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ORIGINAL ARTICLE

Quality of life and persistent symptoms after hospitalization for COVID-19. A prospective observational study comparing ICU with non-ICU patients☆

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Abstract

Background: Hospitalized COVID-19 patients are prone to develop persistent symptoms and to show reduced quality of life following hospital admission.

Methods: Prospective cohort study of COVID-19 patients admitted to a hospital from March 1 to April 30, 2020. The primary outcome was to compare health related quality of life and persistent symptoms six months after hospital admission, of COVID-19 patients who required ICU admission with those who did not.

Results: Among the 242 patients hospitalized during the defined period of time, 44 (18.2%) needed ICU admission. Forty (16.5%) patients died during hospital admission. Two hundred and two (83.5%) patients were discharged alive from the hospital. At six months, 183 (75.6%) patients completed the questionnaires (32 ICU patients and 151 non ICU patients). Ninety-six (52.4%) reported decreased quality of life and 143 (78.1%) described persistent symptoms. More ICU patients showed worsening of their quality of life (71.9% vs 43.7%, P=0.004). There were no

KEYWORDS

COVID-19; SARS-CoV-2; Critically ill patients; Acute respiratory distress (ARDS); Health-related quality of life; Functional status

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Introduction

Coronavirus disease 2019 (COVID-19), the infection caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), is a newly recognized disease that has spread rapidly around the world. The clinical spectrum of COVID-19 ranges from mild to critically ill cases. Although most patients present fever, cough, myalgia, or fatigue with favourable evolution, some patients develop dyspnoea and hypoxemia requiring hospitalization and/or intensive care unit (ICU) admission. The mode of transmission, general epidemiological findings, clinical presentation, treatments, and short-term outcomes, including mortality, have been described elsewhere. However, long-term outcomes in hospitalized patients have rarely been reported. These patients are prone to persistent symptoms and a reduced health-related quality of life (HRQoL) that impact their ability to care for themselves and to perform usual activities in the months following hospital discharge, especially those who have been admitted to the ICU. HRQoL is a major component of outcomes after hospital discharge, especially after intensive care admission, and should be systematically assessed. The aim of this study was to compare HRQoL and persistent symptoms 6 months after hospital admission among COVID-19 patients who required ICU admission and those who did not.

Methods

This prospective cohort observational study was performed at the University Hospital of Santiago de Compostela,
in Northwest Spain. The Galicia (Spain) ethics committee (CEImG) approved this study under number 2020-188. Informed consent was obtained from all participants by telephone. All adult patients admitted between 1 March and 30 April 2020 with SARS-CoV-2 infection confirmed by polymerase chain reaction (PCR) performed on a nasopharyngeal sample were included. Clinical outcomes were monitored until 1 November 2020, the date of last follow-up.

Age, gender, medical history, home treatment, labs on admission, hospital treatment, need for intensive care unit (ICU) admission, ICU treatment, in-hospital outcome, and outcome at 6 months after hospital admission were collected.

Data from all patients who survived were included in order to evaluate health-related quality of life (HRQoL), functional status, and persistent symptoms using a structured interview conducted by trained study investigators 6 months after hospital admission. HRQOL was assessed using the EuroQol Group Association 5-domain, 3-level questionnaire (EQ-5D-3L), which consists of 2 sections: the descriptive system and the visual analogue scale. The descriptive system measures 5 domains of health, including mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, and assesses each domain across 3 levels: no problems, some problems, or extreme problems. The individual domains were converted to a utility score (EQ-5D index) ranging from -0.59 to 1.00, with 1.00 indicating full health and 0 indicating a state as bad as being dead. The visual analogue scale (EQ-VAS) ranges from 0—worst imaginable health state and 100—best imaginable health state. Participants were also asked to describe persistent symptoms potentially correlated with COVID-19 (dyspnoea on exertion, dyspnoea on mild exertion, asthenia, apathy, myalgia, arthralgia, chest pain, anosmia, cough, sleep disorder, hair loss, memory loss, visual disturbances), and to evaluate their quality of life 1–3 months before COVID-19.

The primary outcome was to compare HRQoL and persistent symptoms 6 months after hospital admission in COVID-19 patients who required ICU admission with those who did not.

The secondary outcome was to determine factors associated with poor HRQoL in COVID-19 patients 6 months after hospital admission.

Statistical analyses

All analyses were performed using R (version 4.0.2; R Foundation for Statistical Computing) and IBM SPSS (version 26; SPSS, Inc., Chicago, IL, USA). Quantitative variables are expressed as median, interquartile range (IQR) or mean, standard deviation (SD) and categorical variables as number (%). The means for continuous variables were compared using unpaired or paired t-tests when the data were normally distributed; otherwise, the Mann–Whitney U test or Wilcoxon test were used. Proportions for categorical variables were compared using Pearson’s chi square or Fisher’s exact test, as appropriate; McNemar’s test was used to compare paired proportions.

Multivariable logistic regression analyses were used to determine factors associated with poor quality of life prior to and 6 months after hospitalization. Significant factors identified in the univariate analysis and clinically relevant variables were considered for inclusion in the multivariate models. All tests were 2-sided, with a significance level of \( P < 0.05 \).

Results

Forty-four (18.2%) of the 242 patients included during the study period required ICU admission. There were no differences between patients who did or did not require ICU admission in relation to demographics, comorbidities, or home treatment (Table 1). Table 1 shows the clinical course, and treatment administered during the hospital stay. ICU patients received corticosteroids and tocilizumab more frequently than non ICU patients. Mean (SD) APACHE II score in the 44 ICU patients was 13.09 (4.52), 21 (70.5%) patients required mechanical ventilation, and 8 (21.1%) required tracheostomy. Forty (16.5%) patients died (10 in ICU and 30 on the ward).

Two hundred and two patients were discharged from the Hospital. At 6 months, 183 patients completed the quality-of-life questionnaire (32 needed ICU admission and 151 did not). The study flow chart is shown in Fig. 1.

The results of the quality of life questionnaire (EQ-3D-3L) at the 6-month interview are shown in Tables 2 and 3. Ninety-six (52.4%) patients reported worsening in at least 1 of the 5 dimensions analysed in the EQ-5D-3L, and 44 (24%) patients reported worsening in 2 or more dimensions. The most frequently reported problems were anxiety/depression (37.7%) and pain/discomfort (35.0%). More women than men reported problems in performing their usual activities (25.0% vs 12.1%, \( P = 0.024 \)), pain/discomfort (45.2% vs 26.3%, \( P = 0.007 \)), and anxiety/depression (53.6% vs 24.2%, \( P < 0.001 \)). Need for mechanical ventilation during hospital admission was associated with worsened mobility (63.6% vs 17.4, \( P < 0.001 \)), performance of usual activities (49.9% vs 14.9, \( P = 0.006 \)), pain/discomfort (59.1% vs 31.7%, \( P = 0.011 \)), and anxiety/depression (68.2% vs 33.5%, \( P = 0.002 \)). Age, length of hospital stay and need of ICU admission were associated with worsening in all 5 dimensions studied.

ICU patients reported a significantly reduced quality of life measured on the EQ-5D index score and VAS score compared with non ICU patients (Table 2). More ICU patients showed worsening in at least 1 of the 5 dimensions studied (71.9% vs 43.7%, \( P = 0.004 \)), or in 2 or more dimensions (59.4% vs 16.6%, \( P < 0.001 \)) compared with non ICU patients.

Table 4 shows persistent symptoms potentially correlated with COVID-19 observed in the 183 study patients. Only 40 (21.8%) patients were completely free of persistent symptoms at the 6-month interview. The most frequent persistent symptoms reported were dyspnoea on exertion (53.0%), asthenia (33.9%), sleep disorder (30.6%), hair loss (30.6%), arthralgia (30.1%) and myalgia (29.5). There were no differences between the proportion of ICU and non ICU patients with persistent symptoms (8.7% v 76.2%, \( P = 0.159 \)). Compared with non ICU patients, ICU patients reported more dyspnoea on exertion, dyspnoea on mild exertion, and asthenia (Table 4).

Sex, age, length of hospital stay, comorbidity and need for ICU admission were included as independent variables in a multivariate logistic regression analysis (Table 5). Age
# Table 1  Demographics, clinical characteristics, and treatments during hospitalization (n = 242).

| Characteristics | All hospitalized patients | ICU patients | Non ICU patients | P value |
|-----------------|--------------------------|--------------|------------------|---------|
| Demographics    | No = 242                 | No = 44      | No = 198         |         |
| Age, mean (SD)  | 65.94 (14.08)            | 66.07 (11.17)| 65.91 (14.68)    | 0.987   |
| Age, n (%)      |                          |              |                  |         |
| <50             | 32 (13.2)                | 5 (11.4)     | 27 (13.6)        | 0.710   |
| 50–70           | 113 (46.7)               | 23 (52.3)    | 90 (45.5)        |         |
| >70             | 97 (40.1)                | 16 (36.4)    | 81 (40.9)        |         |
| Male sex, n (%) |                          |              |                  |         |
| No = 242        |                          |              |                  |         |
| Comorbidities, n (%) |                |              |                  |         |
| Hypertension    | 107 (44.2)               | 22 (50.0)    | 85 (42.9)        | 0.393   |
| Hyperlipidaemia | 90 (37.2)                | 13 (29.5)    | 77 (38.9)        | 0.246   |
| Obesity (BMI ≥ 30 kg m⁻²) | 70 (28.9)       | 13 (29.5)    | 57 (28.8)        | 0.920   |
| Diabetes        | 52 (21.6)                | 12 (27.3)    | 40 (20.3)        | 0.310   |
| Chronic pulmonary disease | 44 (18.2)   | 6 (13.6)     | 38 (19.2)        | 0.387   |
| Chronic Heart disease | 32 (13.2)   | 7 (15.9)     | 25 (12.6)        | 0.561   |
| Home treatments, n (%) |                |              |                  |         |
| ACE inhibitors  | 26 (10.7)                | 8 (18.2)     | 18 (9.1)         | 0.103   |
| Anticoagulants  | 21 (8.7)                 | 4 (9.1)      | 17 (8.6)         | 0.999   |
| Antipileptals   | 29 (12.0)                | 2 (4.5)      | 27 (13.6)        | 0.093   |
| Statins         | 90 (37.2)                | 13 (29.5)    | 77 (38.9)        | 0.246   |
| Laboratory parameters, median (IQR) |                |              |                  |         |
| Lymphocyte count, /µL | 800.00 (560.00–1250.00) | 510.00 (380.00–800.00) | 940.00 (630.00–1360.00) | <0.001 |
| Lactate dehydrogenase, U/L | 344.00 (250.50–493.50) | 419.00 (298.75–748.50) | 322.00 (241.00–427.50) | <0.001 |
| D-dimer, ng/mL  | 719.50 (445.50–1261.75)  | 996.50 (603.75–1509.00) | 653.50 (413.50–1148.75) | 0.004   |
| C-reactive protein, mg/L | 7.00 (3.08–13.00)      | 13.00 (6.70–16.99) | 6.28 (2.74–11.00) | <0.001 |
| Procalcitonin, ng/mL | 0.11 (0.07–0.20)     | 0.13 (0.10–0.66) | 0.10 (0.06–0.18) | 0.007   |
| Serum Ferritin, µg/L | 548.00 (320.00–1161.00) | 1179.50 (504.00–920.00) | 505.00 (258.50–937.50) | <0.001 |
| Hospital treatments, n (%) |                |              |                  |         |
| Lopinavir-ritonavir | 206 (85.5)            | 41 (95.3)    | 165 (83.3)       | 0.043   |
| Hydroxychloroquine | 232 (96.3)           | 41 (95.3)    | 191 (96.5)       | 0.664   |
| Azithromycin     | 218 (90.8)              | 39 (92.9)    | 179 (90.4)       | 0.774   |
| Tocilizumab      | 31 (12.8)               | 22 (50.0)    | 9 (4.5)          | <0.001  |
| Corticosteroids  | 91 (37.6)               | 40 (90.9)    | 51 (25.8)        | <0.001  |
| Characteristics during hospitalization |                |              |                  |         |
| Died during ICU stay, n (%) | 10 (4.1)             | 10 (22.7)    |                  |         |
| Died during hospitalization, n (%) | 30 (12.4)            | 11 (25.0)    | 29 (14.6)        | 0.094   |
| Length of hospital stay, days median (IQR) | 10.00 (7.00–17.00)  | 28.00 (18.00–43.00) | 9.00 (7.00–12.75) | <0.001 |
| Invasive ventilation, n (%) | 31 (12.8)            | 31 (70.5)    |                  |         |
| Tracheostomy, n (%) | 8 (3.3)               | 8 (21.1)     |                  |         |
| Duration of MV, days, median (IQR) | 8.50 (0.00–18.00) | 8.50 (0.00–18.00) |                  |         |
| Length of ICU stay, days, median (IQR) | 13.00 (7.25–30.50) | 13.00 (7.25–30.50) |                  |         |
| APACHE II, mean (SD) | 13.09 (4.52)         | 13.09 (4.52) |                  |         |
| Characteristics after hospital discharge, n (%) |                |              |                  |         |
| Hospital readmission | 19 (8.3)              | 6 (13.6)     | 13 (7.0)         | 0.217   |
| Died after hospital discharge | 5 (2.1)            | 1 (2.3)      | 4 (2.0)          | 0.999   |
| Total died at 6 months | 45 (18.6)            | 12 (27.3)    | 33 (16.7)        | 0.089   |

Data shown as number (percentage), median (interquartile range), or mean (standard deviation). ACE: Angiotensin-converting-enzyme; APACHE II: Acute Physiology and Chronic Health disease Classification System II; BMI: Body mass index; ICU: intensive care unit; IQR: interquartile range; MV: mechanical ventilation.
Table 2  Quality of life and functional status (n = 183).

| Characteristics: | Quality of life (EQ-5D-3L) | P value | Usual activities: | No = 183 | 6 months after COVID-19 | No = 183 | P value | Characteristics: | No = 183 | 6 months after COVID-19 | No = 183 | P value |
|------------------|---------------------------|---------|-------------------|---------|------------------------|---------|---------|------------------|---------|------------------------|---------|---------|
| Mobility:        |                           |         |                   |         |                        |         |         |                   |         |                        |         |         |
| No problems      | 169 (92.3)                | <0.001  | No problems       | 177 (96.7) | 0.016                  |         |         | No problems       | 176 (96.2) | <0.001                  |         |         |
| Some problems    | 14 (7.7)                  |         | Unable to walk    | 6 (3.3)  | 0.016                  |         |         | Some problems    | 7 (3.8)   | <0.001                  |         |         |
| Self-care:       |                           |         |                   |         |                        |         |         | Unable to walk   | 13 (7.1)  | 0.016                  |         |         |
| No problems      | 141 (77.0)                |         |                   |         |                        |         |         | Some problems    | 150 (82.0) | <0.001                  |         |         |
| Some problems    | 42 (17.4)                 |         | Unable to       | 33 (18.0) | 0.016                  |         |         | Unable to       | 13 (7.9)  | 0.016                  |         |         |
| Usual activities:|                           |         |                   |         |                        |         |         |                   |         |                        |         |         |
| No problems      | 165 (90.2)                | <0.001  | No problems       | 171 (93.4) | <0.001                 |         |         | No problems       | 159 (65.0) | <0.001                  |         |         |
| Some problems    | 18 (9.8)                  |         | Unable to perform| 114 (62.3) | <0.001                 |         |         | Some problems    | 64 (35.0) | <0.001                  |         |         |
| Anxiety or depression |                   |         |                   |         |                        |         |         | Some problems    | 69 (37.7) | <0.001                  |         |         |
| Not anxious or    |                           |         |                   |         |                        |         |         |有些人 | 0 (0.0)   | <0.001                  |         |         |
| depressed         |                           |         |                   |         |                        |         |         | depressed         | 12 (6.6) | <0.001                  |         |         |
| EQ-5D index       | 0.9474 (0.1306)           | <0.001  |                   |         |                        |         |         |                   | 0.8074 (0.2173) | <0.001                |         |         |
| EQ-VAS (0–100)    | 85.81 (14.74)             | <0.001  |                   |         |                        |         |         |                   | 72.51 (18.85) | <0.001                |         |         |

Data shown as n (%) or mean (SD). Quality of life measured using the EuroQol, 5-dimension, 3-level questionnaire, the EQ-5D index, and the EQ-VAS (0–100). Bold indicates statistical significance.
Table 3 Percentage of EQ-5D problems reported.

|                   |     |     |     |     |     |     |     |
|-------------------|-----|-----|-----|-----|-----|-----|-----|
|                   | Mobility | Self-care | Usual activities | Pain or discomfort | Anxiety or depression |
|                   | Problems or unable | P | Problems or unable | P | Problems or unable | P | Some or extreme | P | Moderate or extreme | P |
| Sex:              |     |     |     |     |     |     |     |
| Male              | 19 (19.2) | 0.189 | 7 (7.1) | 0.985 | 12 (12.1) | 0.024 | 26 (26.3) | 0.007 | 24 (24.2) | <0.001 |
| Female            | 23 (27.4) |     | 6 (7.1) |     | 21 (25.0) |     | 38 (45.2) |     | 45 (53.6) |     |
| ICU               |     |     |     |     |     |     |     |
| ICU              | 19 (59.4) | <0.001 | 5 (15.6) | 0.039 | 12 (37.5) | 0.002 | 17 (53.1) | 0.018 | 20 (62.5) | 0.001 |
| Not ICU           | 23 (15.2) |     | 8 (5.3) |     | 21 (37.5) |     | 47 (31.1) |     | 49 (32.5) |     |
| Comorbidity       |     |     |     |     |     |     |     |
| No                | 16 (21.9) | 0.787 | 3 (4.1) | 0.199 | 12 (16.4) | 0.648 | 24 (32.9) | 0.628 | 28 (38.4) | 0.882 |
| Yes               | 31 (23.3) | 0.851 | 9 (6.8) | 0.753 | 26 (19.5) | 0.384 | 45 (33.8) | 0.599 | 50 (37.6) | 0.960 |
| Obesity           |     |     |     |     |     |     |     |
| No                | 26 (24.5) | 0.552 | 6 (5.7) | 0.372 | 20 (18.9) | 0.730 | 35 (33.0) | 0.516 | 41 (38.7) | 0.750 |
| Yes               | 31 (21.9) | 0.388 | 7 (9.1) | 0.467 | 26 (17.2) | 0.480 | 50 (33.1) | 0.201 | 59 (39.1) | 0.476 |
| Hypertension      |     |     |     |     |     |     |     |
| No                | 16 (20.8) | 0.796 | 10 (6.6) | 0.462 | 27 (17.2) | 0.480 | 50 (33.1) | 0.201 | 59 (39.1) | 0.476 |
| Yes               | 39 (23.4) | 0.676 | 11 (6.6) | 0.317 | 30 (18.0) | 0.999 | 58 (34.7) | 0.824 | 63 (37.7) | 0.986 |
| Diabetes          |     |     |     |     |     |     |     |
| No                | 13 (18.8) | 0.317 | 3 (12.5) | 0.317 | 13 (18.8) | 0.999 | 58 (34.7) | 0.824 | 63 (37.7) | 0.986 |
| Yes               | 37 (23.7) | 0.553 | 10 (6.4) | 0.412 | 28 (17.9) | 0.999 | 54 (34.6) | 0.808 | 59 (37.8) | 0.938 |
| Chronic heart disease |     |     |     |     |     |     |     |
| No                | 37 (23.7) | 0.553 | 10 (6.4) | 0.412 | 28 (17.9) | 0.999 | 54 (34.6) | 0.808 | 59 (37.8) | 0.938 |
| Yes               | 3 (18.8) | 0.317 | 3 (12.5) | 0.317 | 13 (18.8) | 0.999 | 58 (34.7) | 0.824 | 63 (37.7) | 0.986 |
| Chronic pulmonary disease |     |     |     |     |     |     |     |
| No                | 28 (17.4) | <0.001 | 9 (5.6) | 0.054 | 24 (14.9) | 0.006 | 51 (31.7) | 0.011 | 54 (33.5) | 0.002 |
| Yes               | 14 (63.6) | 0.023 | 70 (31.9) | 0.026 | 68.24 (11.15) | 0.009 | 64.25 (12.81) | 0.436 | 63.22 (13.60) | 0.698 |
| Mechanical ventilation |     |     |     |     |     |     |     |
| No                | 28 (17.4) | <0.001 | 9 (5.6) | 0.054 | 24 (14.9) | 0.006 | 51 (31.7) | 0.011 | 54 (33.5) | 0.002 |
| Yes               | 14 (63.6) | 0.023 | 70 (31.9) | 0.026 | 68.24 (11.15) | 0.009 | 64.25 (12.81) | 0.436 | 63.22 (13.60) | 0.698 |

Age, mean (SD) | 67.19 (11.05) | 0.023 | 70.31 (9.94) | 0.026 | 68.24 (11.15) | 0.009 | 64.25 (12.81) | 0.436 | 63.22 (13.60) | 0.698 |

Length of hospital stay, median (IR) | 18.0 (8.0−36.75) | <0.001 | 20.0 (12.5−68.0) | 0.001 | 17.0 (11.0−37.5) | <0.001 | 12.0 (8.0−20.0) | 0.003 | 12.0 (8.0−20.0) | 0.005 |

Data are shown as n (%), mean (SD), or median (IQR). ICU: Intensive care unit. Bold indicates statistical significance.
was associated with greater risk of problems with mobility and usual activities. Female sex was associated with a higher risk of problems in performing usual activities, pain or discomfort, and anxiety or depression. Length of hospital stay was associated with a higher risk of problems with mobility, self-care, performing usual activities, and pain or discomfort (Table 5).

**Discussion**

In this cohort study, we observed that quality of life had declined at 6-month follow-up in patients who required hospitalization for COVID-19. Persistent symptoms such as dyspnoea on exertion, asthenia, myalgia, hair loss, and sleep disorder were frequently reported. We also found that patients who required ICU admission reported lower overall quality of life than patients admitted to general medical wards.

Our findings are similar to those reported in long-term follow-up studies of ARDS survivors due to other aetiologies, such as influenza A(H1N1)\(^9\), or other coronavirus diseases\(^{11-13}\). The long-term problems observed after Severe Acute Respiratory Syndrome (SARS) in 2002 and Middle East Respiratory Syndrome (MERS) in 2012 were reduced HRQoL, respiratory compromise, muscle weakness, fatigue, pain disorders, and depression\(^{10-15}\).

Long-term COVID-19 symptoms are a major concern among the general public. A new term – long Covid\(^{16}\) – has recently been introduced to describe illness in people who have either recovered from COVID-19 but still report long-term effects of the infection or have had the usual symptoms far longer than would be expected. Tenforde et al.\(^{17}\), in a multistate telephone survey of non-hospitalized symp-
tomatic COVID-19 adults, showed that 35% of patients had not returned to their usual health status when interviewed 2–3 weeks after testing, resulting in prolonged illness and persistent symptoms. Fatigue (71%), cough (61%), and headache (61%) were the most commonly reported symptoms. In another study with a 60-day follow-up, Carfi et al.\(^\text{18}\) reported that 87% of patients discharged from hospital after recovering from COVID-19 still experienced at least 1 symptom 60 days after onset. Fatigue (53%), dyspnoea (43%) and joint pain (27%) were the most frequent symptoms reported. In these 2 studies, COVID-19 patients were followed up for 14–21 and 60 days, respectively. Our study included a long follow-up to determine the persistence of symptoms and the HRQoL of patients hospitalized for COVID-19. We found that these patients had worse HRQoL overall, and that patients requiring ICU care reported significantly lower quality of life compared with patients who were admitted to general medical wards. ICU patients present potential risk factors that have a negative impact on quality of life, such as age, comorbidities, prolonged mechanical ventilation, ICU stay or hospital stay, decreased mobility, delirium or depression, malnutrition, and need for muscle relaxants or corticosteroids. Corticosteroids, which have been shown to help reduce mortality secondary to the inflammatory response in COVID-19 patients\(^\text{19,20}\), were used more often in our ICU patients (91%) than in those who did not require ICU admission (26%). Previous studies have shown that corticosteroids induce myopathy, muscle wasting and weakness 1 year after hospitalization\(^\text{21,22}\), and this can significantly reduce the quality of life of ICU survivors. The cumulative effect of these factors on HRQoL is unknown, and could be the focus of future research. Our study supports findings from other authors reporting poor long-term outcomes in critically ill patients\(^\text{23,24}\); however, we have found few studies comparing the HRQoL of patients with the same disease who were admitted to either the ICU or the ward\(^\text{25,26}\). Batawi et al.\(^\text{19}\) studied the HRQoL of MERS survivors who required hospitalization, and observed that 1 year after diagnosis, ICU patients reported lower HRQoL than non ICU patients. Tøien et al.\(^\text{27}\) showed that trauma patients admitted to the ICU for more than 24 h had lower HRQoL questionnaire scores compared with non ICU patients. Although ICU patients might be expected to experience worse HRQoL or decreased functional status compared with non ICU patients, Feemster et al.\(^\text{26}\) found no significant differences in HRQoL among 3 groups of patients: non hospitalized, hospitalized non ICU, and hospitalized ICU, and observed that hospitalization was associated with an increased risk of impairment in HRQoL after discharge. No differences were found between ICU and non ICU patients.

### Limitations of this study

This study has several limitations. First, it is a single-centre study with a limited number of patients. The results may not reflect the experience or outcomes of COVID-19 patients in other regions or countries. Second, 6 months after hospitalization patients were asked to evaluate their quality of life 1–3 months before COVID-19; we do not know whether their assessment may have been influenced by their clinical status at the time of the survey. Nevertheless, HRQoL was evaluated, and was found to correlate significantly with the EQ VAS and EQ-5D Index. Third, HRQoL and persistent symptoms were evaluated at 6 months after hospitalization, based on our hypothesis that the health problems presented at admission would have stabilized after 6 months, and that mortality beyond this date may be due to other factors. It would be important to assess these data at 1 and 5 years after hospitalization, because several authors have reported changes in HRQoL after that time\(^\text{21,27}\). A larger multicentre cohort study of patients with COVID-19 from Spain and other coun-

### Table 4 Persistent symptoms at six months after COVID-19 (n = 183).

| Persistent symptoms at 6 months | Overall | ICU patients | Non ICU patients | P value |
|---------------------------------|---------|--------------|------------------|---------|
|                                 | No = 183 | No = 32     | No = 151        |         |
| Patients with any symptoms      |         |             |                  |         |
| 1 symptom                       | 143 (78.1) | 28 (87.5)   | 115 (76.2)      | 0.159   |
| 2 symptoms                      | 27 (18.9)  | 4 (14.3)    | 23 (20.0)       | 0.680   |
| 3 or more symptoms              | 29 (20.3)  | 5 (17.9)    | 24 (20.9)       |         |
| Dyspnoea on exertion            | 87 (60.8)  | 19 (67.9)   | 68 (59.1)       |         |
| Dyspnoea on mild exertion       | 97 (53.0)  | 25 (78.1)   | 72 (47.7)       | 0.002   |
| Asthenia                         | 19 (10.4)  | 12 (37.5)   | 7 (4.6)          | <0.001  |
| Apathy                          | 62 (33.9)  | 18 (56.3)   | 44 (29.1)       | 0.003   |
| Myalgia                         | 54 (29.5)  | 11 (34.4)   | 43 (28.5)       | 0.506   |
| Arthralgia                       | 55 (30.1)  | 10 (31.3)   | 45 (29.8)       | 0.871   |
| Chest pain                      | 15 (8.2)   | 0 (0.0)     | 15 (9.9)        | 0.077   |
| Anosmia                         | 19 (10.4)  | 3 (9.4)     | 16 (10.6)       | 0.999   |
| Cough                           | 23 (12.7)  | 4 (12.9)    | 19 (12.7)       | 0.999   |
| Sleep disorder                  | 56 (30.6)  | 6 (18.8)    | 50 (33.1)       | 0.109   |
| Hair loss                       | 56 (30.6)  | 10 (31.3)   | 46 (30.5)       | 0.930   |
| Memory loss                     | 48 (26.2)  | 7 (21.9)    | 41 (27.2)       | 0.538   |
| Visual disturbances             | 10 (5.5)   | 1 (3.1)     | 9 (6.0)         | 0.999   |

Data are shown as number (percentage). Bold indicates statistical significance.
Interventions in rehabilitation presented the clinical symptoms in conclusions.

Mobility (Some problems/Unable to walk)

| EQ-5D-3L dimensions                      | β     | se (β) | P value | OR   | IC 95% (OR) |
|------------------------------------------|-------|--------|---------|------|-------------|
| Female sex                               | 0.366 | 0.411  | 0.373   | 1.442| 0.644–3.228 |
| Age                                      | 0.038 | 0.019  | 0.041   | 1.039| 1.001–1.077 |
| Length of Hospital stay                  | 0.051 | 0.021  | 0.015   | 1.053| 1.009–1.097 |
| Comorbidity                              | −0.361| 0.442  | 0.413   | 0.697| 0.293–1.656 |
| Need for ICU admission                   | 1.015 | 0.618  | 0.100   | 2.760| 0.822–9.262 |
| Female sex                               | −0.049| 0.695  | 0.944   | 0.952| 0.244–3.714 |

Self-care (Some problems/Unable to perform)

| EQ-5D-3L dimensions                      | β     | se (β) | P value | OR   | IC 95% (OR) |
|------------------------------------------|-------|--------|---------|------|-------------|
| Female sex                               | 0.047 | 0.032  | 0.137   | 1.048| 0.985–1.114 |
| Age                                      | 0.111 | 0.037  | 0.003   | 1.117| 1.038–1.201 |
| Length of Hospital stay                  | 0.104 | 0.083  | 0.897   | 1.109| 0.229–5.357 |
| Comorbidity                              | −2.949| 1.840  | 0.109   | 0.052| 0.001–1.930 |
| Need for ICU admission                   | 0.960 | 0.454  | 0.034   | 2.613| 1.074–6.355 |
| Female sex                               | 0.040 | 0.020  | 0.048   | 1.040| 1.004–1.082 |
| Length of Hospital stay                  | 0.074 | 0.023  | 0.001   | 1.077| 1.029–1.125 |
| Comorbidity                              | −0.176| 0.475  | 0.711   | 0.839| 0.330–2.126 |
| Need for ICU admission                   | −0.702| 0.806  | 0.384   | 0.496| 0.102–2.406 |
| Female sex                               | 0.885 | 0.335  | 0.008   | 2.424| 1.257–4.670 |

Usual activities (Some problems/Unable to perform)

| EQ-5D-3L dimensions                      | β     | se (β) | P value | OR   | IC 95% (OR) |
|------------------------------------------|-------|--------|---------|------|-------------|
| Female sex                               | 0.005 | 0.014  | 0.730   | 1.005| 0.978–1.031 |
| Age                                      | 0.041 | 0.018  | 0.021   | 1.042| 1.006–1.079 |
| Length of Hospital stay                  | 0.116 | 0.354  | 0.743   | 1.123| 0.056–2.249 |
| Comorbidity                              | −0.144| 0.591  | 0.808   | 0.866| 0.271–2.759 |
| Need for ICU admission                   | 1.320 | 0339   | 0.000   | 3.744| 1.925–7.280 |
| Female sex                               | −0.004| 0.014  | 0.770   | 0.996| 0.969–1.022 |
| Length of Hospital stay                  | 0.029 | 0.018  | 0.098   | 1.030| 0.994–1.065 |
| Comorbidity                              | 0.040 | 0.357  | 0.911   | 1.040| 0.517–2.093 |
| Need for ICU admission                   | 0.549 | 0.586  | 0.349   | 1.731| 0.548–5.464 |

Quality of life was measured using the EuroQol, 5-dimension, 3-level questionnaire, the EQ-5D index, and the EQ-VAS (0–100). Bold values are statistically significant.

Conclusions

In this prospective cohort study of hospitalized patients with COVID-19, a large proportion of patients had persistent symptoms and reduced quality of life. ICU patients presented a greater decline in their quality of life compared with non ICU patients. Persistent symptoms were frequent in both ICU and non ICU patients. Our data suggest that interventions are needed to improve HRQoL after COVID-19, including telephone follow-up, post-hospital discharge rehabilitation programmes, and pain management.

Clinical trial number

The ethics committee of Galicia, Spain (code 2020–188)

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Conflicts of interest

The authors have no conflict of interests to declare.

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