An assessment of the impact of the vaccination programme on coronavirus disease (Covid-19) outbreaks in care homes in Northern Ireland- a pilot study

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Word count: 898

To the Editor
The emergence of the coronavirus disease 2019 (Covid-19) pandemic had significant impact on people living and working in Care Homes. Care-home residents are more vulnerable to infection with an increased likelihood of risk factors, including: age, frailty, disability and multiple long-term conditions. Vaccines have become the hope for a better life after the COVID-19 pandemic. Successful implementation of a vaccine programme is dependent on adequate levels of uptake. Across Northern Ireland, vaccination of care home residents and staff started on the 8th December 2020. The Pfizer vaccine was deployed and the dose interval was 21 days, except in cases where the vaccination team could not visit due to outbreak. Covid-19 outbreaks in closed settings such as care homes provide an opportunity to assess vaccine impact on the scale and magnitude of the outbreaks.

The aim of this pilot study is to evaluate the impact of the vaccination programme on current Covid-19 outbreaks, in care homes with at least two test confirmed cases, which have occurred since the vaccination programme commenced. A convenience sample of four care homes was selected for this evaluation by the Public Health Agency (PHA) on the basis of outbreak notification date. This evaluation included the following specific objectives: (i) to determine the vaccine uptake rate and reasons for non-vaccination in care homes amongst residents and staff for the first and second doses, and (ii) to describe the vaccination status of residents/staff at outbreak and Covid-19 test results. Data collection instruments included a facility questionnaire and staff and resident questionnaires. Care homes were screened to identify those in which an outbreak had been declared more than 9 days since the date of first Covid-19 vaccination in the facility. This period was selected so that individuals identified with potential vaccine failure would have had sufficient time for the vaccine to take effect. Descriptive statistics were used for analysis of data.

Four care homes participated in this study; the average number of residents was 39 (range 21-54 residents) and the average number of staff (care and support) was 64 (range 54-91 staff). For residents, the overall vaccine uptake was 84.6% for the first dose. Reasons reported for declining vaccination
were: resident unwell, history of allergies/allergic reaction, resident Covid-19 positive (or within 28 days of symptom onset/ positive test), refused, and new admission to home. For residents, data for the second dose showed a slightly lower vaccine uptake percentage, i.e. 80.8%. Reasons reported for declining vaccination were: no longer in home/died, allergies, and refusal of second dose—Vaccine uptake rate amongst staff was generally lower. For dose 1 the average was 68.3%. The reasons for declining vaccination were: did not wish to receive vaccine, allergic reactions, pregnancy, and symptomatic or unwell. Uptake for second dose, amongst staff, was 65.9%. The reasons for declining vaccination were similar to those reported for first dose.

Data was collected at the individual resident level from each of the 4 care homes. This covered all 157 (100%) residents identified in the facilities at the time of outbreak. Overall 48.4% (76/157) of residents had received a second dose more than 7 days before the outbreak and COVID-19 testing and for 13.4% (21/157), there was no indication of a vaccine having been received (Table 1). The overall proportion that tested positive was 22.3% (35/157). Out of the latter proportion, 23 (65.7%) and 12 (34.3%) were symptomatic and asymptomatic, respectively. The outcomes for residents who tested Covid-19 positive were: 23 (65.7%) made a full recovery without hospitalisation, 7 (20%) required hospitalisation of which 2 (5.7%) died, and 5 (14.3%) died in the care facility. Analysis of the risk factors determined for each resident showed that the largest proportion had incontinence (86.6%; 136/157) and dementia (69.4%; 109/157). Of those who tested positive, a higher proportion was associated with neurological conditions (62.8% (22/35)) and dementia (91.4% (32/35)).

Data was also collected at the individual staff level from each of the 4 care homes. This covered 210 (82.0%) staff identified in the facilities at the time of outbreak. Overall 27.6% (58/210) of staff had received a second dose more than 7 days before Covid-19 outbreak and testing and for 28.6% (60/210), there was no indication of a vaccine having been received (Table 1). The overall proportion
that tested positive was 12.4% (26/210). Of these, 14 (53.8%) and 12 (46.2%) were symptomatic and asymptomatic, respectively. Where reported, all members of staff made a full recovery (n=25).

This pilot study provides an insight regarding vaccination programmes in care homes followed by a subsequent Co-vid19 outbreak. The proportion of residents who had received a second dose more than 7 days before outbreak and Covid-19 testing, and who tested negative in the outbreak, was 73.7%. The comparable figure for staff was 98.3%. These percentages equate to a clinical success in protecting vulnerable residents and staff against Covid-19 in this environment. The finding of this pilot study showed variations in vaccine uptake, for dose 1 and dose 2, amongst residents and staff, with different reasons for non-vaccination. The study would have benefited from a larger sample size and adjustment for patient level risk factors, e.g. comorbidities, and organisational factors, e.g. infection control practices and this will form part of subsequent studies. Understanding the barriers related to lower levels of vaccination uptake is important to inform current and future Covid-19 vaccination programmes policies in care homes in Northern Ireland.

**Compliance with Ethical Standards:** This is a report on the results of an outbreak investigation, which was conducted as part of public health practice to manage the outbreak, as well as supporting the wider public health surveillance, and assisting to inform policy decisions regarding SARS-CoV2 testing in care homes. As such, the work did not require Research Ethics Committee approval. This is in keeping with the UK Health Research Authority's guidance.

**Funding:** This study was carried out as part of our routine work
Conflict of Interest: None to declare

Acknowledgments: The authors are grateful to colleagues at Four Seasons Care who collected and coded the data in this study and for colleagues who made helpful comments on how the work should be undertaken, including Dr Sarah Milligan and Heather Reid.

References

1- Comas-Herrera A, Zalakaín J, Litwin C, et al. Mortality associated with COVID-19 outbreaks in care homes: early international evidence. 2020a. Available online at: https://ltccovid.org/wp-content/uploads/2020/04/Mortality-associated-withCOVID-26-April-1.pdf (accessed 25/03/2021)
2- Gordon AL, Goodman C, Achterberg W, et al. Commentary: COVID in care homes-challenges and dilemmas in healthcare delivery. Age Ageing. 2020 Aug 24;49(5):701-705. doi: 10.1093/ageing/afaa113. PMID: 32402088; PMCID: PMC7239229.

3- Gordon AL, Franklin M, Bradshaw L, et al. Health status of UK care home residents: a cohort study. Age Ageing 2014; 43: 97–103.

4- Atkins JL, Masoli JAH, Delgado J, et al. Preexisting Comorbidities Predicting COVID-19 and Mortality in the UK Biobank Community Cohort. J Gerontol A Biol Sci Med Sci. 2020;75:2224-2230.

5- Polack FP, Thomas SJ, Kitchin N, et al. Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. N Engl J Med 2020; 383:2603-2615.

6- Voysey M, Costa Clemens SA, Madhi SA, et al. Single-dose administration and the influence of the timing of the booster dose on immunogenicity and efficacy of ChAdOx1 nCoV-19 (AZD1222) vaccine: a pooled analysis of four randomised trials. Lancet. 2021;397:881-891. Erratum in: Lancet. 2021;397(10277):880.

7- Public Health England. Reporting to the enhancing surveillance of COVID-19 cases in vaccinated individuals. Updated 27th January 2021. Accessed 25/3/2021. Available from: https://www.gov.uk/government/publications/covid-19-enhanced-surveillance-of-cases-in-vaccinated-individuals/reporting-to-the-enhanced-surveillance-of-covid-19-cases-in-vaccinated-individuals#collection-of-patient-data.

Table 1 Vaccination status of residents and staff and Covid-19 test result in care homes at outbreak

| Terms                                              | Positive | Negative | Unknown | Total |
|----------------------------------------------------|----------|----------|---------|-------|
|                                                    | n (%)    | n (%)    | n (%)   | n     |
| **a) Residents**                                   |          |          |         |       |
| All residents sampled                              | 35 (22.3)| 119 (75.8)| 3 (1.9)| 157   |
| Dose 1 > 21 days and Dose 2 >=7 days               | *20 (26.3)| 56 (73.7)| 0       | 76    |
| Dose 1 received > 21 days and dose 2 < 7 days      | **5 (83.3)| 1 (16.7)| 0       | 6     |
| Dose 1 received > 9 days                           | 5 (10.2) | 44 (89.8)| 0       | 49    |
| Dose 1 received <= 9 days                          | 0        | 0        | 0       | 0     |
| No vaccine recorded as given                       | 4 (19.0) | 16 (76.2)| 1 (4.8)| 21    |
|                          | 1 (20.0) | 2 (40.0) | 2 (40.0) | 5 |
|--------------------------|---------|---------|---------|---|
| **b) Staff**             |         |         |         |   |
| All staff sampled        | 26 (12.4) | 166 (79.0) | 18 (8.6) | 210 |
| *Dose 1 > 21 days and Dose 2 >=7 days* | 1 (1.7) | 57 (98.3) | 0 | 58 |
| **Dose 1 received > 21 days and dose 2 < 7 days** | 8 (26.7) | 22 (73.3) | 0 | 30 |
| Dose 1 received > 9 days | 2 (4.2) | 46 (95.8) | 0 | 48 |
| Dose 1 received <= 9 days | 2 (40.0) | 3 (60.0) | 0 | 5 |
| No vaccine recorded as given | 13 (21.7) | 35 (58.3) | 12 (20.0) | 60 |
| Missing staff vaccination history | 0 | 3 (33.3) | 6 (66.7) | 9 |

* Equates to clinical vaccine failure, i.e. a laboratory confirmed diagnosis of Covid-19 in an individual more than 7 days following the receipt of the 2nd dose of Covid-19 vaccine.

** Possible post-vaccine infection, i.e. An individual who has died more than 21 days after the receipt of the 1st dose of Covid-19 vaccine where Covid-19 was mentioned on the death certificate (either as a confirmed or suspected cause of death), either has not received a second dose or within 7 days of the second dose, but has not had a confirmatory Covid-19 test.