



## Short communication

## Preventing COVID-19 in assisted living facilities: An impossible task pending vaccination roll out

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## ABSTRACT

Here, we aimed to describe the clinical outcomes of the residents of a long-term care facility during its closure to visitors and suppliers in response to the first COVID-19 pandemic from February 23 to June 22, 2020, and the results of the facility-wide SARS-CoV-2 testing of residents and staff in June 2020 before its partially reopening. Seventy-four residents and 53 members of staff were included in the present study. The staff underwent nasopharyngeal swab tests for SARS-CoV-2, and both the staff and residents underwent serological tests to detect IgG antibodies against SARS-CoV-2. The results of all of the tests were negative. Conversely, 94% of residents and 38% members of the staff were tested positive to the nasopharyngeal swab tests during the second COVID-19 pandemic wave (data collected from November 1 to November 30, 2020).

Our experience suggests that, in the presence of a life-threatening pandemic such as SARS-CoV-2 infection, the prompt use of restrictive procedures can prevent the spread and progression of disease in assisted living facilities in the short term but may fail in the long term, especially when the prevalence of the COVID-19 greatly increased outside the facility enhancing the risk of import the disease from outside. SARS-CoV-2 vaccination of residents and staff members would contribute to control/limit the prevalence and the spread of the virus.

## 1. Introduction

On February 14, 2020, three colleagues met for lunch in a restaurant on “that branch of Lake Como” in Lombardy: two were infectious disease physicians and the third was the health director of the *Cesare e Emilio Prandoni* Onlus, an assisted living facility located in the lakeside village of Torno, in the province of Como. Much of their discussion concerned the latest news about coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which, although it was still confined to China at the time, could possibly spread to Italy and would then require strategies to contain it.

In the following week, on February 20, the first Italian case of SARS-CoV-2 infection was recorded in the small Lombard town of Codogno, and proved to be the harbinger of the outbreak that would severely hit Italy (and particularly Lombardy) in the following months. Remembering his lunchtime discussion of the previous week, and worried about the evidence emerging from China that indicated the efficient person-to-

person transmission of SARS-CoV-2 in family homes and hospitals, and more severe clinical pictures in older patients (Wang et al., 2020); the director of *Cesare e Emilio Prandoni* Onlus took the precautionary decision to close access to visitors (including family members) and suppliers on February 23.

This paper describes the clinical outcomes of the residents during the first closure, and the results of facility-wide SARS-CoV-2 testing carried out in June 2020 before the facility partially reopened and compared it with the second SARS-CoV-2 pandemic wave started in Northern Italy from the end of October 2020.

## 2. Methods

During the first closure of the Prandoni assisted living facility, which lasted from February 23 up to June 22, 2020, a) the residents were not allowed to receive visitors and could only leave the facility for non-deferrable medical reasons; b) suppliers and couriers were not allowed

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to enter, and deliveries were made outside the facility under the strict control of the staff; c) staff members were constantly urged to use personal protective equipment (PPE) such as gloves and surgical masks when assisting the residents and in their everyday lives at home (staff members were allowed to sleep in their homes), and to respect always correct hand hygiene. The management of assisted living facility had identified members within its staff with the task of overseeing the correct application of the restrictive rules (no control on the correct use of PPE was of course available while staff members were with their families at home).

The same stringent rules were reapplied also during the second COVID-19 pandemic wave started in Northern Italy from the end of October 2020. During the summer, instead, residents were allowed to receive a visit from one family member (both with PPE) for 30 min once a week under staff control preferably in the gardens of the facility. In June 2020, dedicated questionnaires, completed by the attending physician, were used to collect detailed information concerning the residents' main demographic features, co-morbidities, clinical symptoms and/or hospital admissions during the first closure. The staff questionnaire also covered their role in the assisted living facility, the specific training received concerning the use of PPE, and their potential contacts or involvement with patient/family members with diagnosed or suspected SARS-CoV-2 infection. Some basic information about the building housing the assisted living facility was also collected.

During June 2020, the staff members underwent nasopharyngeal swab testing for SARS-CoV-2, and both the residents and staff underwent serological testing to detect antibodies against SARS-CoV-2. The first assay identifies the virus by multiplex real-time reverse transcription polymerase chain reaction (RT-PCR) targeting three virus genes (E, RNA-dependent RNA polymerase and N); the second assay is based on the detection of SARS-CoV-2 specific IgG in serum or plasma. We decided not to perform nasopharyngeal swab to asymptomatic elderly patients to limit their discomfort.

The clinical outcomes of the residents during the first closure was compared with the second SARS-CoV-2 pandemic wave observed in Italy from November 1, 2020.

The overall population frequency data were stratified by gender and are expressed as absolute numbers and percentages; the other measures are expressed as mean values  $\pm$  standard deviation.

The study was approved by the Ethics Committee of *Cesare e Emilio Prandoni Onlus*.

### 3. Results

The *Cesare e Emilio Prandoni Onlus* assisted living facility consists of 62 rooms: 46 single and 16 double rooms. During the first observational period (23 February – 22 June 2020), there were 82 residents and 53 members of staff (two of the members of staff did not complete the questionnaire). None of the eight deaths recorded during the study period were due to infectious diseases (the number of deaths recorded during the same period of 2018 and 2019 was respectively 10 and 9). Accordingly, data on 74 residents and 51 staff members were considered in the final analyses.

The large majority of the residents included in the study were females and significantly older than the males ( $91 \pm 5$  vs  $86 \pm 5$  years;  $p < 0.01$ ). All residents were Caucasians. Three of the 74 residents left the facility to go to hospital because of femur fracture, epistaxis, and severe anemia, respectively. Ninety-one percent of the residents had at least one co-morbidity the most frequent of which were arterial hypertension, ischemic cardiomyopathy, cerebrovascular diseases and dementia. None of the residents was positive for SARS-CoV-2 IgG in June 2020. The main characteristics of the residents are shown in [Table 1](#).

Most of the staff members were females: their mean age of  $47 \pm 9$  years was not different from that of their male colleagues ([Table 2](#)). Fifty percent of the staff had received specific training in the use of PPE during the previous year, and 84% declared they had good or excellent

**Table 1**

Characteristics of the living residents in the *Cesare and Emilio Prandoni Onlus* assisted living facility.

Characteristics	All	Females	Males
No. of subjects, n (%)	74 <sup>§</sup>	59 (80%)	15 (20%)
Age, years	$90 \pm 5$	$91 \pm 5^*$	$86 \pm 5$
Corticosteroid use, n	1	1	0
Hospital admissions <sup>o</sup> , n	3	3	0
Clinical symptoms, n	3 <sup>*</sup>	2	1
Dependency, n (%)	34	24	10
- self-sufficient patients	(46%)29	(41%)23	(63%)5
- partly bedridden patients	(39%)11	(39%)12	(37%)
- bedridden patients	(15%)	(20%)	0
Family visits <sup>§</sup> , n	0	0	0
Co-morbidities per patient, n	$1.7 \pm 1.1$	$1.7 \pm 1.1$	$1.8 \pm 0.9$
Co-morbidities, n (% of residents)	47	36	11
- arterial hypertension	(63%)25	(61%)19	(73%)6
- ischemic cardiomyopathy	(34%)19	(32%)14	(40%)5
- cerebrovascular diseases	(26%)19	(24%)17	(33%)2
- dementia	(26%)7	(29%)6	(13%)1
- chronic renal insufficiency	(9%)8	(10%)6	(7%)2
- diabetes mellitus	(11%)4	(10%)3	(13%)1
- COPD	(5%)3	(5%)2	(7%)1
- obesity	(4%)	(3%)	(7%)

<sup>§</sup> 8 out of the 82 residents died for non-SARS-CoV-2-related diseases; <sup>\*</sup>  $p < 0.01$  versus males; COPD: chronic obstructive pulmonary diseases.

**Table 2**

Characteristics of the staff of the *Cesare and Emilio Prandoni Onlus* assisted living facility.

Characteristics	All	Females	Males
No. of subjects, n (%)	51 <sup>*</sup>	42 (82%)	9 (18%)
Age, years	$48 \pm 10$	$47 \pm 9$	$48 \pm 12$
Job, n			
- social health operators	16	14	2
- professional nurses	7	6	1
- administrative staff	5	5	0
- social welfare operators	5	5	0
- other healthcare providers	4	4	0
- cooks	4	2	2
- auxiliary nurses	3	3	0
- physiotherapists	2	2	0
- workers and similar	2	0	2
- physicians	2	0	2
- manager	1	1	0
Training in the use of PPE	26 (51%)	21 (51%)	5 (50%)
Level of knowledge of PPE			
- poor	0	0	0
- fair	8	5	3
- good	25	20	5
- excellent	18	16	2
Concomitant involvement in the care of COVID-19 patients	0	0	0
Co-morbidities, n			
- arterial hypertension	5	3	2
- obesity	3	3	0
- diabetes mellitus	1	1	0

<sup>\*</sup> Two of the 53 staff members did not complete the questionnaire because they were on holiday; PPE: personal protective equipment.

knowledge of the use of PPE. None of the 51 staff members who completed the questionnaire declared that they had been involved in the care of subjects with suspected or confirmed SARS-CoV-2 infection, but one declared contact with COVID-19 patients in the previous three months. None of the staff members (including the two who did not complete the questionnaire) was positive for SARS-CoV-2 RT-PCR or for SARS-CoV-2 IgG serology (all of the tests were carried out in June 2020). No members of the staff families become sick with COVID-19 during the first observational period. To the best of our knowledge, no cases of

COVID-19 were recorded in the village of Torno (1144 citizens) during the first COVID-19 pandemic wave. During the same observational period, 4093 people out of 599,204 inhabitants (0.68%) of the province of Como were tested positive for SARS-CoV-2 infection.

In autumn 2020, a second COVID-19 pandemic wave was observed in Northern Italy. From November, 1 to November 30, 2020, 68 out of 72 (94%) of residents and 20 (39%) members of the staff were tested positive to the nasopharyngeal swab test. Thirteen residents (4 males, mean age  $86 \pm 2$  years; 9 females, mean age  $93 \pm 5$  years,  $p = 0.015$ ) died because of the SARS-CoV-2 infection. Of the remaining residents, 25 were asymptomatic and 30 have had a wide range of symptoms (some patients had more than 1 symptom), specifically: fever (17), shortness of breath (16), fatigue (8), cough (8), headache (3), runny nose (1). Sixteen out of 30 residents required oxygen treatment, none required mechanical ventilation. Five patients lost their independence in activities of daily living after SARS-CoV-2 infection. During the same observational period, 6.8% of citizens of Torno and 3.8% of citizen from the province of Como were tested positive for SARS-CoV-2 infection.

At the last available follow-up (24 December 2020) all residents and members of the staff were tested negative for SARS-CoV-2 RT-PCR.

#### 4. Discussion

Long-term care residents are particularly vulnerable to COVID-19 and account for nearly half of the worldwide total number of deaths recorded during the pandemic (Barnett et al., 2020; Patel et al., 2020; ECDC Public Health Emergency Team, 2020; Graham et al., 2020; Etard et al., 2020; Burki, 2020; Buckner et al., 2020; Lai et al., 2020). This is due to the frailty of this population (long-term elderly residents are at the highest risk of lethal infections because of their age and the high frequency of co-morbidities) and the fact that the closed environment in which they live can favor the spread of infection. A number of outbreaks of COVID-19 have been recorded among residents and staff in assisted living communities for older adults (Etard et al., 2020; Bouza et al., 2020; Roxby et al., 2020), and McMichael et al. have shown that, once SARS-CoV-2 infection has entered a long-term care facility, it can lead to high attack rates among residents, staff members and visitors (McMichael et al., 2020). This situation is further aggravated by recent findings suggesting that screening based on symptoms may fail to identify cases of SARS-CoV-2 infection in 50% of long-term care residents (Kimball et al., 2020). Consequently, unrecognized asymptomatic and pre-symptomatic infections may contribute to the perpetuation of viral transmission. Taken together, these findings indicate that, in the context of rapidly escalating fatal outbreaks of COVID-19, it is critical that long-term care facilities implement active measures to prevent the entry of SARS-CoV-2.

In addition to the identification (and exclusion) of symptomatic staff members, the recently released Centers for Disease Control (CDC) recommendations include restricting visitors except in compassionate care situations, preventing non-essential personnel from entering the building, and strengthening infection prevention and control guidance and adherence, including social distancing (Centers for Disease Control and Prevention, 2019). Roxby et al. have recently shown that adherence to strict hygiene and social distancing strategies leads to a low prevalence of SARS-CoV-2 detection among residents and staff in senior independent/assisted living communities (Roxby et al., 2020).

Isolation policies are more controversial and still a matter of discussion (Jenq et al., 2020). It has been suggested that residents should not be isolated from their loved ones for a long time not only in order to support their social well-being and avoid loneliness, but also because friends and family members often help to provide essential care for residents (Jenq et al., 2020). Unfortunately, the questionnaire did not specifically address the issue of psycho-physical well-being of residents. This is for sure an important limitation of the present study.

Our experience with the *Cesare e Emilio Prandoni* Onlus suggests that the rigorous application of isolation procedures (that is to close access to

visitors including family members), the strict use of PPE by staff members when working and in their everyday life, and correct hand hygiene can effectively prevent a population at high risk of mortality (residents in northern Italy with a mean age of 90 years and highly frequent comorbidities) from becoming infected with SARS-CoV-2 in the short-term. Indeed, SARS-CoV-2 antibody testing, done three months after the widespread diffusion of COVID-19 in Italy, was negative in 100% of the residents. Remarkably, the mortality rate during the study period was totally superimposable with that observed in the previous two years; and none of staff members developed COVID-19. According to the results of our survey, 50% and 84% of the staff members said, respectively, they had attended a training course on the use of PPE and have a good/excellent knowledge on these procedures. This apparent discrepancy may be related to the lack of provision of objective criteria to score the knowledge of PPE. On the other hands, overall these data could be read as reassuring on the high quality of expertise of the staff members.

The picture was completely different during the second COVID-19 pandemic wave observed in autumn 2020. Despite the assisted living facility has maintained the same procedures containment systems applied successfully during the first pandemic wave, as well as fortnightly control of the molecular swab for SARS-CoV-2 for staff members and residents due to the increase of people tested positive for SARS-CoV-2 in the province of Como and in the city of Torno, the structure was heavily affected by an COVID-19 outbreak. Indeed, 39% of staff members and 94% of residents resulted positive to the molecular swab tests.

The outbreak is likely to be caused by a healthcare worker who was most likely infected by her children (then tested positive) and who was in charge of washing the patients during the asymptomatic phase of the disease (she subsequently developed fever and cough). Accordingly, we hypothesized that the difference with the first pandemic wave was related, at least in part, to the non-closure of the schools in autumn 2020, which allowed the spread of the virus in families of staff members. The role of children in the transmission of SARS-CoV-2 infection is still a matter of active debate, with data showing that such risk is low but not absent (Lu et al., 2021; Méndez-Echevarría et al., 2021; Flasche and Edmunds, 2021; Soriano-Arandes et al., 2021). Similarly, preliminary evidence is also available showing that schools re-opening can favor the spread of SARS-CoV-2 infection (Ladhani et al., 2021; Jordan et al., 2021; Gras-Le Guen et al., 2021; Zimmerman et al., 2021). Indeed, in Italy the schools closed in March 2020 and did not re-open until September 2020.

Finally, the difficulty in keeping the PPEs inside their homes when in contact with close family members should also be considered. Ideally the use of PPE in daily life should be implemented not only by health care workers but also by all family members. This is, however, a very difficult task to be accomplished in real life, especially in the long term.

During the second COVID-19 pandemic wave, we observed a 5-fold increase in the proportion of citizen of the province of Como tested positive for SARS-CoV-2 infection (from 0.7 to 3.8%). Accordingly, the possibility that the higher prevalence of SARS-CoV-2 infection outside the facility could have impacted significantly on the prevalence of the disease in the facility cannot be ruled out. Indeed, Gorges and Konetza have recently shown that the strongest predictor of COVID-19 cases and outbreaks in nursing homes is per capita cases in the county (Gorges and Konetzka, 2021). In the same study the Authors documented that higher nurse aide hours and total nursing hours contained the cases and deaths.

Evidence is also available showing that adherence to infection prevention and control (IPC) restrictive measures decreases over time (Houghton et al., 2020; Choi et al., 2021). Unfortunately, no information was available on the adherence of the staff members (and their families) to the IPC rules during the second COVID-19 pandemic wave. Hence, we cannot exclude that the different outcome between the two pandemic waves was related, at least in part, to suboptimal adherence to IPC.

## 5. Conclusions

Our experience suggests that the prompt application of restrictive procedures can eventually prevent the spread and progression of disease in assisted living facilities even in the presence of life-threatening pandemic SARS-CoV-2 infection in the short-term, but may fail in the long term, especially when the prevalence of the COVID-19 greatly increased outside the facility enhancing the risk of import the disease from outside.

Vaccination is important to control outbreaks and spread of SARS CoV2, but use of PPE and social distances remain important. Vaccination is not a guarantee but will contribute to control/limit the prevalence and spread of the virus (Bokharaie, 2021).

## CRedit authorship contribution statement

**Mario Tagliabue:** Conceptualization, Formal analysis, Writing - review & editing. **Anna Lisa Ridolfo:** Conceptualization, Writing - review & editing. **Paolo Pina:** Conceptualization, Writing - review & editing. **Giuseppe Rizzolo:** Conceptualization, Writing - review & editing. **Sonia Belbusti:** Conceptualization, Writing - review & editing. **Spinello Antinori:** Conceptualization, Writing - review & editing. **Martina Beltrami:** Formal analysis, Writing - review & editing. **Dario Cattaneo:** Conceptualization, Formal analysis, Writing - original draft. **Cristina Gervasoni:** Conceptualization, Formal analysis, Writing - original draft.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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