Severity of COVID-19 Hospitalization Outcomes and Patient Disposition Differ by Disability Status and Disability Type

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Key Points

People with disabilities hospitalized with COVID-19 had higher risk for severe outcomes, longer stays, and increased readmission, particularly those with mobility or intellectual/developmental disabilities. Community-dwelling people with disabilities had higher risk of discharge to skilled nursing or long-term care facilities.

Background:

Systemic inequities may place people with disabilities at higher risk of severe COVID-19 illness or lower likelihood to be discharged home after hospitalization. We examined whether severity of COVID-19 hospitalization outcomes and disposition differ by disability status and disability type.

Methods:

In a retrospective analysis of April 2020-November 2021 hospital-based administrative data among 745,375 people hospitalized with COVID-19 from 866 US hospitals, people with disabilities (n=120,360) were identified via ICD-10-CM codes. Outcomes compared by disability status included intensive care admission, invasive mechanical ventilation (IMV), in-hospital mortality, 30-day readmission, length of stay, and disposition (discharge to home, long-term care facility (LTCF), or skilled nursing facility (SNF).

Results:

People with disabilities had increased risks of IMV (aRR: 1.05; 95%CI: 1.03-1.08) and in-hospital mortality (1.04; 1.02-1.06) compared to those with no disability; risks were higher among people with intellectual and developmental disabilities (IDD) (IMV [1.34; 1.28-1.40], mortality [1.31; 1.26-1.37]) or mobility disabilities (IMV [1.13; 1.09-1.16], mortality [1.04; 1.01-1.07]). Risk of readmission was increased among people with any disability (1.23; 1.20-1.27) and each disability type. Risks of discharge to a LTCF (1.45, 1.39-1.49) or SNF (1.78, 1.74-1.81) were increased among community-dwelling people with each disability type.

Conclusions:

Severity of COVID-19 hospitalization outcomes vary by disability status and type; IDD and mobility disabilities were associated with higher risks of severe outcomes. Disparities such as differences in discharge disposition by disability status require further study which would be facilitated by standardized data on disability. Increased readmission across disability types indicates a need to improve discharge planning and support services.

Keywords: COVID-19, Persons with Disabilities, Health Equity, Disability Studies, Healthcare Disparities

Introduction

One in four adults living in the United States report having a disability [1], defined as a physical or mental impairment that substantially limits one or more major life activity [2]. People with disabilities often face greater barriers to accessible healthcare compared to those without disabilities [1], have higher rates of comorbidities that increase risk of severe disability due to COVID-19 [3-5], and were more likely to delay or avoid medical care due to concerns about COVID-19 early in the pandemic [6]. Compared to adults aged 65 years and older, younger adults insured by Medicare due to disability have a higher COVID-19-associated hospitalization rate [7]. Systemic health and social inequities may also place some people with disabilities at higher risk of severe illness due to COVID-19 [3].

Several studies have documented increased adverse COVID-19 outcomes among people with intellectual and developmental disabilities (IDD) [8-11]. However, there has been limited literature on other types of disability. People with disabilities may be concerned about structural inequities or unconscious biases about disability influencing their care during a public health emergency. Historically, people with disabilities may have been disproportionately placed in long-term care facilities during and after disasters [12] and a scoping review found numerous disadvantages for people with disabilities when critical care is rationed [13]. Risk of severe illness due to COVID-19 in the context of potential challenges to obtaining optimal care highlights the importance of understanding severe COVID-19 outcomes by disability type and the association of disability status with discharge disposition.

This study addresses gaps in the literature for people with disabilities; we analyzed a large national hospital-based administrative database, comparing measures of COVID-19 severity and discharge data among people with disabilities compared to those without disabilities, including an analysis by disability type. This is the first large US COVID-19 study to analyze the rate of discharge to home or other settings by disability status.

Methods

Data Sources and Participants

We analyzed the Premier Healthcare Database Special COVID-19 Release (PHD-SR), a large hospital-based administrative database that includes approximately 14% of US hospitals and 20% of US hospital admissions [14]. All patients with COVID-19 who completed a hospitalization during April 2020 through November 2021 were included. COVID-19 was defined using the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) code U07.1 as the primary or a secondary diagnosis code. Persons with disabilities were identified using ICD-10-CM codes listed as diagnosis codes during any outpatient visit or hospitalization during January 2019 through the initial COVID-19 encounter (Supplementary Table A1). Diagnostic codes from a previous study [15] were used to identify people with IDD, and a list of ICD codes associated with other disability types was adapted from the Center for Medicare and Medicaid Services (CMS) Chronic Condition Data Warehouse [16]. Disability types were classified for the purposes of this analysis as mobility, vision, hearing, or intellectual and developmental disabilities (IDD); codes indicating a disability

that did not fall into any of the analytic categories were included in an 'other disability' category. Groups by disability type were not mutually exclusive; a person with diagnostic codes indicating multiple disability types was included in each group. A comparison group included all people hospitalized with COVID-19 who were not identified as persons with disabilities. This activity was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable federal law and CDC policy. *

Measures

Underlying medical conditions, aligned with the CDC list of conditions associated with severe illness for COVID-19, [17] were defined using ICD-10 diagnosis codes during any inpatient or outpatient encounter from January 2019 through the initial COVID-19 encounter (Supplementary Table A2). Acute in-hospital complications were defined using ICD-10 diagnosis or procedure codes during the COVID-19 hospitalization.

Outcomes analyzed included: acute in-hospital complications (Supplementary Table A3), intensive care unit (ICU) admission, invasive mechanical ventilation (IMV), in-hospital mortality, length of stay (LOS), discharge outcome, and 30-day readmission for COVID-19. Acute in-hospital complications were defined using ICD-10 diagnosis or procedure codes during the COVID-19 hospitalization. When enumerating in-hospital complications, diagnostic and procedure codes involving the same organ system (e.g., respiratory) were counted as 1 complication, whereas complications in separate organ

systems were enumerated separately (i.e., codes indicating respiratory, cardiac, and renal complications were counted as 3 complications).

Statistical Analysis

We examined frequencies of demographic characteristics, underlying medical conditions, and frequencies of acute in-hospital complications. We conducted Pearson's chi-square tests (Fisher's exact tests for cell sizes <5) and Wilcoxon tests to compare frequencies or median age between those with and without disabilities [18-19]. We calculated ICU admission, IMV, in-hospital mortality, LOS, disposition status for the index hospitalization, and 30-day readmission for COVID-19 for persons with disabilities compared with those without disabilities using multivariable regression analyses. We obtained risk ratios using either a log binomial model (ICU admission, IMV) or an alternative revised Poisson model (in-hospital mortality, readmission) [20]. We used a zero-truncated, negative binomial model for LOS [21]. For community dwelling people we used the revised Poisson model to obtain risk ratios for discharge to long-term care facilities (LTCF), skilled nursing facilities (SNF) or home.

We calculated unadjusted and age-adjusted models, followed by fully adjusted regression models that included age, sex, race and ethnicity, US Census region, provider urbanicity, and number of underlying medical conditions (0, 1, 2 or ≥3). Neurological or musculoskeletal conditions were not included in the number of underlying conditions because of the large number of disabilities that are neurological or musculoskeletal in nature. We accounted for clustering at the hospital level by calculating confidence intervals based on clustered standard error in log binomial

models and revised Poisson models or by including a hospital random effect in zero-truncated, negative binomial model. All analyses were conducted using SAS software (version 9.4; SAS Institute).

Only people admitted from a non-healthcare point of origin were included in the regression model of discharge status to capture people who were most likely community dwelling at admission. In this fully adjusted model, we included all the variables in the other regressions and added adjustments for severity of illness, including in-hospital complications (0, 1, 2 or ≥3), ICU admission and IMV. Sensitivity analyses for hospitalization and disposition outcomes were conducted using data prior to the widespread availability of vaccination.

Results

Through examination of 25,291,449 records from 866 hospitals, we identified 120,360 people with one or more disability code and 745,375 people without disability codes who were diagnosed with COVID-19 and hospitalized. Of those with disabilities, 66,500 (55.3%) had a mobility disability, 20,960 (17.4%) had a visual disability, 32,270 (26.8%) had a hearing disability, and 17,926 (14.9%) had an IDD; 15,933 (13.2%) had more than one disability type.

While people hospitalized with COVID-19 with most disability types were older, people with IDD had a lower median age than people without disabilities (60 vs 62) and were more likely to be <30 years old ($p<0.001$) (Table 1). People with all disability types

were more likely to be White and be insured under Medicare than people without disabilities; people with IDD were also more likely to be insured under Medicaid. People with each disability type were significantly more likely to have 3 or more underlying conditions compared to people without disabilities (59.6%-79.9% vs 55.2%, p <0.001), while people with IDD who were hospitalized were also as likely to have zero comorbidities as those without disabilities (10.1% vs 10.4%, p=0.172). People with each disability type who were hospitalized for COVID-19 were more likely than people with no disability to have in-hospital complications in three or more organ systems (24.5%-28.4% vs 19.1%, all p<0.001); people with IDD were also more likely to have zero in-hospital complications than people without disabilities (12.7% vs 10.5%, p<0.001) (Table 2).

In fully adjusted models, all hospitalization outcomes except ICU admission were significantly more common among people with any disability, people with a mobility disability, and people with IDD, compared with people with no disability (Figure 1). Risk for IMV was significantly increased among people with any disability (aRR= 1.05; CI: 1.03-1.08), a mobility disability (1.13; 1.09-1.16), and IDD (1.34; 1.28-1.40) compared to people without disabilities, but decreased risk was seen among people with hearing (0.76; 0.73-0.79) or visual (0.87; 0.84-0.91) disabilities. Risk for in-hospital mortality was increased among people with any disability (1.04; 1.02-1.06), a mobility disability (1.04; 1.01-1.07), or IDD (1.31; 1.26-1.37), and decreased among those with hearing (0.91; 0.89-0.94) or visual (0.95; 0.92-0.99) disabilities. Risk for 30-day readmission for COVID-19 was increased among all groups compared to people without disabilities

(aRRs 1.11-1.50), and LOS was significantly increased in all groups (aIRRs 1.07-1.46) except those with hearing disabilities (1.01; 1.00-1.02).

Disposition status was analyzed for the first COVID-19 hospitalization among people admitted from a non-healthcare source in each group. Over 73% of people without disabilities were discharged home compared to about 51% of people with disabilities (Table 3). On a fully adjusted analysis, which included adjustments for measures of disease severity during hospitalization, people with any disability were significantly more likely to be discharged to a LTCF or SNF (aRR 1.69, 95% CI 1.66–1.72) and were less likely to be discharged to home (aRR 0.80, 95% CI 0.79–0.81) compared with people without disabilities (Figure 1), an association consistent across disability types. Risk for discharge to a SNF was more than twice as high for people with a mobility disability (aRR 2.12, 95% CI 2.06-2.17) or IDD (aRR 2.44, 95% CI 2.32-2.56); the risk of discharge to a LTCF was over twice as high for people with IDD (aRR 2.32, 95% CI 2.14-2.52).

Since lack of data precluded adjustment for COVID-19 vaccination status, sensitivity analyses of the fully adjusted models were performed on data during April 2020- December 2020, prior to widespread availability of COVID-19 vaccines. All pre-vaccination period aRRs remained significant and most were equivalent to or slightly above aRRs in the primary analysis (Supplementary Tables A4 and A5).

Discussion

This analysis finds differences in COVID-19 outcomes and disposition by disability status and type. Multiple complications, IMV, and in-hospital death were all increased in people with disabilities compared to people without disabilities. This is consistent with a United Kingdom study, which found an increased COVID-19 related mortality rate among adults with any disability [22] but differed from a Canadian study that showed no significant difference in in-hospital mortality [23]. A previous analysis also showed that cognitive impairment, as well as moderate and severe disability, were independent risk factors for non-COVID pneumonia mortality [24].

On analysis by disability type, risk of multiple acute in-hospital complications was increased for people with each disability type, while risks of IMV and in-hospital death were increased among people with IDD and people with mobility disabilities. LOS was prolonged for people with every disability type except hearing disability, and 30-day readmission for COVID-19 was more common among people with each disability type compared to those without disabilities. People with IDD had the highest risk for all adverse outcomes, including a 34% increased risk of IMV, 31% increased risk of in-hospital death, 50% increased risk of readmission, and a 46% LOS prolongation compared to people without disabilities. This aligns with other reports of increased risk for severe morbidity and mortality due to COVID-19 among people with IDD [4-5; 8-9]. However, increased risk of severe COVID-19 outcomes in people with a mobility disability have not been previously described, including a 13% increased risk of IMV, 4% increased risk of in-hospital death, 22% increased risk of readmission, and a 25%

LOS prolongation compared to people without disabilities. LOS findings could be impacted by factors other than disease severity (e.g., delayed support service availability). There was no disability type for which the risk of ICU admission significantly differed from that of people without disabilities, even among groups with increased rates of IMV. This may indicate that people with these disability types are less likely to be admitted to the ICU for reasons other than IMV that were not captured by these data. A consistent finding across all disability types was an increased risk of 30-day readmission compared to people without disabilities. These findings align with a Canadian study which found that people with disabilities did not have a higher risk of ICU admission but did have a higher rate of both readmission and longer hospital stays, compared to people without disabilities [23].

Community-dwelling people with any disability and those with each disability type were more likely to be discharged to a LTCF or SNF than people without disabilities. Risk varied by disability type; people with IDD or mobility disabilities were over twice as likely to be discharged to a LTCF or SNF compared to people without disabilities. There are several factors that may contribute to disposition recommendations made by hospital personnel for people with disabilities, which may include time available to plan for discharge as well as awareness and availability of home and community-based services. Concerns about disposition decisions have been voiced by many within the disability community [25]. In the context of readmission findings, some discharge disposition decisions may have been made to prevent readmission or to decompress overcrowded hospitals. Further study is needed to investigate the reasons behind the increased risk for discharge to LTCF and SNF among people with disabilities.

People with disabilities face systemic barriers during emergencies [26] despite existing legal protections of their equal access to public health emergency services [27-28]. The National Council on Disability found an increase in nursing home populations and an increase of institutionalization of people with IDD during and after disasters between 2017-2018 [12]. Implicit bias due to disability status has been well-documented [29], including among healthcare workers [30-31]. People with disabilities may be concerned that structural inequities or unconscious biases about disability, quality of life [32], and social utility could influence decisions made by healthcare professionals during and after COVID-19 hospitalization [30; 33-34]; these concerns were supported by a scoping review [13]. While the findings of this analysis are likely multifactorial, implicit biases likely play a role.

It is important to not just identify disparities, but to connect them to evidence-based practices to ameliorate the barriers faced by disproportionately affected groups. Many practical steps at the systemic, organizational and interpersonal levels can be taken to ameliorate disparities faced by people with disabilities. First, widespread adoption of data standards for disability as included in the US Core Data for Interoperability Standards (USCDI) version 3 is needed to better track health outcomes among people with disabilities for a wide range of health conditions. Without high-quality data, we cannot adequately identify and address important barriers and inequities. Second, increased readmission rates across disability types may indicate the need for improved discharge planning and increased home and community-based support services for people with disabilities. Increased access to care and availability of support services that are scalable to be expanded during public health emergencies

would help to meet the needs of people with disabilities in their homes. Recent systematic reviews among a variety of populations and healthcare contexts show that home and community-based services are effective to decrease length of stay and readmission rates when they are multidisciplinary and integrated with hospital services in transitional care structures [35-36]. Effective transitional care programs included elements such as pre- and post-discharge assessments, care coordination, and specialists such as liaison nursing staff with specialized expertise in disability. Finally, healthcare systems and educational institutions can ensure that people with disabilities are included as a population of focus during training on implicit bias, equity, and diversity, including during continuing education. Respectful and clear communication with people with IDD and other disability types, as well as family caregivers, is vital to improve documented challenges in this population [37-38]. Overall, it is important to educate health care professionals, case workers, and policy makers to improve access to health and supportive services, ensure respectful and trauma-informed care, and optimize health outcomes for people with disabilities.

This study has four main limitations. First, while identification of disabilities via ICD codes is an established method in the literature in the absence of needed data standards [10,14], there may be sensitivity and specificity challenges. Providers may be more likely to code for disabilities that are more visible or apparent during the clinical encounter. Furthermore, people without a primary care provider may be at higher risk of having an undiagnosed disability [39]. While 26% of US adults report having a disability, 16% of hospitalized adults in our sample were identified as having a disability, indicating likely under-capture of disability. Second, adjustments for COVID-19

vaccination status were not feasible due to incomplete data. Data during the study period show a 66.7% COVID-19 vaccination rate among adults with disabilities compared to 64.5% of persons without disabilities [40]. However, after adjusting for age, adults with disabilities were less likely (aPR=0.88) to have been vaccinated than adults without disabilities. Sensitivity analyses were performed to address this limitation and showed that the significance and direction of all associations held when examined during the pre-vaccination time period (Tables A4 and A5). Third, while we controlled for underlying conditions, we cannot distinguish whether the disability predated any chronic medical condition(s). Finally, findings represent a convenience sample from hospitals reporting to PDB-SR and might not be generalizable to the U.S. population, as it includes a greater proportion of large hospitals, hospitals in the Southern US Census Region, and non-teaching hospitals compared to all US hospitals.

Conclusion

Increased risk of severe outcomes due to COVID-19 in hospitalized people with disabilities risks varied by disability type, with the highest risk for all outcomes studied among people with IDD, although people with mobility disabilities also had an increased risk adverse outcomes. People with any disability and people with each disability type who were admitted from the community were less likely to be discharged home than people without disabilities, even when controlling for measures of disease severity, a finding which merits further study. Lack of standardized disability data presents a challenge to such analyses. Increased risk of readmission across all disability types

may indicate a need to improve discharge planning and home and community-based services for people with disabilities.

NOTES

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Conflict of Interest Statement

No authors have any conflicts of interest to disclose.

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Table 1. Demographics and Medical Conditions for People Hospitalized with COVID-19 by Disability Status, United States, April 2020–November 2021

	People without disabilities	People who have any disability[a]		Mobility Disability		Visual Disability		Hearing Disability		Intellectual or Developmental Disability	
	(n = 745,375)	(n = 120,360)		(n = 66,500)		(n = 20,960)		(n = 32,270)		(n = 17,926)	
	No. (%)	No. (%)	p-value[b]	No. (%)	p-value[b]	No. (%)	p-value[b]	No. (%)	p-value[b]	No. (%)	p-value[b]
Age											
Median (interquartile range)	62 (48, 74)	**71 (59, 82)**	**<0.001**	**70 (60, 80)**	**<0.001**	**68 (56, 79)**	**<0.001**	**81 (72, 88)**	**<0.001**	**60 (42, 73)**	**<0.001**
<18	8379 (1.1)	1306 (1.1)	0.232	**460 (0.7)**	**<0.001**	**163 (0.8)**	**<0.001**	**127 (0.4)**	**<0.001**	**976 (5.4)**	**<0.001**
18–29	41174 (5.5)	**2956 (2.5)**	**<0.001**	**1126 (1.7)**	**<0.001**	**562 (2.7)**	**<0.001**	**185 (0.6)**	**<0.001**	**1532 (8.6)**	**<0.001**
30–44	101325 (13.6)	**7233 (6.0)**	**<0.001**	**3653 (5.5)**	**<0.001**	**1693 (8.1)**	**<0.001**	**586 (1.8)**	**<0.001**	**2326 (13.0)**	**0.017**
45–54	107866 (14.5)	**10064 (8.4)**	**<0.001**	**6019 (9.1)**	**<0.001**	**2317 (11.1)**	**<0.001**	**998 (3.1)**	**<0.001**	**2124 (11.9)**	**<0.001**
55–64	151590 (20.3)	**20155 (16.8)**	**<0.001**	**12566 (18.9)**	**<0.001**	**4016 (19.2)**	**<0.001**	**2658 (8.2)**	**<0.001**	3578 (20.0)	0.215
65–74	155583 (20.9)	**27948 (23.2)**	**<0.001**	**17565 (26.4)**	**<0.001**	**4846 (23.1)**	**<0.001**	**5746 (17.8)**	**<0.001**	**3506 (19.6)**	**<0.001**
75+	179458 (24.1)	**50698 (42.1)**	**<0.001**	**25111 (37.8)**	**<0.001**	**7363 (35.1)**	**<0.001**	**21970 (68.1)**	**<0.001**	**3884 (21.7)**	**<0.001**
Gender											
Male	379431 (50.9)	**64212 (53.4)**	**<0.001**	**34138 (51.3)**	**0.033**	10802 (51.5)	0.071	**18636 (57.8)**	**<0.001**	**10263 (57.3)**	**<0.001**
Female	365944 (49.1)	**56148 (46.7)**	**<0.001**	**32362 (48.7)**	**0.033**	10158 (48.5)	0.071	**13634 (42.3)**	**<0.001**	**7663 (42.8)**	**<0.001**
Race and ethnicity											
Black, non-Hispanic	126460 (17.0)	**21842 (18.2)**	**<0.001**	**14425 (21.7)**	**<0.001**	**4452 (21.2)**	**<0.001**	**2683 (8.3)**	**<0.001**	3110 (17.4)	0.177
White, non-Hispanic	409053 (54.9)	**75871 (63.0)**	**<0.001**	**39604 (59.6)**	**<0.001**	**12089 (57.7)**	**<0.001**	**24418 (75.7)**	**<0.001**	**11276 (62.9)**	**<0.001**
Hispanic	127536 (17.1)	**11831 (9.8)**	**<0.001**	**6441 (9.7)**	**<0.001**	**2550 (12.2)**	**<0.001**	**2445 (7.6)**	**<0.001**	**1923 (10.7)**	**<0.001**
Other race, non-Hispanic	62629 (8.4)	**8525 (7.1)**	**<0.001**	**4766 (7.2)**	**<0.001**	**1461 (7.0)**	**<0.001**	**2212 (6.9)**	**<0.001**	**1231 (6.9)**	**<0.001**
Unknown	19697 (2.6)	**2291 (1.9)**	**<0.001**	**1264 (1.9)**	**<0.001**	**408 (2.0)**	**<0.001**	**512 (1.6)**	**<0.001**	**386 (2.2)**	**<0.001**
Geographic divisions[c]											
Northeast	110140 (14.8)	**21001 (17.5)**	**<0.001**	**12681 (19.1)**	**<0.001**	**3329 (15.9)**	**<0.001**	4821 (14.9)	0.419	**3601 (20.1)**	**<0.001**
Midwest	146904 (19.7)	**28280 (23.5)**	**<0.001**	**15012 (22.6)**	**<0.001**	**4890 (23.3)**	**<0.001**	**8366 (25.9)**	**<0.001**	**4616 (25.8)**	**<0.001**
South	370860 (49.8)	**55508 (46.1)**	**<0.001**	**30947 (46.5)**	**<0.001**	**10020 (47.8)**	**<0.001**	**14364 (44.5)**	**<0.001**	**7511 (41.9)**	**<0.001**
West	117471 (15.8)	**15571 (12.9)**	**<0.001**	**7860 (11.8)**	**<0.001**	**2721 (13.0)**	**<0.001**	**4719 (14.6)**	**<0.001**	**2198 (12.3)**	**<0.001**
Rural/Urban Provider Location[c]											
Rural	98432 (13.2)	**17436 (14.5)**	**<0.001**	**9692 (14.6)**	**<0.001**	**3253 (15.5)**	**<0.001**	**4695 (14.6)**	**<0.001**	2389 (13.3)	0.636
Urban	646943 (86.8)	**102924 (85.5)**	**<0.001**	**56808 (85.4)**	**<0.001**	**17707 (84.5)**	**<0.001**	**27575 (85.5)**	**<0.001**	15537 (86.7)	0.636
Payer source[c]											
Medicare	339853 (45.6)	**88300 (73.4)**	**<0.001**	**48282 (72.6)**	**<0.001**	**14253 (68.0)**	**<0.001**	**27343 (84.7)**	**<0.001**	**11906 (66.4)**	**<0.001**
Medicaid	115074 (15.4)	**14390 (12.0)**	**<0.001**	**8150 (12.3)**	**<0.001**	**3015 (14.4)**	**<0.001**	**1551 (4.8)**	**<0.001**	**3841 (21.4)**	**<0.001**

Private insurance	218249	(29.3)	**12528**	**(10.4)**	**<0.001**	**7193**	**(10.8)**	**<0.001**	**2646**	**(12.6)**	**<0.001**	**2193**	**(6.8)**	**<0.001**	**1588**	**(8.9)**	**<0.001**
Self-pay	26541	(3.6)	**1367**	**(1.1)**	**<0.001**	**797**	**(1.2)**	**<0.001**	**331**	**(1.6)**	**<0.001**	**182**	**(0.6)**	**<0.001**	**175**	**(1.0)**	**<0.001**
Other	45658	(6.1)	**3775**	**(3.1)**	**<0.001**	**2078**	**(3.1)**	**<0.001**	**715**	**(3.4)**	**<0.001**	**1001**	**(3.1)**	**<0.001**	**416**	**(2.3)**	**<0.001**
Underlying medical conditions[d]																	
Asthma	70791	(9.5)	**12403**	**(10.3)**	**<0.001**	**6851**	**(10.3)**	**<0.001**	**2551**	**(12.2)**	**<0.001**	2996	(9.3)	0.201	**2197**	**(12.3)**	**<0.001**
Chronic obstructive pulmonary disease	114502	(15.4)	**30568**	**(25.4)**	**<0.001**	**17100**	**(25.7)**	**<0.001**	**5405**	**(25.8)**	**<0.001**	**9619**	**(29.8)**	**<0.001**	**3250**	**(18.1)**	**<0.001**
Cystic fibrosis	155	(0.0)	**36**	**(0.0)**	**0.048**	14	(0.0)	0.965	<10	----	----	<10	----	----	**12**	**(0.1)**	**<0.001**
Pulmonary fibrosis	12335	(1.7)	**3077**	**(2.6)**	**<0.001**	**1594**	**(2.4)**	**<0.001**	**564**	**(2.7)**	**<0.001**	**1118**	**(3.5)**	**<0.001**	331	(1.9)	0.047
Other lung conditions	49308	(6.6)	**21791**	**(18.1)**	**<0.001**	**13219**	**(19.9)**	**<0.001**	**4124**	**(19.7)**	**<0.001**	**5737**	**(17.8)**	**<0.001**	**3347**	**(18.7)**	**<0.001**
Heart disease	253150	(34.0)	**70926**	**(58.9)**	**<0.001**	**40171**	**(60.4)**	**<0.001**	**12981**	**(61.9)**	**<0.001**	**21300**	**(66.0)**	**<0.001**	**7920**	**(44.2)**	**<0.001**
Hypertension	353002	(47.4)	**69092**	**(57.4)**	**<0.001**	**40277**	**(60.6)**	**<0.001**	**12158**	**(58.0)**	**<0.001**	**18787**	**(58.2)**	**<0.001**	**8331**	**(46.5)**	**0.019**
Sickle cell and thalassemia	1520	(0.2)	**354**	**(0.3)**	**<0.001**	**203**	**(0.3)**	**<0.001**	**100**	**(0.5)**	**<0.001**	**47**	**(0.1)**	**0.022**	**77**	**(0.4)**	**<0.001**
Cancer	43603	(5.9)	**11984**	**(10.0)**	**<0.001**	**6439**	**(9.7)**	**<0.001**	**2199**	**(10.5)**	**<0.001**	**4058**	**(12.6)**	**<0.001**	**1313**	**(7.3)**	**<0.001**
Cerebrovascular diseases	12668	(1.7)	**29594**	**(24.6)**	**<0.001**	**26203**	**(39.4)**	**<0.001**	**4296**	**(20.5)**	**<0.001**	**3313**	**(10.3)**	**<0.001**	**1730**	**(9.7)**	**<0.001**
Neurologic/musculoskeletal	182426	(24.5)	**81769**	**(67.9)**	**<0.001**	**52528**	**(79.0)**	**<0.001**	**11831**	**(56.5)**	**<0.001**	**18689**	**(57.9)**	**<0.001**	**13209**	**(73.7)**	**<0.001**
Diabetes	288450	(38.7)	**57705**	**(47.9)**	**<0.001**	**33428**	**(50.3)**	**<0.001**	**11498**	**(54.9)**	**<0.001**	**14300**	**(44.3)**	**<0.001**	**6713**	**(37.5)**	**<0.001**
Overweight	30319	(4.1)	**8841**	**(7.4)**	**<0.001**	**5226**	**(7.9)**	**<0.001**	**1611**	**(7.7)**	**<0.001**	**2420**	**(7.5)**	**<0.001**	**1275**	**(7.1)**	**<0.001**
Obesity	155589	(20.9)	**27039**	**(22.5)**	**<0.001**	**15411**	**(23.2)**	**<0.001**	**5635**	**(26.9)**	**<0.001**	**6369**	**(19.7)**	**<0.001**	3845	(21.5)	0.061
Severe obesity	120464	(16.2)	**18373**	**(15.3)**	**<0.001**	**10952**	**(16.5)**	**0.039**	**3610**	**(17.2)**	**<0.001**	**3507**	**(10.9)**	**<0.001**	2847	(15.9)	0.315
Liver diseases	65806	(8.8)	**13691**	**(11.4)**	**<0.001**	**7458**	**(11.2)**	**<0.001**	**2584**	**(12.3)**	**<0.001**	**3101**	**(9.6)**	**<0.001**	**2764**	**(15.4)**	**<0.001**
Chronic kidney disease including dialysis	165312	(22.2)	**48319**	**(40.2)**	**<0.001**	**26703**	**(40.2)**	**<0.001**	**9690**	**(46.2)**	**<0.001**	**14392**	**(44.6)**	**<0.001**	**5354**	**(29.9)**	**<0.001**
Immunosuppression	121612	(16.3)	**26641**	**(22.1)**	**<0.001**	**14941**	**(22.5)**	**<0.001**	**5259**	**(25.1)**	**<0.001**	**7064**	**(21.9)**	**<0.001**	**3841**	**(21.4)**	**<0.001**
Substance use disorder	47972	(6.4)	**10215**	**(8.5)**	**<0.001**	**6323**	**(9.5)**	**<0.001**	**2199**	**(10.5)**	**<0.001**	**1650**	**(5.1)**	**<0.001**	**1609**	**(9.0)**	**<0.001**
Tobacco use	258590	(34.7)	**54382**	**(45.2)**	**<0.001**	**30935**	**(46.5)**	**<0.001**	**9978**	**(47.6)**	**<0.001**	**15999**	**(49.6)**	**<0.001**	**5264**	**(29.4)**	**<0.001**
No underlying medical conditions	77780	(10.4)	**4372**	**(3.6)**	**<0.001**	**1970**	**(3.0)**	**<0.001**	**590**	**(2.8)**	**<0.001**	**681**	**(2.1)**	**<0.001**	1814	(10.1)	0.172
Any 1 medical condition listed above	113190	(15.2)	**9230**	**(7.7)**	**<0.001**	**4163**	**(6.3)**	**<0.001**	**1276**	**(6.1)**	**<0.001**	**2463**	**(7.6)**	**<0.001**	**2551**	**(14.2)**	**<0.001**
2 medical conditions	142830	(19.2)	**15137**	**(12.6)**	**<0.001**	**7248**	**(10.9)**	**<0.001**	**2342**	**(11.2)**	**<0.001**	**4430**	**(13.7)**	**<0.001**	**2873**	**(16.0)**	**<0.001**
≥3 medical conditions	411575	(55.2)	**91621**	**(76.1)**	**<0.001**	**53119**	**(79.9)**	**<0.001**	**16752**	**(79.9)**	**<0.001**	**24696**	**(76.5)**	**<0.001**	**10688**	**(59.6)**	**<0.001**
Other medical conditions of interest[d]																	
Serious mental illness	26429	(3.6)	**8531**	**(7.1)**	**<0.001**	**4408**	**(6.6)**	**<0.001**	**1419**	**(6.8)**	**<0.001**	**1265**	**(3.9)**	**<0.001**	**2991**	**(16.7)**	**<0.001**

[a] Include other disabilities that are not listed.

[b] P-value compared with people without disabilities.

[c] Categories are mutually exclusive based on the first hospitalization for COVID-19.

[d] Categories are not mutually exclusive. Underlying medical conditions and other medical conditions of interest were defined using ICD-10 codes listed as a primary or secondary diagnosis code during any inpatient or outpatient encounter during January 2019 through the initial COVID-19 encounter (see Appendix Table 2)

Findings among any group of people with disabilities that were significantly different than those among people without disabilities (p-value < 0.05) are bolded

Table 2. In-Hospital Complications for People Who are Hospitalized for COVID-19 by Disability Status, April 2020–November 2021

	People without disabilities (n = 745,375)		People who have any disability[a] (n = 120,360)			Mobility Disability (n = 66,500)			Visual Disability (n = 20,960)			Hearing Disability (n = 32,270)			Intellectual or Developmental Disability (n = 17,926)		
	No.	(%)	No.	(%)	p-value[b]	No.	(%)	p-value[b]	No.	(%)	p-value[b]	No.	(%)	p-value[b]	No.	(%)	p-value[b]
Number of in-hospital complications																	
0 complication	78174	(10.5)	**11482**	**(9.5)**	**<0.001**	**6572**	**(9.9)**	**<0.001**	2146	(10.2)	0.245	**2337**	**(7.2)**	**<0.001**	**2273**	**(12.7)**	**<0.001**
1 complication	325534	(43.7)	**41571**	**(34.5)**	**<0.001**	**22009**	**(33.1)**	**<0.001**	**7365**	**(35.1)**	**<0.001**	**11778**	**(36.5)**	**<0.001**	**6338**	**(35.4)**	**<0.001**
2 complications	199231	(26.7)	**34794**	**(28.9)**	**<0.001**	**19055**	**(28.7)**	**<0.001**	**6075**	**(29.0)**	**<0.001**	**9777**	**(30.3)**	**<0.001**	**4923**	**(27.5)**	**0.028**
≥3 complications	142436	(19.1)	**32513**	**(27.0)**	**<0.001**	**18864**	**(28.4)**	**<0.001**	**5374**	**(25.6)**	**<0.001**	**8378**	**(26.0)**	**<0.001**	**4392**	**(24.5)**	**<0.001**
In-hospital complications																	
Respiratory	622809	(83.6)	**96763**	**(80.4)**	**<0.001**	**52122**	**(78.4)**	**<0.001**	**16512**	**(78.8)**	**<0.001**	**27487**	**(85.2)**	**<0.001**	**14238**	**(79.4)**	**<0.001**
Cardiac	86717	(11.6)	**21276**	**(17.7)**	**<0.001**	**11807**	**(17.8)**	**<0.001**	**3869**	**(18.5)**	**<0.001**	**6412**	**(19.9)**	**<0.001**	**2189**	**(12.2)**	**0.017**
Hematologic/Vascular	49344	(6.6)	**8216**	**(6.8)**	**0.008**	**4795**	**(7.2)**	**<0.001**	**1282**	**(6.1)**	**0.004**	2062	(6.4)	0.103	**1114**	**(6.2)**	**0.031**
Neurologic	10673	(1.4)	**9094**	**(7.6)**	**<0.001**	**7659**	**(11.5)**	**<0.001**	**1472**	**(7.0)**	**<0.001**	**918**	**(2.8)**	**<0.001**	**498**	**(2.8)**	**<0.001**
Endocrine	18973	(2.6)	**2889**	**(2.4)**	**0.003**	**1520**	**(2.3)**	**<0.001**	**739**	**(3.5)**	**<0.001**	**557**	**(1.7)**	**<0.001**	477	(2.7)	0.332
Gastrointestinal	15026	(2.0)	2432	(2.0)	0.914	1366	(2.1)	0.502	**367**	**(1.8)**	**0.007**	**492**	**(1.5)**	**<0.001**	**542**	**(3.0)**	**<0.001**
Renal	216141	(29.0)	**46018**	**(38.2)**	**<0.001**	**25333**	**(38.1)**	**<0.001**	**8035**	**(38.3)**	**<0.001**	**12858**	**(39.9)**	**<0.001**	**6068**	**(33.9)**	**<0.001**
Sepsis	190833	(25.6)	**36174**	**(30.1)**	**<0.001**	**20946**	**(31.5)**	**<0.001**	**5649**	**(27.0)**	**<0.001**	**8705**	**(27.0)**	**<0.001**	**6129**	**(34.2)**	**<0.001**

[a] Includes other disabilities that are not listed.
[b] P-value compared with people without disabilities.
Findings among any group of people with disabilities that were significantly different than those among people without disabilities (p-value < 0.05) are bolded

Table 3. Disposition after Hospitalization for People with COVID-19 Admitted from Non-Healthcare Settings by Disability Status, April 2020–November 2021

Discharge status (first encounter)	People without disabilities (n = 624,134) No.	(%)	People who have any disability[a] (n = 95,707) No.	(%)	Mobility Disability (n = 52,053) No.	(%)	Visual Disability (n = 17,345) No.	(%)	Hearing Disability (n = 26,208) No.	(%)	Intellectual or Developmental Disability (n = 13,774) No.	(%)
Ongoing care	23255	(3.7)	5504	(5.8)	3484	(6.7)	899	(5.2)	1163	(4.4)	720	(5.2)
Left against medical advice or discontinued care	9561	(1.5)	920	(1.0)	487	(0.9)	257	(1.5)	159	(0.6)	122	(0.9)
Deceased	68436	(11.0)	14898	(15.6)	8062	(15.5)	2336	(13.5)	4621	(17.6)	1917	(13.9)
Discharged to home	456685	(73.2)	48981	(51.2)	24426	(46.9)	10282	(59.3)	13249	(50.6)	7599	(55.2)
Discharged to long-term care/skilled nursing facility	62684	(10.0)	24921	(26.0)	15342	(29.5)	3497	(20.2)	6904	(26.3)	3301	(24.0)
Long-term care facility	18154	(2.9)	5774	(6.0)	3298	(6.3)	815	(4.7)	1720	(6.6)	904	(6.6)
Skilled nursing facility	44530	(7.1)	19147	(20.0)	12044	(23.1)	2682	(15.5)	5184	(19.8)	2397	(17.4)
Other not listed	3513	(0.6)	483	(0.5)	252	(0.5)	74	(0.4)	112	(0.4)	115	(0.8)

[a] Includes other disabilities group

Figure 1 Legend.

Adjusted risk ratios of hospitalization outcomes (panel A) and disposition (panel B) by disability type (reference group for both analyses: people without disabilities) — United States, April 2020 - November 2021

Legend for Figure 1 (both panels)

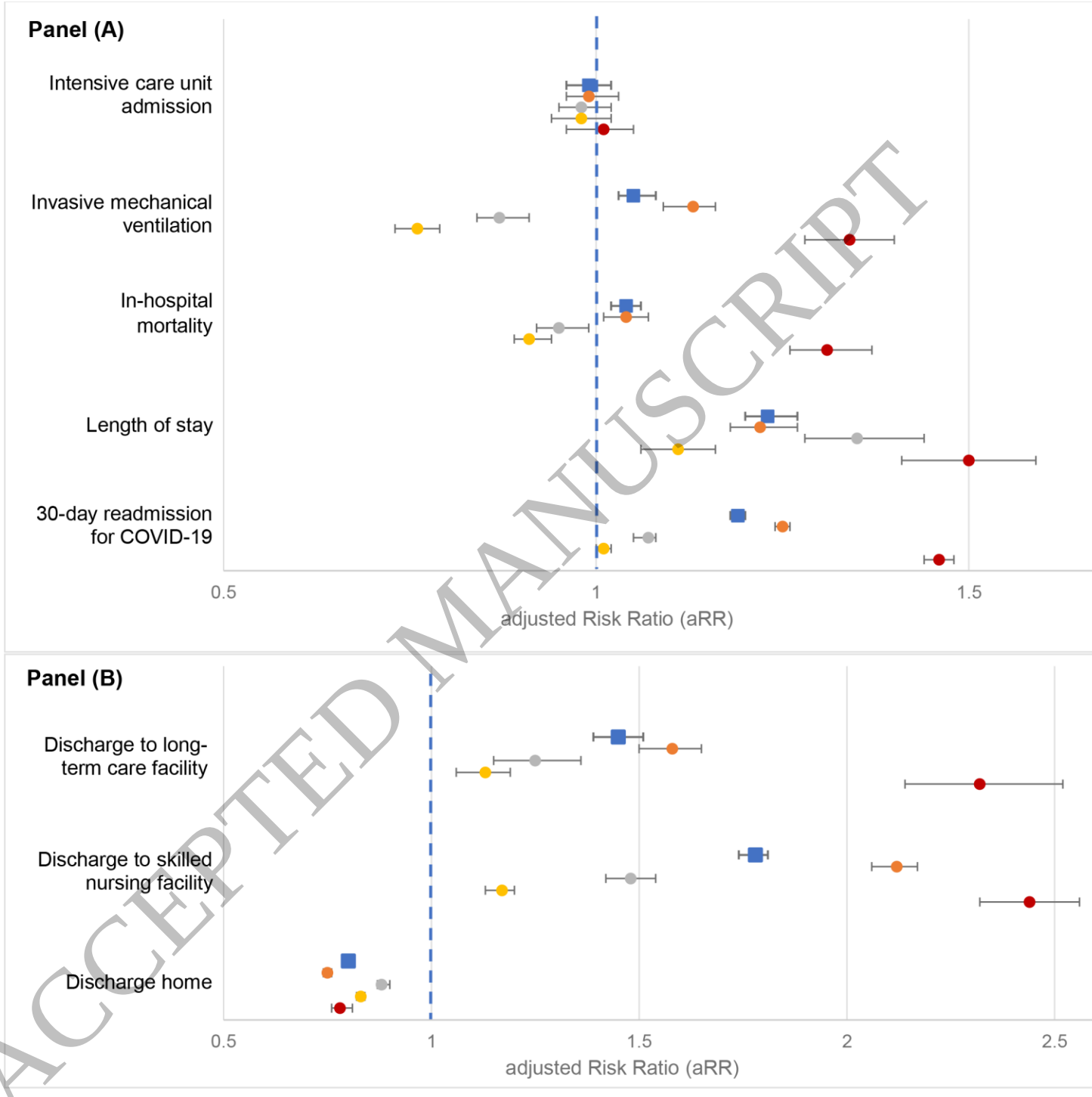

Figure 1
211x190 mm (x DPI)