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DEVELOPMENT OF COVID-19 IN NURSING HOMES FROM THE SECOND WAVE TO VACCINATION. DESCRIPTION OF A PROGRAMME COORDINATION BETWEEN PRIMARY CARE, GERIATRICS AND PUBLIC HEALTH

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The authors declare that there is no conflict of interest.

SUMMARY

Rationale: Residential centres have been particularly affected by the effects of COVID-19 and it is therefore highly desirable to know the evolution of the disease and the impact of vaccination against SARS-CoV2 in these centres. The aim of this study was to determine the evolution of the COVID-19 pandemic from the beginning of the second wave to the end of the vaccination process in homes for the elderly in a health area, in which a programme of coordination between Primary Care and Geriatric and Public Health services was activated.

Methods: 2,668 older people were followed in 39 nursing homes. Data were collected on new, active, deceased cases and place of COVID-19 treatment. Descriptive analysis was performed by measuring the absolute number of SARS-CoV-2 positive cases and frequency distribution.

Results: Between 7 August 2020 and 26 February 2021, 30 outbreaks occurred in 21 residences. Three hundred SARS-CoV-2 positive cases were detected (11% of total residents). The daily average number of active cases was 27. 166 (55%) were hospitalised. Sixty-six patients (22% of those infected) died, 54 of them (78%) in hospital. A total of 1,984 PCR tests were performed. The time profile of new cases did not follow a "wave" distribution as in the community. Thirty-seven days after the start of the second dose of vaccination, there were no active cases until 1 March, when new cases appeared under study for possible vaccine escape.

Conclusions: The incidence of COVID-19 in nursing homes after the first wave of the pandemic is apparently lower. Transmission in these centres follows a different distribution than in the community. The effect of mass vaccination leads to the virtual disappearance of the disease.

Key words: COVID-19, SARS-CoV-2, Elderly residences, Vaccination, Pandemic.

ABSTRACT

Evolution of COVID-19 at nursing homes from the second wave to vaccination. Description of a coordination program between Primary Care, Geriatrics and Public Health.

Background: Nursing homes have suffered in a particularly pronounced way from the effects of COVID-19 so it is very convenient to know the evolution in them of the disease and the impact of SARS-CoV2 vaccination. The objective of this study was to analyze COVID-19 pandemic evolution from the start of the second wave to the end of the vaccination campaign at the nursing homes. A coordination program between Primary Care and Geriatrics and Public Health services was activated.

Methods: 2,668 seniors were followed at 39 nursing homes. Data from new cases, active cases, mortality and place of treatment of COVID-19 were collected. A descriptive analysis was performed with the measurement of the absolute number of positive SARS-CoV-2 cases and the frequency distribution.

Results: Between August 7th 2020 and February 26th 2021, 30 outbreaks occurred at 21 nursing homes. 300 people tested positive for SARS-CoV-2 (11% of total residents). The daily average of active cases was 27,166 were hospitalised (55%). 66 patients died (22% of those infected), 54 of them (78%) at the hospital. 1,984 PCR tests were performed. The temporary profile of new cases did not follow a distribution "in waves" as in the community. Thirty-seven days after the start of the second dose of vaccination, there were no active cases until March 1st, when new cases were under study for possible vaccine leakage.

Conclusions: The incidence of COVID-19 at nursing homes after the first wave of the pandemic has apparently been lower. The transmission in these centres has followed a different distribution than at community. Mass vaccination has achieved the practical disappearance of the disease.

Key words: COVID-19, SARS-CoV-2, Nursing homes, Vaccination, Viral pandemic.

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INTRODUCTION

In Spain, an estimated 300,000 elderly people live in residential care homes⁽¹⁾. As in other countries⁽²⁾, these are people with high rates of chronic illness, disability (both physical and cognitive) and even terminality⁽³⁾.

During the first wave of COVID-19, the incidence of this disease in nursing homes and the mortality resulting from it were very high in all Western countries for which data are available⁽⁴⁾. It is estimated that of the total number of deaths in the first wave in Spain, between 47% and 50% occurred in residential homes, which is intermediate among Western countries⁽⁵⁾.

Once the confusion and lack of resources in the first wave had passed, care for institutionalised older people changed in many respects. The pandemic highlighted the limits and inconsistencies of the health and social systems and, since then, it has been recognised that the protection of people living in residential homes and socio-health centres, due to their vulnerability to infection, must be considered a priority. Specific strategies have been developed in most of the autonomous communities⁽⁵⁾ but new care experiences and their results have not yet been described. It is necessary to evaluate these new strategies and devices in terms of minimising the effects of a possible continuation of the pandemic. The scenario that appears after the mass vaccination of institutionalised persons takes on a much more optimistic tone, but both the possible appearance of new strains for which the vaccine may be less effective and the possibility of other types of future epidemics are still to be assessed.

The European Commission and the European Commission are also working together to identify the strengths and weaknesses of the care system and to keep the actors involved on their toes.

It has been estimated that the mortality of residents caused by the first wave of COVID-19 in the Community of Madrid was 19% of the nearly 44,000 institutionalised elderly people⁽⁶⁾. After the end of the first wave, various actions were taken in the region to minimise the effects of possible subsequent increases in the number of patients. On the part of the health services, the capacity to carry out diagnostic tests was multiplied and their use was generalised in the centres, in addition to establishing a much closer coordination between primary care and public health and geriatric services. The latter were provided with 48 new *liaison geriatricians'* posts in 20 of the public general hospitals, with the aim of ensuring coordination and continuity of care between the nursing homes and these hospitals and to provide specialised monitoring of the health needs arising there^(7,8). In Primary Care, teams of face-to-face visits, known as Residential Care Units (UAR), were set up. The residences were asked to draw up contingency plans in the event of possible new outbreaks, which were to include an action protocol, a plan for the sectorisation of the centres into zones, the training of their staff and the provision and correct use of specific protective material. When antigenic tests became available, they were encouraged to be applied periodically to professionals. These measures were aimed at preventing the entry of COVID-19 into the centres, limiting transmission when at least one case was detected and providing training and support to professionals, all based on existing knowledge, guidelines and protocols^(8,9,10,11).

The aim of this study was to determine the evolution of COVID-19 in nursing homes for the elderly in a large health area in which a coordination programme was implemented between the hospital Geriatrics service, Primary Care and the Public Health service of the area, from the beginning of the second wave of the pandemic until the end of the vaccination process.

SUBJECTS AND METHODS

The catchment area of the hospital in which the present study was carried out covered a population of about 500,000 inhabitants, including, prior to the COVID-19 pandemic, around

5,000 institutionalised persons in 42 residences. With the exception of three large public care homes, which were run by another hospital, specialised geriatric care for the rest, which included 3,561 residents, was provided by the hospital where this study was conducted. The hospital has 1,000 functional beds and a geriatrics department. At the community level, the area has 19 health centres and a public health service.

During the first wave of the pandemic, 679 residents died, 19 per cent of the total, bringing the number down to 2,882. Subsequently, after the opening of the centres, there were voluntary discharges. Between 22 April and 22 May 2020, a mass PCR screening was carried out on all 2,668 residents who remained institutionalised. A total of 225 asymptomatic positive cases were detected, isolated and sectorised in their facilities, and were subsequently monitored with weekly PCR retesting until all were negative on 22 June.

As of 1 June, the following actions were carried out:

- Start-up of a Geriatric Liaison Unit (UGE), with a staff of four geriatricians, a nurse and an administrative assistant. Its activity was previously described⁽¹²⁾. The Liaison Geriatrics Unit drew up a Contingency Plan that established the guidelines for action in the event of new outbreaks. This Plan included a "map of residences" in which residences were catalogued according to their own health resources and their capacity for correct sectorisation. Regular face-to-face visits were scheduled for evaluation, training, information and support. A telephone hotline was maintained open from 8 a.m. to 6 p.m., seven days a week, at the disposal of the care staff in the residences, and video-consultation sessions were also scheduled.
- In Primary Care, four teams of Residential Care Units (UAR) comprising a doctor, a nurse and a driver were maintained to carry out face-to-face visits to the homes. Subsequently, a team with a nurse and driver was increased to five teams.
- Coordination of the EMU team was established through weekly telematic meetings with the Primary Care Technicians and the RAU professionals and, with varying frequency, with the Public Health service of the area. In addition, communication between these three agents by telephone and e-mail was practically daily.
- Between 7 July and 31 August, a seroprevalence study (determination of IgG antibodies against SARS-CoV-2) was carried out as part of the Seroprevalence Study of the Madrid Regional Ministry of Health (SeroSOS), in which 1,882 residents of the reference area agreed to participate and which showed a positivity of 55%.

(1,035 positive and 847 negative), although with very notable differences in the percentages depending on the centres (ranging from 0% to 66%).

The care strategy for each outbreak in a nursing home, defined by the occurrence of at least one case confirmed by PCR or positive antigenic test⁽¹⁰⁾, consisted of:

- Immediate declaration of the opening of the outbreak and communication by e-mail from the members of the EMU to all the agents involved, namely: Management of the nursing home, Hospital Management, North Care Management of Primary Care, Public Health Service of the area and General Directorate of Social and Health Coordination. The communication attached the latest version of the "*Procedure for diagnosis, surveillance and control of COVID-19 cases in social and healthcare centres*" of the Directorate General of Public Health⁽¹⁰⁾ and urged the residence to inform its occupational risk prevention service of the situation, so that the relevant traceability actions could be taken with the centre's workers.
- Public Health opinion on the necessary screening measures and the geographical sectorisation of the centre.
- On-site visit by the EMU or the HRU to carry out the PCR screening tests, check the degree of compliance with the recommended sectorisation and provide training, information and support to the care home professionals.
- Clinical follow-up of the symptomatology and severity of each positive case in co-ordination.

with the doctors and nurses of the residence. If the resident remained in the residence, follow-up was carried out either by means of pre-sential visits by the UAR or the UGE, or by telephone follow-up, depending on the needs of the centre and the severity of the case. If hospitalisation was required, the case was followed and coordinated from before arrival at the ED and during the hospital stay, until discharge or death.

Mass vaccination of residents and workers with the first dose of BNT162b2 vaccine (manufactured by Pfizer Inc. and BioNTech) began on 28 December 2020 and vaccination with the second dose began on 20 January 2021. The administration of the second dose was completed on 10 March 2021 (pending recalls of new admissions, residents who ultimately decide to be vaccinated and pending workers for the same reason or a new contract). The vaccination process involved mainly primary care professionals, supported in some centres by professionals from SUMMA-112 and the Red Cross.

Data were collected for this study on new cases, active cases, deaths and the place of treatment of COVID-19 recorded in the daily computerised work diaries of the EMU and the RAUs from the beginning of the second wave of the pandemic until the end of the vaccination process and the subsequent negative response of all cases. The EMU and RAU professionals also provided care for pathologies other than COVID-19 and also provided care to other types of centres, such as those for people with disabilities and religious communities, but the data for this activity are not included in this report.

study, as it is heterogeneous and not specific to older people. The dates of the vaccination process were obtained from primary care records. The incidence of new cases in the Community of Madrid was obtained from data published by the Instituto de Salud Carlos III⁽¹³⁾.

This study was approved by the Medical Research Ethics Committee of the Hospital Universitario la Paz (PI-4701).

A descriptive analysis was performed by measuring the absolute number of SARS-CoV-2 positive cases and the frequency distribution.

RESULTS

Following negativisation through mass screening and subsequent isolation and sectorisation, the first outbreak in a residence in the area occurred on 7 August 2020. Since then, there have been a total of 30 outbreaks in 21 residences.

The number of COVID-19 cases in the area's residences during the study period was 308 (12% of the estimated 2,668 residents at the beginning of the second wave). Of these, 173 (56%) were hospitalised and 135 (44%) were treated at home. Of the residents who became ill, 66 patients died (2% of all residents, 8% of those who were HIV-negative and 21% of those who were infected), of whom 54 (78%) died in hospital and 12 (22%) in their homes.

During the study period, 42 telematic meetings were held between the various

levels of care. There were 608 visits to care homes by the UAR and 107 by the UGE. There were 5,884 telephone calls between the nursing homes and the hospital. 1,984 PCR tests were performed. Medication for hospital use was provided for treatment in the nursing home for 114 cases and oxygen therapy for 47 cases.

Figure 1 shows the time distribution of the evolution of the occurrence of new cases and the persistence of daily active COVID-19 cases from the first outbreak until the end of the vaccination process. The daily average number of active cases was 27.

Figure 2 shows the temporal distribution of occurrence of new cases in relation to deaths. Figure 3 shows the relationship between mortality and place of treatment. Figure 4 shows the morphology of the daily incidence curves of new cases in the Community of Madrid compared with that of the residences in the area.

In the vaccination process, full vaccinations (two doses) were administered to 2,243 residents. From the start of the administration of the second dose, there was a steep downward slope in new infections (Figure 1). On 26 February 2021, for the first time since August 2020, the number of COVID-19 cases in the residences was zero. On 1 March 2021, eight new cases appeared due to a possible vaccine leakage, currently under study, which was resolved with a favourable evolution of all cases 28 days later.

Figure 1
Lines of occurrence of new cases (solid yellow line) and persistence of active cases (dashed blue line) per day of COVID-19 patients. in residences in the area where this study was conducted from the beginning of the second wave of the pandemic until after vaccination.

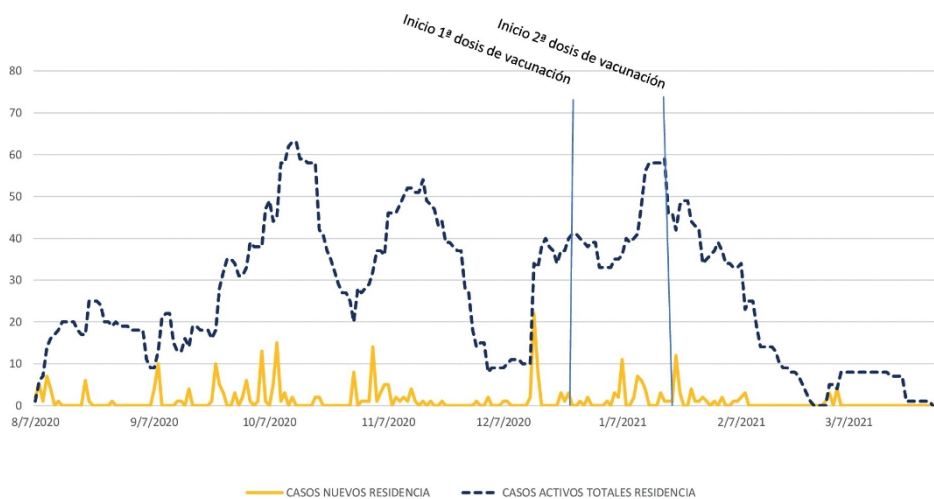


Figure 2
Temporal distribution of the appearance of new cases in relation to deaths in the residences in the area where this study was carried out since the beginning of the study. the second wave of the pandemic until after vaccination.

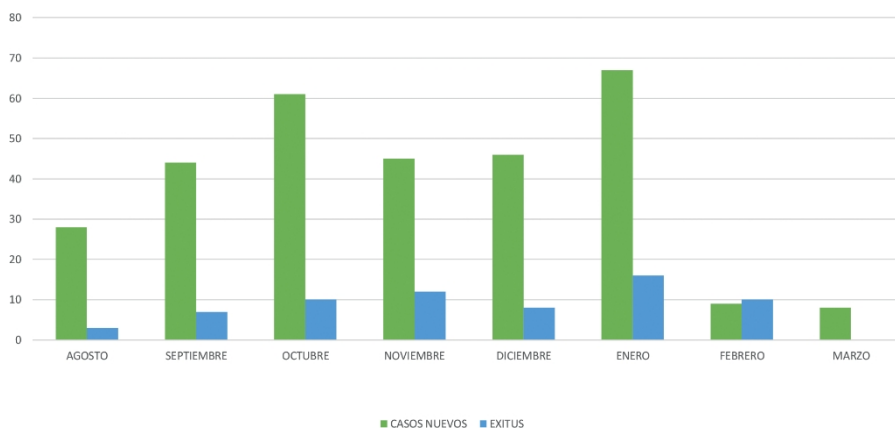


Figure 3
Relationship between mortality and place of treatment of patients diagnosed with COVID-19 from nursing homes in the area where this study was conducted from the beginning of the second wave of the pandemic until after vaccination.

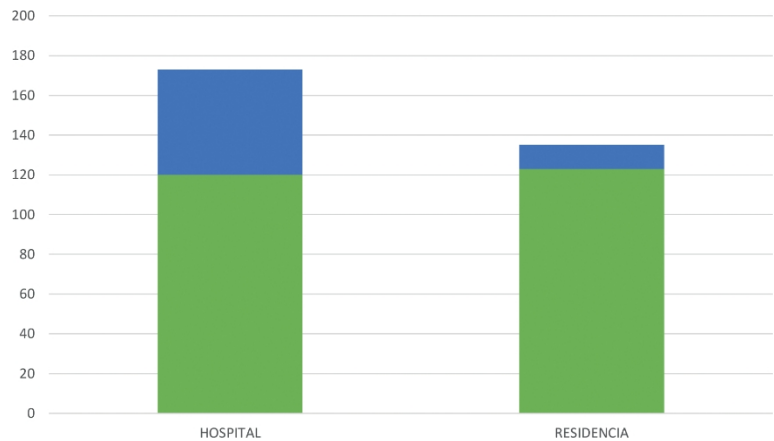
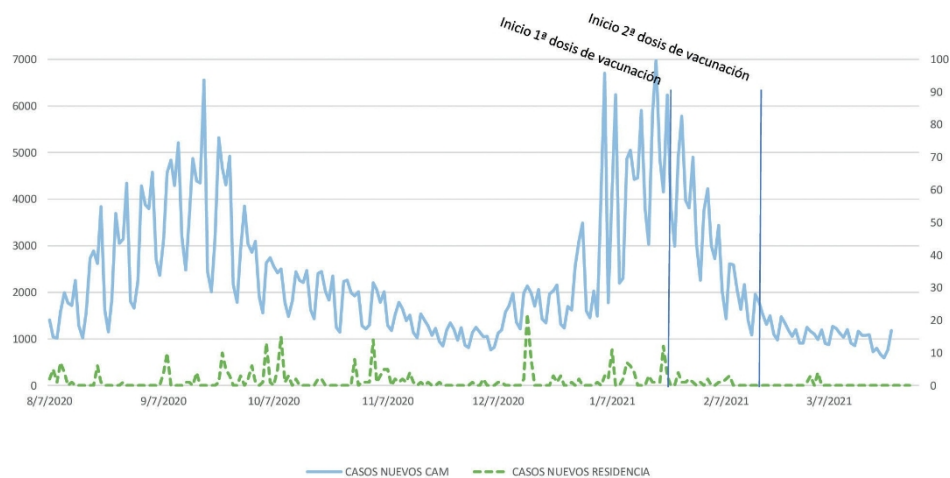


Figure 4
Comparison of the morphology of the incidence of new cases in the Community of Madrid (solid blue line, scale on the left axis) with that of the residences in the Northern area (dashed green line, scale on the right axis). Note the appearance "in waves" of cases in the community and erratic occurrence in residences.



DISCUSSION

effective in the community.

This study presents the evolution of COVID-19 cases in a large sample of nursing homes in a health area from the beginning of the second wave of the pandemic until vaccination and subsequent disappearance of cases, and also describes the health support system put in place. Generally speaking, the presence of disease is constant until the end of the vaccination process, without following a parallelism with community transmission, and the impact of this stage of the pandemic on the centres seems to be less than that of the first wave, especially due to a reduction in mortality. Some aspects deserve a separate comment.

Incidence and prevalence. The overall incidence rate of COVID-19 in the residences of the area in this phase is 11%. Taking into account the overall seropositivity rate of 55%, the incidence rate among seronegatives is 25% (300/1,201), which is between the 15% and 34% described in the first wave in residences in other areas of Spain^(14,15).

The temporal distribution of case occurrence is very different from that in the community, which took the form of two peaks, generally referred to as the second (with 18 September 2020 as the day with the highest number of cases) and third wave (with 19 January 2021 as the day with the highest number of cases). This makes this phase different from the first wave, which followed a similar distribution in residences to infection in the community, and suggests that transmission in residences is not currently following the same pattern. This may be due to the fact that outside contact is only possible through facility workers with very occasional infections, added to the fact that epidemic containment and control measures, which are much stricter and more effective in the residential centres, have been much less

centres than at the community level, slowing down the development of peak incidence in them.

Mortality. During the first wave, the mortality rate in our area is 19% of *all institutionalised persons*, which coincides with the average found in the Community of Madrid (6) and similar to the 15% described in a study carried out in homes in Albacete (15). In the phase studied now, the percentage of exitus is 2.5% of the total number of residents and 5.5% of seronegative patients. This lower mortality rate must be due to the immunity acquired during the first wave and the greater diagnostic capacity of asymptomatic and mild cases, but also, possibly, to a better knowledge of the disease and the development of the measures taken during the current phase, specifically immediate screening at the first case that declared an outbreak and the sectorisation of the centres with the consequent zoning⁽⁹⁾.

Mortality rates in *residents diagnosed with COVID-19* during the first wave have been reported to be between 26% and 50%⁽¹⁷⁾ and in Spanish studies between 33% and 45%^(14,15). In the period studied by us, mortality in diagnosed cases is 22%, which is somewhat lower. During the first wave, due to difficulties of access to PCR tests, the diagnostic capacity was limited to clinically evident cases and the most severe, whereas at present it is possible to diagnose patients with atypical symptoms, which is common in older people⁽¹⁸⁾ and even in asymptomatic patients, groups in which mortality will be lower. Perhaps the use of certain treatments with some efficacy, such as prophylactic anticoagulation or the use of corticotherapy in the inflammatory phase, or a better understanding of the prognostic factors for severity, may also have improved the prognosis.

In-hospital mortality of institutionalised elderly people admitted to hospital ranged between 34% and 42% during the first hospitalisation, similar to the 33% found in this study^(14,15).

One in five patients dies in their residency. End-of-life care in the patient's own home is envisaged, provided that it takes into account the patient's situation and the facility's ability to provide appropriate treatment, together with consideration of the preferences of the patient and their relatives⁽⁸⁾.

Transfers to hospital. Sixty-one percent of patients diagnosed with COVID-19 are transferred to hospital, of which 91% are admitted. This rate is higher than those described in the first wave studies, which ranged from 19% to 46%^(14,15).

Effect of vaccination. As can be seen in the graphs of the appearance of new cases, after the second dose of vaccination, a reduction in the frequency of the disease is observed until it disappears. This confirms the efficacy of the vaccine in a real-life situation outside of clinical trials and in the very special environment of nursing homes. Vaccine escape affects only eight patients, five of whom have completed the vaccination process, with mild or moderate disease in all of them, as expected.

Among the strengths of this study, we would like to highlight that it is the first, to our knowledge, to describe the epidemiological evolution of COVID-19 in the residences of a health area with a high number of institutionalised elderly people in which a care system has been applied, coordinating Geriatrics, Public Health and Primary Care services with the health professionals of the centres.

One weakness is that the numbers of residents necessarily have to be estimated on the basis of records obtained at certain points in time, such as mass screening or the mapping of residences. But there are no stable figures, because there are small daily variations due to the movement of admissions and discharges. However, it is to be assumed that these figures remained fairly stable during the pandemic because of the existing limitations dictated by the administrations, so the estimates are probably very close to the real figures.

It can also be considered a limitation when making comparisons with the first wave that, in the first wave, among other important shortcomings, access to diagnostic tests was very limited in the centres, so that only symptomatic cases could be diagnosed, and most patients were included in the studies of that phase because of their clinical probability of having the disease.

In conclusion, based on the results of this study in care homes for elderly people during the phase after the first wave of the COVID-19 pandemic, which were attended to by a care system with coordination of the health care levels, we can conclude that:

- i) In the above-mentioned institutions, there is an apparently lower incidence of disease overall, but probably similar among residents who have not had the disease and were seronegative.
- ii) Transmission in these centres does not follow a similar distribution as in the community.
- iii) Mortality is strongly reduced.
- iv) The rate of hospitalisations is higher.
- v) The effect of mass vaccination is to effectively eliminate the disease.

It is important to keep action guidelines up to date and to have the necessary material and human resources available to ensure the highest level of prevention, control and treatment tailored to the needs of older people living in residential care homes^(8,19). Coordination mechanisms and methods and their results must be evaluated and maintained. On the one hand, because, despite the good results of vaccination, there is already a certain percentage of ineffectiveness of vaccination, even against the current SARS-CoV-2 strains⁽²⁰⁾, which, although small, may pose a risk in the most vulnerable groups of people, such as institutionalised persons. On the other hand, it cannot be ruled out that new pandemics may arise due to other agents for whose control it is important to have a strategy that is as effective as possible. And, thirdly, because the advances in coordination and care achieved should not be wasted, as they are a useful tool for improving care for this section of elderly people, which has been shown to be insufficiently cared for in our country^(21,22) and which should not again suffer a tragedy like the one experienced in the first wave of the COVID-19 pandemic.

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