Infection Control & Hospital Epidemiology (2024), **45**, 543–545
doi:10.1017/ice.2023.240

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Concise Communication

Association of a coronavirus disease 2019 (COVID-19) vaccine booster with control of a COVID-19 outbreak in a long-term care facility in Switzerland, November to December 2021

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Abstract

Coronavirus disease 2019 (COVID-19) outbreaks in long-term care facilities are often correlated with high case fatality rates. We describe the association of administration of an mRNA booster with the control of an outbreak. Our findings highlight the possibility of vaccine booster early in an outbreak as a promising method to mitigate the spread of infection.

(Received 22 April 2022; accepted 10 October 2023; electronically published 13 December 2023)

Coronavirus disease 2019 (COVID-19) outbreaks in long-term care facilities (LTCFs) are difficult to control and are associated with high case fatality rates of >30% among residents[1,2] due to the vulnerability of the mostly elderly, multimorbid residents.[3]

We describe a COVID-19 outbreak in a 90-bed LTCF in Switzerland in which 82 beds were occupied at the time of the outbreak. The attack rate of the outbreak was 48%. Rapid application of mRNA booster was considered an important item within our intervention bundle. The outbreak occurred when the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) B.1.617.2 (delta) variant was predominant.

The index case, who was tested positive but was clinically asymptomatic, was identified on November 2, 2021. The outbreak began at a time when the recommendations for a third vaccination (booster) for particularly vulnerable population groups had just been issued by the Swiss Agency for Therapeutic Products on November 4, 2021. The additional protective effect of a booster vaccination is reported to be expected within ≥12 days,[4] but the impact on an ongoing LTCF outbreak has not yet been studied.

Methods and results

On day 6 after the first case occurred, we offered and administered vaccination (BNT162b2 booster vaccination) as part of the intervention. Additional interventions included (1) reinforcing strict masking and hygiene policies, (2) quarantine and isolation measures, (3) a visitor ban, and (4) allocation of staff to the care of residents with as little overlap with infected wards as possible. Although dementia decreases adherence with COVID-19 preventive measures,[5] all items were implemented with the appropriate caveat. Data were collected in a continuous line list. Cantonal authorities supervised the investigation of the outbreak. According to Swiss federal law, no ethic approval is required for outbreak investigations.

Testing regimen

Additionally affected wards with symptomatic cases were detected on November 4, 2021, 2 days after the initial case. A conservative testing regimen every 5 days, for asymptomatic residents only and immediately starting testing for every case when symptoms occurred, was performed until November 24, 2021. The testing regimen was applied to the entire institution. Healthcare workers (HCWs) were tested when an indication was given (eg, symptoms, unprotected exposure, etc). Roche SD Biosensor SARS-CoV-2 rapid antigen test (Roche Diagnostics, https://www.roche.com) and PCR were used to test residents and HCWs. In addition, newly symptomatic cases were continuously detected and screened by PCR tests.

Baseline characteristics and intervention

We included all 82 residents of the facility. The median age of the participants was 84.5 years (interquartile range [IQR], 81–90.2), and 27 (33%) were male. Also, 79 (96%) of all residents had had a previous COVID-19 vaccination. Details on previous vaccinations (ie, dates and number) for SARS-CoV-2–negative residents were not collected. Only mRNA vaccines were administered; prime boosters were performed with the same vaccine.

Of the 39 residents with COVID-19, 38 (97%) had had a previous vaccination and 37 (95%) had obtained complete baseline vaccinations with 2 mRNA vaccines. There were no known previous COVID-19 cases. The booster was administered on

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Cite this article: Leiblein TW, Winistörfer A, Seiler K, Hauri R, Sommerstein R. Association of a coronavirus disease 2019 (COVID-19) vaccine booster with control of a COVID-19 outbreak in a long-term care facility in Switzerland, November to December 2021. *Infect Control Hosp Epidemiol* 2024. 45: 543–545, doi: 10.1017/ice.2023.240

Table 1. Baseline Characteristics of the Long-Term Care Facility Population and for SARS-CoV-2–Positive Residents

Characteristic	Overall, No. (%)[a]	SARS-CoV-2 Positive, No. (%)[a]
No. of residents	82	39
Age, median y [IQR]	84.5 [81–90.2]	85.2 [81.9–90.84]
Sex, male	27 (32.9)	13 (33.3)
Time since admission, median y [IQR]	1.63 [0.83–3.41]	2.09 [1.00–3.56]
Building, floor		
Auxilliary 1st	20 (24.4)	10 (25.6)
Auxilliary 2nd	21 (25.6)	17 (43.6)
Auxilliary floor	11 (13.4)	11 (28.2)
Main 1st	10 (12.2)	0 (0.0)
Main 2nd	11 (13.4)	1 (2.6)
Main 3rd	9 (11.0)	0 (0.0)
Single room	34 (41.5)	26 (66.7)
Previous vaccination	79 (96.3)	38 (97.4)
Previous complete vaccination (2 mRNA vaccines)	NA[b]	37 (94.8)
Last vaccine, median months [IQR]	NA[b]	8.84 [8.84–8.84]
Vaccination		
Moderna (mRNA-1273 SARS-CoV-2 vaccine)	NA[b]	5 (13)
Pfizer (BNT162b2 mRNA COVID-19 vaccine)	NA[b]	33 (85)
Unvaccinated	NA[b]	1 (3)
Booster vaccine on November 8	58 (71)	20 (51)

Note. IQR, interquartile range.
[a]Units unless otherwise specified.
[b]Data not collected for SARS-CoV-2–negative residents.

November 8 to 58 (71%) of 82 residents, and 38 (88%) of 43 subsequently SARS-CoV-2–negative residents received a booster.

Table 1 shows the baseline characteristics for all residents and the 39 (48%) of 82 subsequent SARS-CoV-2–positive cases. Of 39 cases, 20 (51%) had received boosters. Of 82 residents, 43 (52%) were uninfected. During the outbreak, 21 (55%) of 38 HCWs were infected; 14 of these had received complete baseline vaccinations with 2 mRNA vaccines, 6 had unknown vaccination status, and 1 had not been vaccinated. At the time of this study, the booster was not available to the general Swiss population; therefore, no HCW received a booster vaccination during the outbreak.

Outcomes

The epidemiologic curve is shown in Figure 1. Only 1 resident tested positive after the presumed effectiveness at day 12 after the booster.[4] Also, 5 residents diagnosed between November 4 and 18, 2021, (including 2 who received the booster) had fatal courses.

We evaluated the rate of infection per disease-free resident day during the outbreak before (November 2–20, 2021) and at least 12 days after the booster (November 21–December 12, 2021, when the outbreak was declared over) using a Poisson regression model. The infection incidence rate ratio (ie, the relative difference measures in infections between the 2 periods) for period 2 versus period 1 was 0.04 (95% CI, 0.00–0.17; $P = .001$).

Discussion

Timely and widespread administration of a COVID-19 mRNA vaccine booster was significantly associated with getting a COVID-19 outbreak in an LTCF under control.

In December 2021, the CDC interim clinical considerations stated that "mRNA vaccines are not currently recommended for outbreak management or for postexposure prophylaxis" (reference no longer available online). To our knowledge, this statement was not supported by clinical data.

In an outbreak situation, there may be a missed opportunity for vaccination for people who are likely to have repeated SARS-CoV-2 exposures. Although protection from the currently authorized mRNA vaccines is not immediate[6] and the median incubation period of SARS-CoV-2 is 4–5 days, our data suggest that a booster vaccination very likely plays an important role in controlling an outbreak in an LTCF.

Notably, the cause–effect relationship between vaccination and the outcome cannot be proven. Further infection control activities have been simultaneously implemented, making it difficult to evaluate the impact of a single intervention as part of a bundle.

This study had several limitations. We were unable to evaluate the extent to which other factors were related to the control of the outbreak, and important variables (eg, SARS-CoV-2 antibody titers) of the residents were missing. We did not sequence viral strains. Furthermore, our findings may not be generalizable to SARS-CoV-2 strains beyond the delta variant nor to other settings; this was a single LTCF study. Detailed data on the precise dates of primary series vaccination administration in SARS-CoV-2–negative residents were not collected because these data were difficult to extract from the medical charts. However, there is no reason to believe that dates and/or vaccine products (Pfizer versus Moderna) differed among the residents who tested positive for SARS-CoV-2. Unfortunately, a meaningful comparison of boosted versus nonboosted residents was not possible because the intervention (with a delay of the onset of action) occurred during the outbreak and not before.

Another major issue was that almost half of the residents were infected in this outbreak; therefore, the outbreak may have infected enough residents to stop the spread. To reach the conclusion that without vaccines the outbreak would continue, comparison of multiple LTCFs would have been required. Finally, we were not able to study in detail the interactions between infected HCWs and residents.

Ultimately, our project also raises the question of the extent to which HCWs should be prioritized for vaccination during a pandemic. In Switzerland, HCWs were vaccinated only after high-risk patients. However, this question cannot be answered with the data from our project. In conclusion, we highlight the possibility of a vaccine booster in the early phase of a COVID-19 outbreak in an LTCF as a promising infection control tool.

https://doi.org/10.1017/ice.2023.240 Published online by Cambridge University Press

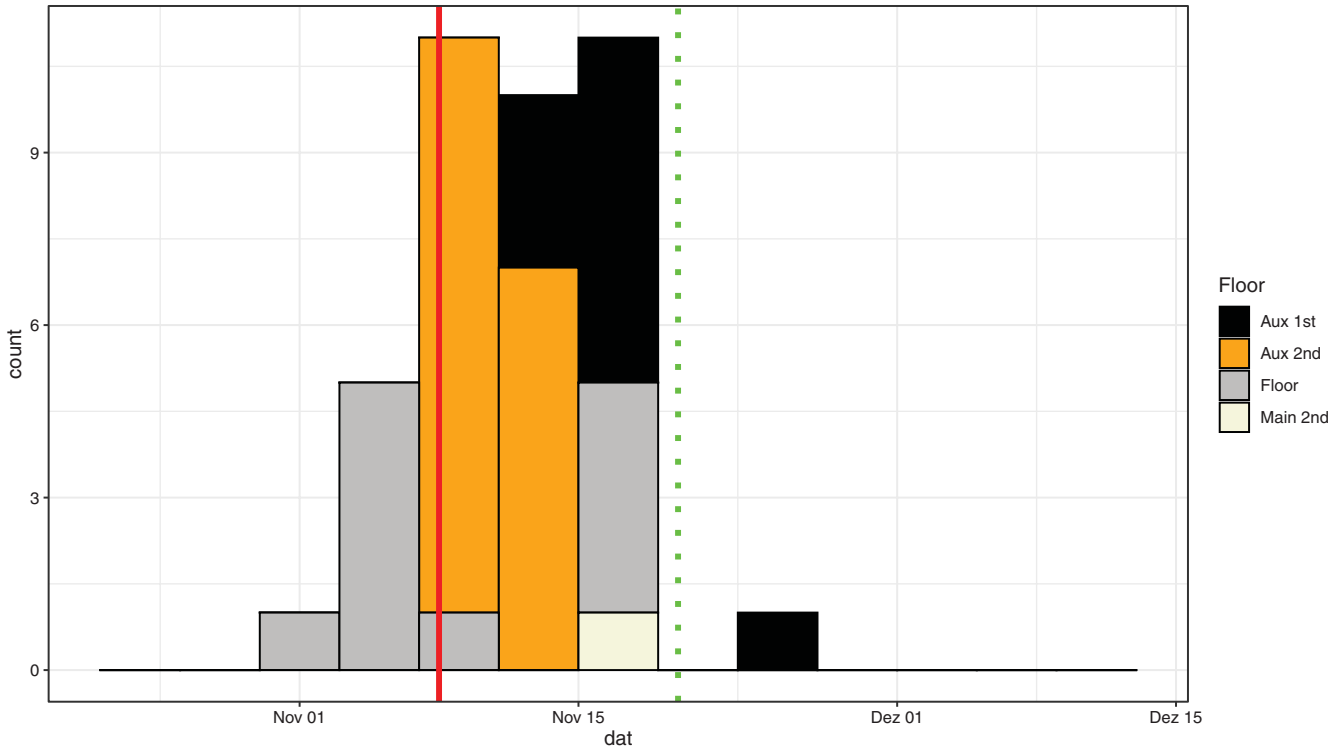

Figure 1. Epidemiologic curve of a COVID-19 outbreak among 82 residents at a long-term care facility with 39 positive cases, November 2021. All positive cases appear at the time of diagnosis (test date). A booster vaccination was administered on November 8, 2021 (red line). The expected unfolding of the vaccine effect is marked with a green dotted line on November 20, 2021, that is, 12 days later.

Acknowledgments. We acknowledge the cantonal authorities for mandating the outbreak vaccination and for enabling the vaccine booster administration. We thank the director of the institution, Jonas Zollinger, for supporting the outbreak investigations. We thank Valmai Spirk, MD for proofreading the article.

Financial support. No financial support was provided relevant to this article.

Competing interests. All authors report no conflicts of interest relevant to this article.

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