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## Effectiveness of an Acute Care for Elders unit at a long-term care facility for frail older patients with COVID-19

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## ABSTRACT

The Acute Care for Elders (ACE) is a model of care addressed to reduce the incidence of loss of self-care abilities of older adults occurring during hospitalization for acute illness.

This observational study aimed to describe the effectiveness of an ACE unit at a long-term care facility to prevent functional decline (decrease in the Barthel Index score of >5 points from admission to discharge) in older adults with frailty (Clinical Frailty Scale score  $\geq 5$ ) and symptomatic COVID-19.

Fifty-one patients (mean age: 80.2 + 9.1 years) were included. Twenty-eight (54.9%) were women, with a median Barthel index of 50 (IQR:30–60) and Charlson of 6 (IQR: 5–7), and 33 (64.7%) had cognitive impairment.

At discharge, 36(70.6%) patients had no functional decline, 6 (11.7%) were transferred to hospital and 4(7.8%) died. An ACE unit at a long-term care facility constitutes an alternative to hospital care to prevent hospital-associated disability for frail older patients with COVID-19.

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## Introduction

During hospitalization for an acute event such as illness or injury, older adults are at risk of suffering functional decline and other medical complications, including falls, pressure ulcers, and delirium, which further contribute to functional decline.<sup>1–5</sup> This negative clinical outcome during acute hospitalization, referred as hospital-associated disability, is highly prevalent, varying from 30% to 80% depending on the assessment methodology, medical status, and age cohorts included,<sup>5</sup> and it is associated with poor quality of life, re-hospitalization, institutionalization, mortality and greater hospital expenditures in older adults.<sup>1–5</sup>

Early intervention is essential to reduce the huge impact of hospital-associated disability because of the short length of time during which older persons can recover functional losses and resume their former lives.<sup>6–8</sup> In this sense, specific geriatric units, based on a rehabilitation and function-focused model of care, called Acute Care for Elders (ACE), have been shown to be effective for the prevention of functional decline and related complications in older patients during the acute phase of hospitalization.<sup>9–13</sup> The ACE model of care consists of four core components: patient-centered care with proactive geriatric assessments, nurse-driven care plans for the prevention and management of geriatric syndromes, comprehensive care transition

planning beginning at admission and medical care review aimed at preventing iatrogenesis and incident geriatric syndromes in a clinical environment that encourages safe patient self-care.<sup>9–13</sup> The care is delivered by interdisciplinary teams, which can include geriatricians, advanced practice nurses, social workers, pharmacists, and physical therapists.<sup>9–13</sup>

In response to the high burden of hospital-associated disability, service providers have adopted the ACE model on hospital units for older adults admitted. Anyway, there is no data about the success of the ACE model for older adults admitted in a COVID-19 unit. In this clinical scenario, older patients are at increased risk of hospital-associated disability as a consequence of the severity of the COVID-19, that requires high needs of oxygen support and causes prolonged length of stay and immobilization,<sup>14–17</sup> and the particularities of confined COVID-19 units, that operate with strict quarantines and restricted social and family activities.<sup>18,19</sup>

The purpose of this study was to describe the feasibility and effectiveness of an ACE unit located in a long-term care facility to reduce hospital-associated disability and medical complications of older patients with COVID-19.

## Material and methods

## Design and setting

This observational study was conducted at the Emili Mira Healthcare Center, a public acute and long-term care facility for medical and

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psychosocial rehabilitation in Barcelona, (Spain) dependent on a large tertiary teaching hospital. The center has 3 main buildings for care; one for acute psychiatric care and two for geriatric and psychiatric long-term care.

### Intervention

When the national state of alarm was declared on March 14, 2020, a COVID-19 unit was created at the Emili Mira Healthcare Center. The rules and functioning of the unit were designed by the infection prevention and control program and approved by the medical direction of the center. The unit was confined and separated on a different floor from other units of the facility without confirmed COVID-19 cases, droplet and contact isolation measures were applied and visits from families and caregivers were restricted.

Intravenous therapies including fluids, nutrition and antibiotics were available at the unit. Oxygen therapy was administered through a face mask or nasal cannula. Blood and urine tests were carried out at the facility and chest X-rays at the referral hospital. Personal protective equipment and training were supplied by the referral hospital.

Geriatric nurses, certified nursing assistants, a social worker and a geriatrician specialized in infectious diseases from the Emili Mira Center voluntarily comprised the interdisciplinary health care team assigned to work exclusively at the COVID-19 unit. The multidisciplinary team developed a holistic patient-centered care plan based on the ACE model,<sup>9–13</sup> with the goal of having the patient return to their baseline physical functioning, and weekly assessed the patient's evolution.

Geriatric nurses undertook patient care, particularly for the prevention and early detection of geriatric syndromes, and the basic nursing interventions to promote and maintain mobility and basic self-care, including bed-chair transfer, once-daily walking training, established trips to the toilet and all daytime meals seated. Nursing assistants took care of bathing, feeding and general care and establishing a patient's video call with their caregivers or family on a daily basis.

The geriatrician's role was primarily medical care review, including the pre-established care plan for each individual, attention to the subject's health problems and COVID-19 treatment according to the local clinical guidelines.<sup>20</sup>

Test-based strategy, including the resolution of symptoms and a negative real-time reverse-transcription polymerase chain reaction assay (RT-PCR) for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was used to discharge older patients from the ACE unit to their long-term care facilities.

### Participants

Patients admitted to the unit were referred from the public long-term care facilities of the same health area of the Emili Mira Center during the national state of alarm period from March 14 to June 21, 2020

All consecutive patients  $\geq 65$  years of age with symptomatic COVID-19 and frailty (score  $\geq 5$  on the Clinical Frailty Scale) were included in the study. Asymptomatic patients with a positive test for SARS-Cov2 RT-PCR and those with total dependence (score  $< 20$  on the Barthel index) admitted to the COVID-19 unit were excluded.

### End-point and instruments

The primary end point was change in functional status from admission (baseline) to unit discharge, using the Barthel Index, a 10-item clinical tool measuring a patient's ability in activities of daily living, including feeding, bathing, personal toileting, dressing, bowel and bladder control, getting on and off the toilet, moving from chair to bed and returning, walking on level surfaces, and ascending/

descending stairs. The total Barthel Index score ranges from 0 (worst independence in activities of daily living) to 100 (full independence in activities of daily living). Levels of dependency based on Barthel Index scoring are categorized as total dependency (0–20), severe dependency (21–60) moderate dependency (61–90), and slight dependency (91–100).<sup>21</sup>

Functional decline was defined as a decrease in the Barthel Index score of at least five points from admission to discharge.<sup>22</sup>

Other individual level variables for geriatric assessment were collected using different instruments: the CFS scale (Clinical Frailty Scale) for frailty diagnosis, the Charlson index for predicting mortality according to comorbidities, the Brief Interview for Mental Status for cognitive impairment screening and the Confusion Assessment Method for delirium.<sup>23</sup>

### Statistics

Descriptive statistics were expressed as mean, standard deviation, median and range for quantitative variables and absolute frequencies and percentages for qualitative variables. The chi-square test was used to compare categorical variables and Mann–Whitney *U* test for quantitative variables that did not follow a normal distribution. A *p* value  $< 0.05$  was considered significant. Analyses were made using SPSS software, version 17.0.0 (Chicago, Illinois).

### Ethical considerations

The study complied with the ethical statements in the Declaration of Helsinki (64th General Assembly, Fortaleza, Brazil, October 2013) and was approved by the local Ethics Committee

(Ethics Committee for Scientific Research IMIM, Barcelona, Spain, CEIm-2020/9479).

### Results

In total 63 patients were admitted to the unit, of whom 12 were excluded for the study: 7 for Barthel Index score of 0, 3 for asymptomatic and 2 for age  $< 65$  years. Finally, 51 older patients were included in the study: 41 from the Emili Mira long-term care facility and 10 from others.

Clinical characteristics of the patients studied are shown in [Table 1](#). Patients included were older and had a high prevalence of cognitive and functional impairment and comorbidities.

The most prevalent comorbidities were hypertension in 40(78.1%) cases, diabetes in 15(29.4%), chronic kidney disease in 14(27.5%), chronic obstructive pulmonary disease in 10 (19.6%), congestive heart failure in 10 (19.6%) and cancer in 4(7.8%).

Severe cases with viral pneumonia requiring oxygen therapy comprised 19 (37.3%) patients who had a longer median duration of symptoms, 9 (7–10) vs. 2.5(2–3) (*p* 0.01) and a higher proportion of cough, 18(94.7%) vs. 13(40.6%) (*p* 0.01) than mild cases.

One or more acute medical events developed in 33(64.7%) patients during admission. Delirium was developed in 17(33.3%) and others geriatric syndromes in 4(7.8%) %, including pressure ulcer(2) and a falls (2).

At admission, 46(90.2%) patients had severe functional dependency, 3(5.9%) moderate dependency and 2(3.9%) slight dependency. At discharge, 36(70.6%) patients had no changes in their Barthel Index score and 15(29.4%) patients had changes with a median of 10 points (range: 5–20). Three patients changed their independence status from severe to total dependency.

Six patients (11.7%) were transferred to hospital for acute care: one for severe anemia secondary to bicalutamide, one for pulmonary embolism, one for ischemic cerebral stroke, one for third-degree

**Table 1**  
Clinical characteristics of older people admitted to the COVID-19 unit.

| Variable                           | Total      |
|------------------------------------|------------|
| n                                  | 51         |
| Age <sup>a</sup> (years)           | 80.2 ± 9.1 |
| Gender (women)                     | 28 (54.9%) |
| Barthel index <sup>b</sup>         | 50(30–60)  |
| Charlson index <sup>b</sup>        | 6(5–7)     |
| Cognitive impairment               | 33(64.7%)  |
| Albumin <sup>a</sup> (g/dL)        | 3.4 ± 0.5  |
| Hemoglobin <sup>a</sup> (g/dL)     | 11.7 ± 1.6 |
| Symptoms                           |            |
| fever                              | 44(86.3%)  |
| cough                              | 31(60.8%)  |
| dyspnea                            | 19 (37.3%) |
| gastrointestinal                   | 3(5.9%)    |
| viral pneumonia                    | 19 (37.3%) |
| Acute medical events               |            |
| delirium                           | 17(33%)    |
| decompensated chronic disease      | 11(21.5%)  |
| infections                         | 8(15.7%)   |
| other geriatric syndromes          | 4(7.8%)    |
| Acute hospital transfer            | 6(11.7%)   |
| Mortality                          | 4(7.8%)    |
| Length of stay <sup>a</sup> (days) | 25.9 + 5.9 |

Data are presented as No. (%) unless otherwise indicated.

<sup>a</sup> Data presented as mean and standard deviation.

<sup>b</sup> Data presented as median and interquartile range (25–75). Abbreviations: g, grams; dL deciliter

atrioventricular block, one for traumatic intracerebral hematoma and one for possible COVID-19 encephalitis.

Four patients (7.8%) died during the first month post-COVID-19 diagnosis: one from COVID-19 pneumonia, one from urinary sepsis, one from ischemic cerebral stroke and one from possible Covid-19 encephalitis. No differences in mortality were observed among severe cases, 1(5.2%) compared to 3(9.4%) mild cases ( $p$  0.52).

Median time from admission to discharge was 25.9 + 5.9 days.

## Discussion

This study showed the feasibility of the implementation of the ACE model in a confined unit for older adults with COVID-19 and frailty. Moreover, only about a third of patients worsened their previous baseline activities of daily living, which is according to the previous data.<sup>5</sup> However, this results were achieved in a subgroup of patients with a high prevalence of risk factors for loss of hospital-associated disability, including frailty and high levels of physical dependence,<sup>1–5</sup> admitted to a unfavorable clinical setting.<sup>18,19</sup> In this sense, despite the COVID-19 unit was located in a long-term care facility with all due physical environmental modifications for the safety of patients, they were confined to their rooms by mandatory quarantine to avoid the spread of COVID-19 and visits from families and caregivers and social activities were restricted.<sup>18,19</sup> These conditions are associated to a feeling of loneliness and environment of social isolation which are predictive factors for the loss of activities of daily living and frailty progression in the community and acute care.<sup>24–28</sup> Furthermore, restricted visits to the COVID-19 unit impeded families and caregivers participating in patient care, which is an important factor for success in patient-centered acute care.<sup>29,30</sup>

One of the cornerstone of the ACE model of this study was the implementation of the basic nursing interventions to promote and maintain mobility and self-care of patients. It is important, as early physical rehabilitation care for acutely hospitalized older adults leads to functional benefits, reduces nursing home discharges and can be safely executed by nurses.<sup>6,7</sup> In addition, motivated and geriatrics specialized nurses could influence the quality of nursing care and the results of this study,<sup>31,32</sup> as they were recruited voluntarily from the

geriatric long-term care of the center and had specific training in geriatric care .

It should be noted the importance of comorbidities on the evolution of COVID-19. Older adults with acute diseases characteristically have comorbidities that precipitate the disease and complicate its management.<sup>33,34</sup> In this regard, this study showed that two thirds of frailty older patients with COVID-19 had another concurrent acute medical event, being delirium the most frequent. Although factors associated with delirium in patients with COVID-19 are multifactorial.<sup>35,36</sup> the characteristics of COVID-19 units, including quarantine, restricted visiting policy and limited support from family and caregivers,<sup>18,19</sup> are contributing factors for disorientation and lack of awareness in older patients. Therefore, delirium should be actively screened for and prevented in the confined units to limit its impact on older patients with COVID-19. In this study, the non-pharmacologic interventions, such as regular care-provider contact and patient re-orientation were provided to prevent delirium during admission.<sup>37</sup>

Finally, other interesting results observed in this study were the low mortality, which contrasts with the high mortality rates among older people with COVID-19, particularly for those are residents of long-term care facilities<sup>38–40</sup> and the few acute-care transfers to a hospital, mainly due to the lack of diagnostic tests or therapies in the unit. This fact is remarkable since, during an emerging pathogen outbreak, ambulance services and hospital emergency departments can be overwhelmed by symptomatic patients,<sup>41</sup> and long-term care facilities may alleviate the problem by creating specific units to manage affected patients and reducing transfers to acute care. Moreover, these specific units could be an alternative for patients with COVID-19 and advance care and end-of-life care planning who do not want to be transferred to the hospital.<sup>42</sup>

## Strengths and limitations

This study had some limitations, namely the small number of older patients included and lack of a control group of older patients receiving in-hospital disease-centered care. However, the sample was representative of frail older people residing in long-term care facilities, including those with a high number of underlying chronic conditions and disabilities and patients with different COVID-19 severity grades.

## Conclusions

This study showed the feasibility of the implementation of the ACE model in a confined unit for older adults with COVID-19 and frailty, however, further research is needed to determine the success of the ACE units to aid recovery from COVID-19 in older adults and reduce hospital-associated disability.

The findings of this study are significant for clinicians, hospital administrators, policy-makers and funders. The decision to create an ACE unit at long-term care facility for older patients with COVID-19 will depend on local health policies and the availability of resources, particularly trained staff and the supply of personal protective equipment. However, this is an opportunity for nurse leaders and health-care organizations to reclaim functional care needs of older patients with COVID-19.

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