proportional hazard regression analysis; Cox proportional hazard regression analysis* *HR: Hazard Ratio; Cox proportional hazard regression* *Mortality, n/N (%):* COPD: • aHR: 16.58 (95% CI: 3.10-88.70), p=0.010 • HR: p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
clinical characteristics, therapy, and clinical outcomes, including mortality, of COVID-19 patients in Daegu who were classified according to the presence or absence of diarrhea. Additionally, to evaluate the prognostic factors and whether diarrhea could be a predictor of severe disease or mortality for COVID-19. **IVA Score:** 23 (moderate)	old admitted to the hospital and diagnosed with COVID-19 by RT-PCR from nasopharyngeal and/or oropharyngeal swabs were included. Sputum and/or endobronchial aspirate were used for patients with severe respiratory disease. **Exclusion criteria:** NR		*Non-elective readmissions*: NR **Comments:** None	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Khose[88] **Year:** 2020 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Ecological study **Study Objective:** To determine county level variations in initial COVID-19 incidence and case fatality risk indexed to the start of epidemic in each county, and to identify the predictors for county level variations in initial	**Population:** N= 1,052 counties **Setting:** Nationwide **Location:** Multiple locations, USA **Study dates:** June 1 - June 29, 2020 **Inclusion criteria:** Data obtained from the COVID19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University.	**Medical Condition, mean prevalence (standard deviation):** Chronic obstructive pulmonary disease (COPD): 12.3% (3.1) **Control/Comparison group:** NR	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy, n/N (%):** NR **Outcome Definitions:** *Mortality:* Case fatality risk (ratio of number of new deaths and new confirmed cases, expressed as a percentage) *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *aOR: Adjusted odds ratio; multinomial logistic regression using quartiles of case fatality risk as a dependent variable; 1st quartile is reference category* *Mortality, Case fatality risk:* COPD: • 2nd Quartile, aOR: 0.94 (95% CI: 0.87-1.01) • 3rd Quartile, aOR: 0.95: (95% CI: 0.88-1.03) • 4th Quartile, aOR: 0.95 (95% CI: 0.91-1.06)

Study	Population and Setting	Intervention	Definitions	Outcomes
incidence and case fatality risk of COVID-19. **IVA Score:** 23 (moderate)	Counties with at least 100 cases on June 1, 2020 to allow for 4-week period before we obtained the data. **Exclusion criteria:** NR		**Comments:** Author's note: Asthma, COPD, and CKD data obtained from Medicare beneficiary data and is not generalizable to general population.	**Long-term Sequelae:** NR
Author: Kim E[34] **Year:** 2021 **Data Extractor:** JH **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To investigate whether underlying diseases and taking ACEi/ARBs, affect the duration of hospitalization and mortality in patients with confirmed COVID-19. **IVA Score:** 23 (Moderate)	**Population:** N=7,590 **Setting:** Hospitals **Location:** Korea **Study dates:** January 20-May 15, 2020 **Inclusion criteria:** Patients within the CORONA-19 International Cooperation Research project for the past three years, Health Insurance Intensive Assessment Service, and national health insurance system claims database for the past three years who were diagnosed with COVID-19 based on RT-PCR testing	**Medical Condition, n/N (%):** COPD: 1,812/7,590 (23.9%) **Control/Comparison group, n/N (%):** No COPD: 5,778/7,590 (76.1%)	**Medical Condition(s):** *COPD:* Patients with ICD-10 codes I27.8, I27.9, J40.x, J67.x, J68.4, J70.1, J70.3 recorded up to 3 years before the diagnosis of COVID-19 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* mortality during COVID-19 infection *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; model included sex, age, socioeconomic status, hypertension and diabetes mellitus* *HR: Hazard Ratio* *Mortality, n/N (%):* COPD: • aHR: 1.27 (95% CI: 0.97-1.67); p=NR • HR: 4.56 (95% CI: 3.49-5.95); p <0.0001 • COPD: 132/1,812 (7.3%) • No COPD: 93/5,778 (1.6%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	at the Korea CDC by end of study period. **Exclusion criteria:** Mortality cases excluded when patient died after COVID-19 infection was cleared up.			
Author: Kim Y[71] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To examine the prognosis of COVID-19 according to the underlying chronic obstructive pulmonary disease (COPD). **IVA Score:** 23 (moderate)	**Population:** N=6,520 **Setting:** Hospitals and residential treatment centers **Location:** South Korea **Study dates:** January 20, 2019-May 15, 2020 **Inclusion criteria:** Patients who had died from COVID-19 or had confirmed COVID-19 infection based on nucleic acid testing by RT-PCR of nasopharyngeal and oropharyngeal swabs and sputum who were at least 19 years old and had medical claims data obtained in	**Medical Condition, n/N (%):** COPD: 35/6,520 (0.5%) **Control/Comparison group, n/N (%):** No COPD: 6,485/6,520 (99.5%)	**Medical Condition(s):** *COPD:* patients aged ≥ 40 years with at least one International Classification of Disease–Tenth Revision (ICD-10) diagnosis code for COPD or emphysema (J43.0x–J44.x, except J43.0 as a primary or secondary [within four positions] diagnosis), and the use of more than one of the following COPD medications at least twice per year: long-acting muscarinic antagonist (LAMA), long-acting β2 agonist (LABA), inhaled corticosteroid plus LABA (ICS + LABA), LABA + LAMA, short-acting muscarinic antagonist (SAMA), short-acting β2 agonist (SABA), SAMA + SABA, phosphodiesterase-4 (PDE-4) inhibitor, methylxanthine, or oral beta-adrenergic agonist; ICD-10 codes I27.8, I27.9, J40.x–J42.x, J45.x-J47.x, J60.x–J67.x, J68.4, J70.1, J70.3 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:**	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included ages, sex, mCCI, socioeconomic status, and COPD* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* • aOR: 1.73 (95% CI: 0.67-4.47), p=0.259 • OR: 8.94 (95% CI: 4.01-19.92); p<0.001 • COPD: 8/35 (22.9%) • No COPD: 208/6,485 (3.2%) • p<0.001 *ICU admission, n/N (%):* • aOR: 0.22 (95% CI: 0.03-1.67), p=0.142 • OR: 0.90 (95% CI: 0.12-6.58); p=0.915 • COPD: 1/35 (2.9%) • No COPD: 206/6,485 (3.2%) • p=0.914 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	the year before the COVID-19 diagnosis. **Exclusion criteria:** Patients younger than 40 years, had no linked medical claims data for confirmed or deceased cases, and had no medical claims data for the year from the date of COVID-19 diagnosis.		*Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Long-term Sequelae:** NR
Author: Ko[80] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To better understand the independent association of age, sex, race/ethnicity, and underlying medical conditions with COVID-19-associated hospitalization relative to the non-hospitalized community-dwelling population. **IVA Score:** COPD: 22 (moderate)	**Population:** N=5,416 **Setting:** Hospitals **Location:** California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah, US **Study dates:** March 1 - June 23, 2020	**Medical Condition, n/N (%):** COVID-NET patients: COPD: 328/5,416 (6%) **Control/Comparison group, n/N (%):** BRFSS estimates: COPD: n/N = NR (5%)	**Medical Condition(s):** *COPD:* ND; collected from medical record for COVID-NET patients; self-reported based on answer to question "Has a doctor, nurse, or other health professional ever told you that you had COPD, emphysema, or chronic bronchitis?" for BRFSS patients **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* laboratory-confirmed COVID-19-associated hospitalization *Non-elective readmissions*: NR	**Severe COVID-19:** *aRR: Adjusted rate ratio; Generalized Poisson Regression Model; model included age, sex, and race/ethnicity* *RR: Rate ratio* *Hospitalization, n/N (%):* COPD: • aRR: 0.9 (95% CI: 0.7-1.4); p=NR • RR: 1.2 (95% CI: 0.4-3.8); p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Inclusion criteria: Adults with laboratory-confirmed COVID-19-associated hospitalizations from 70 counties in 12 states participating in COVID-NET. COVID-NET is a population-based surveillance system capturing patients with a positive SARS-CoV-2 test no more than 14 days before admission or during hospitalization who were a resident of the preidentified surveillance catchment area and were admitted to a hospital where residents of the surveillance catchment area receive care. Behavioral Risk Factor Surveillance System (BRFSS) data were used to estimate community-dwelling adults ≥18 identified		**Comments:** None	

Study	Population and Setting	Intervention	Definitions	Outcomes
	from COVID-NET catchment area. **Exclusion criteria:** Adults whose primary residence was a facility, home with services, hospice, homeless/shelter, corrections facility, other or unknown residence. Adults with primary residence information and underlying medical condition data yet to be abstracted. Adults with missing data on all the underlying medical conditions.			
Author: Kridin[35] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study Design:** Nested case-control **Study Objective:** To characterize a large cohort of adult patients with atopic dermatitis	**Population:** N=3618 **Setting:** General community clinics, primary care, referral centers, hospitalized care facilities; data retrieved from Clalit Health Services (CHS) **Location:** Israel	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 55/3618 (1.5%) **Control/Comparison group, n/N (%):** No COPD: 3563/3618 (98.5%)	**Medical Condition(s):** *COPD:* ND; retrieved from the chronic diseases register of the CHS **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Patients whose cause of death was attributed to COVID-19 or its complications *ICU admission:* NR	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression (model included age, AD duration, extended systemic corticosteroids, cardiovascular diseases, metabolic syndrome, COPD, smoking, chronic renal failure, malignancy, depression)* *aOR2: Multivariable Logistic Regression (model included age, AD duration, sex, Arab ethnicity, socioeconomic status, adult-onset AD, AD severity, extended systemic corticosteroids, cardiovascular diseases, metabolic syndrome, COPD, smoking, chronic renal failure, malignancy, depression)* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):*

Study	Population and Setting	Intervention	Definitions	Outcomes
(AD) who tested positive for COVID-19 and to identify predictors of COVID-19–associated hospitalization and mortality. **IVA Score:** 23 (Moderate)	**Study dates:** February 27, 2020 - January 6, 2021 **Inclusion criteria:** All alive adult patients with AD who tested positive for COVID-19 within the study dates using molecular tests. Patients had AD compatible diagnostic code documented by a board-certified dermatologist or in discharge letter from dermatological wards and were older than 18 years at the onset of the pandemic in Israel which was defined as the date of the first confirmed case of COVID-19 on February 27, 2020. **Exclusion criteria:** NR		*Intubation:* NR *Ventilation:* NR *Hospitalization:* Patients admitted to intensive care units, internal medicine wards, or COVID-19–specific respiratory inpatient wards *Non-elective readmissions*: NR **Comments:** None	COPD: • aOR1: 6.47 (95% CI: 2.34-17.91), p<0.001 • OR: 30.47 (95% CI: 14.32-64.82), p<0.001 • Death: 11/40 (27.5%) • No death: 44/3578 (1.2%) *Hospitalization, n/N (%):* COPD: • aOR2: 2.47 (95% CI: 1.26-4.86), p=0.009 • OR: 11.43 (95% CI: 6.60-19.81), p<0.001 • Hospitalized: 24/250 (9.6%) • Not hospitalized: 31/3368 (0.9%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Lacedonia[36] **Year:** 2021 **Data Extractor:** JKK	**Population:** N=521 **Setting:** 4 inpatient	**Medical Condition, n/N (%):** COPD: 72/521 (13.8%) **Control/Comparison group, n/N (%):** No COPD: 449/521 (86.2%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; Cox proportional hazard model including age, gender, smoking, and neurological, kidney, and heart diseases* *HR: Hazard Ratio; Kaplan-Meier method*

Study	Population and Setting	Intervention	Definitions	Outcomes
Reviewer: MW **Study Design:** Cohort **Study Objective:** To analyze the prevalence of COPD and the prognosis of COPD patients in a selected and homogenous cohort of patients with acute respiratory failure due to COVID-19-related pneumonia and admitted to intermediate Respiratory Intensive Care Units (RICUs), a model of care designed for monitoring and treating respiratory patients whose illness is at a level of severity that is intermediate between that which requires intensive care unit (ICU) facilities and that which can be managed on a conventional ward; and to examine the prevalence of smokers and the association of tobacco smoking with sociodemographic and clinical features during the clinical course of these hospitalized patients. **IVA Score:** 24 (moderate)	intermediate Respiratory Intensive Care Units (RICUs) **Location:** Italy **Study dates:** March 5 – May 31, 2020 **Inclusion criteria:** Hospitalized adult patients with SARS-CoV-2 pneumonia confirmed by RT-PCR tests on nasopharyngeal swab and by chest X-ray or chest CT performed in Emergency rooms. **Exclusion criteria:** NR		**Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital 30-day all-cause mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Numerator calculated by ERT; n/N (%)* *Mortality, n/N (%):* COPD: • aHR: 1.0 (95% CI: 0.63-1.60), p=NR • HR: 2.92 (95% CI: 2.00-4.27), p<0.01 • *COPD: 37/72 (52%) • *No COPD: 95/449 (21%) • p<0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NA **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Author: Lazcano[37] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To determine if a previous stroke is an independent risk factor for mortality after COVID-19, and to determine if this association is maintained within the different sexes, age groups, and stroke subtypes, which include transient ischemic attack (TIA), ischemic stroke, hemorrhagic stroke, and spontaneous nontraumatic subarachnoid hemorrhage (SAH). **IVA Score:** 23 (Moderate)	**Population:** N=91,629 **Setting:** Community setting **Location:** Spain **Study dates:** February 1 – December 31, 2020 **Inclusion criteria:** All positive cases (symptomatic and asymptomatic) and with any severity (ambulatory and hospitalized) registered in the Catalan Service of Epidemiological Surveillance (regional epidemiological surveillance registry for SARS-CoV-2 infection in Catalonia) which had tested positive for COVID-19 within the study dates using all types of tests (polymerase chain	**Medical Condition, n/N (%):** COPD: 2,794/91,629 (3.0%) **Control/Comparison group, n/N (%):** No COPD: 88,835/91,629 (97.0%)	**Medical Condition(s):** *COPD:* ICD-10 code J44.xx **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* Any death (including hospital and nonhospital deaths) occurring after the infection during the study period *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR1: Adjusted Hazard Ratio model including all comorbidities and individual socioeconomic status* *aHR2: Adjusted Hazard Ratio model including time of previous stroke* *Mortality, n/N (%):* COPD: • aHR1: 1.20 (95% CI: 1.12-1.29), p<0.001 • Deceased: 1,072/9,512 (11.3%) • Survived: 1,722/82,117 (2.1%) • p<0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	reaction, antibody test, ELISA, and epidemiological confirmation by chest imaging information). **Exclusion criteria:** Cases aged under 18 years and missing or incomplete information.			
Author: Lee[86] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To analyze the impact of COPD on the risks of disease progression and mortality among COVID-19 patients in South Korea. **IVA Score:** 24 (Moderate)	**Population:** N=4,610 **Setting:** Nationwide **Location:** South Korea **Study dates:** January 20-May 27, 2020 **Inclusion criteria:** Data from national database of the Health Insurance Review and Assessment Service (HIRA). Patients aged 40 years or older who were confirmed to be infected with COVID-19 by a RT-PCR test for SARS-CoV-2 using	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 141/4610 (3.1%) **Control/Comparison group, n/N (%):** No COPD: 4469/4610 (97.0%)	**Medical Condition(s):** *COPD:* defined by the prescription of COPD medication(s) at least two times per year with a diagnosis of COPD (ICD-10 code: J43 and J44 except J43.0) during the enrollment period (January 1, 2017 - December 31, 2018), medications included long-acting muscarinic antagonists (LAMA), long-acting beta-2 agonists (LABA), combination LAMA/LABA, combination inhaled corticosteroid (ICS) and LABA, short-acting muscarinic antagonists (SAMAs), short-acting beta-2 agonists (SABAs), phosphodiesterase-4 (PDE-4) inhibitors, systemic beta agonists, and methylxanthine **Severity Measure(s):** *Severe COPD:* COPD patients who had experienced exacerbations two or more times and those who had been prescribed triple therapy (ICS, LABA, and LAMA), PDE-4 inhibitors, or low-dose macrolides; severity assessed during measurement period (January 1 – December 31, 2019)	**Severe COVID-19:** *aOR1: Adjusted odds ratio; multivariable logistic regression model includes age, sex, CCI, and COPD* *Mortality, n/N (%):* COPD: • aOR1: 1.80 (95% CI: 1.11–2.93) • COPD: 27/141 (19.2%) • No COPD: 199/4469 (4.5%) • p<0.001 **Severity of Condition:** *aOR2: Adjusted odds ratio; multivariate logistic regression analysis in patients with COPD; model includes age, sex, severity of COPD, medication possession ratio (partial/complete vs. low), and number of exacerbations (0 vs. ≥1)* *Mortality, n/N (%):* Severe COPD: • aOR2: 0.82 (95% CI: 0.19–3.39) • Severe COPD: 5/27 (18.5%) • Non-severe COPD: 22/114 (19.3%) • p=0.926 **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	nasopharyngeal swab or sputum specimens. **Exclusion criteria:** NR		**Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* All-cause mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* Invasive and noninvasive mechanical ventilation and extracorporeal membrane oxygenation (ECMO) *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Li[38] **Year:** 2020 **Data Extractor:** CO **Reviewer:** ECS/MW/DOS **Study design:** Retrospective cohort **Study Objective:** to explore risk factors that drive mortality in patients (who received neither dexamethasone nor remdesivir) **IVA Score:** 20 (moderate)	**Population:** N=1,075 patients **Setting:** hospitals **Location:** China, European regions, and North America **Study dates:** January-April 2020 **Inclusion criteria:** COVID-19 patients recorded during study dates **Exclusion criteria:** patients who received either remdesivir or dexamethasone,	**Medical Condition, n/N (%):** Chronic bronchitis: 16/399 (4%) COPD: 11/399 (3%) **Control/Comparison group, n/N (%):** No Chronic bronchitis: 383/399 (96%) No COPD: 388/399 (97%)	**Medical Condition(s):** Chronic bronchitis: ND COPD: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** none	**Severe COVID-19:** *aHR: Multivariable Cox Regression/proportional hazard ratio* *HR: Univariable (Univariate) Cox Regression/proportional hazard ratio* **Odds ratio [OR] (95% CI) calculated by ERT; n/N (%)* *Mortality, n/N (%):* Chronic bronchitis • *HR: 1.76 (1.25-2.48); p=0.10 • Non-survivor: 9/157 (6%) • Survivor: 7/242 (3%) • OR: 2.04 (0.74-5.59) COPD • aHR: 2.19 (1.53-3.15), p=0.03 • HR: 3.45 (2.44-4.88), p=3.6x10^{-4} • *OR: 7.29 (1.55-34.23) • Non-survivor: 9/157 (6%) • Survivor: 2/242 (1%) **Severity of Condition:** NR **Duration of Condition:**

Study	Population and Setting	Intervention	Definitions	Outcomes
	were hospitalized after May 1 and had missing data of therapy, or were from countries with limited online data			**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Lim[39] **Year:** 2021 **Data Extractor:** MC **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To examine whether computed tomography (CT)-quantified emphysema score is associated with a worse clinical outcome in patients with COVID-19. **IVA Score:** 23 (Moderate)	**Population:** N=146 **Setting:** Four tertiary referral hospitals **Location:** South Korea **Study dates:** February 18 – March 25, 2020 **Inclusion criteria:** Patients with COVID-19 who were admitted to the study hospitals between the study dates and underwent chest CT within five days of admission. COVID-19 diagnosis was confirmed using the real-time reverse-transcriptase polymerase chain reaction test for	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 8/146 (5.5%) **Control/Comparison group, n/N (%):** No COPD: 138/146 (94.5%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** *Emphysema:* a chest radiologist blinded to the patients' data evaluated chest CT images by automatically segmenting whole-lung parenchyma after removing the chest wall, mediastinum, diaphragm, and airway; using segmentation software, emphysema percentage score was calculated by determining the percentage of lung voxels between −1000 and −950 Hounsfield units for whole-lung voxels; patients were divided into three groups according to emphysema score (emphysema score ≤1%, 1%< emphysema score ≤5%, and emphysema score >5%) **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model adjusted for* variables with p values <0.1 in the univariate analysis *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* *COPD:* • aOR: 8.07 (95% CI: 1.20-54.49), p=0.032 • OR: 12.80 (95% CI: 2.78-59.00), p=0.001 • COPD: 4/8 (50.0%) • No COPD: 10/140 (7.1%) • p=0.003 **Severity of Condition:** NA **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	SARS-CoV-2 based on nasopharyngeal swabs. **Exclusion criteria:** NR		**Comments:** None	
Author: Lobelo[81] **Year:** 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To identify sociodemographic, clinical and behavioral drivers of racial disparities and their association with clinical outcomes among members with COVID-19 (hospitalization, intensive care unit (ICU) admission, length of stay, mechanical ventilation, readmission and mortality). **IVA Score:** 23 (Moderate)	**Population:** N=5,712 **Setting:** Integrated healthcare system **Location:** Georgia, US **Study dates:** March 3 – October 29, 2020 **Inclusion criteria:** Any Kaiser Permanente Georgia member with a documented diagnosis and/or laboratory-confirmed COVID-19 PCR test in their Electronic Health Record (EHR). At the start of the epidemic, testing was prioritized among symptomatic healthcare	**Medical Condition, n/N (%):** COPD: 153/5,712 (2.7%) **Control/Comparison group, n/N (%):** No COPD: 5,559/5,712 (97.3%)	**Medical Condition(s):** *COPD*: ICD-10 codes **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: adjusted odds ratio (model included age, sex and race/ethnicity)* *Hospitalization:* COPD: • aOR: 2.59 (95%CI: 1.67-4.02); p≤0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Hospitalization:* COPD among Black patients: • aOR: 2.53 (95% CI: 1.24-5.16); p≤ 0.05 COPD among White patients: • aOR: 2.49 (95% CI: 1.38-4.49); p≤0.05 COPD among female patients: • aOR: 4.34 (95% CI: 2.42-7.77); p≤0.001 **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	workers and patients requiring hospital admission. In mid-April testing was progressively expanded to high-risk symptomatic patients and symptomatic patients with public health implications. **Exclusion criteria:** NR			
Author: Machado-Alba[72] **Year:** 2021 **Data Extractor:** JH **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To identify the factors associated with admission to intensive care units (ICUs) and mortality in patients with COVID-19 from 4 clinics in Colombia. **IVA Score:** 23 (Moderate)	**Population:** N=780 **Setting:** Four tertiary care clinics **Location:** Colombia **Study dates:** March 6 – August 31, 2020 **Inclusion criteria:** Patients with COVID-19, confirmed by RT-PCR, of any age, sex and city of residence who were treated for COVID-19 at an	**Medical Condition, n/N (%):** COPD: 75/780 (9.6%) **Control/Comparison group, n/N (%):** No COPD: 705/780 (90.4%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Adjusted Odds Ratio; model included gender, age, city of residence, health related profession, obesity, ischemic heart disease, diabetes mellitus, chronic kidney disease, COPD, arterial hypertension, non-opioid analgesics, severe pneumonia, and NEWS2 score* *ICU Admission* COPD • aOR: 2.07 (95% CI: 1.09-3.90); p=0.026 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	affiliated clinic during the study period. **Exclusion criteria:** Patients with incomplete medical records or incomplete follow-up by teleconsultation and those diagnosed by screening were excluded.			
Author: Maestre-Muñiz[40] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To identify risk factors for death from the COVID-19 infection among subjects admitted to a hospital in central Spain, and to analyze factors that may contribute to mortality. **IVA Score:** 23 (Moderate)	**Population:** N=444 **Setting:** Community medical center **Location:** Spain **Study dates:** February 26 – May 31, 2020 **Inclusion criteria:** Adult inpatients who were confirmed COVID-19 positive either by a nasopharyngeal swab test using real-time reverse-transcriptase-polymerase-chain-reaction (RT-PCR)	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 97/444 (21.8%) **Control/Comparison group, n/N (%):** No COPD: 347/444 (78.2%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *Mortality, n/N (%)* COPD: • aOR: 2.01 (95% CI: 1.01–4.02), p=0.048: • With COPD: 39/97 (40.2%) • Without COPD: 103/347 (29.7%) • p=0.049 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	assay, or by IgG/IgM lateral flow immunoassay chromatography rapid testing and who were admitted to hospital due to respiratory failure during the study dates were included. **Exclusion criteria:** NR			
Author: Manohar[41] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To use real-world healthcare data to quantify the impact of demographic, clinical, and social determinants associated with adverse COVID-19 outcomes, to identify high-risk scenarios and dynamics of risk among racial and ethnic groups. **IVA Score:** COPD: 24 (moderate)	**Population:** N=11,930 **Setting:** Academic medical center **Location:** New York, US **Study dates:** March - August 2020 **Inclusion criteria:** Patients that had nasopharyngeal swab PCR testing performed with "Detected" results or those who received a COVID-19 ICD-10 diagnosis.	**Medical Condition, n/N (%):** COPD: 536/11,930 (4.49%) **Control/Comparison group, n/N (%):** No COPD: 11,394/11,930 (95.51%)	**Medical Condition(s):** *COPD:* ICD-10 J44 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death following a COVID-19 diagnosis, without regard to hospitalization *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model includes age, sex, race/ethnicity, clinical characteristics, BMI, smoking status, neighborhood deprivation index, hospital site, and insurance type* *Mortality, n/N (%):* COPD: • aOR: 1.09 (95% CI: 0.86-1.38); p=0.486 • Died: 131/1,654 (7.92%) • Survived: 405/10,276 (3.94%) *Hospitalization, n/N (%):* COPD: • aOR: 1.49 (95% CI: 1.01-2.2); p=0.045 • Hospitalized: 324/4,895 (6.62%) • Not hospitalized: 212/7,035 (3.01%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients who received a COVID-19 ICD-10 diagnosis that was also confirmed as "Not Detected" by PCR assay.			**Comorbid Conditions:** NR **Risk Markers:** *Mortality:* COPD among non-Hispanic-White: • aOR: 1.29 (95% CI: 0.85-1.95); p=0.226 COPD among non-Hispanic-Black: • aOR: 0.85 (95% CI: 0.43-1.59); p=0.622 COPD among non-Hispanic-Asian: • aOR: 1.45 (95% CI: 0.66-3.1); p=0.348 COPD among Hispanic: • aOR: 1.37 (95% CI: 0.85-2.17); p=0.183 *Hospitalization:* COPD among non-Hispanic-White: • aOR: 2.7 (95% CI: 1.28-5.71); p=0.009 COPD among non-Hispanic-Black: • aOR: 1.89 (95% CI: 0.77-4.74); p=0.169 COPD among non-Hispanic-Asian: • aOR: 3 (95% CI: 0.55-26.6); p=0.255 COPD among Hispanic: • aOR: 0.59 (95% CI: 0.28-1.28); p=0.172 **Long-term Sequelae:** NR
Author: Marron[42] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To determine if patients admitted with a clinical history of COPD and/or radiographic diagnosis of emphysema have worse	**Population:** N=577 **Setting:** Hospital referral center for patients with COPD **Location:** PA, US **Study dates:** March 18-May 4, 2020 **Inclusion criteria:** Patients 18 years	**Medical Condition, n/N (%):** COPD and or emphysema: 103/577 (17.9%) **Control/Comparison group, n/N (%):** No COPD or emphysema: 474/577 (82.1%)	**Medical Condition(s):** *COPD:* patients with available spirometry showing irreversible airflow obstruction or a history of cigarette smoking with outpatient use of an inhaled bronchodilator *Emphysema:* findings of emphysema on CT as interpreted by a board-certified radiologist. **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR	**Severe COVID-19:** *aHR: Multivariable Logistic Regression; model included age, chronic kidney disease, malignancy, oxygen support via low-flow nasal cannula, oxygen support via high-flow nasal cannula, coronary artery disease, congestive heart failure, hypertension* *aOR1: Multivariable Logistic Regression model included age, serum Cr, ALC<1.0 K/mm3, coronary artery disease, congestive heart failure, hypertension* *aOR2: Multivariable Logistic Regression; model included age, oxygen support via low-flow nasal cannula, oxygen support via high-flow nasal cannula, active smoking, former smoking, coronary artery disease, congestive heart failure, hypertension* *HR: Hazard Ratio* *OR: Univariable (Univariate) Logistic Regression*

Study	Population and Setting	Intervention	Definitions	Outcomes
outcomes associated with COVID-19 pneumonia as compared to patients without COPD/ emphysema. **IVA Score:** 24 (moderate)	or older diagnosed with COVID-19 pneumonia based on symptoms, presence of infiltrates on chest X-ray or high-resolution CT scan, and a positive RT-PCR nasopharyngeal swab. All patients included in the COPD/emphysema cohort had either available spirometry showing irreversible airflow obstruction or a history of cigarette smoking with outpatient use of an inhaled bronchodilator, and/or findings of emphysema on CT as interpreted by a board-certified radiologist. **Exclusion criteria:** Patients with a negative RT-PCR test for COVID-19.		**Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR *Ventilation:* mechanical ventilation *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*Mortality, n/N (%):* COPD: • aHR: 1.0 (95% CI: 0.5-2.1), p=0.956 • HR: 1.01 (95% CI: 0.6-2.2); p=0.680 • Deceased: 13/52 (25.0%) • Survived: 90/525 (17.1%) *ICU admission, n/N (%):* COPD: • aOR1: 1.39 (95% CI: 0.86-2.25), p=0.174 • OR: 1.62 (95% CI: 1.03-2.56); p=0.038 • ICU admission: 36/154 (23.4%) • No ICU admission: 67/423 (15.8%) *Ventilation, n/N (%):* COPD: • aOR2: 1.53 (95% CI: 0.75-3.13), p=0.247 • OR: 2.03 (95% CI: 1.17-3.51); p=0.011 • Ventilation: 22/78 (28.2%) • No ventilation: 81/499 (16.2%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Merzon[43] **Year:** 2021	**Population:** N=10,477;	**Medical Condition, n/N (%):** COPD: 54/662 (8.16%)	**Medical Condition(s):** *COPD:* ICD-9 codes	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: DOS **Reviewer:** JH **Study Design:** Cross-sectional **Study Objective:** To analyze the prevalence of low-dose aspirin therapy and clinical characteristics in a large cohort of consecutive outpatients who tested positive in an RT-PCR assay designed to detect infection with COVID-19. **IVA Score:** 23 (moderate)	COVID-19+, N=662 **Setting:** Nationwide **Location:** Israel **Study dates:** February 1 - June 30, 2020 **Inclusion criteria:** All consecutive patients aged ≥40 years from a nationwide health maintenance organization who had been tested for COVID-19 during the study period. COVID-19 RT-PCR testing of nasopharyngeal swabs samples was performed upon physician referral according to Israel Ministry of Health criteria for COVID-19 testing, which includes direct exposure to a confirmed COVID-19 patient and/or presentation of symptoms suggesting COVID-	**Control/Comparison group, n/N (%):** No COPD: 608/662 (91.84%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* deaths among hospitalized patients *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospital-treated COVID-19 positive patients *Non-elective readmissions*: NR **Comments:** None	*aOR1: Multivariable Logistic Regression; model adjusted for sex, age, smoking status, medication use, hypertension, diabetes mellitus, and obesity* *aOR2: Multivariable Logistic Regression; model adjusted for sex and age* *Mortality, n/N (%):* COPD: • aOR1: 0.56 (95% CI: 0.02-16.06), p=0.343 • aOR2: 0.68 (95% CI: 0.65-7.09), p=0.749 • Died: 1/7 (14.29%) • Survived: 14/105 (13.33%) • p=0.94 *Hospitalization, n/N (%):* COPD: • aOR1: 1.80 (95% CI: 0.80-4.08), p=0.154 • aOR2: 1.79 (95% CI: 0.94-3.44), p=0.075 • Hospitalized: 15/112 (13.39%) • Not Hospitalized: 39/550 (7.09%) • p=0.026 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	19 (essentially, a cough, shortness of breath or any other respiratory symptom, with fever). **Exclusion criteria:** Individuals who had been diagnosed with coronary artery disease, cerebrovascular disease, and/or peripheral vascular disease were classified as taking aspirin for secondary prevention.			
Author: Meza[44] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To assess the risk of mortality following COVID-19 diagnosis in patients with COPD compared with patients without COPD. **IVA Score:** 22 (moderate)	**Population:** N=3,453,825; COVID-19+ n=387,008 **Setting:** 81 academic hubs part of the National COVID Cohort Collaboration **Location:** US **Study dates:** NR – February 16, 2021 **Inclusion criteria:** Patients over the	**Medical Condition, n/N (%):** COPD: 7,449/387,008 (2.0%) **Control/Comparison group, n/N (%):** No COPD: 273,963/387,008 (70.8%)	**Medical Condition(s):** *COPD*: ICD-9/10 diagnoses **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* COVID-19 related deaths *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression including age, male sex, diabetes mellitus, hypertension, chronic kidney disease, and obesity* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* • aOR: 2.07 (95% CI: 1.93-2.22), p<0.001 • OR: 6.19 (95% CI: 5.79-6.62), p<0.001 • COPD: 1,107/7,449 (14.9%) • No COPD: 10,126/273,963 (3.7%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	age of 35 with a positive COVID-19 PCR test. **Exclusion criteria:** NR		**Comments:** Proportions reported in the text and tables/figures did not align; table/figure data was reported.	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Mollalo[45] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** CS **Study design:** mixed-effects multinominal logistic regression model **Study Objective:** to apply spatial and statistical analysis to better understand the geospatial distributions of the COVID-19 mortality rate (MR) and case fatality rate (CFR) in US **IVA Score:** 21 (moderate)	**Setting:** nationwide **Location:** US **Study dates:** January 22 – November 22, 2020 **Inclusion criteria:** cumulative COVID-19 cases and deaths collected from *USAFacts*; age-adjusted mortality rates of 20 covariates collected from *University of Washington Global Health Data Exchange* **Exclusion criteria:** counties with less than 16 reported deaths were excluded from subsequent analyses	**Medical Condition:** COPD: NR High-high (HH): counties with high COVID-19 mortality surrounded by counties with high COVID-19 mortalities Low-low (LL): counties with low COVID-19 mortality surrounded by counties with low COVID-19 mortalities **Control/Comparison group:** Non-significant (NS): non-significant counties	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *COVID-19 case fatality ratio (CFR):* proportion of recorded death over the confirmed cases *COVID-19 Mortality rate (MR):* mean COVID-19 mortality rate per 100,000 individuals **Comments:** none	**Severe COVID-19:** *Mixed-effects multinomial logistic regression model odds ratio [OR] (95% CI) for association between COVID-19 CFR classification (HH or LL) and mortalities of other diseases:* COPD: • HH: 0.996 (95% CI: 0.976-1.016), p=0.705 • LL: 1.028 (95% CI: 1.010-1.046), p=0.002 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Momeni-Boroujeni[46]	**Population:** N=553	**Medical Condition, n/N (%):** COPD: 25/553 (4.5%)	**Medical Condition(s):** *COPD:* ND	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** MW **Reviewer:** JKK **Study Design:** Cohort **Study Objective:** To develop a prognostic Markov model for hospitalized COVID-19 patients which incorporates dynamic laboratory value data along with patients' admission profiles, to identify key determinants of risk. **IVA Score:** COPD: 24 (Moderate) Asthma: 25 (Moderate)	**Setting:** Medical Center **Location:** NY, US **Study dates:** February – March 2020 **Inclusion criteria:** Patients admitted with COVID-19-related symptoms and confirmed Polymerase Chain Reaction (PCR)-positive between the study dates. **Exclusion criteria:** Patients whose outcome was unknown or who were missing data.	Asthma: 24/553 (4.3%) **Control/Comparison group, n/N (%):** No COPD: 528/553 (95.5%) No asthma: 529/553 (95.7%)	*Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* COVID-19 related mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** Univariate survival analysis is reported as an odds ratio in the study; ERT relabeled as hazard ratio.	*aOR1: Multivariable Logistic Regression including age, sex, ethnicity, day of hospital admission, recorded comorbidities, initial measurements for each patient for each of the 28 included clinical tests, and percent changes in each clinical test measurement from the initial values for each patient using the last recorded measurement for each patient* *aOR2: Markov model including age, sex, ethnicity, day of hospital admission, recorded comorbidities, initial measurements for each patient for each of the 28 included clinical tests, and percent changes in each clinical test measurement from the initial values for each patient using the last recorded measurement for each patient* *HR: Hazard Ratio; Univariable (Univariate) Survival Analysis* *OR: Univariable (Univariate) Logistic Regression* *Mortality:* COPD: • aOR1: 1.17 (95% CI: NR), p=NR • aOR2: 2.19 (95% CI: NR), p<0.05 • HR: 0.95 (95% CI: NR), p=0.866 • OR: 1.26 (95% CI: NR), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Morales-Romero[75]	**Population:** N=178,306	**Medical Condition, n/N (%):**	**Medical Condition(s):** *COPD:* ND	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** CNS **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To assess whether susceptibility to COVID-19 pneumonia, hospitalization, or severity are altered in Mexican people with asthma. **IVA Score:** COPD: 24 (Moderate)	**Setting:** nation-wide medical units at the first, second, and third level of care; Mexican Epidemiological Surveillance System for Viral Respiratory Diseases database **Location:** Mexico **Study dates:** February 27- June 21, 2020 **Inclusion criteria:** Laboratory confirmed cases of COVID-19 by RT-PCR assay of nasal and pharyngeal swab specimens followed by a nationwide sentinel surveillance model, which collects samples from 10% of the acute respiratory ambulatory cases, severe cases, and associated deaths. **Exclusion criteria:** Those with	Chronic obstructive pulmonary disease (COPD): 3,019/178,306 (1.7%) **Control/Comparison group, n/N (%):** No COPD: 175,287/178,306 (98.3%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* death among outpatients and hospitalized patients *ICU admission:* ICU admission among those hospitalized *Intubation:* Endotracheal intubation among those hospitalized *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	*aOR1: Multivariable Logistic Regression including asthma, diabetes, systemic arterial hypertension, obesity, COPD, immunosuppression, cardiovascular disease, chronic kidney disease, current smoking status, age, sex, indigenous language, pneumonia, and endotracheal intubation* *aOR2: Multivariable Logistic Regression including asthma, diabetes, systemic arterial hypertension, obesity, COPD, immunosuppression, cardiovascular disease, chronic kidney disease, current smoking status, indigenous languages, age, and sex* *RR: Relative risk* *Intubation, n/N (%):* COPD: • aOR2: 1.12 (95% CI: 0.96-1.31), p=0.156 *Hospitalization, n/N (%):* COPD: • aOR2: 2.71 (95% CI: 2.49-2.94), p<0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	negative RT-PCR result, pending RT-PCR test results, incomplete data/mistakes in codification, or were foreigners.			
Author: Mushtaq[47] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To evaluate whether the initial chest X-ray (CXR) severity assessed by an AI system may have prognostic utility in patients with COVID-19. **IVA Score:** 23 (Moderate)	**Population:** N=697 **Setting:** Tertiary care academic hospital **Location:** Italy **Study dates:** February 25 - April 9, 2020 **Inclusion criteria:** All consecutive patients aged ≥ 18 years, admitted to the Institution's Emergency Department (ED) with a positive RT-PCR nasopharyngeal swab between February 25 and May 5, 2020 and patients with a CXR obtained on presentation were included. **Exclusion criteria:** Patients who acquired infection	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 34/697 (4.9%) **Control/Comparison group, n/N (%):** No COPD: 663/697 (95.1%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio (Computed using a multivariate Cox regression model, including terms for sex, age, and comorbidities): Adjusted Hazard Ratio 2 (Computed using a multivariate Cox regression model, including terms for sex, age, and comorbidities)* *Mortality, n/N (%):* COPD: • aHR: 2.29 (95% CI: 1.38–3.80), p=0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	during hospitalization, those transferred to the institution from other hospitals or later transferred to other hospitals, those with positive RT-PCR as outpatients, those with no available initial CXR, and patients with a history of pneumonectomy were excluded.			
Author: Naqvi[48] **Year:** 2021 **Data Extractor:** MC **Reviewer:** CNS/MW **Study Design:** Prospective cohort **Study Objective**: Describe various patterns of coagulopathy (CAC) and thromboembolism in severely ill patients with COVID-19 and to evaluate CAC, thromboembolism, and various comorbidities as predictors of mortality among severely ill	**Population:** N= 261 **Setting:** COVID-19 intensive care unit (ICU) at a university hospital **Location:** Pakistan **Study dates:** September 1 – November 30, 2020 **Inclusion criteria:** All confirmed severe COVID-19 patients aged ≥18 years that were admitted to the COVID-19 ICU	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 31/261 (11.9%) **Control/Comparison group, n/N (%):** No COPD: 230/261 (88.1%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; models adjusted for NR* *OR: Univariate Logistic Regression* *Mortality, n/N (%):* COPD • aOR: 10.357 (95% CI: 2.491-43.060), p = 0.001 • OR: 2.531 (95% CI: 1.118-5.732), p=0.026 • Deceased: 22/135 (16.3%) • Survived: 9/126 (7.1%) • p=0.022 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
COVID-19 patients. **IVA Score:** COPD: 23 (Moderate)	during the study period who gave consent. Patients were confirmed in accordance with WHO guidance where RNA of SARS-CoV-2 was detected by RT-PCR. **Exclusion criteria:** All patients having known coagulation disorders like protein C, S deficiency, parahaemophilia, malignancy, and patients having a history of thromboembolism and already on anticoagulation.			**Long-term Sequelae:** NR
Author: Oh[49] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To investigate various chronic respiratory diseases (CRDs) that affect the risk of COVID-	**Population:** N=122,040 n=7,780 COVID-19 + **Setting:** National Health Insurance Service database **Location:** South Korea **Study dates:** January 1-June 26, 2020	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 4488/122,040 (3.6%) **Control/Comparison group, n/N (%):** No COPD: 117,552/122,040 (96.3%)	**Medical Condition(s):** *COPD:* I27.8, I27.9, J40.x - J47.x, J60.x - J67.x, J68.4, J70.1, J70.3 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *Mortality, n/N (%):* COPD: • aOR: 1.56 (95% CI: 1.06-2.2), p=0.024 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
19 among the general population in South Korea, and to examine the effect of different CRDs on hospital mortality among patients with COVID-19 in South Korea. **IVA Score:** 24 (Moderate)	**Inclusion criteria:** Individuals ≥20 years old, had a respiratory disease diagnosis by the International Classification of Diseases codes, and prescription information concerning drugs and/or procedures from 2015-2020 were included. COVID-19 negative individuals were extracted from the national database using stratification methods with regard to age, sex, and residence in February 2020. **Exclusion criteria:** NR		*Non-elective readmissions*: NR **Comments:** None	**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Parlak[50] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Retrospective cohort **Study Objective:** To retrospectively evaluate	**Population:** N=343 **Setting:** Hospital **Location:** Turkey **Study dates:** March 15 - April 30, 2020 **Inclusion criteria:** COVID-19 suspected patients	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 20/343 (5.8%) **Control/Comparison group, n/N (%):** No COPD: 323/343 (94.2%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* ND *Intubation:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%)* COPD: • aOR: 1.177 (95% CI: 0.225-6.168), p=0.847 • OR: 3.176 (95% CI: 0.848-11.902), p=0.086 • Died: 3/20 (15.0%) • Survived: 17/323 (5.3%) • p=0.071

Study	Population and Setting	Intervention	Definitions	Outcomes
the chest CT of PCR-confirmed COVID19 cases and classify lung involvement by location, extension, and type, and to investigate the relationship between this classification and whether the patient had steatosis or not. **IVA Score:** 23 (Moderate)	with chest CT examinations admitted to the emergency department were included. **Exclusion criteria:** Patients under the age of 18 years, those with image artifacts, those that received an intravenous contrast agent for examinations, such as CT angiography, and those with chronic liver disease were excluded.		*Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Parra-Bracamonte[51] **Year:** 2020 **Data Extractor:** MC **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To identify characteristics of patients who are current positive cases of COVID-19 in Mexico and	**Population:** N= 331,298 **Setting:** Database including information from 475 monitoring units from public and private health sectors **Location:** Mexico **Study dates:** January 13 - July 17, 2020 (database accessed July 18, 2020)	**Medical Condition, n/N (%):** Chronic pulmonary obstructive disease (COPD): 5458/331,298 (1.6%) **Control/Comparison group, n/N (%):** No COPD: 325,840/331,298(98.4%)	**Medical Condition(s):** *COPD*: characterized by respiratory symptoms and persistent limitation of aerial flux related to a constant exposure to particles and harmful gases (i.e., smoking, biomass) **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%)* COPD: • aOR: 1.261 (95% CI: 1.150-1.383), p<0.0001 • OR: 4.047 (95% CI: 3.822-4.285) • Died: 1839/38,310 (4.8%) • Survived: 3619/292,988 (1.2%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
assess risk factors for mortality. **IVA Score:** 24 (moderate)	**Inclusion criteria:** Patients diagnosed positively to COVID-19 included in the Epidemiologic Surveillance Source of Respiratory Viral Diseases (Sistema de Vigilancia Epidemiologica de Enfermedades Respiratorias Virales). All positive cases to COVID-19 were diagnosed using real-time PCR and were officialized by the National Network for Epidemiologic Surveillance (Red Nacional de Laboratorios de Vigilancia Epidemiologica). **Exclusion criteria:** NR		*Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Puebla Neira[52] **Year:** 2021 **Data Extractor:** JH **Reviewer:** CNS	**Population:** N=31,526 **Setting:** Multiple hospital networks **Location:** US	**Medical Condition, n/N (%):** COPD: 4,758/31,526 (15.1%) **Control/Comparison group, n/N (%):** No COPD: 26,768/31,526 (84.9%)	**Medical Condition(s):** *COPD:* Having experienced ≥ 1 inpatient or ≥2 outpatient visits for COPD in the 1 year before the COVID-19 diagnosis using ICD-10-CM codes: J41.8, J42, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, J44.9	**Severe COVID-19:** *aOR: Adjusted Odds Ratio; Multivariate Logistic Regression; model included clinical and demographic factors* *OR: Odds Ratio* *Mortality, n/N (%):* COPD:

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Design: Cohort **Study Objective:** To assess whether COPD increased the risk of mortality among patients hospitalized for COVID-19. **IVA Score:** 23 (Moderate)	**Study dates:** February 10 – November 10, 2020 **Inclusion criteria:** Patients with complete demographic data in the OPTUM EHR database and Integrated Delivery Network during the study dates who were ≥ 40 years of age with COVID-19 identified by a positive laboratory test for SARS-CoV-2 or International Classification for Diseases, 10th revision, Clinical Modification (ICD-10-CM) diagnosis code U07.1 and hospitalized within 14 days of diagnosis. **Exclusion criteria:** Patients younger than 40 years at the time of diagnosis.		**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* inpatient mortality among patients with COVID-19-associated hospitalization *ICU admission:* ND *Intubation:* NR *Ventilation:* ND *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	• aOR: 1.33 (95% CI: 1.18-1.50), p<0.0001 • OR: 1.68 (95% CI: 1.54-1.84), p=NR • COPD: 667/4,758 (14.0%) • No COPD: 2,363/26,768 (8.8%) • p<0.0001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** *Mortality, n/N (%):* Sex, Male *COPD* • aOR: 1.14 (95% CI:0.97 – 1.34), p = NR Sex, Female *COPD* • aOR: 1.62 (1.36 – 1.95); p = NR Age 65-79 (compared to 40-64) • aOR: 2.44 (95% CI: 2.19-2.71), p<0.0001 Age ≥ 80 (compared to 40-64) • aOR: 5.74 (95% CI: 5.09-6.49), p<0.0001 **Long-term Sequelae:** NR
Author: Purroy[53] **Year:** 2021	**Population:** N=1,737	**Medical Condition, n/N (%):** COPD: 119/1,737 (6.9%)	**Medical Condition(s):** *COPD:* based on ICD-10	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: CNS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To describe the rate of thromboembolism event (TEE) complications and its influence in the prognosis of hospitalized patients with COVID-19 after a cross-sectional study. **IVA Score:** 23 (moderate)	**Setting:** 16 hospitals **Location:** Spain **Study dates:** March 1-April 20, 2020 **Inclusion criteria:** All patients with COVID-19 confirmed by RT-PCR test or nasopharyngeal or oropharyngeal swab or sputum specimen. **Exclusion criteria:** Patients under 18 years old or missing ICD-10 codification.	**Control/Comparison group, n/N (%):** No COPD: 1,618/1,737 (93.1%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital death *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*aOR1: Multivariable Logistic Regression; model included demographic characteristics, clinical characteristics, and vital signs* *aOR2: Multivariable Logistic Regression; model included demographic and clinical characteristics* *Mortality, n/N (%):* *COPD* • aOR1: 1.81 (95% CI: 1.00-3.27), p=0.049 • aOR2: 1.61 (95% CI: 1.03-2.53); p=0.039 • Dead: 43/276 (15.6%) • Alive: 76/1461 (5.2%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Ramos-Martinez[83] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To analyze the clinical characteristics of patients	**Population:** N=7,137 **Setting:** 147 hospitals; SEMI-COVID-19 Network Registry collects data on 10% of admitted patients **Location:** Spain	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 406/7,137 (5.7%) **Control/Comparison group, n/N (%):** No COPD: 6,731/7,137 (94.3%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *ICU admission:* NR *Intubation:* NR *Ventilation:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression included variables Age, Charlson Comorbidity Index score, diabetes, COPD, asthma, solid neoplasia, hypertension, dementia, duration of symptoms before admission, hemoglobin level and platelets count at admission, ground-glass infiltrate at admission, acute cardiac injury, acute kidney failure and glucocorticoid treatment* **Severity of Condition:** NR **Duration of Condition:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with COVID-19 who were readmitted to the hospital during the first 30 days after being discharged, determine the proportion of COVID-19 patients who were readmitted after discharge, the causes of readmission, and factors associated with this poor outcome. **IVA Score:** COPD: 23 (moderate)	**Study dates:** March 1-April 30, 2020 **Inclusion criteria:** All consecutive patients admitted to hospitals and discharged with confirmed COVID-19 disease by RT-PCR of a nasopharyngeal or sputum sample and were included in the SEMI-COVID-19 Registry during the study dates. **Exclusion criteria:** Missing data or death during initial hospital admission.		*Hospitalization:* NR *Non-elective readmissions*: patients with COVID-19 who were readmitted to the hospital during the first 30 days after being discharged. Patients who were attended in the emergency department after hospital discharge but not admitted, were not considered readmitted patients. **Comments:** None.	**Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** Non-elective readmissions COPD: • aOR: 1.84 (95% CI: 1.26-2.69), p=0.002 • Readmission: 42/298 (14.1%) • No readmission: 364/6,839 (5.3%) • P<0.001
Author: Rezaei[54] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To determine the clinical and epidemiological characteristics as well as the risk factors associated	**Population:** N=270,949 **Setting:** Hospitals from 31 provinces in the ministry of health registry of Iran **Location:** Iran **Study dates:** February 18 – December 22, 2020	**Medical Condition, n/N (%):** COPD: NR **Control/Comparison group, n/N (%):** No COPD: NR	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR	**Severe COVID-19:** *aOR: Multivariable Logistic Regression including age, sex, ICU admitting, ventilator aid* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%):* COPD: • aOR: 1.48 (95% CI: 1.40-1.57), p<0.001 • OR: 2.05 (95% CI: 1.94-2.17), p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
with the mortality of COVID-19 in diabetic patients in Iran and the impact of prescribed antiviral and antibiotic on patients' mortality. **IVA Score:** 21 (moderate)	**Inclusion criteria:** Hospitalized patients in a national registry with Severe Acute Respiratory Syndrome (SARS) symptoms who are diagnosed with diabetes including patients with confirmed COVID-19; SARS cases were defined as diabetic patients with fever, respiratory symptoms, radiographic evidence of pneumonia, low or normal white-cell count with low lymphocyte count; with a history of travel to contaminated cities or direct contact with patients who have a fever or respiratory symptoms within 14 days before illness; COVID-19 confirmed cases are defined as a positive result of laboratory tests		*Non-elective readmissions*: NR **Comments:** None	**Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	for the COVID-19 from the respiratory specimens by the Real-Time Reverse Transcription Polymerase Chain Reaction (RT-PCR) assay. **Exclusion criteria:** NR			
Author: Rubio-Rivas[73] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To identify three risk categories for the requirement of high flow nasal cannula, mechanical ventilation, ICU admission, and in-hospital mortality based on lymphopenia and inflammatory parameters on admission. **IVA Score:** COPD: 24 (moderate)	**Population:** N=17,122 **Setting:** 150 hospitals nationwide **Location:** Spain **Study dates:** March 1 – July 31, 2020 **Inclusion criteria:** Hospitalized patients included in the Spanish SEMI-COVID-19 registry and diagnosed with COVID-19 by PCR test taken from nasopharyngeal sample, sputum, or bronchoalveolar lavage.	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 1,155/17,122 (6.7%) **Control/Comparison group, n/N (%):** No COPD: 15,967/17,122 (93.3%)	**Medical Condition(s):** *Asthma*: ND *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* ND *Intubation:* invasive mechanical ventilation *Ventilation:* high flow nasal cannula (HFNC); non-invasive mechanical ventilation (NIMV) *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; adjusted for variables with a significance of <0.10 in the univariate analyses, age, and sex* *OR: Univariate Logistic Regression* *Mortality:* COPD • OR: 2.53 (95% CI: 2.24-2.87), p<0.001 *ICU Admission:* COPD • aOR: 0.63 (95% CI: 0.49-0.82), p<0.001 • OR: 0.75 (95% CI: 0.59-0.94), p=0.013 *Intubation:* COPD • aOR: 0.61 (95% CI: 0.47-0.81), p=0.001 • OR: 0.69 (95% CI: 0.53-0.90), p=0.006 *Ventilation:* HFNC: COPD • aOR: 1.26 (95% CI: 1.04-1.53), p=0.017 • OR: 1.62 (95% CI: 1.35-1.95), p<0.001 NIMV: COPD

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: NR			• aOR: 1.52 (95% CI: 1.23-1.88), p<0.001 • OR: 2.28 (95% CI: 1.87-2.78), p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Rubio-Rivas[55] **Year:** 2020 **Data Extractor:** MW **Reviewer:** DOS **Study design:** Cohort study **Study Objective:** To identify clinical phenotypes by cluster analysis in a large nationwide series of COVID-19 illness and to create a predictive model related to poor outcome. **IVA Score:** 23 (Moderate)	**Population:** N=12,066 **Setting:** 109 hospitals **Location:** Spain **Study dates:** March 1 - July 31, 2020 **Inclusion criteria:** Consecutive, hospitalized patients providing data of symptoms of COVID-19 upon admission were included in the Spanish registry SEMI-COVID-19. All patients were diagnosed by PCR test taken from a nasopharyngeal	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 786/12066 (6.5%) **Control/Comparison group, n/N (%):** No COPD: 11280/12066 (93.5%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* Mechanical ventilation *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR1: Adjusted odds ratio; multivariable logistic regression; model includes all variables* *aOR2: Multivariable Logistic Regression; model includes variables with p<0.10 in the univariate analysis* *OR: Univariable Logistic Regression* *Mortality, n/N (%):* COPD: • aOR1: 1.36 (95% CI: 1.21–1.53), p<0.001 • aOR2: 1.36 (95% CI: 1.04–1.78), p=0.024 • OR: 2.82 (95% CI: 2.43–3.27), p<0.001 *Ventilation, n/N (%):* COPD: • aOR1: 1.50 (95% CI: 1.30-1.72), p<0.001 • aOR2: 1.47 (95% CI: 1.07-2.03), p=0.017 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	sample, sputum or bronchoalveolar lavage. **Exclusion criteria:** NR			**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Sahin[56] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Cross-sectional **Study Objective:** To describe the predictors of mortality related to COVID-19 infection and to evaluate the association between overweight, obesity, and clinical outcomes of COVID-19. **IVA Score:** 22 (moderate)	**Population:** N=675 **Setting:** Multiple hospitals **Location:** Turkey **Study dates:** March - August 2020 **Inclusion criteria:** COVID-19 patients over 18 years of age with at least one positive SARS-CoV-2 RT-PCR examination who were admitted to COVID-19 outpatient clinics at study hospitals. Patients, with unstable vital signs and/or lung involvement were hospitalized while patients with normal vital signs and no pulmonary involvement were followed on an outpatient basis.	**Medical Condition, n/N (%):** COPD: 55/675 (8.1%) **Control/Comparison group, n/N (%):** No COPD: 620/675 (91.9%)	**Medical Condition(s):** *COPD:* NR **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* Hospitalization in the ICU *Intubation:* Invasive mechanical ventilation *Ventilation:* Noninvasive mechanical ventilation *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age, malignancy, and COPD* *OR: Univariable (Univariate) Logistic Regression* *Mortality:* COPD: • aOR: 3.08 (95% CI: 1.19-7.97); p=0.021 • OR: 4.70 (95% CI: 2.15-10.28); p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: Patients without any positive RT-PCR examination and identified as "possible" or "probable" according to CDC.			
Author: Sami[57] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To determine the potential risk factors that predict COVID-19-related mortality concentrating on the initial recorded laboratory tests based on the data of multi-center population-based cohort study. **IVA Score:** 20 (moderate)	**Population:** N=408 **Setting:** 4 referral centers **Location:** Iran **Study dates:** February 24 - April 12, 2020 **Inclusion criteria:** Patients ≥18 who died in the hospital due to COVID-19 and discharged inpatients who received care at study referral centers. Diagnosis of COVID-19 relied on positive RT-PCR. **Exclusion criteria:** NR	**Medical Condition, n/N (%):** COPD: 43/408 (10.5%) **Control/Comparison group, n/N (%):** No COPD: 365/408 (89.5%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital death caused by COVID-19 *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; adjusted by sex and age* *OR: Univariable (Univariate) Logistic Regression* *Mortality, n/N (%)* • aOR: 5.36 (95% CI: 2.33-12.30), p<0.001 • OR: 6.07 (95% CI: 3.01-12.26), p<0.001 • Died: 31/136 (22.8%) • Survived: 12/727 (4.4%) • p<0.001 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Santorelli[58] **Year:** 2021	**Population:** N=582	**Medical Condition, n/N (%):** COPD: 78/582 (13.4%)	**Medical Condition(s):** *COPD:* ND	**Severe COVID-19:** *aHR1: Adjusted Hazard Ratio; model included age category on admission sex, South Asian ethnicity,*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: DOS **Reviewer:** JH **Study Design:** Cohort **Study Objective:** To examine the ethnic, demographic, socio-economic and clinical risk factors associated with outcomes of hospital inpatients who tested positive for COVID-19. **IVA Score:** COPD: 23 (moderate)	**Setting:** Three acute hospitals **Location:** United Kingdom **Study dates:** February 17-August 8, 2020 **Inclusion criteria:** All patients admitted to study hospitals during study dates who tested positive for SARS-CoV-2 using RT-PCR on admission or during their stay. **Exclusion criteria:** Patients with missing ethnicity, comorbidity, and deprivation data or those aged <18 years.	**Control/Comparison group, n/N (%):** No COPD: 504/582 (86.6%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* 30-day in-hospital mortality *ICU admission:* ICU admission at any time during inpatient stay *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	*English Indices of Multiple Deprivation quintiles, and pre-existing comorbidities (obesity, type 2 diabetes, hypertension, cardiovascular disease, asthma, COPD, cancer, and renal disease)* *aHR2: Adjusted Hazard Ratio; model included age and sex* *aOR1: Adjusted Odds Ratio; model included age category on admission, sex, South Asian ethnicity, English Indices of Multiple Deprivation quintiles, and pre-existing comorbidities (obesity, type 2 diabetes, hypertension, cardiovascular disease, asthma, COPD, cancer, and renal disease)* *aOR2: Adjusted Odds Ratio; model included age and sex* *Mortality, n/N (%):* COPD: • aHR1: 0.75 (95% CI: 0.35-1.62); p=NR • aHR2: 0.96 (95% CI: 0.54-1.37); p=NR *ICU admission, n/N (%):* COPD: • aOR1: 0.67 (95% CI: 0.37-1.22); p=NR • aOR2: 0.55 (95% CI: 0.28-1.08); p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Sen[84] **Year:** 2021	**Population:** N=27,810; COVID-19+ n=1,288	**Medical Condition, n/N (%):** COPD: 1,288/1,288(100%)	**Medical Condition(s):**	**Severe COVID-19:** *aOR1: Multivariable Logistic Regression including gender, race, age, smoking status (current vs. former),*

Study	Population and Setting	Intervention	Definitions	Outcomes
Data Extractor: JKK **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To investigate whether, amongst patients with COPD who develop COVID-19, those who are on inhaled corticosteroids (ICS) therapy will have similar inpatient outcomes, mortality, and healthcare utilization as those who are not on ICS. **IVA Score:** 25 (moderate)	**Setting:** Clinical facilities **Location:** Ohio, US **Study dates:** March 8 – September 20, 2020 **Inclusion criteria:** Patients with COPD who were tested for COVID-19 and 35 years and older; infection with SARS-CoV-2 was confirmed by laboratory testing using RT-PCR reaction SARS-CoV-2 assay. **Exclusion criteria:** Patients with concurrent diagnosis of asthma and less than a 10 pack year smoking history.	**Control/Comparison group, n/N (%):** No COPD: 0/1,288(0%)	*COPD*: ICD-9 codes 491.x and ICD10 codes J41.0, J41.1, J41.8, J42, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, J44.9 **Severity Measure(s):** *Oral Corticosteroids (OCS):* prednisone, prednisolone, or methylprednisolone; at least one course in the prior year (prior to registry enrollment); more severe than those who had not received OCS in the prior year **Clinical marker:** NR **Treatment/ Associated Therapy:** *Inhaled Corticosteroid (ICS)*: ND **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* ND *Intubation:* endotracheal intubation *Ventilation:* mechanical ventilation *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** Flow chart number of patients in study did not align with number reported in results section; extracted number reported in results section.	*comorbidities (asthma, obesity, diabetes mellitus, congestive heart failure, hypertension), and month of COVID positivity* *aOR2: Multivariable Logistic Regression including gender, race, and age* *OR: Univariable (Univariate) Logistic Regression* **Severity of Condition:** *Mortality (among hospitalized), n/N (%):* COPD: OCS • aOR1: 0.69 (95% CI: 0.33-1.50), p=NR • aOR2: 0.65 (95% CI: 0.33-1.32), p=NR • OR: 0.58 (95% CI: 0.31-1.10), p=NR • OCS: 54/308 (17.5%) • No OCS: 17/63 (27.0%) • p=0.118 *ICU Admission (among hospitalized), n/N (%):* COPD: OCS • aOR1: 1.52 (95% CI: 0.92-2.64), p=NR • aOR2: 1.72 (95% CI: 1.07-2.89), p=NR • OR: 1.60 (95% CI: 1.00-2.66), p=NR • OCS: 106/308 (34.4%) • No OCS: 21/63 (33.3%) • p=0.985 *Ventilation (among ICU admitted), n/N (%):* COPD: OCS • aOR1: 2.10 (95% CI: 0.91-5.77), p=NR • aOR2: 2.30 (95% CI: 1.04-6.12), p=NR • OR: 2.18 (95% CI: 0.99-5.75), p=NR *Hospitalization, n/N (%):* COPD: OCS • aOR1: 1.54 (95% CI: 1.10-2.19), p=NR

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aOR2: 1.90 (95% CI: 1.39-2.63), p=NR • OR: 1.70 (95% CI: 1.26-2.33), p=NR • OCS: 308/988 (31.2%) • No OCS: 63/300 (21.0%) • p=0.001 **Duration of Condition:** NR **Treatment/ Associated Therapy:** *Mortality (among hospitalized), n/N (%):* COPD: ICS • aOR1: 0.80 (95% CI: 0.43-1.49), p=NR • aOR2: 0.94 (95% CI: 0.54-1.64), p=NR • OR: 0.90 (95% CI: 0.54-1.52), p=NR • ICS: 37/201 (18.4%) • No ICS: 34/170 (20.0%) • p=0.798 *ICU Admission (among hospitalized), n/N (%):* COPD: ICS • aOR1: 1.31 (95% CI: 0.82-2.10), p=NR • aOR2: 1.38 (95% CI: 0.89-2.17), p=NR • OR: 1.29 (95% CI: 0.84-1.99), p=NR • ICS: 74/201 (36.8%) • No ICS: 53/170 (31.2%) • p=0.303 *Ventilation (among ICU admitted), n/N (%):* COPD: ICS • aOR1: 1.65 (95% CI: 0.69-4.02), p=NR • aOR2: 1.37 (95% CI: 0.64-2.98), p=NR • OR: 1.61 (95% CI: 0.79-3.32), p=NR *Hospitalization, n/N (%):* COPD: ICS

Study	Population and Setting	Intervention	Definitions	Outcomes
				• aOR1: 1.12 (95% CI: 0.90-1.38), p=NR • aOR2: 1.26 (95% CI: 1.02-1.55), p=NR • OR: 1.34 (95% CI: 1.09-1.65), p=NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Shin[59] **Year:** 2021 **Data Extractor:** DOS **Reviewer:** MW **Study Design:** Cohort **Study Objective:** To examine how comorbidities and symptom networks were associated with outcomes (illness severity or death) among hospitalized patients with COVID-19. **IVA Score:** COPD: 23 (moderate)	**Population:** N=5,571 **Setting:** Hospitals **Location:** Korea **Study dates:** January 21 - April 30, 2020 **Inclusion criteria:** All patients who were confirmed to have COVID-19, hospitalized, and discharged during study dates. Data provided by the National Medical Center for the Korea Disease Control and Prevention Agency. **Exclusion criteria:** Cases involving pregnancy, cases with no clinical	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 40/5,571 (0.7%) **Control/Comparison group, n/N (%):** No COPD: 5,531/5,571 (99.3%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR1: Multinomial logistic regression; model includes age, sex, BMI, diabetes mellitus, hypertension, heart failure, cardiac conduction disease, COPD, asthma, chronic kidney disease, malignancy, chronic liver disease, rheumatic disease/autoimmune disorder, and dementia* *aOR2: Multinomial logistic regression; model includes age, sex, and BMI* *Mortality:* COPD: • aOR1: 1.39 (95% CI: 0.35-5.59); p=0.64 • aOR2: 2.19 (95%CI: 0.60-7.93); p=0.23 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	severity reported, and cases with incomplete data.			
Author: Song[77] **Year:** 2020 **Data Extractor:** JKK **Reviewer:** CS **Study design:** Retrospective cohort study **Study Objective:** To explore the influence of asthma and chronic obstructive pulmonary disease (COPD) comorbidity on disease expression and outcomes, and the potential underlying mechanisms in COVID-19 patients. **IVA Score:** 22 (moderate)	**Population:** N=961 **Setting:** Largest designated hospital to treat patients with COVID-19 in Wuhan **Location:** Wuhan, China **Study dates:** February 1-March 6, 2020 **Inclusion criteria:** Patients diagnosed with SARS-CoV-2 by RT-PCR of throat or nasopharyngeal swab specimens and had definite clinical outcomes (discharge or death) from February 1 to March 6, 2020, at Tongji Hospital were included. **Exclusion criteria:** Patients with locally advanced	**Medical Condition, n/N (%):** COPD: 21/961 (2.2%) **Control/Comparison group, n/N (%):** No Asthma or COPD: 918/961 (95.5%)	**Medical Condition(s):** *COPD*: Diagnosis based on Global Initiative for Chronic Obstructive Lung Disease criterion and patient's self-report on admission **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* invasive and noninvasive mechanical ventilation *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: adjusted odds ratio (95% CI), Multivariable logistic regression, adjusted for age and gender: adjusted odds ratio (95% CI), Multivariable logistic regression, adjusted for age and gender* *Mechanical ventilation, n/N (%)* COPD: • aOR: 1.59 (95% CI: 1.009-2.521), p=0.046 • COPD: 10/21 (47.6%) • No COPD or asthma: 141/918 (15.4%) *Invasive mechanical ventilation, n/N (%):* COPD: • COPD: 3/21 (14.3%) • No COPD or asthma: 53/918 (5.8%) *Non-invasive mechanical ventilation, n/N (%):* COPD: • COPD: 7/21 (33.3%) • No COPD or asthma: 88/918 (9.6%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	stage III lung cancer, received chemotherapy or radiotherapy before surgery, or have bronchiectasis, cystic fibrosis, or any other chronic diseases were excluded from the immunohistochemistry study.			
Author: Tang[60] **Year:** 2020 **Data Extractor:** JKK **Reviewer:** CNS **Study Design:** Cohort **Study Objective:** To assess outcomes associated with SARS-CoV-2 infection among residents who were tested for SARS-CoV-2 RNA across one nursing home system with both long-term and post-acute rehabilitation services. **IVA Score:** COPD: 23 (moderate)	**Population:** N=1970; COVID+ n=752 **Setting:** 15 skilled nursing facilities **Location:** WA, US **Study dates:** March 1 – June 16, 2020 **Inclusion criteria:** All residents from 15 skilled nursing facilities who were universally tested for SARS-CoV-2 by RT-PCR using nasopharyngeal or oropharyngeal swabs and had recorded test	**Medical Condition, n/N (%):** COPD/Emphysema: 146/752 (19.4%) **Control/Comparison group, n/N (%):** No COPD/Emphysema: 606/752 (80.6%)	**Medical Condition(s):** *COPD/Emphysema*: ICD-10 codes J43 and J44 **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* ND *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* ND *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aRR: Adjusted Relative Risk; adjusted for age, sex, race, and facility* *Mortality, n/N (%):* COPD/Emphysema: • aRR: 1.55 (95% CI: 1.08-2.24), p<0.05 *Hospitalization, n/N (%):* COPD/Emphysema: • aRR: 1.31 (95% CI: 0.96-1.80), p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	results during the study dates. **Exclusion criteria:** NR			
Author: Tessitore[61] **Year:** 2021 **Data Extractor:** MC **Reviewer:** DOS **Study Design:** Cohort study **Study Objective:** To examine whether patients with previous cardiovascular diseases (CVDs) have increased risk of death and major adverse cardiovascular event (MACE) when hospitalized for COVID-19. **IVA Score:** 24 (Moderate)	**Population:** N= 839 **Setting:** University hospitals **Location:** Switzerland **Study dates:** February 26 - June 5, 2020 **Inclusion criteria:** All subjects ≥18 years who tested positive for SARS-CoV-2 and exhibited COVID-19 symptoms that required hospitalization between February 26 - April 26, 2020. The diagnostic tool to detect SARS-CoV-2 infection was a nasopharyngeal swab specimen (RT-PCR assay).	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 49/839 (6%) **Control/Comparison group, n/N (%):** No COPD: 790/839 (94%)	**Medical Condition(s):** *COPD*: ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression; model included age, sex, CT scan findings, hypertension, obesity, dyslipidemia, diabetes (type I or II), active smoking, COPD, obstructive sleep apnea, creatinine, C reactive protein, aspartate transaminase/alanine transaminase ratio, and anemia* *Mortality, n/N (%):* • aOR: 2.0 (95% CI: 0.94-4.3) • OR: 3.1 (95% CI: 1.7-5.7) • Died: 19/152 (13%) • Survived: 30/687 (4%) • p=0.07 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: All patients who were found positive for SARS-CoV-2 without COVID-19 symptoms who were hospitalized for other reasons than COVID-19, patients who were still hospitalized on June 5, 2020, and patients that were not able to provide informed consent.			
Author: Timberlake[62] **Year:** 2021 **Data Extractor:** MW **Reviewer:** DOS **Study design:** Retrospective cohort **Study Objective:** To determine the relationship between atopic disease (including asthma) and severity of COVID-19 in hospitalized patients. **IVA Score:** 23 (Moderate)	**Population:** N=275 **Setting:** 1 adult and 1 pediatric tertiary referral center hospital **Location:** OH, USA **Study dates:** March 1st - May 5th, 2020 **Inclusion criteria:** All patients admitted for any reason and subsequently were found to have positive testing for SARS-CoV-2 via RT-PCR during their hospitalization.	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 62/275 (22.5%) **Control/Comparison group, n/N (%):** No COPD: 213/275 (77.4%)	**Medical Condition(s):** *COPD:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* in-hospital mortality *ICU admission:* admission to ICU *Intubation:* ND *Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *Mortality, n/N (%):* COPD: • aOR: 1.37 (95% CI: 0.65-2.90), p=0.41 *ICU admission, n/N (%):* COPD: • aOR: 2.33 (95% CI: 1.19-4.55), p=0.01 *Intubation, n/N (%):* COPD: • aOR: 2.14 (95% CI: 1.11-4.14), p=0.02 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Both hospitals initially only tested patients who were symptomatic or had known contacts with confirmed COVID-19. On April 9, 2020 the children's hospital began all admitted patients. **Exclusion criteria:** Patients who did not have SARS-CoV-2 testing, had negative SARS-CoV-2 testing, or were still admitted on May 5, 2020.			**Risk Markers:** NR **Long-term Sequelae:** NR
Author: Tsai[63] **Year:** 2021 **Data Extractor:** CNS **Reviewer:** MC **Study Design:** Cohort **Study Objective:** To examine the effect of COVID-19 on women veterans, and specifically minorities, because previous studies have demonstrated that COVID-19 has affected veterans of racial and	**Population:** N=77,364; COVID+ n=8,308 **Setting:** VA hospitals and clinics **Location:** US **Study dates:** February 24-November 25, 2020 **Inclusion criteria:** Women veterans who were tested for SARS-CoV-2 infection at U.S.	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 624/8,308 (7.5%) **Control/Comparison group, n/N (%):** No COPD: 7,684/8,308 (92.5%)	**Medical Condition(s):** *COPD:* ICD-9 and ICD-10 codes for histoplasmosis (115), chronic bronchitis or emphysema (490, 491, 492, 494, J40, J41, J43, J44, J47), and screening for chronic bronchitis and emphysema (V81.3) up to two years prior to the index date (COVID-19 test date) **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* 60-day all-cause mortality among the SARS-CoV-2 positive group *ICU admission:* NR *Intubation:* NR	**Severe COVID-19:** *aHR: Adjusted Cox Proportional Hazards Ratio; model included baseline confounders* *Mortality:* *COPD:* • aHR: 1.81 (95% CI: 1.08-3.06), p=statistically significant **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
ethnic minorities disproportionately. **IVA Score:** 23 (moderate)	Veterans Affairs (VA) Health Care during the study dates with complete data based on baseline covariates and outcomes (death and cardiovascular outcomes) in a VA COVID-19 shared data resource. **Exclusion criteria:** Non-veterans who were not eligible for VA health care, patients with missing data on baseline covariates, and patients with death/cardiovascular event dates that were earlier than the COVID-19 test date.		*Ventilation:* NR *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	
Author: Valent[64] **Year:** 2021 **Data Extractor:** JKK **Reviewer:** MW **Study Design:** Cohort	**Population:** N=886 **Setting:** COVID-19 hospitals and nursing homes **Location:** Italy	**Medical Condition, n/N (%):** COPD: 13/886 (1.5%) **Control/Comparison group, n/N (%):** No COPD: 873/886 (98.5%)	**Medical Condition(s):** *COPD*: Identified through the Johns Hopkins ACG System **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:**	**Severe COVID-19:** *aOR: Multinomial Logistic Regression including time from local outbreak state, date of infection diagnosis, age, sex, comorbidities, and nursing home residency; significance level 0.3 was required to allow a variable into the model and significance level of 0.35 was required to stay in the model* *Mortality, n/N (%):* COPD: • aOR: 4.113 (95% CI: 0.829-20.404), p=NR

Study	Population and Setting	Intervention	Definitions	Outcomes
Study Objective: To assess the association of age and chronic comorbidities with different outcomes of SARS-CoV-2 infection, considering the potential confounding effect of residing in a nursing home. **IVA Score:** 22 (moderate)	**Study dates:** March 1 – April 30, 2020 **Inclusion criteria:** People living in the province of Udine who had at least one positive RT-PCR test for SARS-CoV-2 during the study dates. **Exclusion criteria:** NR		*Mortality:* ND *ICU admission:* hospitalization requiring an ICU stay with no death *Intubation:* NR *Ventilation:* NR *Hospitalization:* hospitalization with no ICU stay or death *Non-elective readmissions*: NR **Comments:** None	• COPD: 4/13 (30.8%) • No COPD: 66/873 (7.6%) • p=0.0221 *Hospitalization, n/N (%):* COPD: • aOR: 0.973 (95% CI: 0.145-6.548), p=NR • COPD: 2/13 (15.4%) • No COPD: 169/873 (19.4%) • p=NR **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Vera-Zertuche[74] **Year:** 2021 **Data Extractor:** MW **Reviewer:** JH/CNS **Study Design:** Cohort **Study Objective:** To elucidate if obesity is an independent risk factor for short-term mortality and other adverse outcomes in patients with obesity as their only comorbidity and patients	**Population:** N=71,103; COVID+ n=15,529 **Setting:** COVID-19-accredited medical units **Location:** Mexico **Study dates:** February 24 – April 26, 2020 **Inclusion criteria:** National cohort of patients evaluated for suspected	**Medical Condition, n/N (%):** COPD: 389/15,529 (2.5%) Asthma: 542/15,529 (3.5%) **Control/Comparison group, n/N (%):** Without comorbidities: 8,422/15,529 (54.2%)	**Medical Condition(s):** *COPD:* ND *Asthma:* ND **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* All-cause mortality up to 56 days after inclusion *ICU admission:* ND *Intubation:* Invasive mechanical ventilation *Ventilation:* NR *Hospitalization:* ND	**Severe COVID-19:** *aHR: Adjusted Hazard Ratio; Cox-Proportional Hazards Ratio; model included sex, age, time from symptom onset to care, social lag index, ageing index, afro-descendant per 100 inhabitants, indigenous language-speaking per 100 inhabitants, affiliation to health services per 100 inhabitants, members per household, hospitals per 10 000 inhabitants, hospital beds per 10,000 inhabitants* *aOR: Adjusted Odds Ratio; Logistic regression model; model included sex, age, time from symptom onset to care, social lag index, ageing index, afro-descendant per 100 inhabitants, indigenous language-speaking per 100 inhabitants, affiliation to health services per 100 inhabitants, members per household, hospitals per 10 000 inhabitants, hospital beds per 10,000 inhabitants* *HR: Hazard Ratio*

Study	Population and Setting	Intervention	Definitions	Outcomes
with obesity plus one other comorbidity who were evaluated for suspected COVID-19 in both ambulatory units and hospitals in Mexico. **IVA Score:** Asthma: 24 (Moderate) COPD: 23 (Moderate)	COVID-19 in the first 2-month period of the pandemic between the study dates; patients were grouped according to SARS-CoV-2 (RT-PCR) result into positive, negative or pending. **Exclusion criteria:** NR		*Non-elective readmissions*: NR **Comments:** Denominators for COPD and asthma were different in the supplementary material file than in the main paper (75 & 249 respectively)	*Mortality, n/N (%):* COPD: • aHR: 1.72 (95% CI: 1.05-2.84), p=NR • HR: 5.92 (95% CI: 3.64-9.64), p=NR • COPD: 17/75 (22.7%) • No comorbidities: 370/8422 (4.4%) *ICU Admission, n/N (%):* COPD: • aOR: 1.49 (95% CI: 0.65-3.40), p=NR • COPD: 7/75 (9.3%) • No comorbidities: 235/8422 (2.8%) *Intubation, n/N (%):* COPD: • aOR: 1.06 (95% CI: 0.44-2.58), p=NR • COPD: 6/75 (8.0%) • No comorbidities: 214/8422 (2.5%) *Hospitalization, n/N (%):* COPD: • aOR: 1.29 (95% CI: 0.78-2.13), p=NR • COPD: 43/75 (57.3%) • No comorbidities: 2296/8422 (27.3%) **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR
Author: Wei[82]	**Population:** N= 206,741	**Medical Condition, n/N (%):** COPD: 8,835/206,741 (4.3%)	**Medical Condition(s):** *COPD:* ND	**Severe COVID-19:**

Study	Population and Setting	Intervention	Definitions	Outcomes
Year: 2021 **Data Extractor:** JH **Reviewer:** DOS **Study Design:** Cohort **Study Objective:** To characterize US patients initially diagnosed with COVID-19 in the outpatient setting and to estimate the 30-day incidence of and risk factors for subsequent COVID-19 related urgent medical visits (UMVs) using a large, national, electronic health records (EHR) database. **IVA Score:** COPD: 24 (Moderate)	**Setting:** Emergency room, urgent care, and other outpatient settings **Location:** US **Study dates:** June 1 - December 9, 2020 **Inclusion criteria:** Adult patients (aged ≥ 18 years) having their first confirmed COVID-19 diagnosis (ICD-10 code U07.1) or positive SARS-CoV-2 virus test in the outpatient setting during the study period, were a part of an integrated delivery network health system and had ≥ 1 health care encounter within 2 years prior to COVID-19 diagnosis for assessment of medical history. **Exclusion criteria:** Patients who were hospitalized on the	**Control/Comparison group, n/N (%):** No COPD: 197,906/206,741 (95.7%)	**Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* NR *PICU admission:* NR *Intubation:* NR *Ventilation:* NR *Hospitalization:* COVID-19-related hospitalizations within 30 days of an outpatient COVID-19 diagnosis or positive SARS-CoV-2 test *Non-elective readmissions*: NR **Comments:** None	*aHR: adjusted hazard ratio; model included demographics (age, sex, race/ethnicity, and geographic region), BMI, comorbidities, smoking status, location of first COVID-19 encounter, baseline period resource use (ER/UC hospitalization), and index month* *HR: hazard ratio* *Hospitalization, %:* COPD: • aHR: 1.25 (95% CI: 1.16-1.35), p=NR • HR: 3.48 (95% CI: 3.26-3.72), p=NR • COPD: 11.7% • No COPD: 3.5% **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NR **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	index date, had a prior COVID- 19/ coronavirus diagnosis, or a prior positive SARS-CoV-2 virus or antibody test result before June 1, 2020.			
Author: Yoshida[65] **Year:** 2021 **Data Extractor:** MW **Reviewer:** CS **Study design:** Case series study **Study Objective:** To determine if sex differences exist in clinical characteristics and outcomes of adults hospitalized for coronavirus disease 2019 (COVID-19) in a US healthcare system. **IVA Score:** 23 (moderate)	**Population:** N=776 **Setting:** Two tertiary care academic hospitals **Location:** Louisiana, USA **Study dates:** February 27 – July 23, 2020 **Inclusion criteria:** All consecutively admitted adults (> 18 years) hospitalized from February 27-July 15, 2020 with confirmed SARS-CoV-2 (by PCR of a nasopharyngeal sample) infection on admission were included nasopharyngeal sample) infection on admission were included.	**Medical Condition, n/N (%):** Chronic obstructive pulmonary disease (COPD): 140/776 (18.8%) **Control/Comparison group, n/N (%):** Chronic obstructive pulmonary disease (COPD): 636/776 (82.0%)	**Medical Condition(s):** *Chronic obstructive pulmonary disease (COPD):* Ascertained by codes in the International Classification of Diseases, 10th Revision [ICD-10] and physician notes 6 months prior to the admission **Severity Measure(s):** NR **Clinical marker:** NR **Treatment/ Associated Therapy:** NR **Outcome Definitions:** *Mortality:* In hospital mortality *ICU admission:* ND *Intubation:* NR *Ventilation:* Invasive mechanical ventilation (IMV) *Hospitalization:* NR *Non-elective readmissions*: NR **Comments:** None	**Severe COVID-19:** *aOR: Multivariable Logistic Regression: Multivariable Logistic Regression* *Mortality, n/N (%):* COPD: • aOR: 1.13 (95% CI 0.69-1.85) *ICU admission, n/N (%):* COPD: • aOR: 1.86 (95% CI 1.25-2.78), p<0.05 *IMV, n/N (%):* COPD: • aOR: 1.68 (95% CI 1.09-2.57), p<0.05 **Severity of Condition:** NR **Duration of Condition:** NR **Treatment/ Associated Therapy:** NR **Comorbid Conditions:** NR **Risk Markers:** NA **Long-term Sequelae:** NR

Study	Population and Setting	Intervention	Definitions	Outcomes
	Exclusion criteria: NR			

B.3.c. Internal Validity Assessments of Extracted Studies

Table 8. Internal Validity Assessments of Extracted Studies reporting the Association between COPD and Severe COVID-19 Outcomes

	Author Year	Ahlstrom 2020[1]	Arslan 2021[2]	Aveyard 2021[3]	Beatty 2021[4]	Beltramo 2021[5]	Bergman 2021[66]	Boari 2020[6]
	Outcome(s)	Mortality, ICU admission	Mortality	Mortality, ICU, Hospitalization	Mortality, ICU admission	Mortality, ICU admission	ICU admission, hospitalization	Mortality
Domain	**Signaling question**	National registries	All data have been regulated with the valid guides edited and updated by the Science Board of Turkish Republic Ministry of Health	data extracted from medical records	data from database	Hospital records	Registries	Clinical records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	0	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0

	Author Year	Ahlstrom 2020[1]	Arslan 2021[2]	Aveyard 2021[3]	Beatty 2021[4]	Beltramo 2021[5]	Bergman 2021[66]	Boari 2020[6]
	Outcome(s)	Mortality, ICU admission	Mortality	Mortality, ICU, Hospitalization	Mortality, ICU admission	Mortality, ICU admission	ICU admission, hospitalization	Mortality
Domain	**Signaling question**	National registries	All data have been regulated with the valid guides edited and updated by the Science Board of Turkish Republic Ministry of Health	data extracted from medical records	data from database	Hospital records	Registries	Clinical records
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1

	Author Year	Ahlstrom 2020[1]	Arslan 2021[2]	Aveyard 2021[3]	Beatty 2021[4]	Beltramo 2021[5]	Bergman 2021[66]	Boari 2020[6]
	Outcome(s)	Mortality, ICU admission	Mortality	Mortality, ICU, Hospitalization	Mortality, ICU admission	Mortality, ICU admission	ICU admission, hospitalization	Mortality
Domain	**Signaling question**	National registries	All data have been regulated with the valid guides edited and updated by the Science Board of Turkish Republic Ministry of Health	data extracted from medical records	data from database	Hospital records	Registries	Clinical records
	Adequately powered to detect result	1	0	0	0	0	1	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	1	0	0	0	1	1	0

	Author Year	Ahlstrom 2020[1]	Arslan 2021[2]	Aveyard 2021[3]	Beatty 2021[4]	Beltramo 2021[5]	Bergman 2021[66]	Boari 2020[6]
	Outcome(s)	Mortality, ICU admission	Mortality	Mortality, ICU, Hospitalization	Mortality, ICU admission	Mortality, ICU admission	ICU admission, hospitalization	Mortality
Domain	**Signaling question**	National registries	All data have been regulated with the valid guides edited and updated by the Science Board of Turkish Republic Ministry of Health	data extracted from medical records	data from database	Hospital records	Registries	Clinical records
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	25	23	23	23	23	25	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Caliskan 2020[7]	Calmes 2021[8]	Castilla 2021[9]	Choi 2020[10]	Ciardullo 2021[11]	Corradini 2021[12]	Cosio 2021[13]
	Outcome(s)	Mortality, ICU admission	Mortality, ICU admission	Mortality, ICU admission, Hospitalization	Mortality, Intubation, Ventilation, Hospitalization	Mortality	Mortality	Mortality
Domain	**Signaling question**	data was extracted from medical records	data extracted from medical records	data extracted from medical records	data collected from nationwide database	Data extracted from medical records	data reported from electronic medical records	Data analyzed after hospital admission
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	0	1
	Attrition <10-15% of population	1	1	1	1	1	0	1

	Author Year	Caliskan 2020[7]	Calmes 2021[8]	Castilla 2021[9]	Choi 2020[10]	Ciardullo 2021[11]	Corradini 2021[12]	Cosio 2021[13]
	Outcome(s)	Mortality, ICU admission	Mortality, ICU admission	Mortality, ICU admission, Hospitalization	Mortality, Intubation, Ventilation, Hospitalization	Mortality	Mortality	Mortality
Domain	**Signaling question**	data was extracted from medical records	data extracted from medical records	data extracted from medical records	data collected from nationwide database	Data extracted from medical records	data reported from electronic medical records	Data analyzed after hospital admission
	Attrition appropriately analyzed	1	1	1	1	1	0	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	1	0	0	0	0	1
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1

	Author Year	Caliskan 2020[7]	Calmes 2021[8]	Castilla 2021[9]	Choi 2020[10]	Ciardullo 2021[11]	Corradini 2021[12]	Cosio 2021[13]
	Outcome(s)	Mortality, ICU admission	Mortality, ICU admission	Mortality, ICU admission, Hospitalization	Mortality, Intubation, Ventilation, Hospitalization	Mortality	Mortality	Mortality
Domain	**Signaling question**	data was extracted from medical records	data extracted from medical records	data extracted from medical records	data collected from nationwide database	Data extracted from medical records	data reported from electronic medical records	Data analyzed after hospital admission
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	24	23	23	23	20	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Cummins 2021[14]	De Vito 2021[15]	Eshrati 2020[16]	Estiri 2021[17]	Experton 2021[18]	Fayol 2021[67]	Ferastraoaru 2021[19]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, Hospitalization	ICU admission, hospitalization	Mortality
Domain	**Signaling question**		Data was extracted from medical records	data retrieved from medical records	medical records	Data extracted from database	data extracted from electronic health records	electronic health records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	0	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1

	Author Year	Cummins 2021[14]	De Vito 2021[15]	Eshrati 2020[16]	Estiri 2021[17]	Experton 2021[18]	Fayol 2021[67]	Ferastraoaru 2021[19]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, Hospitalization	ICU admission, hospitalization	Mortality
Domain	**Signaling question**		Data was extracted from medical records	data retrieved from medical records	medical records	Data extracted from database	data extracted from electronic health records	electronic health records
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	1	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	0	1

	Author Year	Cummins 2021[14]	De Vito 2021[15]	Eshrati 2020[16]	Estiri 2021[17]	Experton 2021[18]	Fayol 2021[67]	Ferastraoaru 2021[19]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, Hospitalization	ICU admission, hospitalization	Mortality
Domain	**Signaling question**		Data was extracted from medical records	data retrieved from medical records	medical records	Data extracted from database	data extracted from electronic health records	electronic health records
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	1	0	1
Confounding	Potential confounders identified	1	1	1	1	1	1	0
	Adjustment for confounders in study design phase	0	0	0	0	0	0	1
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	0
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	0	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	22	23	24	23	22	1
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	23

	Author Year	Fisman 2020[20]	Gao 2021[78]	Garcia-Posada 2021[79]	Ge 2021[21]	Girardin 2021[22]	Gottlieb 2020[68]	Grasselli 2020[23]
	Outcome(s)	Mortality	Hospitalization	Mortality, Hospitalization	Mortality	Mortality	ICU Admission, Hospitalization	Mortality
Domain	**Signaling question**	Data retrieved from electronic medical records	datasets	Data collected from patients admitted to hospital	insurance database	data was extracted from medical records	extracted from medical records	database based on the prescription of the general practitioners
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	0	1
	Well described control/ comparator	1	1	1	1	1	0	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	0	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	0	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	0	1

	Author Year	Fisman 2020[20]	Gao 2021[78]	Garcia-Posada 2021[79]	Ge 2021[21]	Girardin 2021[22]	Gottlieb 2020[68]	Grasselli 2020[23]
	Outcome(s)	Mortality	Hospitalization	Mortality, Hospitalization	Mortality	Mortality	ICU Admission, Hospitalization	Mortality
Domain	**Signaling question**	Data retrieved from electronic medical records	datasets	Data collected from patients admitted to hospital	insurance database	data was extracted from medical records	extracted from medical records	database based on the prescription of the general practitioners
	Attrition <10-15% of population	1	1	1	1	1	0	1
	Attrition appropriately analyzed	1	1	1	1	1	0	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	0	1
	Adequately powered to detect result	1	0	0	0	0	1	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	0	1
	Data collection methods appropriate	1	1	1	1	1	1	1

	Author Year	Fisman 2020[20]	Gao 2021[78]	Garcia-Posada 2021[79]	Ge 2021[21]	Girardin 2021[22]	Gottlieb 2020[68]	Grasselli 2020[23]
	Outcome(s)	Mortality	Hospitalization	Mortality, Hospitalization	Mortality	Mortality	ICU Admission, Hospitalization	Mortality
Domain	**Signaling question**	Data retrieved from electronic medical records	datasets	Data collected from patients admitted to hospital	insurance database	data was extracted from medical records	extracted from medical records	database based on the prescription of the general practitioners
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	1	1	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	0	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1

	Author Year	Fisman 2020[20]	Gao 2021[78]	Garcia-Posada 2021[79]	Ge 2021[21]	Girardin 2021[22]	Gottlieb 2020[68]	Grasselli 2020[23]
	Outcome(s)	Mortality	Hospitalization	Mortality, Hospitalization	Mortality	Mortality	ICU Admission, Hospitalization	Mortality
Domain	**Signaling question**	Data retrieved from electronic medical records	datasets	Data collected from patients admitted to hospital	insurance database	data was extracted from medical records	extracted from medical records	database based on the prescription of the general practitioners
SCORE	Threat to internal validity	24	21	23	24	24	16	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	High	Moderate

	Author Year	Guan 2021[69]	Gupta 2021[24]	Haki 2021[25]	Hansen 2021[26]	He 2021[27]	Hippisley-Cox 2021[28]	Hu 2020[70]
	Outcome(s)	Mortality, ICU Admission, Intubation	Mortality	Mortality	Mortality, ICU Admission	Mortality	Mortality, Hospitalization	ICU Admission
Domain	**Signaling question**	EMR	data was extracted from electronic medical records	Data retrieved from electronic hospital records	data was extracted from national registries	data retrieved from electronic medical records	Data retrieved from database	data was extracted from medical records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	0	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1

	Author Year	Guan 2021[69]	Gupta 2021[24]	Haki 2021[25]	Hansen 2021[26]	He 2021[27]	Hippisley-Cox 2021[28]	Hu 2020[70]
	Outcome(s)	Mortality, ICU Admission, Intubation	Mortality	Mortality	Mortality, ICU Admission	Mortality	Mortality, Hospitalization	ICU Admission
Domain	**Signaling question**	EMR	data was extracted from electronic medical records	Data retrieved from electronic hospital records	data was extracted from national registries	data retrieved from electronic medical records	Data retrieved from database	data was extracted from medical records
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0

	Author Year	Guan 2021[69]	Gupta 2021[24]	Haki 2021[25]	Hansen 2021[26]	He 2021[27]	Hippisley-Cox 2021[28]	Hu 2020[70]
	Outcome(s)	Mortality, ICU Admission, Intubation	Mortality	Mortality	Mortality, ICU Admission	Mortality	Mortality, Hospitalization	ICU Admission
Domain	**Signaling question**	EMR	data was extracted from electronic medical records	Data retrieved from electronic hospital records	data was extracted from national registries	data retrieved from electronic medical records	Data retrieved from database	data was extracted from medical records
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	0	1	1	1	1
	Adequately powered to detect result	0	0	0	1	0	1	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1

	Author Year	Guan 2021[69]	Gupta 2021[24]	Haki 2021[25]	Hansen 2021[26]	He 2021[27]	Hippisley-Cox 2021[28]	Hu 2020[70]
	Outcome(s)	Mortality, ICU Admission, Intubation	Mortality	Mortality	Mortality, ICU Admission	Mortality	Mortality, Hospitalization	ICU Admission
Domain	**Signaling question**	EMR	data was extracted from electronic medical records	Data retrieved from electronic hospital records	data was extracted from national registries	data retrieved from electronic medical records	Data retrieved from database	data was extracted from medical records
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	23	22	24	23	23	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Huang 2021[29]	Iaccarino 2021[30]	Izzy 2020[87]	Jacobs 2021[76]	Jiang 2021[31]	Jung 2021[85]	Kandula 2021[32]
	Outcome(s)	Mortality, ICU admission, ventilation, hospitalization	Mortality	ICU Admission, Hospitalization	Ventilation	Mortality	Mortality	Mortality
Domain	**Signaling question**	Data was extracted from medical records	questionnaires completed by hospitals/centers	Data from database	Data extracted from medical records	electronic medical records	data retrieved from database	data retrieved from public sources including the US census and large population surveys
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	0
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	0
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1

	Author Year	Huang 2021[29]	Iaccarino 2021[30]	Izzy 2020[87]	Jacobs 2021[76]	Jiang 2021[31]	Jung 2021[85]	Kandula 2021[32]
	Outcome(s)	Mortality, ICU admission, ventilation, hospitalization	Mortality	ICU Admission, Hospitalization	Ventilation	Mortality	Mortality	Mortality
Domain	**Signaling question**	Data was extracted from medical records	questionnaires completed by hospitals/centers	Data from database	Data extracted from medical records	electronic medical records	data retrieved from database	data retrieved from public sources including the US census and large population surveys
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0

	Author Year	Huang 2021[29]	Iaccarino 2021[30]	Izzy 2020[87]	Jacobs 2021[76]	Jiang 2021[31]	Jung 2021[85]	Kandula 2021[32]
	Outcome(s)	Mortality, ICU admission, ventilation, hospitalization	Mortality	ICU Admission, Hospitalization	Ventilation	Mortality	Mortality	Mortality
Domain	**Signaling question**	Data was extracted from medical records	questionnaires completed by hospitals/centers	Data from database	Data extracted from medical records	electronic medical records	data retrieved from database	data retrieved from public sources including the US census and large population surveys
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	0	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1

	Author Year	Huang 2021[29]	Iaccarino 2021[30]	Izzy 2020[87]	Jacobs 2021[76]	Jiang 2021[31]	Jung 2021[85]	Kandula 2021[32]
	Outcome(s)	Mortality, ICU admission, ventilation, hospitalization	Mortality	ICU Admission, Hospitalization	Ventilation	Mortality	Mortality	Mortality
Domain	**Signaling question**	Data was extracted from medical records	questionnaires completed by hospitals/centers	Data from database	Data extracted from medical records	electronic medical records	data retrieved from database	data retrieved from public sources including the US census and large population surveys
Other Bias	No other sources of bias	1	1	1	1	1	1	0
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	22	23	23	23	23	20
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Kang 2020[33]	Khose 2020[88]	Kim E 2021[34]	Kim Y 2021[71]	Ko 2021[80]	Kridin 2021[35]	Lacedonia 2021[36]
	Outcome(s)	Mortality	Case fatality	Mortality	Mortality, ICU Admission	Hospitalization	Mortality, Hospitalization	Mortality, Ventilation
Domain	**Signaling question**	data retrieved from medical records	data retrieved from database	data analyzed from medical insurance claims	data retrieved from national medical insurance claims	data extracted from COVID-NET, medical records, and BFRSS data	data extracted from database	data collected from medical records and questionnaires
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	0	1	1	1	1	1

	Author Year	Kang 2020[33]	Khose 2020[88]	Kim E 2021[34]	Kim Y 2021[71]	Ko 2021[80]	Kridin 2021[35]	Lacedonia 2021[36]
	Outcome(s)	Mortality	Case fatality	Mortality	Mortality, ICU Admission	Hospitalization	Mortality, Hospitalization	Mortality, Ventilation
Domain	**Signaling question**	data retrieved from medical records	data retrieved from database	data analyzed from medical insurance claims	data retrieved from national medical insurance claims	data extracted from COVID-NET, medical records, and BFRSS data	data extracted from database	data collected from medical records and questionnaires
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	0	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1

	Author Year	Kang 2020[33]	Khose 2020[88]	Kim E 2021[34]	Kim Y 2021[71]	Ko 2021[80]	Kridin 2021[35]	Lacedonia 2021[36]
	Outcome(s)	Mortality	Case fatality	Mortality	Mortality, ICU Admission	Hospitalization	Mortality, Hospitalization	Mortality, Ventilation
Domain	**Signaling question**	data retrieved from medical records	data retrieved from database	data analyzed from medical insurance claims	data retrieved from national medical insurance claims	data extracted from COVID-NET, medical records, and BFRSS data	data extracted from database	data collected from medical records and questionnaires
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	1
	Fidelity to intervention is valid	0	0	0	0	0	0	1
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	1	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	0
	Sufficient follow up to detect outcome	1	0	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1

	Author Year	Kang 2020[33]	Khose 2020[88]	Kim E 2021[34]	Kim Y 2021[71]	Ko 2021[80]	Kridin 2021[35]	Lacedonia 2021[36]
	Outcome(s)	Mortality	Case fatality	Mortality	Mortality, ICU Admission	Hospitalization	Mortality, Hospitalization	Mortality, Ventilation
Domain	**Signaling question**	data retrieved from medical records	data retrieved from database	data analyzed from medical insurance claims	data retrieved from national medical insurance claims	data extracted from COVID-NET, medical records, and BFRSS data	data extracted from database	data collected from medical records and questionnaires
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	1	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	1	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	0	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	23	23	23	22	23	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Lazcano 2021[37]	Lee 2021[86]	Li 2020[38]	Lim 2021[39]	Lobelo 2021[81]	Machado-Alba 2021[72]	Maestre-Muniz 2021[40]
	Outcome(s)	Mortality	Mortality, ICU admission, Ventilation, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, ICU Admission	Mortality
Domain	**Signaling question**	data extracted from database	data extracted from medical records	Data retrieved from medical records	Data obtained from electronic medical records and chest CTs	data extracted from electronic health record	Data extracted from medical records	Data was extracted from electronic medical records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	0	1	1	1	1
	Well described setting	1	1	0	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1

	Author Year	Lazcano 2021[37]	Lee 2021[86]	Li 2020[38]	Lim 2021[39]	Lobelo 2021[81]	Machado-Alba 2021[72]	Maestre-Muniz 2021[40]
	Outcome(s)	Mortality	Mortality, ICU admission, Ventilation, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, ICU Admission	Mortality
Domain	**Signaling question**	data extracted from database	data extracted from medical records	Data retrieved from medical records	Data obtained from electronic medical records and chest CTs	data extracted from electronic health record	Data extracted from medical records	Data was extracted from electronic medical records
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	0	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	0	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1

	Author Year	Lazcano 2021[37]	Lee 2021[86]	Li 2020[38]	Lim 2021[39]	Lobelo 2021[81]	Machado-Alba 2021[72]	Maestre-Muniz 2021[40]
	Outcome(s)	Mortality	Mortality, ICU admission, Ventilation, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, ICU Admission	Mortality
Domain	**Signaling question**	data extracted from database	data extracted from medical records	Data retrieved from medical records	Data obtained from electronic medical records and chest CTs	data extracted from electronic health record	Data extracted from medical records	Data was extracted from electronic medical records
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1

	Author Year	Lazcano 2021[37]	Lee 2021[86]	Li 2020[38]	Lim 2021[39]	Lobelo 2021[81]	Machado-Alba 2021[72]	Maestre-Muniz 2021[40]
	Outcome(s)	Mortality	Mortality, ICU admission, Ventilation, Hospitalization	Mortality	Mortality	Hospitalization	Mortality, ICU Admission	Mortality
Domain	**Signaling question**	data extracted from database	data extracted from medical records	Data retrieved from medical records	Data obtained from electronic medical records and chest CTs	data extracted from electronic health record	Data extracted from medical records	Data was extracted from electronic medical records
SCORE	Threat to internal validity	23	23	20	23	23	23	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Manohar 2021[41]	Marron 2021[42]	Merzon 2021[43]	Meza 2021[44]	Mollalo 2021[45]	Momeni-Boroujeni 2021[46]	Morales-Romero 2021[75]
	Outcome(s)	Mortality, hospitalized	Mortality, ICU admission, ventilation	Mortality, hospitalization	Mortality, Hospitalization	Mortality	Mortality	Mortality, ICU admission, Intubation, Hospitalization
Domain	**Signaling question**	data from EMR	data extracted from EMR	data from HMO	data from electronic health records	Data retrieved from USAFacts and University of Washington Global Health Data Exchange	data extracted from medical records	Data collected by national database
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1

	Author Year	Manohar 2021[41]	Marron 2021[42]	Merzon 2021[43]	Meza 2021[44]	Mollalo 2021[45]	Momeni-Boroujeni 2021[46]	Morales-Romero 2021[75]
	Outcome(s)	Mortality, hospitalized	Mortality, ICU admission, ventilation	Mortality, hospitalization	Mortality, Hospitalization	Mortality	Mortality	Mortality, ICU admission, Intubation, Hospitalization
Domain	**Signaling question**	data from EMR	data extracted from EMR	data from HMO	data from electronic health records	Data retrieved from USAFacts and University of Washington Global Health Data Exchange	data extracted from medical records	Data collected by national database
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	0	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	1	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	0	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0

	Author Year	Manohar 2021[41]	Marron 2021[42]	Merzon 2021[43]	Meza 2021[44]	Mollalo 2021[45]	Momeni-Boroujeni 2021[46]	Morales-Romero 2021[75]
	Outcome(s)	Mortality, hospitalized	Mortality, ICU admission, ventilation	Mortality, hospitalization	Mortality, Hospitalization	Mortality	Mortality	Mortality, ICU admission, Intubation, Hospitalization
Domain	**Signaling question**	data from EMR	data extracted from EMR	data from HMO	data from electronic health records	Data retrieved from USAFacts and University of Washington Global Health Data Exchange	data extracted from medical records	Data collected by national database
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	0	1	1
	Adequately powered to detect result	1	0	0	0	0	1	1
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	1	0	0

	Author Year	Manohar 2021[41]	Marron 2021[42]	Merzon 2021[43]	Meza 2021[44]	Mollalo 2021[45]	Momeni-Boroujeni 2021[46]	Morales-Romero 2021[75]
	Outcome(s)	Mortality, hospitalized	Mortality, ICU admission, ventilation	Mortality, hospitalization	Mortality, Hospitalization	Mortality	Mortality	Mortality, ICU admission, Intubation, Hospitalization
Domain	**Signaling question**	data from EMR	data extracted from EMR	data from HMO	data from electronic health records	Data retrieved from USAFacts and University of Washington Global Health Data Exchange	data extracted from medical records	Data collected by national database
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	0	1	1	1
SCORE	Threat to internal validity	24	24	23	22	21	24	24
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Mushtaq 2021[47]	Naqvi 2021[48]	Oh 2021[49]	Parlak 2021[50]	Parra-Bracamonte 2020[51]	Puebla Neira 2021[52]	Purroy 2021[53]
	Outcome(s)	Mortality	Mortality	Mortality	Mortality, ICU admission	Mortality	Mortality, ICU, Mechanical Ventilation	Mortality
Domain	**Signaling question**	data was extracted from electronic database	Data was collected prospectively at the time of visit	data was extracted from database	data extracted from medical records	extracted from open data source	data extracted from electronic health records	data extracted from medical records
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	1	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1

	Author Year	Mushtaq 2021[47]	Naqvi 2021[48]	Oh 2021[49]	Parlak 2021[50]	Parra-Bracamonte 2020[51]	Puebla Neira 2021[52]	Purroy 2021[53]
	Outcome(s)	Mortality	Mortality	Mortality	Mortality, ICU admission	Mortality	Mortality, ICU, Mechanical Ventilation	Mortality
Domain	**Signaling question**	data was extracted from electronic database	Data was collected prospectively at the time of visit	data was extracted from database	data extracted from medical records	extracted from open data source	data extracted from electronic health records	data extracted from medical records
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	0	0	1	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	1	1	1	1	1	1

	Author Year	Mushtaq 2021[47]	Naqvi 2021[48]	Oh 2021[49]	Parlak 2021[50]	Parra-Bracamonte 2020[51]	Puebla Neira 2021[52]	Purroy 2021[53]
	Outcome(s)	Mortality	Mortality	Mortality	Mortality, ICU admission	Mortality	Mortality, ICU, Mechanical Ventilation	Mortality
Domain	**Signaling question**	data was extracted from electronic database	Data was collected prospectively at the time of visit	data was extracted from database	data extracted from medical records	extracted from open data source	data extracted from electronic health records	data extracted from medical records
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	1	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1

	Author Year	Mushtaq 2021[47]	Naqvi 2021[48]	Oh 2021[49]	Parlak 2021[50]	Parra-Bracamonte 2020[51]	Puebla Neira 2021[52]	Purroy 2021[53]
	Outcome(s)	Mortality	Mortality	Mortality	Mortality, ICU admission	Mortality	Mortality, ICU, Mechanical Ventilation	Mortality
Domain	**Signaling question**	data was extracted from electronic database	Data was collected prospectively at the time of visit	data was extracted from database	data extracted from medical records	extracted from open data source	data extracted from electronic health records	data extracted from medical records
SCORE	Threat to internal validity	23	23	24	23	24	23	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Ramos-Martinez 2021[83]	Rezaei 2021[54]	Rubio-Rivas 2021[73]	Rubio-Rivas 2020[55]	Sahin 2021[56]	Sami 2021[57]	Santorelli 2021[58]
	Outcome(s)	Re-admissions	Mortality	Mortality, ICU Admission, Intubation, Ventilation	Mortality, ICU admission, Ventilation	Mortality	Mortality	Mortality, ICU admission
Domain	**Signaling question**	data extracted from nation-wide registry	Data from electronic health records	Data extracted from medical records	Data extracted from nationwide registry	Data from medical records	data from medical records	data from EMR
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	0	1	1	1	1	1
	Well described control/ comparator	1	0	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/	1	1	1	1	1	1	1

	Author Year	Ramos-Martinez 2021[83]	Rezaei 2021[54]	Rubio-Rivas 2021[73]	Rubio-Rivas 2020[55]	Sahin 2021[56]	Sami 2021[57]	Santorelli 2021[58]
	Outcome(s)	Re-admissions	Mortality	Mortality, ICU Admission, Intubation, Ventilation	Mortality, ICU admission, Ventilation	Mortality	Mortality	Mortality, ICU admission
Domain	**Signaling question**	data extracted from nation-wide registry	Data from electronic health records	Data extracted from medical records	Data extracted from nationwide registry	Data from medical records	data from medical records	data from EMR
	interventions and outcomes							
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	0	1
	Attrition <10-15% of population	1	1	1	1	1	0	1
	Attrition appropriately analyzed	1	1	1	1	1	0	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	0	0	0	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1

	Author Year	Ramos-Martinez 2021[83]	Rezaei 2021[54]	Rubio-Rivas 2021[73]	Rubio-Rivas 2020[55]	Sahin 2021[56]	Sami 2021[57]	Santorelli 2021[58]
	Outcome(s)	Re-admissions	Mortality	Mortality, ICU Admission, Intubation, Ventilation	Mortality, ICU admission, Ventilation	Mortality	Mortality	Mortality, ICU admission
Domain	**Signaling question**	data extracted from nation-wide registry	Data from electronic health records	Data extracted from medical records	Data extracted from nationwide registry	Data from medical records	data from medical records	data from EMR
	Adequately powered to detect result	0	0	1	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1
	Data collection methods appropriate	1	0	1	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	1	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0

	Author Year	Ramos-Martinez 2021[83]	Rezaei 2021[54]	Rubio-Rivas 2021[73]	Rubio-Rivas 2020[55]	Sahin 2021[56]	Sami 2021[57]	Santorelli 2021[58]
	Outcome(s)	Re-admissions	Mortality	Mortality, ICU Admission, Intubation, Ventilation	Mortality, ICU admission, Ventilation	Mortality	Mortality	Mortality, ICU admission
Domain	**Signaling question**	data extracted from nation-wide registry	Data from electronic health records	Data extracted from medical records	Data extracted from nationwide registry	Data from medical records	data from medical records	data from EMR
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	0	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	23	21	24	23	22	20	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Sen 2021[84]	Shin 2021[59]	Song 2020[77]	Tang 2020[60]	Tessitore 2021[61]	Timberlake 2021[62]	Tsai 2021[63]
	Outcome(s)	Mortality, ICU Admission, Intubation, Ventilation, Hospitalization	Mortality	Mortality, Ventilation	Mortality, Hospitalization	Mortality	Mortality, ICU admission, Intubation	Mortality
Domain	**Signaling question**	data from electronic medical records	national database	data was extracted from medical records and self-reported by patients	data extracted from medical records	Data extracted from electronic medical records	Data was extracted from retrospective chart review of all patients	VA COVID-19 data resource
Study Elements	Design appropriate to research question	1	1	1	1	1	1	1
	Well described population	1	1	1	1	1	1	1
	Well described setting	1	1	1	1	1	1	1
	Well described intervention/ exposure	1	1	1	1	1	1	1
	Well described control/ comparator	0	1	1	1	1	1	1
	Well described outcome	1	1	1	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0	0	0	0
	Allocation adequately concealed	0	0	0	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1	1	1	1

	Author Year	Sen 2021[84]	Shin 2021[59]	Song 2020[77]	Tang 2020[60]	Tessitore 2021[61]	Timberlake 2021[62]	Tsai 2021[63]
	Outcome(s)	Mortality, ICU Admission, Intubation, Ventilation, Hospitalization	Mortality	Mortality, Ventilation	Mortality, Hospitalization	Mortality	Mortality, ICU admission, Intubation	Mortality
Domain	**Signaling question**	data from electronic medical records	national database	data was extracted from medical records and self-reported by patients	data extracted from medical records	Data extracted from electronic medical records	Data was extracted from retrospective chart review of all patients	VA COVID-19 data resource
	Attrition <10-15% of population	1	1	1	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1	1	1	1
Information Bias: Measurement and Misclassification	Measure of intervention/ exposure is valid	0	0	0	0	0	0	0
	Measure of outcome is valid	1	1	1	1	1	1	1
	Fidelity to intervention is measured	1	0	0	0	0	0	0
	Fidelity to intervention is valid	1	0	0	0	0	0	0
	Prospective study	1	1	1	1	1	1	1
	Adequately powered to detect result	1	0	0	0	1	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0	0	0	0
	Study participant blinded	0	0	0	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1	1	1	1

	Author Year	Sen 2021[84]	Shin 2021[59]	Song 2020[77]	Tang 2020[60]	Tessitore 2021[61]	Timberlake 2021[62]	Tsai 2021[63]
	Outcome(s)	Mortality, ICU Admission, Intubation, Ventilation, Hospitalization	Mortality	Mortality, Ventilation	Mortality, Hospitalization	Mortality	Mortality, ICU admission, Intubation	Mortality
Domain	**Signaling question**	data from electronic medical records	national database	data was extracted from medical records and self-reported by patients	data extracted from medical records	Data extracted from electronic medical records	Data was extracted from retrospective chart review of all patients	VA COVID-19 data resource
	Data collection methods appropriate	1	1	0	1	1	1	1
	Sufficient follow up to detect outcome	1	1	1	1	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1	1	1	1
	Confidence interval is narrow	0	0	0	0	0	0	0
Confounding	Potential confounders identified	1	1	1	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1	1	1	1

	Author Year	Sen 2021[84]	Shin 2021[59]	Song 2020[77]	Tang 2020[60]	Tessitore 2021[61]	Timberlake 2021[62]	Tsai 2021[63]
	Outcome(s)	Mortality, ICU Admission, Intubation, Ventilation, Hospitalization	Mortality	Mortality, Ventilation	Mortality, Hospitalization	Mortality	Mortality, ICU admission, Intubation	Mortality
Domain	**Signaling question**	data from electronic medical records	national database	data was extracted from medical records and self-reported by patients	data extracted from medical records	Data extracted from electronic medical records	Data was extracted from retrospective chart review of all patients	VA COVID-19 data resource
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1	1	1	1
SCORE	Threat to internal validity	25	23	22	23	24	23	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

	Author Year	Valent 2021[64]	Vera-Zertuche 2021[74]	Wei 2021[82]	Yoshida 2021[65]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality, ICU admission, Ventilation, Hospitalization	Hospitalization	Mortality, ICU admission, Ventilation
Domain	**Signaling question**	data from database	Data extracted from an open dataset	Data extracted from electronic health records	data was extracted from medical records
Study Elements	Design appropriate to research question	1	1	1	1
	Well described population	1	1	1	1
	Well described setting	1	1	1	1
	Well described intervention/ exposure	1	1	1	1

	Author Year	Valent 2021[64]	Vera-Zertuche 2021[74]	Wei 2021[82]	Yoshida 2021[65]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality, ICU admission, Ventilation, Hospitalization	Hospitalization	Mortality, ICU admission, Ventilation
Domain	**Signaling question**	data from database	Data extracted from an open dataset	Data extracted from electronic health records	data was extracted from medical records
	Well described control/ comparator	1	1	1	1
	Well described outcome	1	1	1	1
	Clear timeline of exposures/ interventions and outcomes	1	1	1	1
Selection Bias: Sampling	Randomization appropriately performed	0	0	0	0
	Allocation adequately concealed	0	0	0	0
	Population sampling appropriate to study design	1	1	1	1
Selection Bias: Attrition	Attrition not significantly different between groups	1	1	1	1
	Attrition <10-15% of population	1	1	1	1
	Attrition appropriately analyzed	1	1	1	1
Information Bias: Measurement and	Measure of intervention/ exposure is valid	0	0	0	0
	Measure of outcome is valid	1	1	1	1

	Author Year	Valent 2021[64]	Vera-Zertuche 2021[74]	Wei 2021[82]	Yoshida 2021[65]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality, ICU admission, Ventilation, Hospitalization	Hospitalization	Mortality, ICU admission, Ventilation
Domain	**Signaling question**	data from database	Data extracted from an open dataset	Data extracted from electronic health records	data was extracted from medical records
Misclassification	Fidelity to intervention is measured	0	0	0	0
	Fidelity to intervention is valid	0	0	0	0
	Prospective study	1	1	1	1
	Adequately powered to detect result	0	0	0	0
Information Bias: Performance & Detection	Outcome assessor blinded	0	0	0	0
	Study participant blinded	0	0	0	0
	Investigator/ data analyst blinded	0	0	0	0
	Data collection methods described in sufficient detail	1	1	1	1
	Data collection methods appropriate	1	1	1	1
	Sufficient follow up to detect outcome	0	1	1	1
Information Bias: Analytic	Appropriate statistical analyses for collected data	1	1	1	1
	Appropriate statistical analyses are conducted correctly	1	1	1	1
	Confidence interval is narrow	0	0	1	0

	Author Year	Valent 2021[64]	Vera-Zertuche 2021[74]	Wei 2021[82]	Yoshida 2021[65]
	Outcome(s)	Mortality, ICU Admission, Hospitalization	Mortality, ICU admission, Ventilation, Hospitalization	Hospitalization	Mortality, ICU admission, Ventilation
Domain	**Signaling question**	data from database	Data extracted from an open dataset	Data extracted from electronic health records	data was extracted from medical records
Confounding	Potential confounders identified	1	1	1	1
	Adjustment for confounders in study design phase	0	0	0	0
	Adjustment for confounders in data analysis phase	1	1	1	1
Reporting Bias	All pre-specified outcomes are adequately reported	1	1	1	1
Other Bias	No other sources of bias	1	1	1	1
COI	Funding sources disclosed and no obvious conflict of interest	1	1	1	1
SCORE	Threat to internal validity	22	23	24	23
	Low, Moderate, High	Moderate	Moderate	Moderate	Moderate

Threat to internal validity measures:

- Low >75% of elements are satisfied indicated by a 1 meaning yes,
- Moderate ≤75% to > 50% of elements are satisfied indicated by a 1 meaning yes.,
- High ≤50% of elements are satisfied, which is indicated by a 1 meaning yes.

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D. Abbreviations

Acronym	Full
95% CI	95% confidence interval
ALC	Absolute lymphocyte count
aHR	Adjusted hazard ratio
aOR	Adjusted odds ratio
aRR	Adjusted risk ratio
BMI	Body mass index
CF	Cystic fibrosis
CHF	Chronic heart failure
COI	Conflict of interest
COPD	Chronic obstructive pulmonary disease
ECMO	Extracorporeal membrane oxygenation
EMR	Electronic medical records
ERT	Evidence Review Team
HR	Hazard ratio
ICD-10	International Classification of Diseases, 10th Revision
ICD-9	International Classification of Diseases, 9th Revision
ICS	Inhaled corticosteroid
ICU	Intensive care unit
IVA	Internal Validity Assessment
LABA	Long-acting beta-agonist
LAMA	Long-acting muscarinic antagonist
LTRA	Leukotriene receptor antagonist therapy
MOA	Measure(s) of association
ND	Not defined
NR	Not reported
NSAID	Non-steroidal anti-inflammatory drug
OCS	Oral corticosteroid
OR	Odds ratio
PECO	Population, exposure, comparator, and outcomes

RR	Risk ratio
RT-PCR	Real-time polymerase chain reaction
SABA	Short-acting beta-agonist
SAMA	Short-acting muscarinic antagonist
US	United States