

COMMENTARY**Post-acute sequelae of SARS-CoV-2 infection in nursing homes: Do not forget the most vulnerable****Himali Weerahandi MD, MPH^{1,2}** | **Mana Rao MD^{3,4}** |
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Funding information

National Institutes of Health; National Heart, Lung, and Blood Institute, Grant/Award Number: K23HL145110

In the early days of the current pandemic, many expected that COVID-19 would behave like most other respiratory viral illnesses—causing an acute illness that would resolve after, at most, a couple of weeks. However, there is now a rapidly emerging literature on long COVID or a post-acute sequelae of SARS-CoV-2 infection (PASC)¹ syndrome in which patients may experience significant limitations in physical, cognitive, and mental health for several weeks to months after the initial COVID-19 diagnosis. It is unclear whether these sequelae are directly related to damage caused by SARS-CoV-2 itself, a post-viral syndrome, deconditioning from prolonged hospital stays or post-intensive care syndrome. Also unknown about PASC are its incidence, prevalence, trajectory, and risk factors. Presently, there is growing concern that there will be a subsequent public health crisis if this syndrome is not recognized or adequately treated.²

While it is well known that residents of skilled nursing facilities have endured a disproportionate impact from COVID-19 with high case fatality rates, little is known about PASC in this specific patient population. Like PASC patients in the community,³ survivors of COVID-19 residing in nursing homes may have new supplemental oxygen requirements and significant debilitation from acute COVID-19, resulting in high rehabilitation needs and need for additional caregiver

support for activities of daily living (ADLs). It is also uncertain whether COVID-19 has synergistic adverse effects on preexisting medical conditions, such as chronic obstructive pulmonary disease, given the severe lung damage that it can cause in some patients. Furthermore, current data characterizing PASC syndrome profiles are dominated by symptoms of neurological dysfunction and persistent fatigue. Whether PASC may alter the disease course of patients with mild cognitive impairment, Alzheimer's disease and related dementia, or other types of dementia remains unknown. Prolonged social confinement imposed by clinical isolation requirements may affect cognitive faculties. Social confinement also significantly impacts a nursing home resident's overall quality of life. Prior work has indicated that in community-dwelling older adults, the COVID-19 pandemic has had a global effect on worsened physical functioning and fall outcomes, notably in those with reduced activity levels and social isolation.⁴ These observations will likely be more apparent in nursing home residents.

In addition, little is known about how immunization might modulate the development and progression of PASC, particularly in nursing home residents—given the likely differential immune response to vaccination in impaired older adults. Though COVID-19 vaccination rates among nursing home residents are relatively high in

TABLE 1 Characteristics of nursing home residents with symptomatic COVID-19 March 1–June 1, 2020 in a large urban nursing home^a

Characteristics (N = 314 except where indicated)	N (%) or Mean (SD)
Age (years)—Mean (SD)	79.8 (12.0)
Female gender—N (%)	188 (59.9)
Race—N (%)	
White	83 (26.4)
Black or African American	83 (26.4)
Other	4 (1.3)
Not reported	144 (45.9)
Hispanic or Latino—N (%)	46 (14.6)
Body mass index (BMI)—Mean (SD) ^b	26.1 (7.1)
Comorbidity count (0–14)—Mean (SD)	3.4 (1.7)
Chronic conditions—N (%)	
Congestive heart failure	76 (24.2)
Kidney failure	73 (23.2)
Diabetes	133 (42.4)
Ischemic heart disease	89 (28.3)
Peripheral vascular disease	57 (18.2)
Cerebrovascular disease	63 (20.1)
Chronic pulmonary disease	72 (22.9)
Dementia	144 (45.9)
Physical function (ADL ^c score 0–28; higher = worse)—Mean (SD)	18.8 (3.8)
Cognitive impairment (CFS ^d)—N (%)	
Intact	134 (42.7)
Mild	77 (24.5)
Moderate	84 (26.8)
Severe	19 (6.1)
Post-acute (residence ≤100 days)—N (%)	97 (30.8)
Do not resuscitate order—N (%)	202 (64.3)
Do not hospitalize order—N (%)	120 (38.2)

^aData from consecutive symptomatic residents with positive COVID-19 PCR or antibody test.

^bAmong those with weight and height available (N = 266).

^cADL = Activities of daily living; each of 7 ADLs rated as 0 = independent, 1 = supervision, 2 = limited assistance, 3 = extensive assistance, or 4 = total dependence; and summed.

^dCFS = Cognitive function score.

many regions, breakthrough infections occur, especially among frail older adults.⁵ It has been theorized that this persistent increased risk may be from repeated exposures through increased interactions with the healthcare system. Current national vaccination rates among nursing home staff are 60%,⁶ though they are substantially higher in locations that have vaccination mandates (e.g., 92% in New York State⁷). While primary immunization against COVID-

19 has demonstrated some promise against the risk of developing PASC,⁵ these results may not be generalizable to patients residing in nursing homes. In addition, the effect of booster doses, authorized in the Fall of 2021, remains to be fully understood.

We applaud the National Institute of Health's RECOVER (Researching COVID to Enhance Recovery) Initiative to study PASC.⁸ However, previous PASC research is limited in that it has focused primarily on community-dwelling patients. These patients are able to enroll selectively into studies and self-report symptoms either over a web-based survey or over the phone. Patients in these studies tend to be younger (<60 years old), English-speaking, or have been able to form patient advocacy groups highlighting their experiences.^{9–11} They are also likely to have had no functional impairments prior to COVID-19 infection.¹¹ While these patients' disease trajectory is important, it is also vital to include patients with multimorbidity and baseline functional impairments in longitudinal studies of PASC. An example of the profile of nursing home patients with COVID-19 is illustrated in Table 1, which represents a cohort of laboratory-confirmed symptomatic COVID-19 patients from a large skilled nursing facility in an urban setting.

Important post-acute clinical events occur among nursing home residents who have survived COVID-19, including geriatric syndromes such as falls, delirium, and progression of frailty, all of which affect quality of life and are important to include in studies of PASC. Nursing home data also routinely capture signs and symptoms such as fever, hypoxia, dyspnea; complications such as dehydration¹²; and treatment information including supplemental oxygen and antimicrobials—all of which may be important predictors of PASC and its outcomes. Standardized assessments conducted on ADL function, frailty, and cognitive function are also routinely captured in nursing home data, in the form of the Minimum Data Set (MDS) 3.0, which is federally mandated for all residents in Medicare and Medicaid certified nursing homes. This information should be leveraged to study longitudinal function trajectories in PASC.

Given their potential need for increased ADL support and rehabilitation, we should anticipate that many patients with PASC will utilize health care services over an extended period of time, with some requiring post-acute and long-term care, including skilled nursing facility care. Thus, nursing home data will be important to describing health services outcomes. In addition, given the significant role that nursing homes play in post-acute care, transitions in and out of these facilities should be studied to examine the ramifications they have on health outcomes, care fragmentation, and healthcare costs, as post-acute care and long-term care cost about \$426.1 billion in the United States in 2019.

In the spirit of directing research toward health equity,^{13,14} we urge researchers to prospectively engage diverse and vulnerable communities—those at most risk for poor outcomes—including those who reside in nursing homes. Nursing homes caring for high proportions of racial/ethnic minorities have reported higher incident COVID-19 cases¹⁵ and must not be left out of PASC research. To do this successfully, researchers should proactively engage organizations such as nursing homes that may not have formal ties to the academic institutions that are likely to be funded for the study of PASC. Only if these patients are included can we ensure that results from this important work will be generalizable to the most vulnerable in our community.

ACKNOWLEDGMENTS

Dr. Weerahandi is supported by a grant from the National Heart, Lung, and Blood Institute, National Institutes of Health (K23HL145110).

CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

All authors meet the criteria for authorship stated in the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. Dr. Weerahandi and Dr. Boockvar conceptualized the manuscript. Dr. Weerahandi wrote the first draft of the manuscript. All authors provided interpretation of data and critical revision of the manuscript for important intellectual content.

SPONSOR'S ROLE

The National Institutes of Health had no role in design and conduct of the study; collection, management, analysis, or interpretation of the data; or preparation, review, or approval of the manuscript.

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How to cite this article: Weerahandi H, Rao M, Boockvar KS. Post-acute sequelae of SARS-CoV-2 infection in nursing homes: Do not forget the most vulnerable. *J Am Geriatr Soc*. 2022;1-3. doi:10.1111/jags.17760