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Research Letter

Environmental Noise in New York City Long-Term Care Facilities: A Window Into the COVID-19 Pandemic

*To the Editor:*

One-third of all deaths attributed to severe acute respiratory syndrome coronavirus 2 [Coronavirus Disease 2019 (COVID-19)] in the United States have occurred in nursing homes (NHs), where more than 1.3 million residents live and are cared for by more than 3 million employees.^{1,2} Limiting the spread of COVID-19 in NHs has been uniquely challenging, likely related to asymptomatic carriers,^{3,4} atypical COVID-19 symptoms,⁵ and the need for frequent close contact between staff and residents.² In an effort to decrease COVID-19 spread, on March 13, 2020, the Centers for Medicare & Medicaid Services (CMS) and Centers for Disease Control and Prevention (CDC) released guidance to NHs, including restriction of visitors and nonessential personnel and cancelling communal dining and group activities.⁶ The effects of these necessary changes on NH residents are unknown. In the context of an ongoing research project in several New York City NHs, we were able to explore nighttime noise changes in the NH environment before and after implementation of COVID-19 restrictions. Nighttime noise has been linked to poor sleep and increased behavioral disturbances among NH residents.⁷

Methods

In 2018, we launched a study in New York City, funded by the National Institutes of Health, to evaluate an intervention to improve NH residents' sleep/wake patterns using a staff-participatory framework. The intervention included 3 key components over a 4-month period:

1. Four face-to-face meetings between study mentors (physicians, psychologists, and nurses) and NH direct care staff across day, evening, and night shifts.
2. Three educational webinars on sleep and wakefulness.

3. Weekly text message reminders to staff during and after the intervention phase.

Intervention activities focused on the following:

1. Reducing nighttime environmental noise and light, and feedback on environmental noise monitoring.
2. Limiting resident time in bed during the day, increasing activity engagement and social interactions.
3. Facilitating appropriate treatments and individualized behavioral plans for residents with nighttime behavioral disturbances.

As part of this study, we placed 3 noise-monitoring devices near nursing stations and resident rooms on 6 nursing units within 2 New York City NHs in January 2020 (4 units at Facility 1; 2 units at Facility 2). Devices were custom-configured and validated against industry standard meters to detect and record sound levels ranging from 30 to >90 dB every second. Data were transmitted daily via Wi-Fi connection to a secure remote server for storage. Using interrupted time series analysis (ITS),⁸ we compared noise levels during nighttime hours (10 PM–6 AM) “before” (January 30, 2020, to March 6, 2020) and “after” (March 24, 2020, to June 30, 2020) the implementation of CMS/CDC recommended restrictions due to the COVID-19 pandemic.

Results

Mean nighttime noise levels ranged from 40 to 51 dB in the “before” phase, and 44 to 57 dB in the “after” phase. **Figure 1** shows the nightly average noise levels within each unit (ie, the mean across the 3 monitoring devices). In Facility 1, noise levels significantly increased in all locations on both units (**Figure 1A and B**). In Facility 2, noise significantly increased in 2 of 3 locations in 2 units (**Figure 1C and D**), 1 of 3 locations on 1 unit (**Figure 1E**), and did not increase significantly on 1 unit (**Figure 1F**). For individual monitoring devices, the raw mean differences ranged from +2.6 to +7.6 dB in Facility 1, and –2.5 to +7.5 dB in Facility 2 from the “before” phase to the “after” phase of the monitoring period.

Discussion

Our ability to unobtrusively and continuously measure the NH environment during the COVID-19 pandemic provides an observational window into the lived experiences of NH residents and staff. Nighttime noise abruptly increased immediately following implementation of necessary COVID-19–related restrictions on daytime activities and visitors, a change that has been sustained for months. During this time, residents were in their rooms isolated from family and friends, and usual recreational activities were limited. Care provided by unfamiliar staff due to illness of regular staff may have led to unmet needs and altered sleep patterns

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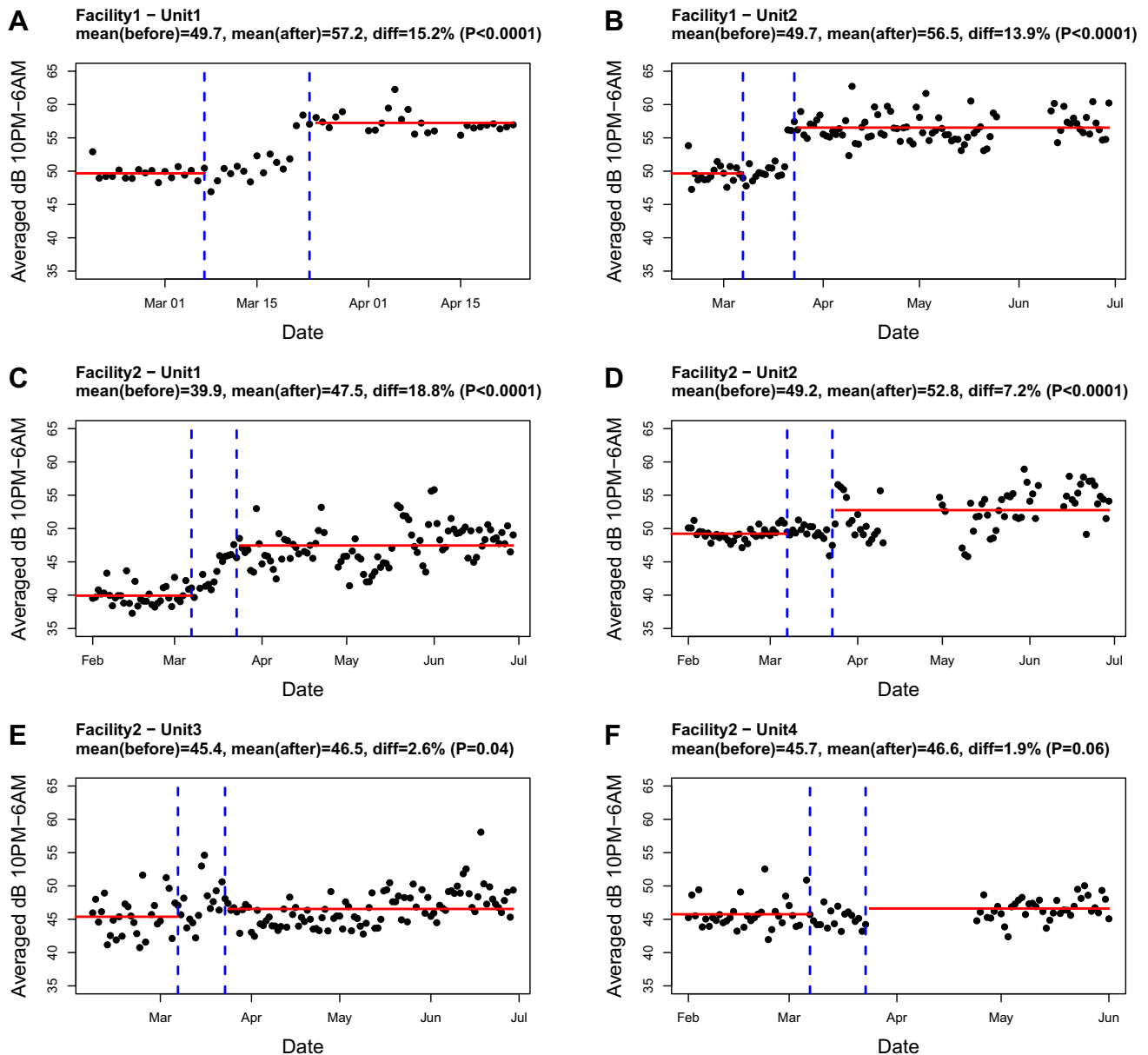


Fig. 1. Nightly (10 PM–6 AM) noise levels [in decibels (dB)] collected from select monitoring devices on 6 nursing units across 2 facilities in New York City. (A) and (B) reflect noise levels in Facility 1. (C–F) reflect noise levels in Facility 2. Statistical results for ITS analyses demonstrate significant increases in nightly noise in 5 of the 6 units. Each black circle represents 1 night. Red lines indicate the “before” and “after” means. Dotted blue lines mark the 2-week period of implementation of the COVID-19 guidelines and were excluded from ITS analyses. The percent change from the before to after periods are noted as “diff” in each panel of the figure.

among residents as well. Although critical to health and safety, there were unexpected consequences of the CDC/CMS guidelines. Although it is unclear why changes were more pronounced on some units than others, the adverse impact of nighttime noise on resident sleep and quality of life is a critical consideration. As necessary precautions are taken to protect this vulnerable group from COVID-19, efforts to attenuate the negative impact of environmental changes on residents are needed.

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Jennifer L. Martin, PhD

*Geriatric Research Education and
Clinical Center, VA Greater Los Angeles Healthcare System, Los
Angeles, CA, USA*

Diana Hernandez, BS

*Division of Geriatric Medicine and Palliative Care, NYU Grossman
School of Medicine, New York, NY, USA*

Mary P. Cadogan, DrPH, RN, FAAN

UCLA School of Nursing Los Angeles, CA, USA

Abraham A. Brody, PhD, RN, FAAN

*Division of Geriatric Medicine and Palliative Care, NYU Grossman
School of Medicine, New York, NY, USA*

*Hartford Institute for Geriatric Nursing, New York University Rory
Meyers College of Nursing, New York, NY, USA*

Cathy A. Alessi, MD

*Geriatric Research Education and Clinical Center, VA Greater Los
Angeles Healthcare System, Los Angeles, CA, USA*

Michael N. Mitchell, PhD

*Geriatric Research Education and Clinical Center, VA Greater Los
Angeles Healthcare System, Los Angeles, CA, USA*

Yeonsu Song, PhD, RN

*Geriatric Research Education and Clinical Center, VA Greater Los
Angeles Healthcare System, Los Angeles, CA, USA*

UCLA School of Nursing Los Angeles, CA, USA

Jessica Smilowitz, MPH

*Division of Geriatric Medicine and Palliative Care, NYU Grossman
School of Medicine, New York, NY, USA*

Alok Vedvyas, MS, MSJ

*Division of Geriatric Medicine and Palliative Care, NYU Grossman
School of Medicine, New York, NY, USA*

Yingzhi Qian, MS

*Division of Biostatistics, Department of Population Health, NYU
Grossman School of Medicine, New York, NY, USA*

Hua Zhong, PhD

*Division of Biostatistics, Department of Population Health, NYU
Grossman School of Medicine, New York, NY, USA*

Joshua Chodosh, MD, MSHS*

*Division of Geriatric Medicine and Palliative Care, NYU Grossman
School of Medicine, New York, NY, USA*

VA New York Harbor Health Care System, New York, NY, USA

* Address correspondence to Joshua Chodosh, MD, MSHS, Division
of Geriatric Medicine and Palliative Care, NYU Grossman School of
Medicine, 227 E. 30th Street, TRB 839, New York, NY 10016
E-mail address: Joshua.Chodosh@nyulangone.org