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Outbreak Investigation of COVID-19 Among Residents and Staff of an Independent and Assisted Living Community for Older Adults in Seattle, Washington

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IMPORTANCE Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused epidemic spread of coronavirus disease 2019 (COVID-19) in the Seattle, Washington, metropolitan area, with morbidity and mortality concentrated among residents of skilled nursing facilities. The prevalence of COVID-19 among older adults in independent/assisted living is not understood.

OBJECTIVES To conduct surveillance for SARS-CoV-2 and describe symptoms of COVID-19 among residents and staff of an independent/assisted living community.

DESIGN, SETTING, AND PARTICIPANTS In March 2020, public health surveillance of staff and residents was conducted on site at an assisted and independent living residence for older adults in Seattle, Washington, after exposure to 2 residents who were hospitalized with COVID-19.

EXPOSURES Surveillance for SARS-CoV-2 infection in a congregate setting implementing social isolation and infection prevention protocols.

MAIN OUTCOMES AND MEASURES SARS-CoV-2 real-time polymerase chain reaction was performed on nasopharyngeal swabs from residents and staff; a symptom questionnaire was completed assessing fever, cough, and other symptoms for the preceding 14 days. Residents were retested for SARS-CoV-2 7 days after initial screening.

RESULTS Testing was performed on 80 residents; 62 were women (77%), with mean age of 86 (range, 69-102) years. SARS-CoV-2 was detected in 3 of 80 residents (3.8%); none felt ill, 1 male resident reported resolved cough and 1 loose stool during the preceding 14 days. Virus was also detected in 2 of 62 staff (3.2%); both were symptomatic. One week later, resident SARS-CoV-2 testing was repeated and 1 new infection detected (asymptomatic). All residents remained in isolation and were clinically stable 14 days after the second test.

CONCLUSIONS AND RELEVANCE Detection of SARS-CoV-2 in asymptomatic residents highlights challenges in protecting older adults living in congregate settings. In this study, symptom screening failed to identify residents with infections and all 4 residents with SARS-CoV-2 remained asymptomatic after 14 days. Although 1 asymptomatic infection was found on retesting, a widespread facility outbreak was avoided. Compared with skilled nursing settings, in assisted/independent living communities, early surveillance to identify asymptomatic persons among residents and staff, in combination with adherence to recommended preventive strategies, may reduce viral spread.

Invited Commentary
page 1106

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Coronavirus disease 2019 (COVID-19), caused by infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused disproportionate morbidity and mortality among older adults.[1,2] The first case of COVID-19 in the US was identified in mid-January 2020 in the Seattle, Washington metropolitan area.[3] A notable proportion of cases in Seattle have occurred among older adults living in diverse congregant settings, ranging from independent and assisted living communities to memory care, long-term care, and skilled nursing facilities (SNFs).[4-6] Nationwide, the COVID-19 epidemic has caused numerous devastating outbreaks in senior living facilities, with the problem growing in scope and mitigation strategies uncertain. It is not known how different senior living arrangements influence spread of the virus.

To inform infection prevention and control in these settings, we conducted SARS-CoV-2 testing and administered a symptom questionnaire of residents and staff in an independent and assisted living community in Seattle during the same week that 2 facility residents were hospitalized with COVID-19. The first resident died the day before the survey after a 4-day hospitalization, and a second resident was hospitalized for several weeks. The hypothesis was that an investigation of the facility would find incubating or mild COVID-19 cases. Some of the information obtained in this investigation was rapidly reported through a *Morbidity and Mortality Weekly Report*.[7]

Key Points

Question In an independent and assisted living community implementing social isolation and infection prevention, can symptom screening and testing for severe acute respiratory coronavirus 2 identify cases and reduce transmission after exposure to persons with coronavirus disease 2019 (COVID-19)?

Findings In this case series study of 142 residents and staff exposed to persons with COVID-19, 3 asymptomatic infected residents and 2 symptomatic infected staff were identified; 1 week later, 1 additional asymptomatic infected resident was found (staff were not retested); a facility-wide outbreak did not occur.

Meaning In independent/assisted living facilities, testing was a better strategy for identifying staff and older adults with COVID-19 than symptom screening. Adherence to social distancing and preventive guidelines may contribute to interruption of COVID-19 transmission.

Methods

Public Health–Seattle and King County, UW Medicine, and the Centers for Disease Control and Prevention (CDC) were invited by the facility to evaluate a possible outbreak after the hospitalization of 2 residents with COVID-19. The residence included both independent and assisted living, and was composed of 83 private apartments, 45 independent, and 38 assisted living, on multiple hallways and floors, with communal dining, library, and activity areas. Independent residents had access to help but were otherwise unaided; assisted living residents had daily help with aides entering apartments to assist with taking medications and with activities of daily living (ADL) including bathing and dressing. These aides wore gloves but did not typically use other personal protective equipment (PPE) prior to the outbreak. All residents were physically able to leave their apartments and move about the facility independently. Because of the cases of COVID-19, social distancing measures were implemented 72 hours before the survey. Residents were isolated in their rooms with no communal meals or activities and visitors were not allowed on the premises. Enhanced hygiene practices were implemented, including disinfection of frequently touched surfaces and additional hand hygiene stations in hallways for workers. Daily staff screening and temperature monitoring was implemented, with exclusion of workers with symptoms, specifically fever, cough, or shortness of breath.

All residents and staff were offered participation in the testing and survey. This activity was determined by CDC to be public health surveillance, not research, and therefore written informed consent was determined to be unnecessary. If residents or staff were off site, they were offered testing the next day.

Residents and staff completed a questionnaire assessing symptoms of COVID-19 including fever, cough, malaise, diarrhea, and sore throat, covering the preceding 14 days, and documenting existing health conditions. Staff were available to assist residents to complete the questionnaire as needed. Symptom data was only collected during the first survey and was not collected at the 7-day follow-up testing.

The surveillance team collected nasopharyngeal (NP) swabs and administered questionnaires in person; residents were visited in their rooms and staff were surveyed in the dining area. Staff from all shifts came for the survey; 2 staff who felt ill were tested in their cars to avoid entering the facility. Two residents who were off site, and remaining staff, were surveyed 24 hours later. Residents, but not staff, had a second NP swab collected 7 days later.

Trained clinicians wearing PPE (masks, goggles, gowns, and gloves) collected a flocked swab (Copan Diagnostics, Inc) inserted into a nostril and rotated at the nasopharynx for 15 seconds. The procedure was repeated with the same swab inserted into the contralateral nostril. Swabs were placed in universal transport medium and tested at the virology laboratory of the University of Washington.

A 1-step real-time reverse transcription polymerase chain reaction (RT-PCR) assay was performed following the SARS-CoV-2 CDC assay protocol, which amplifies 2 distinct regions, N1 and N2, in the N gene of SARS-CoV-2 along with the human housekeeping gene ribonuclease P.[8] A cycle threshold (Ct) value of less than 40 indicated viral detection. Symptom questionnaires were analyzed and symptoms were described.

Results

Of 83 facility residents, 2 were hospitalized with COVID-19 and 1 was off site with family for the entire evaluation period. Testing of NP swabs for SARS-CoV-2 was completed for 142 persons (**Table 1**): all 80 residents on site and 62 staff. Staff included persons working as health aides, and in environmental

services, food service, and administration. Symptom questionnaires were collected from all 80 residents and from 57 (92%) staff. Sixty-two residents were women (77%), with mean (range) age of 86 (69-102) years. Staff had a mean (range) age of 40 (16-70) years, and 42 were women (68%). Overall, 63 of 80 residents (79%) had at least 1 serious chronic medical condition and 33 (41%) reported symptoms including cough (7 [9%]), dizziness (4 [5%]), headache (5 [6%]), and diarrhea (5 [6%]) (Table 1). Of 57 staff who completed a questionnaire, 16 (28%) reported illness symptoms including malaise (6 [11%]); sore throat (7 [12%]), and body aches (5 [9%]).

SARS-CoV-2 was detected in 3 residents: 1 man in his 70s (Ct, N1 = 24.4 N2 = 23.0); a woman in her 90s (Ct, N1 = 31.6, N2 = 31.3); and a woman in her 80s (Ct, N1 = 30.9 N2 = 29.7). All 3 residents with incident SARS-CoV-2 detected were living in their own apartments. One received assistance with ADLs due to sequelae of a stroke, 1 used a walker, and the third was independent with all ADLs and mobility. Residents identified with SARS-CoV-2 were housed on 3 different floors; 1 was on the same floor as a hospitalized index case, and 1 had close contact to a hospitalized patient with COVID-19. All 3 residents reported feeling well and in their usual state of health on the day of testing. However, in the preceding 14 days, 1 had reported a new cough, described as mild, and 1 episode of loose stool (**Table 2**). The other 2 reported no symptoms.

On day 7, 1 additional asymptomatic resident, a woman in her 80s who had negative screening results the week prior, had SARS-CoV-2 detected (Ct, N1 = 35.7; N2 = 37.1). This resident lived on the same floor as the hospitalized residents with COVID-19. The original 3 cases reported good health on day 7. Two of the cases had SARS-CoV-2 detected again on day 7, and 1 case no longer had SARS-CoV-2 detected (Table 2). On day 8, 1 case developed a mild cough, but continued to feel well, and after emergency department evaluation, returned to isolation in their apartment. On day 21, all cases continued to exhibit their usual state of health, and no new cases of COVID-19 were found among residents.

SARS-CoV-2 was detected in 2 symptomatic female staff; 1 worked in dining services and 1 was a health aide. The symptoms reported by staff were headache for 10 days, and body aches, headache, and cough for 5 days. The staff member with 5 days of symptoms had not worked while ill.

Discussion

In this community residence for older adults, which included both independent and assisted living, we showed that early surveillance after exposure to cases may identify asymptomatic residents infected with SARS-CoV-2. All of the cases identified felt well on the day of testing and only 1 case had any preceding symptoms to report. Asymptomatic and minimally symptomatic SARS-CoV-2 infection has been noted among younger populations,[9,10] and this report confirms a report describing this among older adults including elders with multiple comorbidities.[11] Screening for typical symptoms of COVID-19 may be inadequate in this population to identify infected persons. Also, symptom screening would have incor-

Table 1. Demographic Characteristics and Reported Symptoms From a Baseline Survey of Study Participants

	No. (%)	
Characteristics[a]	Residents (n = 80)	Staff (n = 62)
Age, mean (SD), y	85.8 (7.6)	40.0 (15)
Female sex	62 (78)	42 (68)
History of smoking	38/79 (48)	12/48 (25)
Current smoker	4/79 (5)	5/48 (10)
Symptoms in past 14 d[b]		
No symptoms	47 (59)	41/57 (72)
Any symptoms in past 14 d	33 (41)	16/57 (28)
Only chronic[c]	13 (16)	1/57 (2)
1 new or worsened	14 (18)	7/57 (12)
≥2 new or worsened	6 (8)	8/57 (14)
Specific symptoms in past 14 d[b]		
Fever	0/78 (0)	2/56 (4)
Sore throat	2/78 (3)	7/57 (12)
Chills	1/77 (1)	2/57 (4)
Confusion	3/76 (4)	4/57 (7)
Body aches		
Chronic, stable	2/78 (3)	0/57 (0)
Worsened or new	3/78 (4)	0/57 (0)
Dizziness		
Chronic, stable	4/78 (5)	0/57 (0)
Worsened or new	4/78 (5)	0/57 (0)
Malaise	5/74 (7)	6/57 (11)
Headache	5/78 (6)	5/57 (9)
Chronic, stable	0/78 (0)	1/57 (2)
Worsened or new	5/78 (6)	5/57 (9)
Cough		
Chronic, stable	7/79 (9)	0/57 (0)
Worsened or new	2/79 (3)	4/57 (7)
Shortness of breath		
Chronic, stable	1/79 (1)	0/57 (0)
Worsened or new	3/79 (4)	0/57 (0)
Diarrhea		
Chronic, stable	4/79 (5)	0/57 (0)
Worsened or new	5/79 (6)	1/57 (2)
Preexisting medical conditions[d]		
Chronic lung disease	34/72 (47)	0/44 (0)
Diabetes mellitus	11/71 (15)	1/44 (2)
Cardiovascular disease	42/70 (60)	2/44 (5)
Cerebrovascular disease/stroke	10/71 (14)	0/44 (0)
Renal disease[e]	10/72 (14)	0/44 (0)
Cognitive impairment	28/78 (36)	0/44 (0)
Obesity	19/72 (26)	0/44 (0)

[a] Data missing for 2 residents and 7 staff for smoking history, 4 staff for self-reported gender.

[b] Symptom and medical data only collected on 57 staff.

[c] "Chronic" defined as respondent choosing 1 or more of the following descriptions: "chronic," "not unusual," "frequently," "related to other condition," or "ongoing for more than past 30 days."

[d] Medical conditions data collected for 44 staff.

[e] No residents were receiving hemodialysis.

Table 2. Characteristics of Residents and Staff With SARS-CoV-2 Detected by RT-PCR

Category	Comorbid conditions	Living arrangement	Day 1 SARS-CoV-2 test result	Day 7 SARS-CoV-2 test result	Symptoms reported in prior 14 d
Resident	None	Independent	Detected	Not detected	None
Resident	Diabetes, cardiovascular disease, lung disease, obesity, renal disease	Independent	Detected	Detected	None
Resident	Cardiovascular disease	Assisted	Detected	Detected	Cough, resolved in past 14 d, 1 loose bowel movement on day of test
Resident	Diabetes	Independent	Not detected	Detected	None
Staff	Diabetes	NA	Detected	Not retested	Body aches, cough, headache for 5 d
Staff	None	NA	Detected	Not retested	Headache for 10 d

Abbreviations: NA, not applicable; RT-PCR, real-time reverse transcription polymerase chain reaction test; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

rectly identified as possibly infected many residents without COVID-19 because more than 40% reported 1 or more potential COVID-19 symptoms.

Asymptomatic SARS-CoV-2 detection has concerning implications for infection control in congregate living settings. Modeling suggests that transmission occurring before symptom onset will have the greatest effect on the ability to control a COVID-19 outbreak with usual public health efforts.[12] The elders described have had no evidence of disease progression and are now beyond the 14-day incubation period for COVID-19 illness.

These results draw a sharp contrast to reports from a long-term care facility in the Seattle area with dramatically high transmission, morbidity, and mortality from an outbreak of COVID-19.[5] Further, another report found a high percentage of asymptomatic residents of an SNF with detection of SARS-CoV-2, although most of those residents progressed to symptomatic COVID-19 disease within days of their test result.[11] In this investigation, 2 screenings 1 week apart did not reveal rapid spread of infection. There are several possible explanations for this. First, apartment living provides more social distance between residents and less contact with health aides, which may have protected residents from transmission. Second, this survey occurred rapidly after the first resident was hospitalized with symptoms (5 days vs 16 days in Kimball et al[11]), enabling identification and isolation of cases, and reducing the amount of time that asymptomatic residents may have transmitted to others. Third, residents in assisted or independent living have better baseline health, in contrast to persons with skilled medical needs, and different from those with cognitive or health issues that require 24-hour monitoring. Finally, staff and residents implemented stringent isolation and protective measures as soon as they learned that a resident was infected with COVID-19.

The PCR Ct observed among residents, which represent an approximation of viral load, are similar to Ct reported among ill hospitalized patients,[13,14] and those reported in an SNF surveyed in Seattle the same week.[11] Thus it is possible that these persons may have sufficient shedding of virus to be an infectious risk to others. Current infection control recommendations for SNFs are that SARS-CoV-2–positive patients should be isolated with close monitoring in the facility, and that staff interacting with these patients should use PPE.[15] Although the guidance was developed for SNFs, the guidelines suggest that these recommendations could be applied to both symptomatic and asymptomatic persons with SARS-CoV-2 detection in assisted living communities, which have 1 million licensed beds in the US.[16]

Independent and assisted living facilities are designed around improving the health and lifestyle of older adults, not around delivering skilled medical care. Social distancing can therefore be practiced effectively because staff contact is more limited. However, confining older adults to their rooms for extended periods of time can result in physical deterioration from lack of exercise and the mental health consequences of social isolation. New CDC guidance specifically geared toward independent/assisted living settings, which includes recommendations for a buddy system in addition to social distancing, could alleviate concerns about effects of prolonged distancing protocols on older adults.[17]

Testing of staff revealed 2 workers with symptomatic COVID-19, emphasizing the need for staff with any symptoms to stay out of the workplace. Staff reported a variety of symptoms, but only 2 had SARS-CoV-2 detected. Although testing could help identify infected staff, it remains a limited resource in the US. Mask wearing has therefore been recommended for workers who care for older adults in congregate settings.

Limitations

Limitations of the study include reliance on self-reporting of 14 days of symptoms, which can be inaccurate; information was not collected about loss of taste and smell, COVID-10 symptoms that emerged after study completion.[19] The symptom survey was not repeated at the second assessment and staff members were only assessed once for SARS-CoV-2. Data are missing on whether and how long residents were exposed to the index cases, how the original resident acquired SARS-CoV-2, and therefore we cannot speculate as to the direction of transmission between residents and staff. Social distancing efforts were practiced in the facility for 3 days before the survey, which limits the generalizability of these findings to settings where these precautions are not being taken. The sensitivity and specificity of NP swabs to detect SARS-CoV-2 in asymptomatic per-

sons is not well understood; however, this test is being deployed for such surveillance at this time.

Conclusions

These data demonstrate asymptomatic detection of SARS-CoV-2 among older adults in an independent/assisted living community, underlining challenges in protecting residents and staff. The findings of both asymptomatic and mild SARS-CoV-2 infection in elderly persons, and in staff providing them assistance, underscore the vital importance of current recommendations for continued social distancing, strict staff screening, and visitor exclusion per current CDC guidance.[17] The nonalignment of symptoms and test results signals the need for strategies beyond symptom screening, such as mask wearing of staff, and facility-based surveillance testing.[18] The low prevalence of SARS-CoV-2 detection among residents and staff observed on 2 separate dates, despite exposure to persons with known COVID-19, demonstrates a hopeful message: that adherence to strict hygiene and social distancing strategies may be effective in preventing widespread SARS-CoV-2 transmission in senior independent/assisted living communities.

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