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Characteristics and quality of nursing homes reporting COVID-19 admissions from hospitals

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has had a devastating impact on US nursing homes, which accounted for more than one-third of all COVID-19 deaths in the United States in 2020.¹ On May 25, 2020, the Centers for Medicare & Medicaid Services (CMS) began requiring nursing homes to report weekly COVID-19 admissions, which comprise new and returning residents previously hospitalized and treated for the disease.² We describe the characteristics and quality of nursing homes reporting COVID-19 admissions through late December 2020, which is when the vaccine rollout to nursing homes began and their death rates started to substantially decline.³

METHODS

We used CMS's COVID-19 Nursing Home Dataset to determine the total number of COVID-19 admissions and confirmed and suspected cases and deaths among residents for each facility from May 25, 2020 to December 20, 2020.² This information was then merged with data on facility characteristics from LTCfocus,⁴ quality data from Nursing Home Compare,⁵ and county data from USAFacts.⁶ For facility characteristics, we examined the number of certified beds, ownership type, the proportion of white residents, and resident health as measured by the LTCfocus acuity index (which captures functional limitations and cognitive impairment, with scores ranging from 0 to 27) and the proportion of residents with hypertension. We also examined community spread as measured by the number of confirmed COVID-19 cases (excluding cases among nursing home residents) per 1000 people in the county from May 25, 2020 to December 20, 2020. For quality measures, we examined the overall CMS star rating (which ranges from 1 to 5, with 1 indicating lowest quality and 5 indicating highest quality),⁷ case-mix adjusted nursing hours per resident per day, and the number of citations from infection control inspections in the past 3 years. We also examined the number of COVID-19 cases, deaths, and deaths per 100 cases among residents. In the CMS data, resident

cases exclude COVID-19 admissions (which are counted separately), but resident deaths can include COVID-19 admissions. Our analysis included 13,104 nursing homes that passed CMS data quality checks and had no missing data. This sample represents over 85% of all nursing homes in the United States.

Nursing homes were divided into four groups based on their number of COVID-19 admissions, with 4147 facilities having no admissions, 6129 facilities having low admissions (1–10), 1828 facilities having medium admissions (11–30), and 1000 facilities having high admissions (>30). *T* tests were performed for continuous measures and chi-square tests were performed for binary and categorical measures to determine if there were significant differences between facilities with high versus no admissions.

RESULTS

Compared to nursing homes with no admissions, nursing homes with high admissions were larger (mean [SD] beds, 153.2 [81.8] vs. 91.9 [43.9]; $p < 0.0001$) and had worse resident health as measured by acuity scores (mean [SD], 12.6 [1.2] vs. 12.1 [1.5]; $p < 0.0001$) and the proportion of residents with hypertension (mean [SD], 78.4% [8.9%] vs. 75.7% [10.8%]; $p < 0.0001$) (Table 1). They also had a lower proportion of white residents (mean [SD], 65.4% [26.5%] vs. 82.8% [22.1%]; $p < 0.0001$), were more likely to be for-profit (82.2% vs. 68.7%; $p < 0.0001$), and were located in counties with more COVID-19 cases per capita (mean [SD] cases per 1000 people, 55.2 [18.0] vs. 52.1 [21.8]; $p < 0.0001$). In terms of quality, they had lower overall star ratings (mean [SD], 2.9 [1.4] vs. 3.4 [1.4]; $p < 0.0001$), lower case-mix adjusted nursing hours per resident per day (mean [SD], 3.9 [0.8] vs. 4.1 [1.0]; $p < 0.0001$), and more citations from infection control inspections in the past 3 years (mean [SD], 1.4 [2.1] vs. 0.8 [1.6]; $p < 0.0001$). They also had more COVID-19 cases (mean [SD], 60.1 [57.5] vs. 23.7 [34.9]; $p < 0.0001$), deaths (mean [SD], 11.1 [12.1] vs. 2.5 [5.0]; $p < 0.0001$), and deaths per 100 cases (mean [SD], 45.1 [159.5] vs. 10.8 [37.2]; $p < 0.0001$) among residents.

TABLE 1 Characteristics of nursing homes by number of COVID-19 admissions from May 25, 2020 to December 20, 2020

	Number of COVID-19 admissions ^a			
	None	Low	Medium	High
	(0)	(1–10)	(11–30)	(>30)
Characteristic	(n = 4147)	(n = 6129)	(n = 1828)	(n = 1000)
Certified beds, mean (SD)	91.9 (43.9)	107.5 (53.9)	136.6 (72.4)	153.2 (81.8)
Demographics, mean (SD)				
Acuity index	12.1 (1.5)	12.2 (1.2)	12.4 (1.1)	12.6 (1.2)
Percent with hypertension	75.7 (10.8)	76.9 (10.2)	78.1 (9.7)	78.4 (8.9)
Percent of white residents	82.8 (22.1)	79.1 (23.6)	70.3 (27.2)	65.4 (26.5)
Ownership, %				
For-profit	68.7	70.7	76.5	82.2
Nonprofit	24.3	24.1	19.4	14.8
Government	7.1	5.1	4.0	3.0
Quality, mean (SD)				
Overall CMS star rating	3.4 (1.4)	3.2 (1.4)	3.0 (1.4)	2.9 (1.4)
Adjusted nursing hours per resident per day	4.1 (1.0)	4.1 (0.9)	3.9 (0.8)	3.9 (0.8)
Citations from infection control inspections	0.8 (1.6)	1.1 (1.9)	1.3 (2.1)	1.4 (2.1)
COVID-19 cases				
≥1 resident case, %	87.2	96.9	98.7	98.2
Resident cases, mean (SD)	23.7 (34.9)	39.4 (43.3)	55.8 (50.2)	60.1 (57.5)
County-level cases per 1000 people, mean (SD)	52.1 (21.8)	55.1 (21.3)	54.9 (18.4)	55.2 (18.0)
COVID-19 deaths				
≥1 resident death, %	45.9	73.9	89.4	93.9
Resident deaths, mean (SD)	2.5 (5.0)	4.8 (6.1)	7.9 (8.2)	11.1 (12.1)
Deaths per 100 cases, mean (SD)	10.8 (37.2)	16.5 (42.4)	20.9 (35.2)	45.1 (159.5)

Abbreviations: CMS, Centers for Medicare & Medicaid Services; COVID-19, coronavirus disease 2019.

^aDifferences between nursing homes with high versus no COVID-19 admissions were statistically significant ($p < 0.0001$) for all variables using t tests for continuous measures and chi-square tests for binary and categorical measures.

DISCUSSION

In this nationally representative study, we found that nursing homes with high COVID-19 admissions had lower levels of nurse staffing, more infection control citations, and more cases and deaths among residents than nursing homes with no COVID-19 admissions from late May 2020 to late December 2020. These findings suggest that the nursing homes most likely to take on patients with a prior COVID-19 diagnosis may have been the ones least able to do so safely.

This study has limitations. The extent to which these patients were contagious after transfer to a nursing home could not be determined. In addition, CMS's COVID-19 admissions measure encompasses both new admissions and readmissions, and nursing homes with more cases are likely to have more readmissions. Thus, our findings must be interpreted as descriptive and not causal.

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CONFLICT OF INTEREST

The authors have no conflicts.

AUTHOR CONTRIBUTIONS

Both authors contributed to the study concept and design. Matlin Gilman performed the data analysis. Both authors contributed to the interpretation of the data and preparation of the manuscript.

SPONSOR'S ROLE

Not applicable.

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Trends in COVID-19 death rates by racial composition of nursing homes

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has taken a severe toll on US nursing homes, which accounted for more than one-third of all COVID-19 deaths in the United States in 2020.¹ Nursing homes with low proportions of white residents accounted for a disproportionate share of these deaths through mid-September 2020.² We examine trends in COVID-19 death rates by racial composition of nursing homes through mid-April 2021.

METHODS

On May 25, 2020, the Centers for Medicare & Medicaid Services (CMS) began requiring nursing homes to report the weekly number of residents with suspected or laboratory-positive COVID-19 who died in the facility or another location and the weekly number of occupied beds. This weekly information is included in CMS's COVID-19 Nursing Home Dataset.³ We used this dataset to determine weekly COVID-19 deaths per 1000 residents for each facility from May 25, 2020 to April

18, 2021. This information was then merged with data on facility characteristics from LTCfocus,⁴ quality data from Nursing Home Compare,⁵ and county data from USAFacts.⁶ Using these data, we examined the census region in which each facility was located, the number of certified beds, and the overall CMS star rating (which measures quality using a scale of 1–5, with 1 indicating lowest quality and 5 indicating highest quality).⁷ We also examined trends in community spread, which we defined as the weekly average number of confirmed COVID-19 cases per 1000 people in the county. Our analysis included 13,820 nursing homes that passed CMS data quality checks and had no missing data. This sample represents over 90% of all nursing homes in the United States.

RESULTS

Nursing homes were categorized into quintiles based on the percentage of residents who were white, with quintile 1 indicating 0%–58.1%, quintile 2 indicating 58.1%–80.7%, quintile 3 indicating 80.7%–92.2%, quintile 4 indicating 92.2%–97.7%, and quintile 5 indicating 97.7%–100%. Nursing homes in quintile 5 (high white) were more