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SARS-CoV-2 in assisted living: Mortality and asymptomatic infection

Marisa A Montecalvo, Sherlita Amler, Thomas K.M. Cudjoe, Lori Smittle, Antonella D'Ascanio, Ada Huang, Renee Recchia, Dial Hewlett

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Abstract: In response to a rapid rise in mortality within assisted living, facility-wide resident testing found 42% of 182 residents had SARS-CoV-2 infection; 68% of which were asymptomatic for 14 days before and after testing. Resident testing was a critical infection control measure needed to control transmission of SARS-CoV-2 infection.

Keywords: COVID-19 ■ SARS-CoV-2 ■ Assisted living ■ Mortality

Author affiliations: Marisa A Montecalvo Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Sherlita Amler Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Thomas K.M. Cudjoe Department of Medicine, Division of Geriatric Medicine and Gerontology, Johns Hopkins University School of Medicine, 5200 Eastern Ave, Mason F. Lord Bldg, Center Tower, Floor 7, Baltimore, MD 21224, United States; Lori Smittle Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Antonella D'Ascanio Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Ada Huang Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Renee Recchia Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States; Dial Hewlett Westchester County Department of Health, 134 Court Street, White Plains, NY 10601, United States

Corresponding authors. emails: mzmh@westchestgov.com, dqhh@westchestgov.com

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INTRODUCTION

The US outbreak of SARS-CoV-2 infection began in a long-term skilled nursing facility, where rapid spread of the virus was demonstrated, including pre-symptomatic transmission of infection.¹ Although the experiences of long-term skilled nursing facilities during this pandemic have been well documented, few data are available for assisted living facilities (ALFs). In the United States, it is estimated that over 800,000 adults live in ALF.² ALFs have several features that favor transmission of a novel respiratory virus. These features include the ALF social model of care which emphasizes community engagement and interaction, the high prevalence of dementia,³ the lack of federal or state regulations related to infection control, limited medical and nursing provider presence, and ALFs utilize direct care staff that historically have had limited training, particularly in infection control.²

In Westchester County, a county adjacent to New York City, the first SARS-CoV-2 case was reported on March 2, 2020, with the identification of a local synagogue as an epicenter of the pandemic. In April, 2020, the Westchester County Department of Health (WCDH) was alerted of outbreaks of SARS-CoV-2 infections in two ALFs, potentially associated with multiple resident deaths. We report the incidence of death, the results of facility-wide resident SARS-CoV-2 diagnostic testing, and the correlation of symptoms with the detection of confirmed SARS-CoV-2 infection. As more transmissible variants of SARS-CoV-2 lead to increases in infection rates, it is now important to review the original manifestations of this infection within assisted living communities.

METHODS

The two facilities, ALF A and ALF B, each have enhanced ALF certification and house residents needing memory care services on a separate locked unit. ALF A has 112 apartments, all with private baths; ALF B has 87 apartments, approximately 35% have a shared bath. Both facilities have extensive areas for group activities that include cafés, game / computer rooms, salons, and an area for physician consultation. The number of staff at ALF A and at ALF B were 157 and 205, respectively, with approximately 70–80% being direct caregivers (home health aides, nursing assistants, dietary staff, RN).

In response to five deaths at ALF A and three deaths due to pneumonia at ALF B, public health epidemiologists closely evaluated all COVID-19 preparedness measures with ALF leadership. Personal protective equipment in use was a face mask, eye/face shield, gloves; staff performing hands on activity used an N95 respirator and a gown, if available. Gowns and N95 respirators were in short supply, and were not used regularly for symptomatic residents. On March 13, 2020, in accordance with the New York State Department of Health (NYSDOH) directive, all visitation was stopped and symptom checks for all facility staff were instituted. On March 30th all communal dining and activities had been cancelled, and daily resident symptom monitoring was performed. By April 13th resident symptom

screening was increased to twice daily and pulse oximetry was added to symptom screening.

Resident SARS-CoV-2 testing was performed on April 14th, 2020 and on April 28, 2020 at ALF A and ALF B, respectively. All residents providing verbal consent had a nasal-pharyngeal swab collected by the WCDH nurses. Specimens were tested for SARS-CoV-2 virus by RT-PCR at the NYSDOH Public Health Laboratory. Symptoms of SARS-CoV-2 infection on the day of testing and for the 14 day period before testing were collected by interview of the resident and nursing staff. Fourteen days after testing medical records were reviewed for the development of possible SARS-CoV-2 symptoms. Staff SARS-CoV-2 test results were self-reported by the staff to the facility administration and were not part of this facility-wide resident testing. This project was undertaken as part of the emergency public health response to the SARS-CoV-2 pandemic and thus IRB review was not sought.

RESULTS

Before the SARS-CoV-2 pandemic, the number of resident deaths was approximately one per month at each facility. For ALF A and ALF B combined, the number of resident deaths was two in January, two in February, but in March 2020 deaths increased to eight with only two of the eight deaths confirmed as having SARS-CoV-2 infection. The six patients with an unknown SARS-CoV-2 status had fever, weakness, lethargy or an increased oxygen requirement as the predominant symptom before death. In April 2020 there were 22 deaths, 20 of which had confirmed SARS-CoV-2 infection (Fig. 1).

At ALF A, the first resident with SARS-CoV-2 infection was hospitalized with decreased oxygen saturation on March 27; within 48 h three other residents on the same floor had either fever, decreased appetite, or required more oxygen supplementation. The following day, a nurse who had worked throughout the facility testing positive for SARS-CoV-2. During the 18 days from the date of the first identified case to the date of facility wide resident testing, 29 residents developed symptoms of SARS-CoV-2 infection and 15 tested positive. At ALF B the first resident with SARS-CoV-2 infection was identified on April 1 when the resident was hospitalized with fever. During the subsequent four weeks until the date of testing, seven residents had confirmed SARS-CoV-2 infection, all diagnosed at hospitalization.

On the day of testing, resident occupancy was 78% and 73% at ALF A and ALF B, respectively. At each facility, over 70% of the residents were women; the median age of residents was 88.9 years at ALF A, and 86.5 years at ALF B. At ALF A, 57 (60%) of 95 residents present tested

positive for SARS-CoV-2 infection. Within the memory care unit, which housed 20 of the 95 residents tested, 16 (80%) of 20 residents tested positive. Before the facility-wide testing there had been only one resident identified with SARS-CoV-2 infection on the memory care unit. At ALF B, 19 (21.8%) of 87 residents present tested positive for SARS-CoV-2 infection. Although six of these 19 residents shared a room, only one of six roommates tested positive. At ALF A and B combined, 52 (68%) of the 76 SARS-CoV-2 infected residents identified by facility wide testing were asymptomatic throughout the 14 days before and after the test (Fig. 1). Fifteen of the 24 symptomatic residents displayed only a single symptom. The most common symptoms were cough ($n = 9$), fever ($n = 9$), shortness of breath or decreased O₂ saturation ($n = 5$) and fatigue ($n = 4$).

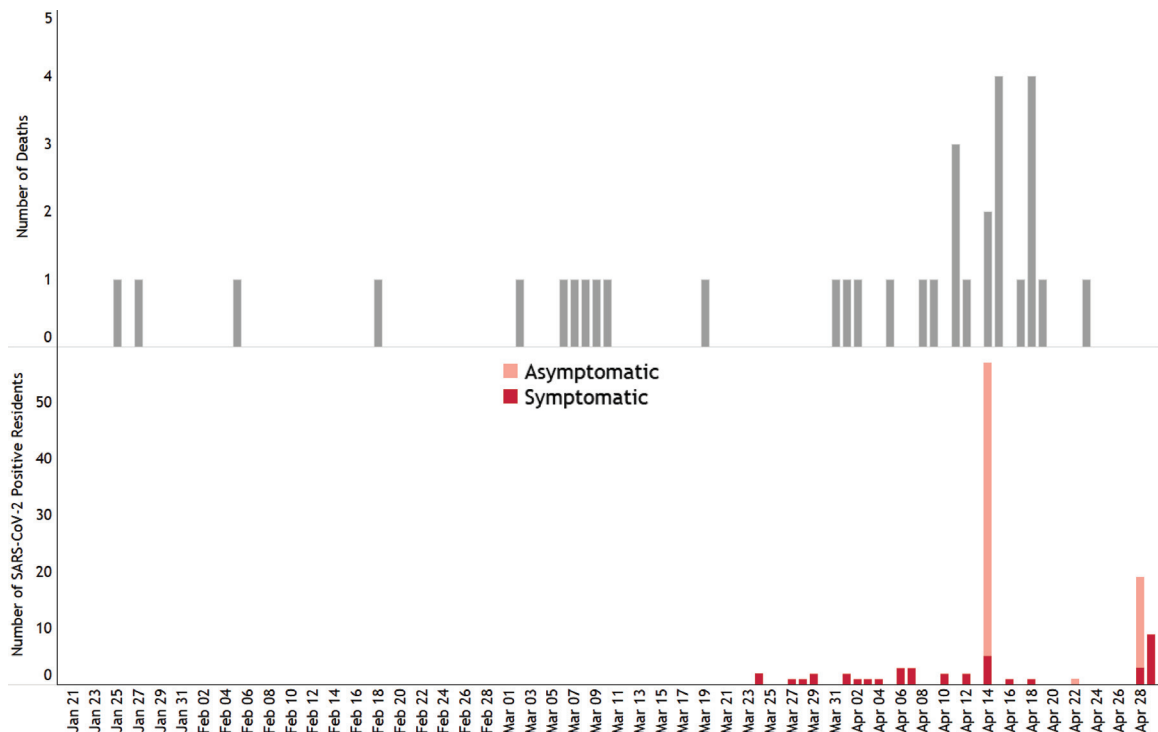
From the time of the first report of a SARS-CoV-2 positive resident in the ALF A or B, until the end of the 14 day follow up period after facility-wide screening, there were 24 residents hospitalized, all of whom had confirmed SARS-CoV-2 infection. These 24 residents were all symptomatic at the time of hospitalization. The symptoms were: Fever ($n = 11$ residents); decreased O₂ ($n = 8$ residents); lethargy or weakness ($n = 6$ residents); decreased appetite ($n = 5$ residents); and one resident each had diarrhea, cough, seizure, and urinary tract infection.

DISCUSSION

At two relatively similar ALF in Westchester County, New York, the combined point prevalence of SARS-CoV-2 infection in April 2020 was 42% for 182 residents tested, and 68% of infected residents were asymptomatic for the 14 days before and the 14 days after the test. Although in March 2020, only two of the eight resident deaths were known to have SARS-CoV-2 infection, the rapid rise in deaths in these ALFs was clearly the initial indicator of widespread SARS-CoV-2 infection. It is now known from publicly reported ALF mortality data that the SARS-CoV-2 case fatality rate among ALF residents can be three to four times greater than the SARS-CoV-2 case fatality rate of the general population.⁴

Although widespread transmission of SARS-CoV-2 infection was well documented in long term skilled nursing facilities,^{5,6} the initial report within assisted living found limited transmission.⁷ However the report within ALF did demonstrate the lack of utility of symptom screening.^{8,9} Our study also demonstrated a lack of utility of symptom screening using the case definition of fever, with cough or shortness of breath as the indicator of SARS-CoV-2 infection. During the facility wide testing period 68% SARS-CoV-2 positive residents were asymptomatic; but

Fig. 1. Number of deaths and number of SARS-CoV-2 positive residents. For both assisted living facilities combined, the upper part of Fig. 1 is the number of deaths from January through April 2020; the lower part of Fig. 1 represents the number of asymptomatic and symptomatic SARS-CoV-2 positive residents.



even among SARS-CoV-2 residents that were symptomatic and hospitalized, subtle symptoms such as lethargy and decreased appetite were common, whereas fever when present was often the only symptom. Eliciting symptoms from patients with dementia is more difficult, further reducing the utility of symptom screening.

Limitations of this study include that it is only representative of the two ALF, at a time shortly after the peak incidence of SARS-CoV-2 infection in Westchester County. No data were collected regarding underlying medical conditions, and the ascertainment of symptoms was confined to the 14 days before and after testing. Of the 68% of residents that were asymptomatic, some may have acquired infection earlier than 14 days before the testing, however it is unlikely that these residents would have been symptomatic because ALFs were carefully screening all residents for symptoms beginning in March 2020.

The rapid rise in deaths occurred during the first month of SARS-CoV-2 pandemic in Westchester County. At this time ALF faced marked infection control challenges with shortages of gowns and N95 respirators for staff; there was either no use of gowns, or repeated use of gowns between residents. The complete lack of diagnostic testing for symptomatic residents who did not require hospitalization resulted in ample opportunity for SARS-CoV-

2 transmission. Hospice residents remained undiagnosed for SARS-CoV-2 infection because these patients were not transferred to a hospital. Although symptom screening was instituted in response to the deaths in March, it is now well known that symptom screening of residents and staff is of limited utility due to SARS-CoV-2 transmission from asymptomatic and pre-symptomatic persons.

ALF A experienced a more severe outbreak than ALF B with 60% of residents testing positive despite all residents having individual rooms. At the time of testing 20% of staff were no longer working, due either to illness or resignation. We suspect early widespread transmission occurred at this facility likely related to the presence of infected staff or visitors associated with the New Rochelle outbreak. In May 2020 the Governor of New York mandated weekly testing SARS-CoV-2 of all ALF and long term facility staff.¹⁰ This appears to have contributed to the control of SARS-COV-2 spread. Our experience illustrates how vulnerable ALFs can be, with death being the first indicator of widespread infection. Residents of memory care units likely need particular special attention. Our data support periodic facility wide diagnostic testing as an important infection control adjunct within ALFs, particularly when a novel communicable infection is present.

REFERENCES

1. Kimball A, Hatfield KM, Arons M, et al., Asymptomatic and pre-symptomatic SARS-CoV-2 infections in residents of a long-term care skilled nursing facility – Kings County, Washington 2020. *MMWR* (April 3, 2020); Vol 69:13, p 377-81.
2. Zimmerman S, Sloane PD, Katz PR, Kunze M, O'Neil K, Resnick B. The need to include assisted living in responding to the COVID-19 pandemic. *JAMDA*. 2020;21:572–575.
3. Zimmerman S, Sloane PD, Reed D. Dementia prevalence and care in assisted living. *Health Aff*. 2014;33:4 658-66.
4. Temkin-Greener H, Guo W, Mao Y, Cai X, Li Y. COVID-19 pandemic in assisted living communities: results from seven states. *J Am Geriatr Soc*. 2020 10.1111 gjs16850.
5. Arons MM, Hatfield KM, Reddy SC, et al. Presymptomatic SARS-CoV-2 infections and transmission in a skilled nursing facility. *New Engl J Med*. 2020;382:2081–2090.
6. McMichael TM, Currier DW, Clark S, et al. Epidemiology of COVID-19 in a long-term care facility in King County, Washington. *New Engl J Med*. 2020;382:2005–2011.
7. Roxby AC, Greninger AL, Hatfield KM, et al., Detection of SARS-CoV-2 among residents and staff members of an independent and assisted living community for older adults- Seattle, Washington, 2020. *MMWR* (April 10, 2020) Vol 69:14, p. 416-418
8. Roxby AC, et al. Outbreak investigation of COVID-19 among residents and staff of an independent and assisted living community for older adults in Seattle, Washington. *JAMA Intern Med*. 2020;180(8):1101–1105.
9. Jeng GY, Mills GP, Malani PN. Preventing COVID-19 in assisted living facilities- a balancing act. *JAMA Intern Med*. 2020;180(8):1106–1107.
10. Governor Andrew Cuomo. Executive order No. 202.30. Continuing temporary suspension and modification of laws relating to the disaster emergency. <https://www.governor.ny.gov/news/no-20230-continuing-temporary-suspension-and-modification-laws-relating-disaster-emergency> Last downloaded April 23, 2021.