Assessing the Relationship Between Infection Citations and COVID-19 Infections in Nursing Homes

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Background

Nursing homes (NHs) bear the responsibility of caring for our more vulnerable geriatric population. As of 2016, there are 15,600 nursing homes across the United States with 1.7 million licensed beds. In order to guarantee quality care for this population, the Centers for Medicare and Medicaid have regulations for all aspects of NHs, including infection control, in order to remain within the Medicare and Medicaid programs. The regulations regarding infection control denote various aspects of the infection prevention plan that NHs must follow in order to minimize the spread of infections, including the implementation of an infection prevention, reducing direct and indirect transmissions, and documenting and monitoring infections, among others. NHs are surveyed by the Centers for Medicare and Medicaid to ensure adherence to the regulations, risking violations of various degrees of harm if they are found to be noncompliant. As of June 26, 2020, the total number of reported deaths from COVID-19 in NHs in the US had reached 35,517. At that time, fatalities from COVID-19 in NHs made up roughly 40% of all fatalities from the virus in the United States, demonstrating a significant need for NHs to prevent the spread of these infections. During the COVID-19 pandemic, NHs most commonly face citations for deficient infection prevention and control practices, with 83% of these facilities receiving a citation between 2013 and 2017, according to a study conducted by the United States Government Accountability Office. An article discussing NHs specifically in Ohio cited low staffing as a major determinant of deficient infection control practices, and suggested a connection between these variables and COVID-19 cases.[7]

Introduction

The emphasis placed upon regulation of NHs suggests a potential link between the number of citations a nursing home receives for improper infection control, and the number of COVID-19 cases and deaths among residents that a NH faces. This study focused on nursing homes in the West Coast, assessing:

1. the relationship between staff COVID-19 cases and resident COVID-19 infections
2. the relationship between staff shortages in nursing homes and COVID-19 infections and deaths among residents among those that a NH faces. This study focused on nursing homes in the West Coast, assessing:
3. the potential relationship between nursing home citations for various infection control related deficiencies and the number of COVID-19 cases and deaths.

Methods

Data Collection

Data regarding deficiency citations and COVID-19 cases/deaths for six states (Nevada, New Mexico, Arizona, Idaho, Utah, and California) was obtained from CMS Nursing Home Compare Dataset and COVID-19 Nursing Home Dataset, respectively.

Citations for deficiencies pertaining to infection control as defined by the CMS were selected based on standards updated in May 2020.

Citation data was collected for the period between March 1, 2019 and February 29, 2020. COVID-19 data was collected for the period between January 1, 2020 to June 11, 2020.

Analysis

The relationship between staff-confirmed COVID-19 cases and resident cases was examined using a Fisher’s exact test.

A linear model with binomial error was used to explore how prior citations and staff shortages affected the number of cases (relative to the number of occupied beds in the facility), and the number of occupied beds was included in the model as a covariate. In the model looking at predictors of COVID-19 deaths, only NHs with at least one case were included. The model predicting COVID-19 deaths was otherwise identical to that for COVID-19 cases.

Additional models were fit to look at the relationship between each specific citation type and COVID-19 cases and deaths for the state of California.

Results

NHs with at least one COVID-19 positive staff member were 14.1 to 27.8 times more likely to have at least one COVID-19 positive resident (Table 1).

No significant association was found between staffing shortages and COVID-19 cases or deaths for any state.

A positive correlation was found between citations received for the five deficiency categories in the previous year and the number of COVID-19 cases in California NHs (Figure 1, p<0.001).

Previous citations regarding infection prevention and control specifically was also strongly associated with COVID-19 cases (Figure 1, p<0.001), as well as deaths (Figure 2, p<0.018) in California NH residents.

A negative correlation was found between citations in the previous year and the number of COVID-19 cases and deaths in a facility in Arizona (Figure 1, p=0.05 and Figure 2, p=0.05 respectively). A negative relationship between citations and COVID-19 cases was observed for Utah NHs as well (Figure 1, p=0.001).

In California, one or more citations for problems related to implementing a program monitoring antibiotic use, preventing urinary tract infections, and preventing or caring for ulcers, but not pneumococcal vaccinations, were positive predictors of COVID-19 cases (Figure 3, p<0.001).

Discussion and Conclusions

COVID-19 positive staff members strongly predicted COVID-19 cases in residents, suggesting community spread was taking place (Table 1). This may be due, in part, to the fact that the virus may be transmitted by asymptomatic individuals, and that asymptomatic individuals may be more common in nursing homes due to the nature of the facility.[9,10] This suggests community spread, as nursing home staff are not confined to the facilities as residents are; staff then may have encountered the virus within the community and introduced it to the residents in the facility.

Staff shortages did not appear to be a predictor in COVID-19 cases or related deaths in these states. However, a previous study conducted in Connecticut showed that during times with higher registered nurse staffing had the potential to better control the spread of COVID-19.[19]

Previous infection control citations could either positively or negatively predict COVID-19 cases and deaths (Figure 1 and Figure 2, respectively). The variability observed in the different states also suggests the possibility that there are different responses to infection control citations.

Overall infection prevention best practices, such as maintaining good hygiene, keeping catheters and wounds clean, and preventing overprescription of antibiotics help mitigate the risk of transmitting and contracting infectious diseases such as COVID-19. An analysis of California showed that one or more citations for problems related to implementing an infection prevention and control program, preventing urinary tract infections, implementing an antibiotic stewardship program, and/or preventing or caring for ulcers were positively associated with the number of COVID-19 cases per occupied bed (Figure 3). Data from other states was insufficient to draw any conclusions.

Study Limitations: First, the CMS was critiqued for the number of errors in the COVID-19 Nursing Home Dataset in early June, though the CMS has acknowledged that the data is preliminary and may contain data entry and reporting errors, as nursing homes had the option to either retrospectively report cases from January 1, 2020 to May 20, 2020, or report cases from May 1, 2020. The data from the COVID-19 Nursing Home Dataset we accessed was the most recent as of July 5, 2020, so it is possible that not all corrections have been made. Additionally, nursing home data was insufficient for states that we looked at, namely Idaho and New Mexico, as they had low numbers overall for the year which hindered statistical power. This may be due to the reporting rules implemented by CMS as well.

Future Directions and Recommendations

A thorough exploration into the relationship between staffing shortages and COVID-19 infections with more states is warranted. Although a significant association between citations and infections, there may be variation between states due to a multitude of factors.

With increasing data availability, further research may elucidate the relationship between citation history and COVID-19 cases in different settings. An overview of previous infection control citations between March 1, 2019 and February 29, 2020 predicted different trends in the number of COVID-19 cases between states. An exploration of the underlying root cause of deficiencies between states is necessary in order to determine the cause of the trend. Our study provides a preliminary glance at the trends occurring in these states.

The breakdown of citations within California provides important information regarding best infection control practices that can be used to reduce the impact of a pandemic. Many of these violated were classified as isolated cases or patterns in the facilities that may not have caused actual harm to the residents, but had the potential to more severely impact the residents. Small outbreaks or infections control citations may unnecessarily expose residents to undue disease transmission, justifying the need for stricter infection control policies.

Future studies can analyze the effectiveness of nursing home infection prevention policies in other nations. Hong Kong provides anecdotal evidence, for example. At the time of this research, the nation reported no COVID-19 deaths in nursing homes, and officials reported they were prepared for a novel coronavirus outbreak after experiencing the devastating effects of the SARS epidemic in 2003.[14]

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Approval & Disclaimer

The views expressed on this poster are those of the authors only and do not reflect the official policy of Touro University Nevada, College of Osteopathic Medicine or the Touro University System.

Selected References


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