SARS-CoV-2 Delta outbreak among fully vaccinated nursing home residents likely initiated by a fully vaccinated staff member – Connecticut, July–August 2021

Stephen M. Bart, PhD1,2,*, Adora Harizaj, MPH2,*, Claire L. Pearson, PhD2, Tiara Conteh, BSN2, Erin Grogan, MS2, Randy Downing, BS2, Hannah L. Kirking, MD3, Jacqueline E. Tate, PhD3, John A. Jernigan, MD3, Vivian Leung, MD2

1Epidemic Intelligence Service, CDC, Atlanta, GA, United States
2Connecticut Department of Public Health, Hartford, CT, United States
3CDC COVID-19 Response, Atlanta, GA, United States

*Co-first authors

Corresponding author:
Stephen M. Bart
sbart@cdc.gov
410 Capitol Avenue
Hartford, CT 06134
United States
(860) 509-7994
Abstract

During July–August 2021, a COVID-19 outbreak involving 21 residents (all fully vaccinated) and 10 staff (9 fully vaccinated) occurred in a Connecticut nursing home. The outbreak was likely initiated by a fully vaccinated staff member and propagated by fully vaccinated persons. Prior COVID-19 was protective among vaccinated residents.

Keywords: COVID-19, long-term care facilities, COVID-19 vaccines, SARS-CoV-2 transmission
Background
Nursing home resident COVID-19 morbidity and mortality dramatically decreased after COVID-19 vaccinations began, but decreased vaccine effectiveness has been reported [1,2]. The duration of vaccine protection and likelihood of SARS-CoV-2 transmission from vaccinated persons are unclear. On July 14, 2021, a Connecticut nursing home reported two staff COVID-19 cases to the Connecticut Department of Public Health (CTDPH). During July 14–August 9, an outbreak of SARS-CoV-2 infections in 21 residents (all fully vaccinated) and 10 staff (9 fully vaccinated) occurred in the nursing home memory care unit. Five residents were hospitalized with respiratory symptoms within 10 days of COVID-19 diagnosis. Three resident COVID-19-related deaths occurred, including one resident who had been hospitalized. Memory care unit vaccination coverage was 93% for residents and 89% for staff. In Connecticut in mid-July 2021, the SARS-CoV-2 Delta variant was predominant, and all counties experienced moderate SARS-CoV-2 community transmission (7-day COVID-19 case rate of 10–49/100,000 population, https://covid.cdc.gov/covid-data-tracker/#county-view).

CTDPH investigated factors associated with infection and transmission among fully vaccinated persons within the nursing home memory care unit.

Methods
A case was COVID-19 diagnosed by a SARS-CoV-2 nucleic acid amplification or antigen test in a nursing home resident or staff member on or after July 14, the date the first infection was identified. Antigen (Abbott BinaxNOW™) and reverse transcription-polymerase chain reaction (RT-PCR, TaqPath™ COVID-19 Combo Kit) tests were used for screening and diagnostic testing; positive antigen test results for asymptomatic persons were confirmed by RT-PCR (CDC Influenza SARS-CoV-2 (Flu SC2) Multiplex Assay). Nursing home staff provided visitor logs and demographic and clinical information including vaccination status. Persons were considered fully vaccinated 14 days after the final dose of a primary
vaccination series. SARS-CoV-2 test results for residents, staff, and visitors, including results from before this outbreak, were reviewed in the Connecticut Electronic Disease Surveillance System. Demographic and clinical characteristics were compared for residents infected during the outbreak (case-residents) and those not infected (non-case-residents). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq) and was considered public health surveillance exempt from review by the CT DPH Human Investigations Committee.

Results

The nursing home was a 333-bed, 6-unit facility with 247 residents and 594 staff. The memory care unit was separated from the rest of the facility by locked doors and had 53 residents and 23 staff who worked only in this unit. The earliest case occurred in a memory care unit staff member who experienced COVID-19 symptoms while working on July 11 (Figure). The staff member did not return to work and tested positive for SARS-CoV-2 on July 14. On July 14, the nursing home suspended visitation and began antigen test screening all residents and staff (Figure). One additional asymptomatic memory care unit staff case was identified. No cases were identified outside the memory care unit; subsequent asymptomatic antigen test screening was limited to the unit. During the outbreak, all residents and staff underwent weekly RT-PCR testing. The first resident case was identified on July 15. Cases continued in memory care unit residents and staff for several weeks; no cases occurred outside the unit. Residents diagnosed with COVID-19 were isolated, and other unit residents were generally restricted to their rooms. Symptoms were reported for 17/21 resident cases and 9/10 staff cases (Supplementary Table 1). The only case in an unvaccinated person in the memory care unit occurred in a staff member on August 9, at the end of the outbreak (Figure). No cases were identified in recent visitors. No residents received COVID-19 monoclonal antibody therapy.
Fully vaccinated residents were not required to wear facemasks unless in contact with an unvaccinated resident. Before the outbreak, all staff regardless of vaccination status were required to wear a facemask. During the outbreak, staff interacting with memory care unit residents wore fit-tested N-95 respirators and transmission-based precautions were in place. No improper staff mask use was observed during a formal infection control assessment during the outbreak.

Factors associated with COVID-19 in nursing home memory care residents were evaluated. The mean resident age was 85 years, 79% of residents were female, and 94% of residents were White (Supplementary Table 2). Case-residents and non-case-residents were of similar age and had similar odds of being female, White, and vaccinated. The mean number of high-risk conditions for each resident was similar for case-residents and non-case-residents (1.4 conditions/resident for both). Compared with non-case-residents, case-residents were more likely to have type 2 diabetes (odds ratio [OR]: 4.8, 95% CI: 1.1–21.6). Thirteen residents previously tested positive for SARS-CoV-2, all during May 2020–January 2021. One of 21 case-residents had COVID-19 previously (233 days prior to the outbreak), compared with 12 of 32 non-case-residents (median: 233 days prior, range: 177–430 days) (OR: 0.08, 95% CI: 0.01–0.7).

RT-PCR cycle threshold (Ct) values were available for 21 specimens (17 residents and 4 staff, all vaccinated). For 13 specimens tested with the Flu SC2 assay, the median SARS-CoV-2 nucleocapsid gene Ct value was 19.6 cycles (interquartile range [IQR]: 17.0–24.9). For 8 specimens tested with the TaqPath™ assay, the median SARS-CoV-2 nucleocapsid gene Ct was 16.6 cycles (IQR: 15.2–20.5). In a phylogenetic analysis of 820 genomes collected in the surrounding county during July–August 2021 and deposited in GISAID, genomes from residents, a staff member, and a staff household contact were closely related and clustered separately from other community Delta AY.119 genomes (Supplementary Table 3, Supplementary Figure).
Discussion

This SARS-CoV-2 Delta variant nursing home outbreak occurred in a setting of high vaccination coverage and was likely initiated by a fully vaccinated staff member. Prior COVID-19 was inversely associated with infection in residents. Regardless of vaccination status, consistent adherence to infection control measures and testing recommendations is important to reduce SARS-CoV-2 transmission, particularly in high-risk settings.

Source control is recommended for all staff in healthcare settings [3]. Despite a staff masking policy and high vaccination coverage, COVID-19 cases occurred in this unit for several weeks. The suspected index case occurred in a fully vaccinated staff member who worked the day of symptom onset. Frequent testing made detection of any resident or staff SARS-CoV-2 infection likely. Activities were canceled, limiting resident interactions outside of roommate pairs. The genomic similarity among nursing home sequences, dissimilarity from other community sequences, and extended outbreak duration support the likelihood of transmission between vaccinated persons in the unit, potentially from vaccinated staff to vaccinated residents. Dedication of staff to the locked unit likely contributed to outbreak containment in this facility.

While the likelihood of transmission between vaccinated persons is unclear, previous reports have suggested that vaccinated persons infected with the Delta variant might transmit to others. A Finland hospital Delta outbreak investigation concluded that vaccinated healthcare workers likely transmitted to patients, most of whom were not fully vaccinated [4]. Unvaccinated and vaccinated cases had similar C_t values during a large Delta cluster in Provincetown, Massachusetts [5]. Lower C_t values, like those observed here, correlate with an increased likelihood of culturable virus [6] and might correlate with infectivity. We could not address duration of viral shedding during this outbreak.
A recent study suggested diminishing vaccine effectiveness among nursing home residents in the United States; another study in Israel reported waning protection several months after vaccination, especially in older persons [2,7]. This outbreak occurred ~6 months after most residents completed their primary vaccine series. Nursing home residents are often older, and neurological conditions including dementia are associated with severe COVID-19 [8]. Memory care unit residents might be at particularly high risk for infection due to a high degree of close contact with staff during their care and might be less able to independently perform hand hygiene or use source control.

Case-residents had increased odds of type 2 diabetes compared with non-case-residents. While diabetes is associated with severe COVID-19 [8], less is known about the risk for any SARS-CoV-2 infection among persons with diabetes. Type 2 diabetes has been associated with higher risk of infection in a household transmission study [9]. These independent findings might together support a link between type 2 diabetes and SARS-CoV-2 infection.

During this outbreak, only one case occurred in a fully vaccinated resident who previously had COVID-19. While any undiagnosed prior infections could potentially bias the effect estimate, persons who previously had COVID-19 have been reported to produce a robust antibody response to vaccination [10]. Further, six months after vaccination, serum from nursing home residents previously infected with SARS-CoV-2 retains a higher neutralization capacity than serum from residents without prior infection [11]. During this outbreak, nursing home residents without another prior SARS-CoV-2 exposure were at higher risk of infection. An additional exposure could lead to a response that lasts longer or is more effective against the Delta variant as protection from primary COVID-19 vaccination series wanes. To increase protection against COVID-19, fully vaccinated long-term care facility residents should receive a booster dose when eligible [12].
NOTES

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Disclosures

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Figure Legends

Figure. Epidemic curve of cases in nursing home residents and staff associated with this SARS-CoV-2 Delta COVID-19 outbreak — Connecticut, July–August 2021. Gray boxes represent dates of asymptomatic antigen (Ag) or reverse transcription-polymerase chain reaction (RT-PCR) testing for residents and staff. Because of shift scheduling variation, staff testing occurred during 3–4-day windows.
Figure

- Vaccinated residents
- Vaccinated staff
- Unvaccinated staff

Symptom onset or specimen collection date

Cases

2021 July 10 12 14 16 18 20 22 24 26 28 30 August 01 03 05 07 09