

Trends in Clinical Severity of Hospitalized Patients With Coronavirus Disease 2019—Premier Hospital Dataset, April 2020–April 2021

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Background. Clinical severity of coronavirus disease 2019 (COVID-19) may vary over time; trends in clinical severity at admission during the pandemic among hospitalized patients in the United States have been incompletely described, so a historical record of severity over time is lacking.

Methods. We classified 466 677 hospital admissions for COVID-19 from April 2020 to April 2021 into 4 mutually exclusive severity grades based on indicators present on admission (from most to least severe): Grade 4 included intensive care unit (ICU) admission and invasive mechanical ventilation (IMV); grade 3 included non-IMV ICU and/or noninvasive positive pressure ventilation; grade 2 included diagnosis of acute respiratory failure; and grade 1 included none of the above indicators. Trends were stratified by sex, age, race/ethnicity, and comorbid conditions. We also examined severity in states with high vs low Alpha (B.1.1.7) variant burden.

Results. Severity tended to be lower among women, younger adults, and those with fewer comorbidities compared to their counterparts. The proportion of admissions classified as grade 1 or 2 fluctuated over time, but these less-severe grades comprised a majority (75%–85%) of admissions every month. Grades 3 and 4 consistently made up a minority of admissions (15%–25%), and grade 4 showed consistent decreases in all subgroups, including states with high Alpha variant burden.

Conclusions. Clinical severity among hospitalized patients with COVID-19 has varied over time but has not consistently or markedly worsened over time. The proportion of admissions classified as grade 4 decreased in all subgroups. There was no consistent evidence of worsening severity in states with higher vs lower Alpha prevalence.

Keywords. COVID severity trends; electronic medical records; epidemiology.

Coronavirus disease 2019 (COVID-19) is a complex disease that manifests in a wide range of clinical severity, from asymptomatic infection to multiorgan failure needing intensive care [1]. Severity of COVID-19 may change over time in a population for several reasons. The development and use of more effective therapy may reduce severity of disease [2], the populations in which the pathogen is most commonly circulating may change over time (eg, fewer cases among groups at higher risk of infection after focused vaccination efforts), and the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variants may impact clinical severity [3, 4]. This third possibility is a particular concern as the Alpha (B.1.1.7) and then Delta variants became dominant in the

United States (US) in 2021 [5], with conflicting reports of clinical severity [3, 4].

Changes in clinical severity over time can impact the healthcare and public health sectors. With increasing severity, healthcare systems may need to plan for increased demand for intensive care for COVID-19 patients. This could put greater strain on healthcare infrastructure and increase the importance of nonclinical interventions (eg, cloth face coverings, social distancing, hand hygiene) [6] to reduce transmission. Conversely, if clinical severity is decreasing, the burden on healthcare infrastructure may be reduced, prompting some nonclinical strategies to be relaxed, particularly when combined with data on transmissibility and other disease characteristics.

Measures of clinical severity of COVID-19 have often relied on a single dichotomous characteristic of an admission to gauge severity (eg, admission to intensive care unit [ICU] vs not or use of invasive mechanical ventilation [IMV] vs not) [7, 8]. Reliance on these binary indicators of severity may not detect changes in severity that do not reach the threshold of requiring ICU admission or IMV. Also, reliance on a single indicator of severity may be overly sensitive to changes in clinical management and

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resource availability. For example, use of IMV is dependent on current practice guidelines and availability of equipment. A more comprehensive assessment with multiple levels of severity could provide a more nuanced examination of severity over time.

The National Institutes of Health (NIH) Clinical Center has proposed a 4-category severity scale for hospital admissions designed to assess clinical severity early in an admission [9]. To date, this scale has not been used to document trends in severity over time in a national-level admissions dataset. The purpose of this article is to examine trends in disease severity using the 4-category scale among hospitalized patients with COVID-19 in the Premier Dataset from April 2020 to April 2021, thereby providing a historical record of severity during this phase of the pandemic. First, we examined trends overall and stratified by gender, age, race/ethnicity, and the presence of comorbid conditions. Second, we calculated adjusted clinical severity estimates for each month. Third, we examined differences in recent clinical severity in subsamples from states with higher vs lower prevalence of the Alpha variant of SARS-CoV-2. If continued use of the NIH severity scale occurs, this study may provide values for future comparisons.

METHODS

Data Source

Data on inpatient admissions were obtained from the Premier Healthcare Database Special COVID-19 Release (release date: 21 June 2021). This database consists of patient-level administrative and clinical data from >800 nonprofit, nongovernmental, community and teaching hospitals and health systems across the US, and includes data from rural and urban areas [10].

There were 7.1 million admissions among adults (≥ 18 years) from April 2020 to April 2021. Of these, 639 049 included an *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* diagnosis code consistent with COVID-19 (U07.1 was adopted on 1 April 2020 [11, 12] and 99.9% of admissions in this analysis were identified using this code; 0.1% used B97.29). Among patients with multiple admissions with these codes, we restricted analyses to the 597 922 admissions that were the patients' first admission with a SARS-CoV-2 diagnosis. Consistent with the NIH severity scale (described below), this allowed a focus on severity early in the disease process. Furthermore, because we were examining trends, we limited analyses to admissions from 655 hospitals that contributed data in all 13 months under study, resulting in 466 677 admissions in the analytic dataset.

Outcome Variable

Each admission was classified according to the 4-category NIH clinical severity scale [9]. This scale assesses severity within the

first 2 days of admission, which is consistent with our interest in severity early in the disease process. Grade 4, the most severe, includes all patients admitted to the ICU and requiring IMV on days 0–2 (Supplementary Table). Grade 3 includes patients admitted to the ICU on days 0–2 but not requiring IMV, or patients requiring noninvasive positive pressure ventilation on days 0–2, regardless of ICU status. Grade 2 includes patients with a diagnosis of acute respiratory failure on admission but who did not meet grade 4 or 3 criteria during hospital days 0–2. Finally, grade 1 includes any other COVID-19–related admission that did not meet criteria for grades 4, 3, or 2 during hospital days 0–2.

Independent Variables

Gender was classified as male or female; 3 records had unknown gender and are excluded from gender-specific analyses. Age was categorized as 18–49 years, 50–64 years, and ≥ 65 years [8]. Racial and ethnic groups were combined into 5 categories: non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic other race, and unknown (unknown comprised 17.1% of records [79 669/466 677]).

We assessed the presence of 9 comorbid conditions associated with severe COVID-19 illness in systematic reviews or meta-analyses, as reported by the Centers for Disease Control and Prevention (CDC) [13]: cancer, cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease, diabetes (types 1 and 2), heart conditions (including heart failure, coronary artery disease, cardiomyopathy), obesity, pregnancy (current/recent), and smoking (current/previous). These conditions were identified using *ICD-10* diagnostic codes present in the first admission for each patient in the dataset (Supplementary File). Patients were categorized as having none, 1–2, or ≥ 3 of the conditions.

To investigate possible relationships between disease severity and the Alpha variant, we obtained estimates of the contribution of the Alpha variant (lineage B.1.1.7) to the circulation of SARS-CoV-2 by state as of 27 March 2021 from the CDC [5]. The Alpha variant comprised $\geq 40\%$ of sequenced circulating SARS-CoV-2 strains (high-Alpha) in Tennessee, Michigan, Minnesota, Florida, Georgia, and Texas. The Alpha variant comprised $\leq 25\%$ (low-Alpha) in Indiana, Wisconsin, West Virginia, North Carolina, Kentucky, and California. Because the Alpha variant was first detected in the US in December 2020 [14], we compared month-specific disease severity between high-Alpha and low-Alpha states for admissions between December 2020 and April 2021.

Statistical Analyses

Patient characteristics were described by calendar quarter of admission; differences across quarters were tested using χ^2 tests. By month of admission, we calculated the proportion of admissions in each severity grade overall and stratified by the independent variables above. Proportions allow comparisons across groups with differing population sizes, allowing comparison of severity on a “per admission” basis. Given the large sample size, we used

Cohen's H as a measure of effect size for the difference between 2 proportions and flagged any comparison where $H > 0.20$ (below which is considered a “small” effect size by Cohen) [15]. We compared the highest vs lowest value for a severity grade over time, and in stratified analyses compared month- and severity-specific values to a reference group (men vs women, non-Hispanic White vs other racial/ethnic groups, 18–49 years vs other age groups, no comorbidities vs any comorbidities, high- vs low-Alpha states). Because of the smaller sample size for the high- vs low-Alpha variant comparisons, we used traditional statistical testing (adjusted Wald tests with a Bonferroni correction) to determine if month-specific estimates for each severity were significantly different between high- vs low-Alpha states.

For each severity grade, we tested for linear and higher-order trends using logistic regression and orthogonal polynomial contrasts, which is appropriate for the equal spacing between months. When linear trends were present, we calculated η^2 (which is analogous to R^2) to determine the proportion of variability explained by the linear trend [16].

We estimated adjusted prevalence of each severity grade over time using 2 methods. First, a multinomial logistic regression model included main effects for all the demographic variables. Second, because there were statistically significant interactions between most covariates and admission month, we created

month-stratified multinomial logistic regression models. For both modeling strategies, we calculated the marginal adjusted prevalence of each severity grade for each month.

In post hoc analyses, we additionally excluded admissions where COVID-19 was only a secondary diagnosis code. This attempted to eliminate patients who were admitted for non-COVID-19 reasons but tested positive during routine screening, despite having no or mild symptoms.

All analyses were performed in Stata 13.1 software (StataCorp, College Station, Texas). Statistical tests were deemed significant at $P < .05$.

Patient Consent Statement

This activity was reviewed by the CDC and was conducted consistent with applicable federal law and CDC policy (see, eg, 45 Code of Federal Regulations [C.F.R.] part 46; 21 C.F.R. part 56; 42 US Code [U.S.C.] §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.). This secondary analysis of deidentified administrative data did not require patient consent.

RESULTS

Overall, males comprised 51% of the patient sample and females 49% (Table 1). Most patients (52%) were ≥ 65 years of age,

Table 1. Characteristics of Adult Inpatients Diagnosed With Coronavirus Disease 2019 (COVID-19), Premier Healthcare Database Special COVID-19 Release, April 2020—April 2021

Characteristic	Overall	Quarter					P Value ^a
		Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	
No. of patients (%)	466 677 (100)	70 288 (15)	77 577 (17)	169 155 (36)	126 609 (27)	23 048 (5)	
Sex							
Male	239 689 (51)	36 151 (52)	39 231 (51)	88 090 (52)	64 866 (51)	11 351 (49)	<.001
Female	226 701 (49)	34 047 (48)	38 323 (49)	80 946 (48)	61 705 (49)	11 680 (51)	
Age group, y							
18–49	99 022 (21)	16 771 (24)	19 538 (25)	29 937 (18)	25 380 (20)	7 396 (32)	<.001
50–64	125 844 (27)	19 704 (28)	20 963 (27)	43 370 (26)	34 099 (27)	7708 (33)	
≥ 65	241 811 (52)	33 813 (48)	37 076 (48)	95 848 (57)	67 130 (53)	7944 (34)	
Race/ethnicity ^b							
White, non-Hispanic	210 858 (45)	20 367 (29)	29 681 (38)	89 648 (53)	60 219 (48)	10 943 (47)	<.001
Black, non-Hispanic	70 779 (15)	13 990 (20)	13 468 (17)	20 591 (12)	18 440 (15)	4290 (19)	
Hispanic	82 277 (18)	14 967 (21)	19 510 (25)	23 583 (14)	20 771 (16)	3446 (15)	
Other, non-Hispanic	23 094 (5)	4631 (7)	3324 (4)	7805 (5)	6373 (5)	961 (4)	
Unknown	79 669 (17)	16 333 (23)	11 594 (15)	27 528 (16)	20 806 (16)	3408 (15)	
Selected comorbidities ^c							
None	94 052 (20)	14 733 (21)	16 402 (21)	31 996 (19)	25 262 (20)	5659 (25)	<.001
1–2 conditions	234 473 (50)	35 286 (50)	38 949 (50)	84 900 (50)	63 520 (50)	11 818 (51)	
≥ 3 conditions	138 152 (30)	20 269 (29)	22 226 (29)	52 259 (31)	37 827 (30)	5571 (24)	

Data are presented as No. (%) unless otherwise indicated.

^a χ^2 test, testing overall association between stratifying variable and quarter of admission.

^b“Hispanic” includes all patients of Hispanic ethnicity, regardless of race. “Other” includes all races other than White and Black. “Unknown” includes any patient with missing data for Hispanic ethnicity or any patient reporting non-Hispanic ethnicity and missing data for race.

^cSelected comorbidities shown to be associated with severe COVID-19 illness based on systematic reviews or meta-analyses: cancer, cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease, diabetes (types 1 and 2), heart conditions (including heart failure, coronary artery disease, cardiomyopathy), obesity, pregnancy (current/recent), and smoking (current/previous).

45% were non-Hispanic White, and 50% had 1 or 2 comorbid conditions. By quarter, 36% of admissions occurred in Q4 2020, corresponding to the winter peak of the pandemic. The distribution of all independent variables varied across quarters ($\chi^2 P < .001$); however, most effect sizes for quarter-to-quarter differences were small ($H < 0.2$). Overall, 41.3% of admissions were classified as grade 1, 39.8% were grade 2, 14.8% were grade 3, and 4.0% were grade 4 (not shown).

The proportion of admissions classified as grade 1, the lowest severity, peaked in May 2020 (47.4% of admissions) and was lowest in December 2020 (37.6%, $H: 0.20$) (Figure 1). Grade 1 exhibited statistically significant higher-order and linear decreasing trends; however, the linear component explained only 0.1% of variability over time with an average change of 0.5 percentage points per month (PP/month). The proportion classified as grade 2 peaked in January 2021 (45.2%) and was lowest in May 2020 (31.6%, $H: 0.28$). Grade 2 exhibited statistically significant higher-order and linear increasing trends; the linear component explained 0.3% of variability over time; average change was 0.8 PP/month. The proportion classified as grade 3 peaked in September 2020 (18.4%) and was lowest in April 2020 (10.2%, $H: 0.24$). Grade 3 exhibited statistically significant higher-order and linear decreasing trends, but the linear component explained $<0.1\%$ of variability over time. The proportion in grade 4 peaked in April 2020 (8.1%) and was lowest in April 2021 (2.8%, $H: 0.24$). Grade 4 exhibited statistically significant higher-order and linear decreasing trends: the decreases were largest early in the study period. The linear component explained 0.3% of variability over time; average change was 0.3 PP/month.

Women were more likely than men to be classified as grade 1, with $H > 0.2$ for male-female differences in June through September 2020 (not shown), but no differences in point estimates for grades 2 through 4 exhibited $H > 0.2$. Trends in disease severity over time were similar for men and women, except grade 3 among men lacked a significant linear component.

Compared to adults aged 18-49 years, adults in older age groups were less likely to be classified in grade 1 (least severe) and more likely to be classified in grade 2, with several month-specific estimates exhibiting $H > 0.02$ (Figure 2). Estimates for grades 3 and 4 were similar across age groups (all $H > 0.2$). With 2 exceptions, trends over time were similar across age groups: neither those aged 18-49 nor 50-64 years exhibited a linear trend in grade 3.

Severity across racial and ethnic groups tended to be similar. When each racial/ethnic group was compared to the non-Hispanic White reference group, no comparison in any month exhibited $H > 0.20$. Trends over time were similar across racial and ethnic groups, and no linear component explained more than 0.6% of the variability in a given grade.

Compared to those with no comorbidities, adults with 1-2 comorbidities were less likely to be grade 1 and more likely to be grade 3, with several months exhibiting $H > 0.20$ (Figure 3). Point estimates for grade 4 were generally higher among those with 1-2 vs no comorbidities, but only April and May of 2020 exhibited $H > 0.2$. Compared to adults with no comorbidities, adults with ≥ 3 comorbidities were less likely to be grade 1 and more likely to be grade 3 or 4, with all months exhibiting $H > 0.20$. All severity grades across all levels of comorbid conditions exhibited statistically significant linear and

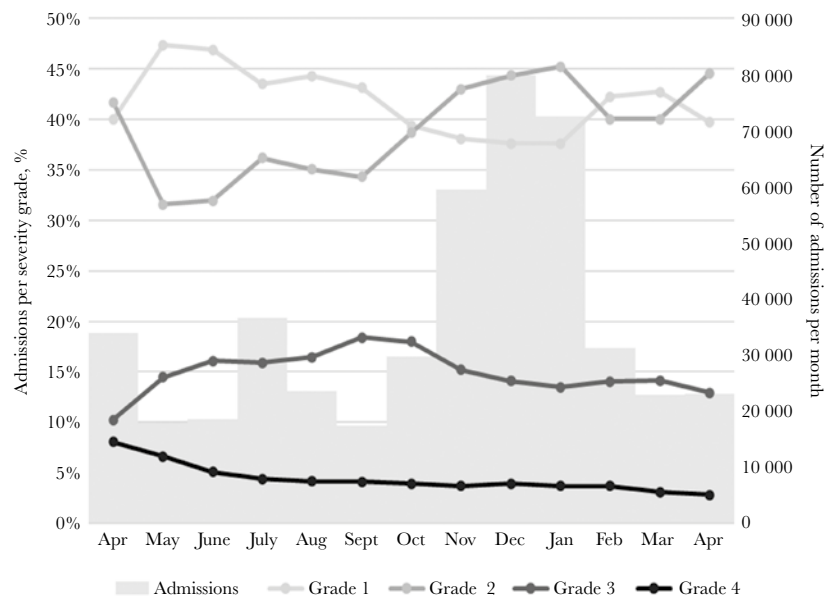


Figure 1. Trends in grades of coronavirus disease 2019 (COVID-19) disease severity and admissions per month, Premier Healthcare Database Special COVID-19 release, April 2020–April 2021. All severity grades exhibited statistically significant linear and higher-order trends over time.

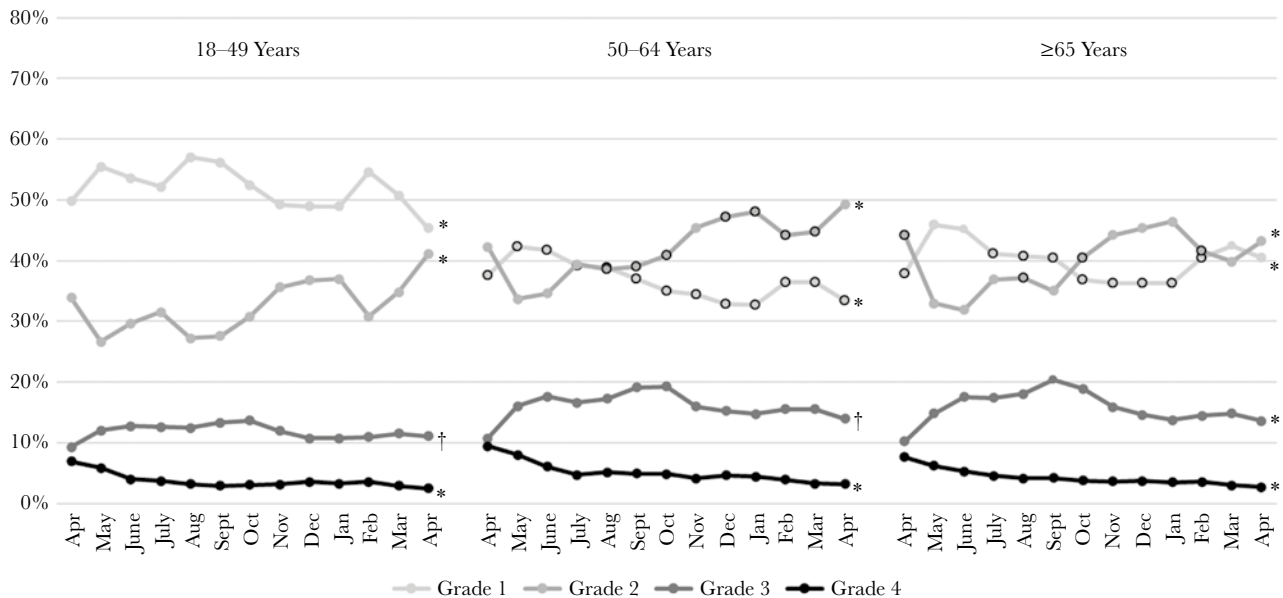


Figure 2. Trends in grades of coronavirus disease 2019 (COVID-19) disease severity per month by age group, Premier Healthcare Database Special COVID-19 Release, April 2020–April 2021. Accentuated marker border indicates Cohen H > 0.2 for difference from comparable value for those aged 18–49 years. *Statistically significant linear and higher-order trends. †Statistically significant higher-order trends only.

higher-order trends. Linear trends were statistically significant but generally of small magnitude: no linear component explained >0.5% of variability in any grade for any level of comorbidities.

Regardless of the method of adjustment, the proportion of admissions in each grade changed by a maximum of only

1.9 percentage points (grade 1, April 2021: 39.7% unadjusted, 37.8% in the main effects model; [Supplementary Figure 1](#)).

After stratifying by high- or low-Alpha variant prevalence, there were 52 208 admissions from low-Alpha states and 71 592 admissions from high-Alpha states from December 2020 to April 2021. The proportion classified as grade 1 was

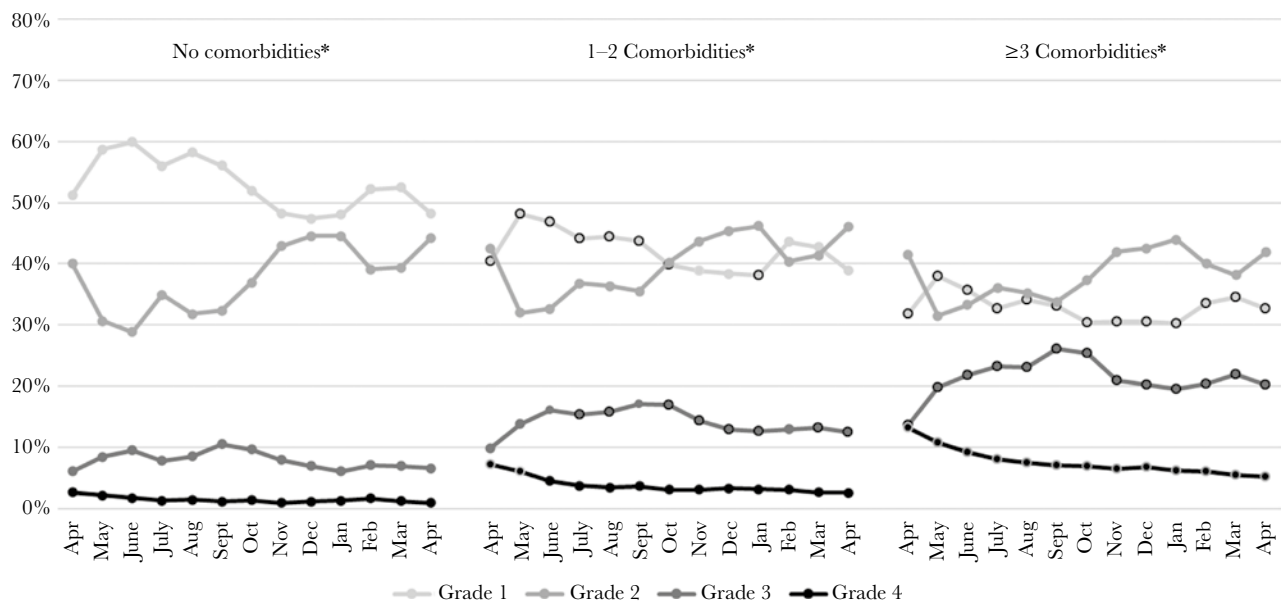


Figure 3. Trends in grades of coronavirus disease 2019 (COVID-19) disease severity per month by selected comorbidities, Premier Healthcare Database Special COVID-19 Release, April 2020–April 2021. Accentuated marker borders indicate Cohen H > 0.2 for difference from comparable value for the no comorbidities group. Selected comorbidities shown to be associated with severe COVID-19 illness based on systematic reviews or meta-analyses: cancer, cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease, diabetes (types 1 and 2), heart conditions (including heart failure, coronary artery disease, cardiomyopathy), obesity, pregnancy (current/recent), and smoking (current/previous) [13]. *All levels of severity for all comorbidity groups exhibited statistically significant linear and higher-order trends.

significantly lower in low-Alpha vs high-Alpha states in December–February, but nearly identical in March and April (Figure 4). Conversely, the proportion classified as grade 2 was higher in low-Alpha states than in high-Alpha states in December and January and lower in March and April. The proportion of admissions classified as grade 3 was lower in January but higher in March and April in low- vs high-Alpha states. The proportion classified as grade 4 was consistently higher in low- vs high-Alpha states.

In supplemental analyses, point estimates were lower for grade 1 and higher for grade 2, when limited to primary or admitting diagnoses only. However, only the grade 2 February and March differences exhibited $H > 0.2$ when comparing original estimates to those limited to primary/admitting diagnoses (Supplementary Figure 2). Differences in grade 3 and grade 4 were smaller than those observed between grades 1 and 2.

DISCUSSION

This study presents a comprehensive examination of severity of acute illness over time based on administrative and clinical indicators of severity among hospitalized patients with COVID-19 in the US. Although disease severity fluctuated over time (especially grades 1 and 2), overall linear trends that represent long-term changes were of small magnitude. Perhaps most encouraging, the 2 most severe grades (3 and 4) made up a minority of admissions each month and showed no signs of recent increases in any subgroup under study, including by Alpha prevalence. Overall, this analysis of a large observational cohort

of hospitalized patients diagnosed with COVID-19 suggests a consistent reduction in the highest severity grade among hospitalized patients with COVID-19 over time and may be a useful comparator for future analyses.

The lack of evidence for population-level worsening in clinical severity using the scale in this study is consistent with previous research on COVID-19 severity in the US. A pre-publication report from the National COVID Cohort Collaborative (March–November 2020, 34 US medical centers) [17] assessed severity ranging from outpatient care to death or hospice, and reported a decrease in severity over time, driven largely by reduced hospitalization and mortality/hospice referral. This is also consistent with an analysis from Roth et al showing decreased severity (assessed by in-hospital mortality) from March–April 2020 through November 2020, regardless of the level of adjustment for patient and treatment history [18]. Similarly, national hospital surveillance from CDC’s COVID-NET suggests that the proportion of COVID-19–positive admissions that are admitted to ICU has decreased 55% from March 2020 (37.7% of admissions) to March 2021 (17.0%) [8], and data on IMV have shown comparable trends [8]. Together, this suggests clinical severity of COVID-19 is not consistently worsening among inpatients in the US.

This study expands upon the previous evidence noted above in several important ways. First, we used a large, detailed dataset of hospitalized patients across 43 US states and the District of Columbia spanning the winter 2020–2021 peak. Second, the 4-grade clinical severity scale provided more information than binary severity indicators and focused on severity at admission and early in the hospital stay. This may better capture

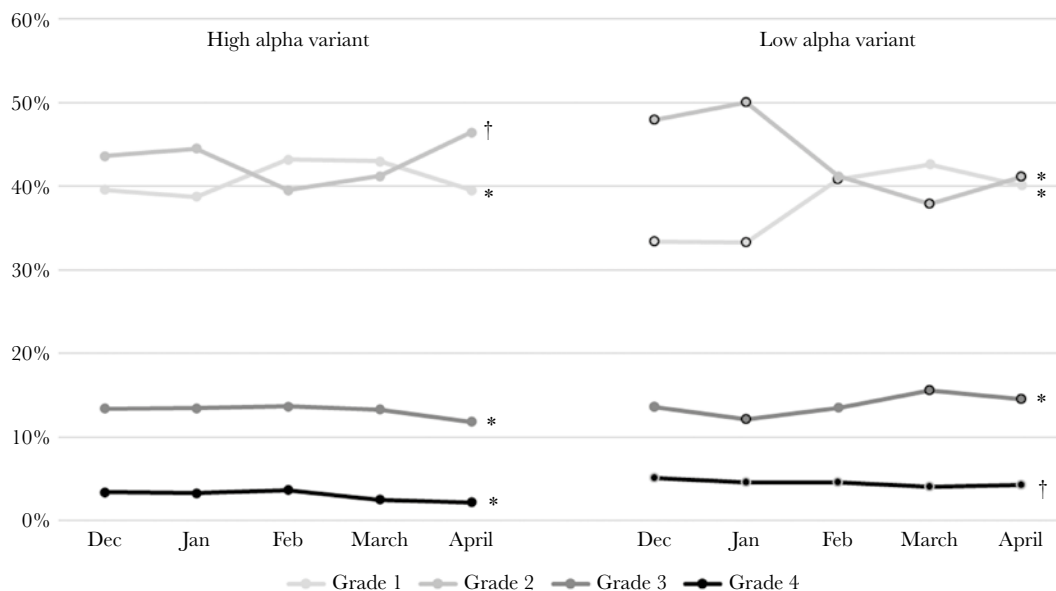


Figure 4. Trends in grades of coronavirus disease 2019 (COVID-19) disease severity per month by B.1.1.7 circulation, Premier Healthcare Database Special COVID-19 Release, December 2020–April 2021. Accentuated marker border indicates Bonferroni-adjusted $P < .05$ for difference from comparable value for high-Alpha-variant states. *Statistically significant linear and higher-order trends. †Statistically significant higher-order trends only.

severity in the community than measures during later periods of a hospitalization that could be impacted by complications of hospitalization. This approach allows for comparisons of severity-on-presentation over time, which was our study objective. Finally, we were able to classify admissions as occurring in low- or high-Alpha prevalence states to better understand its role on clinical severity.

Since the Alpha variant of SARS-CoV-2 was first reported in the US in December 2020 [14], our data suggest there have been no consistent differences in the most severe illness (grades 3 and 4) between states with higher vs lower Alpha circulation. This is consistent with a recent United Kingdom report finding no increased severity among 341 inpatients with fully sequenced SARS-CoV-2 isolates [3]. However, continued monitoring for grade 2 may be important, as data from March and April of 2021 suggest that states with high Alpha circulation have a greater proportion of admissions classified as grade 2 than states with lower Alpha circulation. This and related analyses may serve as documentation of severity trends during a single period of variant proliferation. Continued surveillance is also warranted during the period of Delta variant emergence, and any subsequent periods of novel variant proliferation.

In the overall sample and most subgroups under study, the proportion of admissions that were grade 1 or 2 tended to fluctuate in opposite directions: as grade 1 would increase in proportion, grade 2 would decrease. This was particularly evident during the winter 2020–2021 peak, when grade 1 became less common and grade 2 more common. The exact reasons for this cannot be determined by these analyses but may be related to hospital capacity. Per CDC data, prevalent hospitalizations peaked around 5–14 January 2021 with >120 000 per day [8]. As space became limited, patients without acute respiratory failure (thus not meeting grade 2 criteria) may have been less likely to be admitted. As the peak waned in February and March 2021, grade 1 again overtook grade 2 as the most common severity grade among all admissions.

In supplementary analyses, restriction to admissions with COVID-19 as the primary or admitting diagnosis impacted grades 1 and 2, with relatively little change in grades 3 and 4. This supports the contention that some patients with a COVID-19 diagnosis are admitted for conditions or procedures unrelated to COVID-19, but test positive during universal screening of inpatients. The minimal impact on grades 3 and 4 suggests that most patients during this period who met the criteria for grades 3 and 4 received this level of care specifically for management of COVID-19 illness.

This analysis is subject to several limitations. First, though 43 states (all except Idaho, Maine, New Hampshire, New Mexico, Rhode Island, Utah, and Vermont) and the District of Columbia were represented in the analytic dataset, 10 states accounted for nearly two-thirds of admissions (Florida, Texas, New York,

Michigan, California, Arizona, Ohio, North Carolina, Illinois, Pennsylvania); although the sample is large, it may not be representative of all hospital admissions in the US. Additionally, the 4-level severity scale is specific to inpatients and is unable to assess severity among nonhospitalized patients. Furthermore, using administrative data to estimate clinical severity relies on diagnoses and treatments that have evolved throughout the pandemic and may detect changes in clinical practice rather than changes in severity, though these changes were likely more common in the early months of the pandemic. For example, remdesivir was approved in the US in October of 2020 for the treatment of COVID-19 among hospitalized patients [19]. Improved outcomes due to remdesivir treatment could mask increased severity, though this would likely be attenuated by our focus on the first 2 days of an admission. Finally, using administrative data relies on fidelity of reporting and coding procedures and diagnoses. We do not have access to medical records for direct verification or validation.

In conclusion, clinical severity of patients hospitalized with COVID-19 has shown variability from month to month, but no evidence was found for consistent or marked worsening of COVID-19 severity over the course of the pandemic. Despite some variability across subgroups, there were consistent trends for decreases in the proportion of admissions classified as grade 4. There was no consistent evidence of worsening clinical severity in states with higher vs lower Alpha prevalence, though additional monitoring may be needed as new variants emerge. With continued monitoring, these results may serve as a useful comparison for future results.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Supplementary Figure 1: Adjusted prevalence of COVID-19 disease severity, Premier Healthcare Database Special COVID-19 Release, April 2020–April 2021.

Supplementary Figure 2: Disease severity limited to admissions with a primary or admitting diagnosis of COVID-19, Premier Healthcare Database Special COVID-19 Release, April 2020–April 2021. Accentuated marker borders indicate Cohen's $H > 0.2$ for difference from comparable value for the original estimates.

Supplementary Table: NIH 4-category clinical severity scale. More severe (high numbered) grades supersede lower. For example, an encounter with ICU mechanical ventilation and acute respiratory failure would be classified grade 4, not grade 2.

Notes

Disclaimer. The findings of this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the National Institutes of Health. All authors are employees of the federal government and this work was conducted as part of regular duties.

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