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IMPACT OF EVACUATING SKILLED NURSING HOME RESIDENTS TESTING POSITIVE FOR COVID-19 TO AN INPATIENT ACUTE CARE SETTING

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Abstract: We report a case series of 38 patients infected with coronavirus disease 2019 (COVID-19) evacuated to Mann-Grandstaff Veterans Affairs Medical Center (MGVAMC) in Spokane, Washington following disease outbreak in a skilled nursing home (SNH). Range of symptoms were none to mild on transfer. Patients were admitted to stem the outbreak, provide enhanced medical care and improve clinical outcome. The nursing home outbreak was arrested within two weeks of the initial patient transfer and mortality in this cohort was 13.2%.

Key words: COVID-19, skilled nursing home, outbreak, evacuation, mortality.

Introduction

As of July 7, the United States has suffered the largest number of COVID-19 confirmed cases (2,980,906) and deaths (131,248) worldwide, representing roughly a quarter of all cases and deaths globally (1). According to the American Geriatrics Society, nursing home residents are among the most vulnerable to complications and death from COVID-19 and represent a particular challenge in diagnosis and infection control owing to the frequent absence of typical symptoms along with the highly contagious nature of the disease (2), even among asymptomatic patients (3).

As of June 28, there have been 126,402 COVID-19 confirmed cases in nursing homes and 33,517 deaths with a fatality rate of 28% (4). Nursing home cases represent 4% of all COVID-19 cases in the US but 26% of deaths (33,509 of 131,248). Of the 1.3 million residents in 15,600 nursing homes, 9.7% have contracted COVID-19 by recent reporting. Two or more cases were experienced in 30.1% of the 14,577 reporting nursing homes, however, 129 facilities suffered 100 or more cases as of June 28. Overall, 5,522 (37.9%) had at least one infected resident (5).

Here we report on a COVID-19 outbreak in a SNH and the results of our efforts to stem infection and improve resident outcome.

Methods

This observational case series describes a cohort of 38 COVID-19 patients evacuated from a 100-bed local SNH to a designated acute care unit in the MGVAMC in Spokane, Washington between April 24 and June 2, 2020 after testing positive for infection. Patients were asymptomatic or only mildly symptomatic at time of transfer and would normally not meet hospital admission criteria. The goals of hospitalization were to stem the outbreak by removing infected patients from the SNH and provide enhanced medical care to prevent disease progression. At a minimum, daily physician rounding was conducted and a high nurse-to-patient ratio maintained (1:3 to 1:4). Consultation with physical and respiratory therapy, nutritional services, pharmacy, physiatry, rehabilitation services, audiology, social work, chaplaincy and other services were readily provided as necessary. Oral and fluid intake were monitored closely, and electrolyte imbalance corrected when identified.

Real-time reverse-transcriptase polymerase chain reaction (RT-PCR) sample collection was performed at MGVAMC by swabbing the nasopharynx. Testing was accomplished using the Cepheid GeneXpert™ rapid testing platform. All sample collection and processing followed CDC guidelines. Demographic and clinical data and information related to comorbidities were abstracted from electronic medical records (Department of Veteran Affairs Computerized Patient Records System, CPRS). A case was determined to be symptomatic if there was presence of fever, cough, shortness of breath or if the attending physician diagnosed symptomatic COVID-19 at any point during the hospitalization. The duration of viral shedding is defined as the number of days between the first positive COVID-19 test and the last positive test prior to two serial negative tests at least 24 hours apart. The COVID-19 case duration is the number of days between an initial positive test and the second negative test 24 hours after the initial negative test (test of cure). For those who succumbed, the date of decease was used as an end date for both measures. Data to calculate the Modified National Early Warning System (NEWS) (6) score was obtained from review of admission notes in the electronic health record.

Patients were returned to the SNH following hospitalization at MGVAMC only after strict discharge criteria were met: two negative RT-PCR tests at least 24 hours apart, or a period of 30 days had elapsed since the first positive test if negative testing could not be achieved; and no new resident or staff cases identified in the SNH for two consecutive weeks. For those residents still shedding virus after 30 days and returned to the SNH, isolation was required until two serial negative tests were obtained. At the time of the outbreak, there were 86 residents present in the SNH with a first resident case identified on April 6. By the time of evacuation (April 24), 35 residents and 12

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Table 1
Demographics and Findings

Characteristic	Cohort (N = 38)
Median Age (range) - years	83.0 (44 - 99)
Male	29 (76.3)
Female	9 (23.7)
Chronic Underlying Conditions Known to be a Risk for Severe COVID-19 - no. (%)	
Hypertension	26 (68.4)
Cardiac disease	22 (57.9)
Renal disease	5 (13.2)
Diabetes mellitus	10 (26.3)
Obesity	6 (15.8)
Pulmonary disease	6 (15.8)
Cancer	3 (7.9)
Compromised immune system	*2 (5.3)*
Other Clinical Attributes on Admission	
Liver disease	2 (5.3)
Dementia - no. (%)	22 (57.9)
Median no. comorbidities* - median (IQR)	2.0 (1.3-3.0) 5
EHR† List of Problems‡ - median (IQR)	22.0 (15.0-33.8)
Do not attempt resuscitation - no. (%)	29 (76.3)
Median modified NEWS score§ - median (IQR) max.	5.0 (3.0-6.0) 10
Non-verbal owing to medical condition - no. (%)	5 (13.2)
Clinical Findings	
Viral sheddingǁ, days{ (last pos. test) - median (IQR) max.	29.0 (20.3-36.8) 71.0
Case duration#, days{ (2d neg. test)** - median (IQR) max.	49.0 (24.0-56.8) 77.0
Persistently asymptomatic - no. (%)	17 (44.7)
Case fatality rate - no. (%)	5 (13.2)

*Underlying conditions (comorbidities) known to be a risk for Severe COVID-19 (as of April 24, 2020); †Electronic Health Record; ‡A count of problems excluding COVID-19; §Modified National Early Warning Score of 5-6 represents medium risk progression to severe disease; ǁViral shedding is duration between initial RT-PCR positive test and last positive test; {Among those who died - duration is between initial test and date of decease; #Case duration is days between a first positive test and second negative testing for COVID-19; **A second negative RT-PCR test for COVID-19 repeated 24 hours after previous negative test. Results of RT-PCR testing obtained from Apr 24 to June 24.

staff had already tested positive for COVID-19.

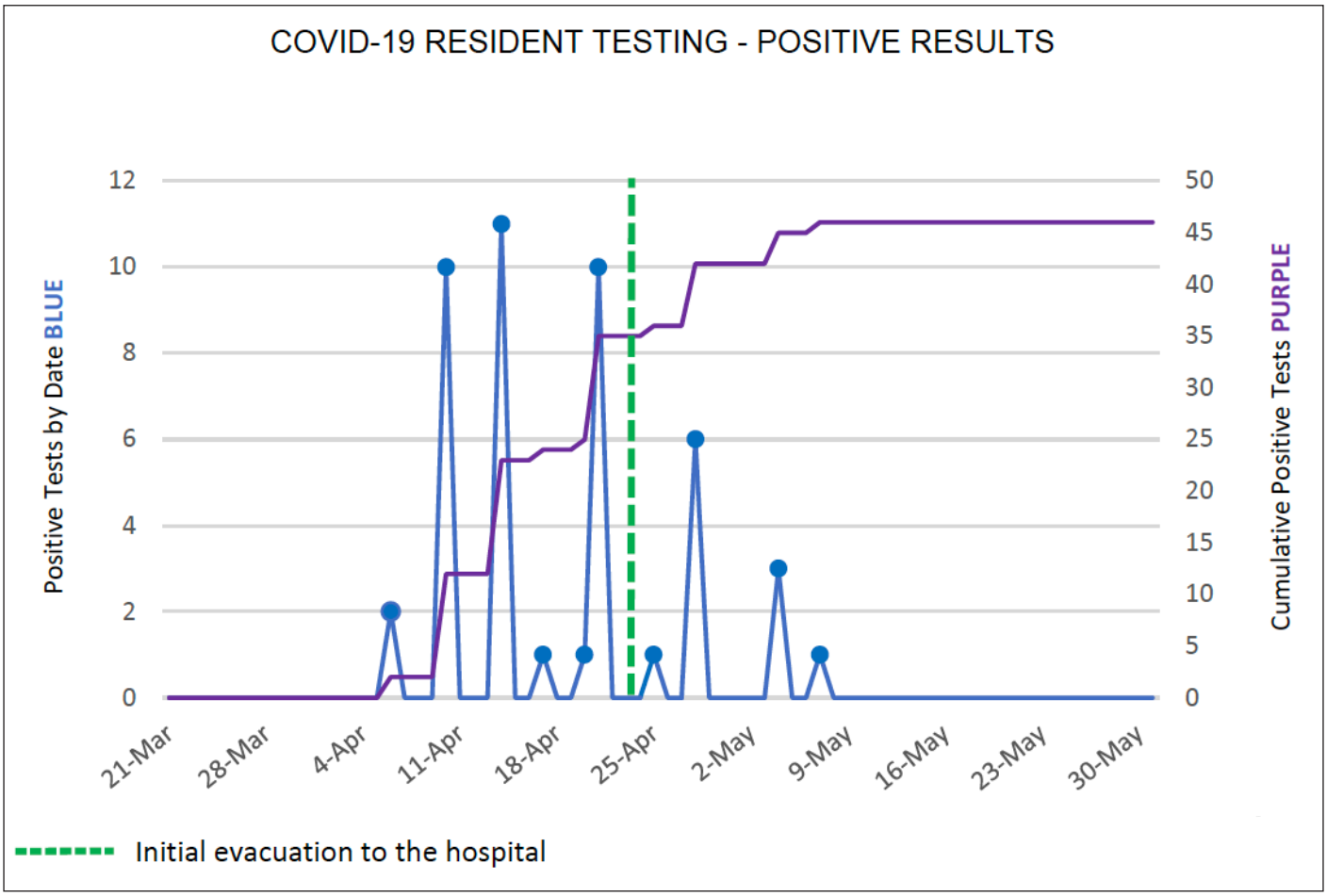
Findings

Table 1 is a summary of the demographic and clinical findings of the cohort of 38 patients on admission to MGVAMC. The median age was 83 with a male to female ratio of 3 to 1. The most prevalent underlying conditions associated with severe COVID-19 disease were hypertension (68.4%) and cardiac disease (57.9%). The median number of these comorbidities was 2.0 (IQR, 1.3-3.0) with a maximum of 5 conditions. Additionally, 57.9% of patients suffered from dementia. The median number of medical problems listed in the electronic health record was 22. Moreover, 76.3% of patients requested to continue or initiate "do not attempt resuscitation" status after goals of care discussions with the attending physician. Many in the cohort suffered from a wide array of serious conditions such as Huntington's disease, Parkinson's disease, liver disease, post-traumatic stress disorder and history of stroke.

Notably, 44.7% of the cohort remained asymptomatic throughout hospitalization with 13.2% unable to respond verbally to questions owing to underlying conditions. The median Modified National Early Warning Score (an indicator of risk of clinical deterioration) was 5.0 (IQR, 3.0-6.0). A score of 5-6 indicates a medium risk for progression to severe COVID-19. Twenty patients (52.6%) had a score equal to or greater than 5 while 7 (18.4%) a score compatible with high risk. The mortality rate for the cohort was 13.2% (5 patients). One of 38 evacuated patients received Remdesivir™ (Gilead Sciences) antiviral therapy by protocol and did well. No patients received hydroxychloroquine, but several patients did receive antibiotic therapy for community-acquired pneumonia. One patient in the cohort was transiently admitted to the ICU for cardiac-related issues unrelated to COVID-19.

Viral shedding showed a median duration of 29.0 days (IQR, 20.3-36.8) with a maximum of 71. Case duration, a median of 49.0 days (IQR, 24.0-56.8) and a maximum of 77. The cohort underwent serial RT-PCR testing at intervals between one and two weeks to minimize patient discomfort and test kit

Figure 1
Skilled Nursing Home Outbreak and Testing



consumption.

Prior to SNH resident evacuation to MGVAMC, 35 residents and 12 staff were infected between March 23 and April 24 (32 days). Following evacuation, the last case occurred on May 11 (staff member), 17 days later. As of this publication, no additional resident cases have been detected (Figure 1). Overall, 46 of 83 residents contracted COVID-19 (55.4%) and 10 patients died (21.7%) during the period of this study. Of the 38 patients evacuated to MGVAMC, the case fatality rate was 13.2%.

Discussion

With respect to infection transmission in nursing homes, it is important to recognize that there is frequent, prolonged and close contact between frail patients and staff during activities of daily living (ADLs). Assistance is required for ambulating, feeding, dressing, personal hygiene, continence and toileting (7). Lai et al. (2020) point out that nursing home "residents share the same sources of air, food, water, caregivers, and medical care" and are exposed to visitors who come and go at will (8). These factors contribute to the high degree of COVID-19 penetration in skilled nursing homes in the US (5) and may explain the difficulty with outbreak control experienced by the SNH we observed before evacuation of infected residents to MGVAMC.

Our findings serve to highlight the extent of underlying health and cognitive conditions and disabilities among SNH residents. There is also growing evidence nursing home resident comorbidities including Alzheimer's disease and related dementias (ADRD) contribute strongly to coronavirus mortality in skilled nursing homes (9). For example, it is difficult to elicit a reliable history from cognitively impaired patients and they often present with atypical symptoms (10); as a consequence, they are at risk for delay in diagnosis of symptomatic and serious infection. Fully 60% of our cohort were cognitively impaired. Comorbidities, cognitive disability, persistent absence of symptoms of infection and the impact of immunosenescence (11) combined to mask typical signs and symptoms of disease and made detection of progressive COVID-19 a challenge for the MGVAMC caregivers. This difficulty with accurate assessment, triage and treatment would

be an even greater challenge in the SNH setting.

The duration of viral shedding may provide important insight into the severity of COVID-19 in our cohort. These patients experienced a median duration of viral shedding of 29 days. This is comparable to findings from Wuhan, China showing a median of 31 days in patients with *severe* COVID-19 (12). The duration of viral shedding in asymptomatic and mildly symptomatic younger patients has been reported to show a median of only 19 days (13). Furthermore, advanced age and comorbidities do not appear to play a role in the duration of viral shedding (12, 14). A possible explanation for prolonged viral shedding in our cohort, therefore, may be more advanced COVID-19 than is apparent on daily clinical assessment in the SNH. This is borne out by our findings that over half of the cohort had a Modified NEWS score of 5 or more on evacuation and admission to MGVAMC.

Our cohort is likely representative of nursing home residents everywhere insofar as they are elderly, poor historians, suffer from numerous serious health conditions, and may often present atypically (2) and with blunted fever response to infection (15). The ability to distinguish symptoms of COVID-19 from those associated with underlying health conditions along with an attenuated physiologic response to infection combine to place nursing home residents at serious risk for delay in appropriate comprehensive supportive care with subsequent rapid progression of infection and suboptimal outcome.

Our decision to evacuate the SNH residents to our hospital appeared to have a salutary effect on outbreak control. Seventeen days after implementing evacuation procedures, no further cases of COVID-19 had been identified among residents or staff.

There are significant limitations to this case series. The number of patients is small (38), observations are retrospective, and the study does not have a matched control group for comparison purposes.

Our findings do suggest that early evacuation of COVID-19 residents from the SNH stemmed the outbreak and improved patient outcomes by timely hospitalization and robust multidisciplinary medical care following positive testing. In order to avoid prolonged isolation, however, additional research is needed to resolve the question of infectivity in residents who continue to test positive for COVID-19 over very long periods of time.

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