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Title

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Permalink

<https://escholarship.org/uc/item/3x73x0m2>

Journal

Clinical Infectious Diseases, 72(11)

ISSN

1058-4838

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Publication Date

2021-06-01

DOI

10.1093/cid/ciaa1020

Peer reviewed

Lessons from Mass-Testing for COVID-19 in Long Term Care Facilities for the Elderly in San Francisco

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Abstract

COVID-19 can cause significant mortality in the elderly in Long Term Care Facilities (LTCF). We describe four LTCF outbreaks where mass testing identified a high proportion of asymptomatic infections (4-41% in health care workers and 20-75% in residents), indicating that symptom-based screening alone is insufficient for monitoring for COVID-19 transmission.

Keywords: Coronavirus, COVID-19, skilled nursing facility, elderly, infection control, mass testing, health care worker

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Background

On January 30, 2020, the World Health Organization declared a public health emergency due to a global outbreak of COVID-19, caused by a novel coronavirus (SARS-CoV-2). Since then, reports worldwide have identified that COVID-19 can cause significant morbidity and mortality in the elderly, including those residing in long term care facilities (LTCF) (1-4). Rapid and widespread transmission of COVID-19 in Skilled Nursing Facility (SNF) settings has resulted in COVID-19 related mortality rates of up to 34% (2). Assisted Living Facilities (ALF) also have a highly vulnerable population that is similar to those in SNFs.

On March 5, 2020, the San Francisco Department of Public Health (SFDPH) announced the first two laboratory-confirmed cases of COVID-19 infection. On March 12, SFDPH issued a Health Officer Order restricting visitors and non-essential personnel from entering SNFs. Concurrently, SFDPH released a guidance outlining aggressive efforts for use of administrative controls to restrict transmission, including banning of communal dining or other activities, and best practices for use of personal protective equipment (PPE) by health care workers (HCW). All LTCFs were instructed to actively monitor every person entering or residing in the facility for suspect COVID-19 infection using temperature monitoring and symptom-based screening, and to report suspect cases of COVID-19 infection to SFDPH.

We describe the results of surveillance, outbreak response and control measures to prevent COVID-19 transmission in four San Francisco LTCFs early in the pandemic.

Methods

A suspect case of COVID-19 was defined as fever ($\geq 100.0^{\circ}\text{F}$), cough or shortness of breath according to Centers for Disease Control and Prevention (CDC) recommendations (5). SFDPH conducted active surveillance with daily calls to SNFs to provide education and query about suspect COVID cases, as well as scheduled site visits to train on CDC-recommended infection control practices and appropriate use of personal protective equipment (PPE) (6). For all suspect COVID-19 patients, nasopharyngeal swabs were collected for testing at the San Francisco Public Health Laboratory (SFPHL) for SARS-CoV-2 with CDC reverse transcription-polymerase chain reaction (RT-PCR) using the Abbott m2000 RT-PCR assay.

An outbreak was defined as at least one confirmed COVID-19 case in the setting of ≥ 2 new suspect or confirmed cases (HCW or resident) within a 14-day period. Once an outbreak was identified, contact investigations were conducted; close contacts were defined as being within 6 feet of a person with confirmed COVID-19 for 10 minutes or more, or having unprotected direct contact with infectious secretions or excretions of a person with confirmed COVID-19.

Mass testing was implemented in each facility once the following criteria were met: sustained transmission, defined as occurrence of ≥ 1 new confirmed COVID-19 resident case(s) ≥ 14 days after report of the first case (suspected or confirmed) to SFDPH OR absence of epidemiologic link identified between HCW case(s) and resident case(s).

These activities were public health surveillance, and not research; therefore, institutional review board review was not requested.

Results

From March 30 through April 30, 2020, SFDPH investigated and responded to four outbreaks in LTCFs, including in three SNFs and one ALF; in these facilities, residents were housed in shared double or triple rooms. A total of 431 persons were tested as part of the outbreak investigation. Of these, 214 (49.7%) were COVID-19 positive, including 128 (59.8%) symptomatic and 86 (40.2%) asymptomatic persons. Of the 128 symptomatic infections identified, 50 (39.1%) were among HCWs and 78 (60.9%) were among residents. As of May 28, 2020, 22 (28.2%) symptomatic COVID-19 infected residents have required hospitalization, and 12 (15.4%) hospitalized residents have died. No symptomatic COVID-19 infected HCWs required hospitalization or died.

In all four outbreaks, the decision was made to conduct facility-wide testing in an additional 303 asymptomatic persons, including 147 (48.5%) HCWs and 156 (51.5%) residents. Of these 86 (28.4%) were COVID-19 positive, including 23 (26.7%) HCWs and 63 (73.3%) residents. Among the different facilities, the range of asymptomatic COVID-19 positive HCWs was 3.6% to 40.7%, and of asymptomatic COVID-19 positive residents was 20.0% to 75.0% (Table).

In response to the high proportion of asymptomatic infections, the SFPHL conducted additional validation testing in ten persons with positive results. Samples from the original specimen media were collected, manually extracted and tested using the Qiacube extraction system and the RNA tested using the CDC RT-PCR test using the ABI 7500 platform. The results were identical to those using the automated Abbott m2000 RT-PCR platform.

Upon further investigation, four HCWs were identified as the likely source cases for transmission in each facility - one employee had cared for an infected resident and the remaining

three had no other exposure except in the community. Despite temperature and symptom surveillance before each shift, three out of the four reported working while symptomatic with documented fever and/or cough; upon further interview, these HCWs also reported additional varied combinations of symptoms including rhinorrhea, sore throat, headache, myalgias, diarrhea and loss of smell or taste. The reported number of shifts for three HCWs who worked while symptomatic were 1, 2 and 28 respectively; all HCWs reported wearing either isolation or N95 masks (but not universally using eye protection, gloves or gowns) while symptomatic and interacting with residents. Two HCWs were employed at another facility which experienced an outbreak.

Discussion

Elderly and medically frail residents are at high risk for COVID-19 associated morbidity and mortality in congregate settings; we found among acutely ill residents requiring hospitalization, more than half have died. Our findings of asymptomatic infection in as high as 75% of residents and 41% of HCWs is higher than has been reported by others (2). The high proportion of COVID-19 infection in both populations supports the hypothesis that unrecognized asymptomatic infections is likely an important driver of sustained transmission in LTCF settings (1-2).

With restrictions of visitors in place since mid-March, HCWs remain the main source of introduction of COVID-19 into a facility (1-2). Despite directing HCWs to not work while ill, and systematic monitoring for fever or respiratory symptoms among HCWs at the facilities, several COVID-19 positive HCWs worked while symptomatic. This is especially concerning in the LTCF setting, where medically frail elderly may require close and prolonged contact with HCWs to assist with activities of daily living such as feeding, bathing, and dressing, manage

devices such as urinary catheters and G-tubes, and administer daily medications. Residents with dementia may have difficulty adhering to recommendations for isolation, quarantine, social distancing and universal masking, and need close monitoring and support by staff.

After these four outbreaks, on May 7, 2020 SFDPH issued an Emergency Order mandating mass testing of all residents and staff in San Francisco SNFs. Results of mass testing have assisted with implementation of strategies to stop transmission within a facility, including cohorting of COVID-19 infected from non-infected residents, prohibiting HCWs who refuse testing from returning to work, allowing asymptomatic COVID-infected HCWs to return to work to care for COVID-19 positive residents using full PPE, and overall allowing more efficient use of limited supplies of PPE.

The findings in this report are subject to limitations. First, testing represented a single point in time, so we may have identified infections in the pre-symptomatic phase. Furthermore, some HCWs and residents declined testing. During the surveillance period, facilities monitored HCWs for fever or respiratory symptoms according to CDC criteria at the time, but did not systematically screen for other symptoms (e.g., rhinorrhea or diarrhea), therefore some cases identified as asymptomatic in this analysis may have had non-respiratory COVID symptoms; this is not thought to be a large number. Symptomatic HCWs who reported always wearing masks while working may not have had accurate recall. Additionally, during this surveillance period, SNFs were experiencing intermittent supplies of masks and other PPE, and universal masking was not recommended by SFDPH until April 16, 2020. Finally, only a small sample of specimens was retested using a different method to ensure that contamination or laboratory error did not result in false positives, however given recent reports in other congregate settings, the high percentage of positives was not unexpected.

Together, our findings suggest that symptom-based monitoring is not an effective strategy to detect COVID-19 among staff or elderly residents in LTCFs. In addition to the challenges in screening HCWs, elderly patients with underlying cognitive problems may be unable to accurately report new symptoms suggestive of COVID-infection or may present with atypical symptoms. Routine serial facility wide testing should be conducted to detect asymptomatic and pre-symptomatic COVID-19 before it spreads. In addition, identifying COVID-19 infected HCWs and implementing supportive and nonpunitive policies for home isolation may play a key role in limiting inter-facility transmission in other health care facilities where those HCWs may be concurrently working. Other approaches for mass testing in SNFs have been proposed, including performing routine testing in a sampling of HCWs and residents or testing only after identification of a laboratory confirmed COVID-19 case (7-9). As the COVID-19 pandemic evolves and novel public health approaches are implemented, it will be important to perform ongoing review of the most effective strategies to reduce hospitalization and death in the vulnerable elderly population.

Acknowledgments

Thank you to Janice Kim and Shantala Ahanya, California Department of Public Health Hospital, for their support in providing guidance and training to San Francisco SNFs.

SFDPH COVID-19 Skilled Nursing Facility Outbreak Response Team

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Conflicts of Interest: None of the authors has disclosed potential conflicts of interest.

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Table**Results of COVID-19 Mass-Testing in Asymptomatic Health Care Workers and Residents in Skilled Nursing and Assisted Living Facilities in San Francisco (March 30-April 30, 2020)**

	Total		Health Care Workers		Residents		Facility Type
	No. tested	No. (%) positive	No. tested	No. (%) positive	No. tested	No. (%) positive	
Outbreak 1	81	38 (46.9)	27	11 (40.7)	54	27 (50.0)	Skilled Nursing Facility
Outbreak 2	124	23 (18.5)	66	9 (13.6)	58	14 (24.1)	Assisted Living Facility
Outbreak 3	48	5 (10.4)	28	1 (3.6)	20	4 (20.0)	Skilled Nursing Facility
Outbreak 4	50	20 (40)	26	2 (7.7)	24	18 (75.0)	Skilled Nursing Facility
TOTAL	303	86 (28.4)	147	23 (15.6)	156	63 (40.4)	

Abbreviations: COVID-19, coronavirus 2019