

**Consequences of the Covid-19 pandemic on complex
multimorbid elderly: Follow-up of a community-based
cohort. SAMAC3 study**

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Title

Consequences of the Covid-19 pandemic on complex multimorbid elderly: Follow-up of a community-based cohort. SAMAC3 study

Abstract

Background: The restrictions imposed during the management of the pandemic led to lack of care of other health problems.

Purpose: To assess changes in the health status of complex multimorbidity elderly, functional and cognitive capacities, perception of the social surroundings, care provided by the nurses, including nursing diagnosis and interventions, use of health services, adverse events, and use of devices and technical help during the first 6 months of the Covid-19 pandemic.

Design: A 1-year longitudinal cohort study was conducted.

Methods: Ninety-seven complex multimorbid elderly attended in primary care were evaluated every 3 months in a health area of the Spanish National Health System (SNHS). The research was called "SAMAC3 study".

Results: Significant negative changes were observed in the functional and cognitive capacity of the elderly, and in several nursing diagnoses. A decrease was observed in the frequency of visit to the nurses, hospital admittance, length of hospital stays, and falls.

Conclusions: The functional and cognitive capacities of the cohort became worse. However, a significant decrease in the frequency of use of health services was observed. The nurses detected significant changes in activity-exercise, cognitive-perception, and roles-relationships, but their interventions were mostly centered on resolving clinical matters that required immediate attention.

Clinical Relevance: The present study allowed us to observe that a situation of social and health stress has worsened the health indicators of multimorbid elderly, and the clinical care of community nurses was insufficient to providing care for the deterioration of the physical and cognitive domains.

Key words

Community-setting; Covid-19, Health Services for the Aged; Multimorbidity; Nursing Diagnosis; Outcome assessment

Background

Multimorbidity, defined as the presence of two or more co-existing chronic conditions, has a worldwide prevalence of 41.3% and is perhaps greater than 80% among individual aged ≥ 85 years old (Nguyen et al., 2019). The chronic multimorbid patient has more associated health problems (Lavan et al., 2016), which in the elderly translates into complex states of health, responsible for polypharmacy, fragility, loneliness, social isolation, depression, anxiety, cognitive deterioration, and gradual loss of autonomy (Papathanasiou et al., 2021). The high complexity and vulnerability of this population habitually leads to a greater consumption of health resources and services, and an increased visits to emergency services (Palladino et al., 2016), a greater meetings with primary care (PC) professionals (Barrio Cortes et al., 2019; Bleijenberg et al., 2013), an increase in hospitalizations (Morales-Asensio et al., 2019), a higher mortality (Holt-Lunstad et al., 2015), and an escalation in health care spending (Larkin et al., 2021). The informal caregivers who provide care to complex multimorbid patients can also experience high levels of stress and fatigue (Price et al., 2020).

Within this framework of nurses' action, multimorbidity presents us with numerous challenges for the community. The use of nursing care plans through the use of Standard Nursing Language (SNL), such as NANDA-I and the Nursing Intervention Classification (NIC) eases the monitoring and follow-up of these patients through the identification of precise nursing diagnoses, an essential aspect for planning adequate interventions. Research on this area has normally focused on the evaluation of patients with specific pathologies, although there is a scarce number of studies directed to multimorbid patients in the community. Recent studies have been found which studied patients who either required home care, or in nursing homes. These individuals, showed alterations mainly in mobility, lack of self-care, risk for falls, inefficient family processes, risk due to pressure ulcers, and impaired memory (Shin et al., 2021; Sousa et al., 2021).

During the COVID-19 pandemic, restriction of movement was mandated worldwide to reduce the impact of the disease (World Health Organization, 2020), with detrimental effects on the care provided by healthcare institutions. The elderly were forced to avoid physical contact and to remain at home, which led to the substantial increase in the effects of multimorbidity. These measures affected their physical health (Hugelius et al., 2021), increased their levels of pain (Sizoo et al., 2020), and reduced their ability to self-care, including the maintenance of personal hygiene (O'Caomh et al., 2020). An increase was observed in the levels of loneliness, symptoms of depression, agitation, and aggression among the elderly during the period of restricted visits, as compared to periods of normal visits (Hugelius et al., 2021). Also, cognitive functions, such as the loss of memory, were also affected (Wammes et al., 2020).

The health care model in primary care in many regions of Spain utilizes a care model named Family Care Unit, composed of family doctors and community nurses, in which the care is

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3 determined by uniform procedures derived from the needs associated to classifications of
4 illnesses and degrees of dependence and by organizational constraints where care is given
5 according to user demand (Ong et al., 2020). According the health professionals, the
6 organization of health systems is not oriented towards an adequate follow-up of the complex
7 multimorbid patients, but instead towards the treatment of acute processes, which results in
8 maladjustments in the health care loads of health professionals, as well as the collapse in the
9 different health care services that impede the adequate monitoring of these patients (Tambo-
10 Lizalde et al., 2021). Similarly, the changes experienced due to the overflow in the health
11 systems resulting from the management of the COVID-19 pandemic led to the lack of care of
12 other health problems, or the way care was provided (Halcomb et al., 2020). It has been
13 shown that nurses worked under situations of high stress, anxiety, and fear, which affected
14 the quality of their care (Baysal et al., 2022).

21 The unprecedented events due to the pandemic had a great repercussion on the health care
22 of the population, but it is unknown whether health systems have been able to soundly adapt
23 to the new needs. Also, the repercussion on the quality of care of the most vulnerable
24 multimorbid elderly who were care for by the community are unknown. Moreover,
25 longitudinal studies do not exist that describe the main changes in the functional capacity and
26 health of these users, or the consequences these aspects have had on the care provided by
27 and health professionals. Thus, the objective of the present study was to assess the changes
28 produced in the health of complex multimorbid elderly individuals, and the changes in the
29 frequency of use of health services from September 2019 to September 2020, 6 months after
30 the COVID-19 pandemic began. More specifically, we studied the changes in the health status,
31 functional and cognitive capacities, perception of the social surroundings, care provided by
32 the nurses, including nursing diagnosis and interventions, use of health services, adverse
33 events, and use of devices and technical help.

41 **Methods**

44 **Design**

47 A 1-year longitudinal cohort study was conducted in a group of complex multimorbid elderly
48 individuals from September 2019 to September 2020, in a health area of the Spanish National
49 Health System (SNHS). The research was called "SAMAC3 study".

52 **Setting and Participants**

54 In Spain, each geographical area is divided into different "health areas" (i.e., Health Area 1
55 covers the main city, while other Health Areas cover the surrounding towns). The health area
56 studied includes a 200-bed university hospital and 10 primary health centers, which in 2021
57 provided care to a total population of 182,338 inhabitants, of which 27,438 were older than
58 65 years old. The community health care is conducted through a primary care team composed

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3 of 113 general practitioners, 117 community nurses, 119 healthcare assistants, 7 physical
4 therapists, and 4 social workers. At the level of Primary care, this area offers services for the
5 prevention and detection of problems in the elderly. It also includes a service of at-home care
6 for immobilized patients, to guarantee continuity of care, accessibility, and equity of
7 comprehensive care of the patients who would otherwise not be able to visit the health
8 center.
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11 The study population was comprised by patients older than 65, who were registered in the
12 home-based care of the health area of the SNHS. Of these, the complex patients were
13 included, who were found in any of the following situations: a) polymedicated with 10 or more
14 drugs; b) two or more simultaneous chronic pathologies; c) living alone, or not being cared
15 for by a family member or formal caregiver; d) presence of some type of help device at home:
16 oxygen therapy, aerosol therapy, sub-cutaneous or intravenous perfusion pump, vesical or
17 nasogastric catheter.
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20 The community nurses from the 10 primary care centers were invited for the selection the
21 study subjects. The nurses selected the participants according to the selection criteria,
22 through convenience sampling. A design with a sample size of 82 subjects, as that obtained
23 in this study, can detect effect sizes of $\delta \geq 0.32$ with a power of 80%, assuming a two-tailed
24 criterion for detection that allows for a maximum Type-I error rate of $\alpha = 0.05$.
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30 **Variables and instruments**

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32 The design of the study was guided by two conceptual frameworks. First, the CURVE model
33 (Morales-Asencio et al., 2016), which describes the factors that affect complexity across a
34 course of life with chronic illness, such as self-care behaviors, family support, effective coping,
35 lifestyle adaptation, proactivity of the health care team, continuity of care, and
36 socioeconomic determinants. This model guided the inclusion of nursing diagnoses and
37 interventions related to self-care, coping, and lifestyle adaptation, with educational level as a
38 socioeconomic determinant. On the other hand, for the analysis of the use of health services,
39 the Andersen's framework was utilized. This framework has been widely used to evaluate
40 health care frequentation in multiple settings (Andersen, 1995). According to this model,
41 there are three domains that determine health care use: predisposing factors (such as health
42 beliefs, sociodemographic characteristics), facilitating factors (family support, perceived
43 social support) and health status. As predisposing factors, age, gender, and nationality were
44 evaluated. Moreover, as facilitating factors, the number of individuals living with the patient,
45 the presence of a family caregiver, and the perceived social support and loneliness, were
46 selected to identify facilitating factors. Finally, health status was evaluated by collecting the
47 main medical diagnoses, Charlson comorbidity index, functional status (Barthel Index), and
48 cognitive assessment evaluated with the short portable mental status questionnaire
49 (SPMSQ). Adverse events were also evaluated, as they can exert an important influence on
50 health status.
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3 The following variables were measured using robust and validated instruments:

4 -Sociodemographic characteristics of the patient: age, sex, nationality, level of education.

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6 -Social context of the patient: environment in which the patient lived, number of individuals
7 living with the patient, presence of a family member caregiver, characteristics of the family
8 caregiver (age, sex, relationship, level of education, housing), social support received, through
9 the DUKE questionnaire, (Bellón Saameño et al., 1996) an instrument with an adequate
10 reliability, as shown by its Cronbach's alpha of 0.90, and appropriate construct and criterion
11 validity; loneliness through the UCLA scale (Velarde-Mayol et al., 2016);, this scale has an
12 adequate reliability, with a Cronbach's alpha value of 0.95, and with satisfactory results in its
13 construct and discriminant validity; and lastly, the effort of the caregiver was measured with
14 the Caregiver Strain Index (CSI) (López Alonso & Moral Serrano, 2005), which obtained a
15 Cronbach's alpha of 0.80, and an adequate criterion validity for its use in the screening of
16 strain experienced by the caregiver.
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23 -Health and functional characteristics: medical diagnoses; Charlson Comorbidity Index (CCI)
24 (Charlson et al., 1987), this is a weighted index that takes into account the number and the
25 seriousness of comorbid disease, and it has shown to be readily applicable and valid method
26 of estimating risk of death; assessment of functionality of the elderly with the Barthel index
27 (González et al., 2018); this tool has shown to have a good reliability, with Cronbach's alpha
28 coefficients between 0.88 and 0.91, aside from an adequate construct validity and convergent
29 and discriminant validity, and lastly, a cognitive assessment was performed through the short
30 portable mental status questionnaire (SPMSQ) (Pfeiffer's Test) (Martínez De La Iglesia et al.,
31 2001), this instrument was shown to have a good reliability, with a test-retest of 0.92, and an
32 adequate convergent and discriminant validity.
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39 - Nursing care. In our Health Area, the nurses use the Gordon patient assessment system
40 (Herdman & Kamitsuru, 2017), which assesses 11 Functional Patterns. After their assessment,
41 the nurses identify the diagnoses corresponding to the patient from a total of 196 diagnoses
42 from the NANDA-I nursing diagnosis taxonomy (Herdman & Kamitsuru, 2017), that were pre-
43 selected for the study. Next, they plan and conduct interventions oriented towards the
44 reduction or the prevention of the diagnoses detected, selecting them starting with 53
45 standardized nursing interventions (Butcher et al., 2019). For the analysis of data, the nursing
46 diagnoses were grouped into 11 functional patterns, while the NIC interventions were
47 grouped into 30 classes and 7 domains for ease of use: The 7 domains were: (1) Physiological:
48 Basic, (2) Physiological: Complex, (3) Behavioral, (4) Safety, (5) Family, (6) Health System, and
49 (7) Community.
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54 - Adverse events: number of falls, number of pressure ulcers, problems associated with the
55 medication, institutionalization.

56 -Use of services, devices, and technical help: number of visits to emergencies, number of
57 hospital admittances, type of admittance (planned/urgent), number of days at the hospital,
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3 number of visits with health professionals, number of diagnostic tests, use of devices, and
4 technical help, visits to day centers, use of home-based help.
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7 **Data collection process**

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10 For the collection of data, the online access platform RANGECOM was utilized, previously
11 developed by BLINDED (BLINDED et al., 2015). This platform includes all the variables used in
12 the study. The nurses who participated in the study were trained on the RANGECOM platform
13 and the recording of the information from the patients included in the study. Each of the
14 nurses was provided with personal access to the RANGECOM platform. Once a patient was
15 included in the study, the nurses gave the patient an appointment, either at the health center,
16 or at their home, to assess them and for the initial recording of the data. Next, another
17 appointment was given every 12 weeks (3 months) until completing a year of follow-up, or
18 until their death or abandonment of the study for other reasons. In total, each patient was
19 assessed 5 times: T0 (basal assessment: September 2019), T1 (3 months, December, 2019),
20 T2 (6 months: March, 2020), T3 (9 months: June, 2020), and final assessment T4 (12 months:
21 September, 2020). Lastly, the main researcher downloaded the data recorded to an
22 anonymized database for posterior analysis.
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30 **Ethical considerations**

31 The study was approved by the Research Ethic Committee from the Health Area (209/2018)
32 and follows the principles of the Declaration of Helsinki. The participants were informed
33 about the objective of the study. The participant's consent was solicited in writing to be
34 included in the registry. The data were pseudo-anonymized before their analysis and
35 processing, to avoid the identification of any user. The information was utilized in a strictly
36 confidential manner.
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40 **Data analysis**

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43 An exploratory analysis was performed with the data, through the calculation of the central
44 tendency and dispersion or percentages. The bivariate analysis was performed with Student's
45 t test, Chi-square, Wilcoxon test, and Mann-Whitney U test. For the longitudinal analysis of
46 the data, statistical tests were performed for related samples. A McNemar test and Cochran's
47 Q were utilized to compare the dichotomous or qualitative variables with more than 2
48 categories. For the quantitative variables, Student's t-test was used for related samples, as
49 well as a single factor repeated measures ANOVA. All the analyses were performed with the
50 SPSS v.25 package. All the results were considered statistically significant at $p < .05$.
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57 **Results**

58 A total of 48 nurses from 8 primary care centers in the health areas of the SNHS participated
59 in the study. On the first assessment, 97 patients were included in the registry. Each subject
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3 was re-assessed every 3 months on four occasions after the first (basal) assessment, for a
4 total of one year in duration and a total of 434 records. During the study, the sample was
5 reduced to 82 subjects, after the loss of 14 users due to death, and one due to a change of
6 address.
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10 Sociodemographic and clinical data

11 The patients studied had a mean age of 83.6 years (SD: 6.7), and were predominantly female
12 (71.1%), and without an education or primary education (94.8%). Of these, 86.6% lived with
13 one or more individuals, and 88.7% had a caregiver (table 1). 28% of participants had at least
14 two pathologies, 37% three pathologies, and 35% four or more pathologies. The most
15 prevalent medical diagnoses were high blood pressure (71.1%), diabetes mellitus (45.5%),
16 arthrosis (41.2%), heart failure (27.8%), and depression (24.7%). None were diagnosed with
17 Covid-19 during the study period.
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21 Changes in the functional state and state of health

22 Statistically significant worsening changes were observed in their everydaylife functional
23 ability, and in their cognitive state (table 2). The mean score in the assessment of loneliness
24 barely changed. No statistical differences were observed in social support, CCI and the CSI
25 (table 2).
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28 Changes in nursing care

29 The nurses detected more alterations in the patterns of Health Perception-Health
30 Management, Activity-exercise, Nutritional-metabolic and Cognitive-perception with some
31 modifications during the year assessed (table 3). Particularly, a statistically significant increase
32 was produced in the diagnoses "Impaired physical mobility", "Impaired ambulation", and
33 "Dressing self-care deficit", and "Constipation". There was also an increase in the importance
34 of the Roles-Relationships pattern, which showed a statistically significant increase in the
35 frequency of the diagnoses "Impaired social interaction" and "Impaired verbal
36 communication". Lastly, a considerable change was observed in the Self-perception-self-
37 concept pattern due to the increase in the diagnoses "Risk of loneliness" and "hopelessness"
38 (table 3).
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45 The interventions proposed and performed by the nurses are shown grouped into domains
46 and classes (Table 4). The nursing interventions mainly took place in the domain Safety,
47 associated with the measures taken to prevent falls; the domain Physiological complex,
48 related with interventions for the management of pressure ulcers; and lastly, in the domain
49 Family, associated with the care provided to the caregivers of the elderly. The order and size
50 of the interventions from these domains was not modified at the end of the assessment
51 period, although some statistically significant changes were observed in some interventions
52 (table 4). Additional material table 7 shows the nursing diagnoses in the basal time (T0) and
53 final time (T4) assessed, which are linked with the nursing interventions.
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60 Use of services, adverse events, devices, and technical help

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3 The complex multimorbid elders spent more time with the nurses, with a mean of 6 face-to-
4 face meetings every 3 months at the start, which decreased in a statistically significant
5 manner to 3.6 meetings ($p=0.007$). In second place, we find the number of meetings with the
6 general practitioner, with a mean of 2 contacts every 3 months without statistically significant
7 changes ($p=0.128$). The number of consultations with other professionals, and the number of
8 diagnostic tests were less than one per trimester, and statistically significant changes were
9 not observed throughout the study (table 5).
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14 The hospital admissions at the start of the study (15.7%) were reduced to almost half at the
15 end of the study (7.3%). The mean number of days at the hospital also decreased, and the
16 visits to emergencies were reduced by 11%. A change was observed in the main cause of
17 hospital admittance, "exacerbation of the chronic condition", with initial values of 14.3%,
18 increasing to 66.7% at the end of the study (table 6). The number of falls decreased by 12%,
19 while the pressure ulcers and associated problems with the medications did not change.
20 About 13% of the patients utilized some type of device, mainly oxygen therapy, which
21 significantly increased by 4% during the study. Between 74-75% of the patients utilized some
22 type of technical help, mainly a "walker", "adjustable bed", or "anti-bedsore mattress", with
23 similar percentages observed during the entire assessment period (table 6).
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30 Discussion

31 This study shows how the application of movement restriction measures and changes in
32 health care at the start of the Covid-19 pandemic affected the health and the use of health
33 services of the most vulnerable elderly population in the community. According to the
34 dimensions proposed in the model of health services' use by Andersen (Andersen, 1995), the
35 predisposing factors, and the health status of the elderly who participated in the study, the
36 participants had a profile of high dependency. They were mainly women older than 80 years
37 old, without an education or primary education, with various chronic pathologies, with the
38 most prevalent coinciding with multimorbidity patterns identified in previous studies (Garin
39 et al., 2016). The elderly lived with one or more people and received care from a family
40 member, mainly a daughter, so that they had an adequate family support network. Care
41 provided by the family was found as a facilitating factor and having support from family and
42 caregivers could explain that elders perceived an adequate social support during the entire
43 period of assessment.
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51 In the year-long period of assessment, the multimorbid elderly who lived in the community
52 suffered a significant worsening in their functional ability for their day-to-day activities, and
53 an increase in cognitive deterioration. Until now, data on this worsening was only available
54 for the elderly who were institutionalized during the pandemic (Pérez-Rodríguez et al., 2021).
55 On the other hand, significant changes were not observed in the main adverse events, and a
56 paradoxical decrease in the incidence of falls was observed, which can be attributed to the
57 reduction in the outdoor daily activity of the elderly due to the movement restrictions, or as
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3 suggested in other studies, due to a decrease in the mobility at the home due to the fear of
4 falling (Nakamura et al., 2021).
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7 In this context, and in a health system in which community care is universal and free for all
8 citizens, the predisposing factors, and the worsening of the state of health of the multimorbid
9 elderly led to a higher expectation of demand for health services. However, as other studies
10 in Spain and other countries have shown (Lange et al., 2020; Torres-Cantero et al., 2022), only
11 the confinement measures and the restrictions to the access to the health system can justify
12 the reduction in the number of face-to-face meetings with health services and care providers,
13 mainly in the number of meetings with the nurses, and hospital admittances, together with
14 reduced visits to emergency services and the mean length of hospital stays. These results
15 could have negative long-term consequences for these patients, perhaps even resulting in an
16 increase in morbi-mortality (Cuschieri & Mamo, 2021).
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23 Our results highlight that community nurses play a central role in the care of multimorbid
24 elderly in the management model utilized in the Health Area studied. Community nurses had
25 the most personal contact with the multimorbid elderly, even higher than the general
26 practitioners throughout the study. The most frequent NANDA-I nursing diagnoses were risk
27 for falls, and impaired ambulation, similar to the study conducted with the elderly in nursing
28 homes (Shin et al., 2021), followed by diagnoses of risk and impaired skin integrity. As a
29 response, the nurses prioritized the interventions within the Safety and Physiological complex
30 domains, which included activities directed towards preventing falls, and the management
31 and prevention of skin lesions related with dependency. Also highlighted due to their high
32 incidence, we found interventions in the domains Behavioral and Family, which promote
33 interventions such as health education, caregiver support, and active listening. As previously
34 pointed out, these aspects are key for the care of multimorbid patients, given that most of
35 the time, patients and their families are alone, with no support from the health care system
36 (Morales-Asencio et al., 2016).
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44 An interesting yet controversial finding was that community nurses were able to detect the
45 physical and cognitive worsening of those they provided cared to. They observed an increase
46 in the number of patients with the diagnoses of impaired physical mobility, ambulation, self-
47 care, social interaction, constipation, and a worsening in verbal communication and risk of
48 fatigue of the caregiver. However, these did not involve the implementation of interventions
49 for solving them. It is difficult to know if this was due to the situation derived from the
50 pandemic, the deficiencies suffered by the professionals, the increase in other demands
51 (Halcomb et al., 2020), the novel and potential complexity of the interventions required, or
52 as other previous studies have pointed out, because in traditional models of care, the
53 community nurses prioritize acute clinical interventions, with less consideration given to
54 prevention-type activities (Ramos-Morcillo et al., 2014).
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Limitations

We should mention that the study has sheer number of variables, and the limited size of the sample could be insufficient and affect its statistical power, leading to the underdetection of significant changes in some of the variables studied. On the other hand, the temporal and unprecedented characteristics of the study did not allow us to obtain a comparison cohort, which could have allowed us to assess if the changes observed would have been different under a different caregiving model. Lastly, the duration of the assessment did not allow us to observe the long-term results of the decrease in the number of visits and consultations to health services.

Conclusions

Throughout the year-long monitoring of the patients, which included the first 6 months of the Covid-19 pandemic, the multimorbid elderly suffered a significant worsening in their functional and cognitive capacities. Despite living with other individuals, and obtaining help from a caregiver, there was an eventual worsening of moderate loneliness. The system of care of multimorbid elderly in primary care is fundamentally based on nurse care and meetings. These health professionals diagnosed an increase in problems associated with mobility, cognitive abilities, social contact, and communication. However, their interventions were focused on resolving clinical matters, about which they have a great experience for their management, and which require immediate attention. A significant decrease was found in the frequency of use of health services, and in the number of falls, which could be explained by the restrictions imposed due to the pandemic, and which in the long-term could have negative consequences for these patients.

Clinical Resources

- Multimorbidity Care Model CHRODIS+. <http://chrodis.eu/06-multimorbidity-care-model/>
- Coronavirus disease (COVID-19) pandemic (WHO). <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

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Table 1. Sociodemographic data of the elderly and the caregivers

	Mean (SD)		Mean (SD)
Age of patient (years)	83.6 (6.7)	Age of family caregiver (years)	59.1(11.6)
Sex of the patient	n (%)	Sex of family caregiver familiar	n (%)
Female	69(71.1)	Female	58(82.9)
Male	28(28.9)	Male	12(17.1)
Level of education of the patient	n (%)	Level of education of family caregiver	n (%)
None	75(77.3)	None	18(25.7)
Primary	17(17.5)	Primary	40(57.1)
Secondary	3(3.1)	Secondary	7(10)
University	2(2.1)	University	5(7.1)
Advance directives	n (%)	Relationship family caregiver	n (%)
	12(12.4)	Spouse	13(18.6)
Tutorships	n (%)	Son/daughter	48(68.6)
NoneInformal	61(62.9)	Brother/sister	3 (4.3)
Formal or legal	30(30.9)	Niece	3 (4.3)
	6(6.2)	Son-in-law	3 (4.3)
Living conditions	n (%)	Hours dedicated family caregiver	n (%)
Alone One persons	13(13.4)	0-6h	9(12.9)
2 or more persons	40(41.3)	7-12h	12(27.1)
	44(45.3)	13-18h	42(60)
Presence of caregiver formal or family	n (%)	Area of residence of family caregiver	n (%)
	86(88.7)	Urban	58(82.9)
Presence of caregiver formal	n (%)	Rural	12(17.1)
	38(39.2)		
Presence of caregiver family	n (%)	Caregiver Strain Index (CSI)	Mean (SD)
	70(72.0)		5.2(3.5)

Table 2. Comparison of the mean base and final clinical assessment scores of the elderly

	Basal Time (T0) Mean (SD)	Final Time (T4) Mean (SD)	p-value
Social support (DUKE)	45.07 (9.13)	43.33 (9.84)	0.14
Loneliness (UCLA)	30.99 (6.96)	30.03 (7.05)	0.099
Comorbidity (CCI)	2.83 (1.85)	3.21 (2.39)	0.35
Functionality (Bhartel)	56.28 (32.41)	50.91 (33.46)	<0.001
Cognitive state (Pheiffer's Test)	3.38 (3.33)	3.82 (3.22)	0.006
Caregiver Strain Index (CSI)	4.80 (3.55)	4.90 (3.52)	0.641

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Table 3. Comparison of the most frequent nursing diagnoses in the 5 moments evaluated

Health pattern	Nursing diagnoses	T0 n(%)	T1 n(%)	T2 n(%)	T3 n(%)	T4 n(%)	p- value
Health perception- health management	Risk of falls	56 (68)	59 (71.9)	59 (71.4)	55 (67.1)	57 (69.5)	0.340
Activity-exercise	Impaired physical mobility	41 (49.5)	41 (49.4)	46 (56)	48 (58.5)	54 (65.9)	0.004
	Impaired ambulation	38 (46.4)	41 (49.4)	41 (50)	40 (48.8)	47 (57.3)	0.033
	Sedentary lifestyle	15 (18.6)	22 (27)	22 (27.4)	23 (28)	25 (30.5)	0.114
	Bathing self-care deficit	19 (23.7)	19 (23.6)	19 (22.6)	18 (22)	20 (24.4)	0.795
	Dressing self-care deficit	13 (15.5)	12 (13.5)	13 (15.5)	15 (18.3)	16 (19.5)	0.034
	Impaired transfer ability	15 (18.6)	14 (16.9)	15 (17.9)	16 (19.5)	16 (19.5)	0.891
	Decreased diversional activity engagement	14 (17.5)	17 (21.3)	17 (20.2)	16 (19.5)	15 (18.3)	0.764
	Toileting self-care deficit	13 (15.5)	13 (15.7)	14 (16.7)	15 (18.3)	15 (18.3)	0.255
	Impaired bed mobility	8 (10.3)	10 (12.4)	11 (13.1)	9 (11)	13 (15.9)	0.084
	Activity intolerance	11 (13.4)	11 (13.5)	11 (13.1)	11 (13.4)	12 (14.6)	0.856
	Feeding self-care deficit	8 (10.3)	11 (13.5)	11 (13.1)	10 (12.2)	10 (12.2)	0.115
Nutritional- metabolic	Risk for impaired skin integrity	27 (33)	25 (30.3)	27 (33.3)	26 (31.7)	27 (32.9)	0.821
	Impaired skin integrity	18 (21.6)	21 (25.8)	21 (26.2)	22 (26.8)	18 (22)	0.461
	Risk for unstable blood glucose level	7 (8.2)	6 (7.9)	9 (10.7)	7 (8.5)	8 (9.8)	0.760
Cognitive-perception	Impaired memory	16 (19.6)	15 (18)	15 (17.9)	16 (19.5)	20 (24.4)	0.076
	Chronic pain	14 (16.5)	16 (19.1)	18 (21.4)	15 (18.3)	16 (19.5)	0.649
	Deficient knowledge	8 (10.3)	8 (10.1)	12 (14.3)	12 (14.6)	8 (9.8)	0.213
Elimination	Impaired urinary elimination	11 (13.4)	10 (12.4)	12 (14.3)	12 (14.6)	15 (18.3)	0.357
	Functional urinary incontinence	12 (14.4)	10 (12.4)	11 (13.1)	11 (13.4)	11 (13.4)	0.720
	Constipation	4 (5.2)	4 (4.5)	8 (9.5)	7 (8.5)	8 (9.8)	0.012
Roles-relationships	Impaired social interaction	4 (5.2)	11 (13.5)	12 (14.3)	11 (13.4)	15 (18.3)	0.001
	Impaired verbal communication	8 (10.3)	10 (12.4)	11 (13.1)	9 (11)	13 (15.9)	0.055
	Risk for caregiver role strain	9 (11.3)	9 (11.2)	11 (13.1)	11 (13.4)	13 (15.9)	0.066
Sleep-rest	Disturbed sleep pattern	9 (11.3)	11 (13.5)	12 (14.3)	11 (13.4)	11 (13.4)	0.472
Self-perception-self-	Risk of loneliness	4	5	8	6	8	0.406

concept		(5.2)	(6.7)	(9.5)	(7.3)	(9.8)	
	Hopelessness	2 (2.1)	2 (2.2)	2 (2.4)	2 (2.4)	4 (4.9)	0.757
Coping – stress tolerance	Generalized adult impairment	13 (15.5)	8 (10.1)	8 (10.7)	9 (11)	8 (9.8)	0.174

For Peer Review

Table 4. Comparison of the most frequent nursing interventions in the 5 moments assessed

Domain	Classes	Nursing interventions	T0 n(%)	T1 n(%)	T2 n(%)	T3 n(%)	T4 n(%)	p-value
Safety	Risk Management	Fall Prevention	61 (74.2)	60 (73)	57 (69)	56 (68.3)	59 (72)	0.762
		Risk identification	30 (36.1)	30 (37.1)	30 (36.9)	25 (30.5)	23 (28)	0.245
		Environmental Management: Safety	26 (32)	28 (33.7)	29 (35.7)	28 (34.1)	26 (31.7)	0.533
		Dementia Management	13 (15.5)	8 (10.1)	8 (9.5)	7 (8.5)	10 (12.2)	0.240
		Immunization/Vaccination Management	8 (10.3)	16 (19.1)	14 (16.7)	10 (12.2)	10 (12.2)	0.273
Physiological: complex	Skin/Wound Management	Skin surveillance	41 (50.5)	45 (55.1)	48 (58.3)	43 (52.4)	50 (61)	0.020
		Pressure ulcer prevention	37 (45.4)	36 (43.8)	38 (46.4)	37 (45.1)	39 (47.6)	0.919
	Tissue Perfusion Management	Cardiac care	12 (14.4)	11 (13.5)	10 (11.9)	8 (9.8)	9 (11)	0.437
		Cardiac Risk Management	7 (8.2)	5 (6.7)	5 (6)	5 (6.1)	4 (4.9)	0.092
	Drug Management	Drug management	16 (19.6)	12 (14.6)	17 (20.2)	16 (19.5)	19 (23.2)	0.088
Family	Lifespan Care	Family support	20 (24.7)	26 (31.5)	26 (32.1)	28 (34.1)	28 (34.1)	0.078
		Caregiver support	45 (54.6)	49 (59.6)	46 (56)	43 (52.4)	46 (56.1)	0.692
Behavioral	Coping Assistance	Emotional support	27 (33)	24 (29.2)	24 (29.8)	24 (29.3)	27 (32.9)	0.690
		Counselling	21 (25.8)	20 (24.7)	18.5 (22.6)	23 (28)	24 (29.3)	0.623
		Decision-Making Support	10 (12.4)	7 (9)	11 (13.1)	11 (13.4)	14 (17.1)	0.223
	Patient Education	Health Education	57 (69.1)	53 (65.2)	60 (72.6)	59 (72)	61 (74.4)	0.489
	Psychological Comfort Promotion	Active listening	40 (48.5)	45 (55.1)	43 (52.4)	41 (50)	45 (54.9)	0.406
		Anxiety Reduction	11 (13.5)	10 (12.4)	8 (9.5)	6 (7.3)	7 (8.5)	0.235
	Behavior Therapy	Patient Contracting	21 (25.8)	21 (25.8)	19 (22.6)	19 (23.2)	21 (25.6)	0.246
		Mutual Goal Setting	14 (17.5)	7 (9)	9 (10.7)	10 (12.2)	8 (9.8)	0.339
Physiological: basic	Activity and Exercise Management	Exercise Therapy: Joint Mobility	16 (19.6)	14 (16.9)	16 (19)	14 (17.1)	15 (18.3)	0.756
		Exercise Promotion: Strength Training	10 (12.4)	14 (16.9)	12 (14.3)	11 (13.4)	10 (12.2)	0.492
		Exercise Therapy: Ambulation	10 (12.4)	11 (13.5)	9 (10.7)	10 (12.2)	11 (13.4)	0.934
		Exercise Therapy: Muscle Control	8 (10.3)	7 (9)	6 (7.1)	5 (6.1)	9 (11)	0.130
	Physical Comfort Promotion	Pain Management	8 (10.3)	14 (16.9)	14 (16.7)	16 (19.5)	17 (20.7)	0.013
		Environmental Management: Comfort	8 (10.3)	8 (10.1)	8 (9.5)	9 (11)	9 (11)	0.959
	Elimination management	Constipation Management	8 (9.3)	9 (11.2)	10 (11.9)	9 (11)	10 (12.2)	0.750
	Immobility management	Positioning	8 (9.3)	14 (16.9)	15 (17.9)	14 (17.1)	10 (12.2)	0.002
Health System	Information Management	Health Care Information Exchange	13 (15.5)	13 (15.7)	15 (17.9)	13 (15.9)	18 (22)	0.252

Table 5. Comparison of the number of contacts with the health services in the 5 moments evaluated

	T1	T2	T3	T4	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	p-value
General practitioner	1.99 (1.91)	2.27 (1.56)	2.66 (2.5)	2.18 (2.5)	0.128
Community-nurse	5.89 (8.01)	6.07 (5.83)	4.77 (5.99)	3.6 (4.3)	0.007
Social worker	0.12 (0.47)	0.01 (0.11)	0.06 (0.28)	0.01 (0.32)	0.119
Specialist	0.44 (0.89)	0.37 (0.65)	0.3 (0.71)	0.18 (0.11)	0.62
Physiotherapist	0.48 (4.45)	0.38 (3.38)	0.13 (1.21)	0.04 (0.33)	0.269
Imaging test	0.3 (0.71)	0.15 (0.44)	0.16 (0.65)	0.17 (0.62)	0.344
Analytical test	0.82 (1.32)	0.71 (1.10)	0.88 (1.80)	0.66 (1.3)	0.733

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Table 6. Comparison of use of services and adverse events in the 4 moments evaluated

Use of services / Adverse events	T1 n (%)	T2 n (%)	T3 n (%)	T4 n (%)	p-value
Visits to emergency services	23(25.8)	20(23.8)	20(24.4)	12(14.6)	0.241
Admittance or re-admittance	14 (15.7)	5 (6)	5 (6.1)	6 (7.3)	0.095
Type of admittance					
Urgent	12 (92.9)	3 (60)	4 (80)	5 (83.3)	NPC
Planned	1 (7.1)	2 (40)	1 (20)	1 (16.7)	
Days of hospital stay (mean; SD)	6.21 (4.3)	3.00 (2.0)	4.60 (3.7)	4.00 (2.3)	NPC
Cause of admittance					
Exacerbation of chronic condition	2 (14.3)	1(20)	2 (40)	4(66.7)	NPC
Surgical intervention	1 (7.1)	1(20)	1(20)	0	
Diagnostic study	1 (7.1)	1(20)	0	0	
Accident or lesion	2 (14.3)	1(20)	0	1(16.7)	
Other	8 (57.1)	1(20)	2(40)	1(16.7)	
Discharge after admittance					
Home	14 (100)	5 (100)	5 (100)	6 (100)	NPC
Hospital transfer	0(0)	0(0)	0(0)	0(0)	
Exitus	0(0)	0(0)	0(0)	0(0)	
Discharging unit					
Internal medicine	8(57.1)	4(80)	3(60)	3(50)	NPC
Cardiology	1(7.1)	1(20)	1(20)	1(16.7)	
Pulmonology	0(0)	0(0)	1(20)	0(0)	
Trauma	1(7.1)	0(0)	0(0)	1(16.7)	
Surgery	1(7.1)	0(0)	0(0)	0(0)	
Other	3(21.4)	0(0)	0(0)	1(16.7)	
Pressure ulcer	11 (12.4)	10 (11.9)	8 (9.8)	8 (9.8)	0.786
Falls	14(15.7)	3(3.6)	6(7.3)	3(3.7)	0.006
Problems related with medication	3 (3.4)	0 (0)	2 (2.4)	3 (3.7)	0.351
Presence of devices	13(14.6)	11(13.1)	9(11)	11(13.4)	0.629
Oxygen therapy	4(4.5)	4(4.8)	4(4.9)	7(8.5)	0.029
Aerosol therapy	2(2.2)	2(2.4)	3(3.7)	3(3.7)	0.392
CPAP	4(4.5)	2(2.4)	2(2.4)	2(2.4)	0.392
Vesical catheter	5(5.6)	4(4.8)	3(3.7)	4(4.9)	0.494
Nasogastric catheter	1(1.1)	1(1.2)	0(0)	0(0)	NPC
Presence of technical help	66(74.2)	63(75)	61(74.4)	62(75.6)	0.096
Adjustable bed	22(24.7)	20(23.8)	21(25.6)	23(28)	0.137
Rails	11(23.6)	19(22.6)	18(22)	19(23.2)	0.261
Anti-bedsore mattress	22(24.7)	22(26.2)	21(25.6)	22(26.8)	0.112
Crane	8(9)	8(9.5)	8(9.8)	8(9.8)	1.000

	Walker	31 (34.8)	28 (33.3)	28 (34.1)	29 (35.4)	0.392
	Crutches	13 (14.6)	13 (15.5)	13 (15.9)	13 (15.9)	1.000
	Self-propelled wheelchair	20 (22.5)	18 (21.4)	18 (22)	20 (24.4)	0.112
	Motorized wheelchair	3 (3.4)	3 (3.6)	3 (3.7)	3 (3.7)	1.000
	Day center	1 (1.1)	1 (1.2)	1 (1.2)	1 (1.2)	1.000
	Home help	14 (15.7)	14 (16.7)	15 (18.3)	15 (18.3)	0.392

NPC: Not possible calculate

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Table 7. NANDA-I Nursing diagnosis linked with the Nursing interventions (NICs)

Nursing diagnoses (NANDA-I)	T0 n (%)	T4 n (%)	Nursing interventions (NIC)	T0 n (%)	T4 n (%)
Risk for falls	56 (68)	57 (69.5)	Fall Prevention Risk identification Environmental Management: Safety	61 (74.2) 30 (36.1) 26 (32)	59 (72) 23 (28) 26 (37.1)
Impaired physical mobility	41 (49.5)	54 (65.9)	Exercise Therapy: Joint Mobility Exercise Promotion: Strength Training	16 (19.6) 10 (12.4)	15 (18.3) 10 (12.2)
Impaired ambulation	38 (46.4)	47 (57.3)	Exercise Therapy: Ambulation	10 (12.4)	11 (13.4)
Risk for impaired skin integrity	27 (33)	27 (32.9)	Skin surveillance Pressure ulcer prevention	41 (50.5) 37 (45.4)	50 (61) 39 (47.6)
Bathing self-care deficit	19 (23.7)	20 (24.4)	Mutual Goal Setting	14 (17.5)	8 (9.8)
Impaired skin integrity	18 (21.6)	18 (22)	Skin surveillance Positioning	41 (50.5) 8 (9.3)	50 (61) 10 (12.2)
Impaired memory	16 (19.6)	20 (24.4)	Emotional support Family support Dementia Management Cardiac care	27 (33) 20 (24.7) 13 (15.5) 12 (14.4)	27 (33) 28 (34.1) 10 (12.2) 9 (11)
Sedentary lifestyle	15 (18.6)	25 (30.5)	Exercise Therapy: Joint Mobility Exercise Therapy: Ambulation Exercise Promotion: Strength Training Exercise Therapy: Muscle Control	16 (19.6) 10 (12.4) 10 (12.4) 8 (10.3)	15 (18.3) 11 (13.4) 10 (12.2) 9 (11)
Impaired transfer ability	15 (18.6)	16 (19.5)	Environmental Management: Safety Positioning	26 (32) 8 (9.3)	26 (37.1) 10 (12.2)
Decreased diversional activity engagement	14 (17.5)	15 (18.3)	Patient Contracting Mutual Goal Setting	21 (25.8) 14 (17.5)	21 (25.6) 8 (9.8)
Chronic pain	14 (16.5)	16 (19.5)	Active listening Drug management Pain Management	40 (48.5) 16 (19.6)	45 (54.9) 19 (23.2)

			Environmental Management: Comfort	8 (10.3) 8 (10.3)	17 (20.7) 9 (11)
Toileting self-care deficit	13 (15.5)	15 (18.3)	Drug management Constipation Management	16 (19.6) 8 (9.3)	19 (23.3) 10 (12.2)
Dressing self-care deficit	13 (15.5)	16 (19.5)	Patient Contracting Mutual Goal Setting	21 (25.8) 14 (17.5)	21 (25.6) 8 (9.8)
Generalized adult impairment	13 (15.5)	8 (9.8)	Health Care Information Exchange Immunization/Vaccination Management Cardiac Risk Management	13 (15.5) 8 (10.3) 7 (8.2)	18 (22) 10 (12.2) 4 (4.9)
Functional urinary incontinence	12 (14.4)	11 (13.4)	Environmental Management: Safety	26 (32)	26 (31.7)
Impaired urinary elimination	11 (13.4)	15 (18.3)	Skin surveillance Drug management	41 (50.5) 16 (19.6)	50 (61) 19 (23.2)
Activity intolerance	11 (13.4)	12 (14.6)	Exercise Promotion: Strength Training Exercise Therapy: Muscle Control	10 (12.4) 8 (10.3)	10 (12.2) 9 (11)
Risk for caregiver role strain	9 (11.3)	13 (15.9)	Caregiver support Family support	45 (54.6) 20 (24.7)	46 (56.1) 28 (34.1)
Disturbed sleep pattern	9 (11.3)	11 (13.4)	Exercise Therapy: Ambulation Environmental Management: Comfort	10 (12.4) 8 (10.3)	11 (13.4) 9 (11)
Feeding self-care deficit	8 (10.3)	10 (12.2)	Patient Contracting Anxiety Reduction	21 (25.8) 11 (13.5)	21 (25.6) 7 (8.5)
Impaired bed mobility	8 (10.3)	13 (15.9)	Fall Prevention Exercise Therapy: Joint Mobility	61(74.2) 16 (19.6)	59 (72) 15 (18.3)
Deficient knowledge	8 (10.3)	8 (9.8)	Counselling Decision-Making Support	21 (25.8) 10 (12.4)	24 (29.3) 14 (17.1)
Impaired verbal communication	8 (10.3)	13 (15.9)	Active listening Dementia Management	40 (48.5) 13 (15.5)	45 (54.9) 10 (12.2)
Risk for unstable blood glucose level	7 (8.2)	8 (9.8)	Health Education Drug management	57 (69.1)	61 (74.4)

				16 (19.6)	19 (23.2)
Constipation	4 (5.2)	8 (9.8)	Constipation Management	8 (9.3)	10 (12.2)
Impaired social interaction	4 (5.2)	15 (18.3)	Active listening Anxiety Reduction	40 (48.5) 11 (13.5)	45 (54.9) 7 (8.5)
Risk of loneliness	4 (5.2)	8 (9.8)	Emotional support Counselling	27 (33) 21 (25.8)	27 (32.9) 24 (29.3)
Hopelessness	2 (2.1)	4 (4.9)	Active listening Emotional support Counselling Decision-Making Support	40 (48.5) 27 (33) 21 (25.8) 10 (12.4)	45 (54.9) 27 (32.9) 24 (29.3) 14 (17.1)