RESEARCH ARTICLE

Health related quality of life in COVID-19 survivors discharged from acute hospitals: results of a short-form 36-item survey [version 1; peer review: awaiting peer review]

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Abstract

Background: Health-related quality of life (HRQL) is important for evaluating the impact of a disease in the longer term across the physical and psychological domains of human functioning. The aim of this study is to evaluate HRQL in COVID-19 survivors in Italy using the short form 36-items questionnaire (SF-36).

Methods: This is an observational study involving adults discharged home following a coronavirus disease 2019 (COVID-19)-related hospital admission. Baseline demographic and clinical data including the Cumulative Illness Rating Scale (CIRS) and the Hospital Anxiety and Depression Scale (HADS) were collected. The validated Italian version of SF-36 was administered cross-sectionally. The SF-36 contains eight scales measuring limitations in physical and social functioning, the impact on roles and activities, fatigue, emotional well-being, pain and general health perception.

Results: A total of 35 patients, with a mean age of 60 years, completed the SF-36. The results showed difficulties across the physical and psychological domains, particularly affecting the return to previous roles and activities. A higher burden of co-morbidities as well as a more severe muscle weakness was associated to a lower physical functioning. Younger age, rather than older, correlated to a perceived greater limitation in physical functioning and vitality.

Conclusions: COVID-19 survivors particularly the ones of working age may need support for resuming their premorbid level of functioning and returning to work.

Keywords
Health Related Quality of Life, long-COVID, return to work

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Introduction

More than 100 million cases of coronavirus disease 2019 (COVID-19) have been reported worldwide since January 2020.[1] Recent publications have described various persistent physical, cognitive and psychological symptoms in COVID-19 survivors, also named "long-COVID",[2] following their discharge from acute hospital units.[3–5] These symptoms include fatigue, difficulty in breathing, difficulty in concentration and memory, pain, anxiety, depression and symptoms of post-traumatic stress disorder. Some authors have found an association of these symptoms to reduced functioning and performance in activities of daily living (ADL)[6] with an improvement when a period of rehabilitation was offered.[6,7] These findings appear to confirm what was expected based on previous literature on post ITU syndrome[8–10] and pulmonary rehabilitation[11,12] and have an important implication for implementing follow up services and rehabilitation pathways.[13,14]

Health-related quality of life (HRQL) is an important domain for evaluating the impact of a disease in the longer term, which can be measured by a large variety of either disease-specific or generic questionnaires. The Short Form 36 Health Survey (SF-36) is one of the most widely used generic HRQL questionnaires. It was developed in the USA for use in the RAND corporation's health insurance experiment[15] and has subsequently been used around the world to gauge the health of populations and to help with service planning. A validated Italian version is available.[16] The SF-36 contains eight scales, assessing the quality of life across different domains with physical and mental components. The SF-36 has been found to be a valid instrument to measure HRQL in patients with other chronic respiratory problems such as COPD[17] and idiopathic pulmonary fibrosis.[17] HRQL has been evaluated in a post COVID-19 population at one month following their discharge from acute hospitals in Wenzhou, China,[18] showing significantly poorer SF 36 scores, particularly in the dimensions of physical and emotional role (RP and RE) as well as social functioning (SF), when compared to the Chinese population norm. Based on their findings, these authors highlighted the importance of addressing physical and psychological long-term suffering in post COVID-19 patients.

Preliminary results have been published to evaluate the response to pulmonary rehabilitation in a cohort of post COVID-19 elderly patients,[7] showing a positive effect both on respiratory function as well as on HRQL.

The focus during the acute COVID-19 infection is on the survival of the patient followed by physical functioning in basic ADLs in the post-acute phase.[19] In the authors' opinion other domains beyond basic ADLs, such as role limitations, vitality, and social and emotional functions become at least as important once patients are discharged home expecting to resume their previous roles and functioning.

The aim of our study is to determine the quality of life in a group of COVID-19 survivors following their discharge from acute hospitals using the SF-36 questionnaire.

Methods

Study design

This was a descriptive observational study. A telephone survey was administered cross-sectionally by one of the researchers (IC) to COVID-19 survivors following their discharge from hospital. The researcher administering the survey was unknown to the patients and unrelated to the delivery of their care in order to reduce a potential social desirability bias i.e. patients reporting a more positive outcome to please the treating staff.

The outcomes of the survey were compared to normative data as well as a range of baseline clinical tests. Being a non- interventional study with an unknown prevalence of the variable under investigation, the sample size was not calculated.

Participants

All patients had an initial admission to an acute hospital unit in Genoa, Italy, including intensive care units (ICUs) and general acute COVID-19 wards, followed by an interim stay in a subacute unit (Nave Ospedale unit, Genoa) before their discharge home. This interim admission was arranged to free beds in acute units and step-down patients to a non-acute level of medical care. Two consecutive negative COVID-19 tests were considered necessary criteria for discharge at that time. Although at this stage patients were encouraged to walk and actively engage in ADLs under the supervision of the nursing staff, they did not receive any specific physiotherapy or pulmonary rehabilitation.

All patients admitted to the Nave Ospedale unit from the 6th May and discharged within the 4th June 2020, who were able to understand the informed consent protocol and complete the survey in Italian, were considered eligible. Patients were approached within the first week of their admission and written informed consent was taken.

Ethics and governance

This study was registered within the Ospedali Galliera Scientific Committee and approved by the Regione Liguria Ethics Committee (CER Liguria, RP/52/UCS). All participants gave written informed consent to participate in the study.

Data collection

Demographic and clinical characteristics were collected whilst patients were admitted to the Nave unit. This included age, sex, illness burden measured by the Cumulative Illness Rating Scale (CIRS),[20] the modified Medical Research Council Dyspnea scale (mMRC-D),[21] the 30 second sit to stand test (30sSTS),[22] and the Hospital Anxiety and Depression Scale (HADS).[23] The mMRC-D describes the level of difficulty in breathing experienced at different levels of activity intensity. The 30sSTS is a standard measure for lower limb muscle strength and measures the number of times a patient can stand up from a chair in 30 seconds. The HADS is a self-reported questionnaire for screening anxiety and depression in community and hospital medical practice, which provides a total anxiety and depression score, where 8-10 is considered borderline abnormal and 11-21 abnormal.

The SF-36 survey was administered at a single point in time on the 13th June 2020 to the patients who had been discharged from the Nave Ospedale unit in the previous 2 months.

The SF-36 includes one multi-item scale which is feasible to be administered to individuals over the age of 14 by a telephone interview.[24] The survey includes eight scales measuring HRQL across physical and psychological domains: 1) limitations in physical functioning (PF) because of health problems; 2) limitations in usual role activities because of physical health problems (RP); 3) limitations in usual role activities because of emotional problems (RE); 4) energy and fatigue (EF); 5) emotional well-being (EWB); 6) social functioning (SF); 7) bodily pain (BP); and 8) general health perceptions (GH). All questions are scored on a scale of 0 to 100, with 100 representing the highest level of functioning. The scores belonging to each scale are averaged together to give eight total scores.

Statistical analysis

Summary statistics are presented as mean, standard deviation (SD), and range for continuous variables (age; time between acute admission and SF-36; time from discharge to SF-36; CIRS; mMRC-D; 30sSTS; HADS), and as counts with percentages for categorical variables (sex) (Table 1). Testing for significant differences in discrete variable distributions was carried out with the Chi-Squared (χ^2) test. Continuous variables are tested for association with linear regression modelling and associated t-tests, and continuous and discrete variables are compared with the Kolmogorov-Smirnov test. Two-sample difference of means t-tests are initially conducted on the continuous variables from a simple linear regression analysis and then with multiple regression to account for possible confounding of age and sex. Correlations for continuous variables are reported as Spearman's rank correlations with p-values, Pearson correlations were also calculated for continuous variables in order to support the Spearman correlations, but these are not reported. The SF-36 scale scores are compared to the normative data for the Italian population[15] via two-tailed t-tests. Benjamini-Hochberg multiple testing correction was used to adjust for the possibility that significant p-values may occur by chance. Adjusted p-values are reported and a significant result is taken to be one with a (adjusted) p-value less than or equal to 0.05. There were no missing

Table 1. Description of the population (n = 35).

	Mean (SD)	Range
Age (years)	59.9 (15.4)	30-85
Male/Female	23/12 (65.8/34.2)	
Time between acute hospital admission and SF-36 (days)	61.8 (15.5)	20-95
Time from hospital discharge to SF-36 (days)	39.1 (14.8)	15-71
CIRS	9.0 (4.3)	3-25
mMRC-D	0.68 (0.9)	0-3
30sSTS	10.4 (5.4)	0-24
HADS A	6.3 (5.0) HAD A $\geq$ 8 = 31.4%	0-18
HADS D	5.7 (3.6) HAD D $\geq$ 8 = 28.6%	0-17

CIRS: Cumulative Illness Rating Scale; mMRC-D: modified Medical Research Council Dyspnea scale; 30sSTS: 30 second sit to stand test; HADS: Hospital Anxiety Depression Scale (HADS A anxiety subscale; HADS D depression subscale).

Table 2. SF-36 scores out of 100 (n = 35 patients).

	Physical functioning	Role physical	Role emotional	Vitality	Emotional wellbeing	Social functioning	Bodily pain	General health
Mean (SD)	51.6 (23.3)	6.4 (17.5)	30.5 (27.3)	48.4 (15.3)	60.2 (16.6)	48.2 (22.5)	60.9 (19.2)	42.4 (17.8)
Max	95	75	100	80	84	75	100	80
Min	10	0	0	15	20	0	22.5	0

Table 3. Spearman rank correlations (with p-values). Only significant values are reported, dashes indicate non-significant.

	Physical functioning	Vitality	Social functioning	General health
Age	0.57 (<0.01)	0.49 (0.01)	0.41 (0.04)	0.39 (0.05)
CIRS	−0.58 (<0.01)	-	-	−0.57 (<0.01)
30sSTS	0.63 (<0.01)	-	-	-

CIRS: Cumulative Illness rating Scale; 30sSTS: 30 second sit to stand test.

data in the SF-36 outcomes and missing data in other variables was handled by case-wise deletion when required in analysis, sample sizes are reported alongside results. Analysis was performed with R version 4.0.2.

Results

Baseline demographic and clinical characteristics of the population are reported in Table 1.[27] A total of 45 out of 80 (56%) patients were eligible for the study and agreed to participate, of which 35 patients completed the SF-36 questionnaire. Of these, 12 were female and 23 were male, with a mean age of 60 years (±15) ranging from 30 to 85 years; 63% were below 65 years. The average CIRS score was 9 (±4.3), ranging from 3 to 25.

At the time of the SF-36 administration, the average time in days since the initial hospital admission for COVID-19 related symptoms was 61.8 days (±15.5), ranging from 20 and 95, while the average time from the discharge from acute hospitals was 39 days (±14.8), ranging from 15 and 71 days.

Table 2 shows the scores for the different SF-36 domains. The mean (SD) SF-36 scales scores in ascending order (from the lowest to the highest) were as follows: limitations in role physical RP = 6.4 (17.5); limitations in role emotional problems RE = 30.5 (27.2); social functioning SF = 48.2(19.2); general health perceptions GH = 42.4 (17.7); energy and fatigue EF = 48.4 (15.3); physical functioning PF = 51.6 (24.4); emotional well-being EWB = 60.2 (16.8); bodily pain BP = 60.8 (19.2). All scores were significantly different from the normative data ($p < 0.01$) except emotional wellbeing ($t = -1.79$, $p = 0.07$).

Higher age was significantly associated with higher physical functioning ($t = 4.34$, $p = 0.01$; $r(32) = 0.57$, $p = 0.01$) and higher energy fatigue ($t = 3.14$, $p = 0.05$; $r(32) = 0.49$, $p = 0.03$). Whilst age was significantly associated to higher general health ($t = 3.09$, $p = 0.05$), the correlation is non-significant ($p = 0.09$). Higher performance on the 30sSTS test was significantly associated to higher physical functioning ($t = 4.01$, $p = 0.02$; $r(23) = 0.63$, $p = 0.01$). Finally higher CIRS was significantly associated with lower physical functioning ($t = -3.63$, $p = 0.03$; $r(33) = -0.58$, $p < 0.01$), as well as being significantly correlated with poorer general health ($r(33) = -0.57$, $p = 0.01$). Time between acute admission and SF-36, as well as time from discharge to SF-36, sex, MRC-D, HADS A and HADS D showed non-significant correlation to SF-36 scores. Correlations for the components of the SF-36 with demographic and clinical factors are shown in Table 3. After adjusting for age, only age remained significantly associated with the SF-36 scores. The full results from univariate and multivariate analysis are provided as supplementary material.

Discussion

We describe the impairment of HRQL in both physical and psychological functioning in COVID-19 survivors about a month (average 39 days) following their discharge from an acute hospital unit. All eight scales of the SF-36 showed significantly lower scores in comparison to the normative data for the Italian population[16] apart from emotional wellbeing. Participants' role limitation due to physical problems was particularly impaired, followed by role limitation due to emotional difficulties. The SF-36 role limitation domain evaluates the perception of restriction in people's own job

and daily activities as result of their physical health (RP) or emotional problems (RE), such as anxiety or depression. The restriction is assessed by the SF-36 in term of perceived effort, amount of time spent, quality and efficiency in carrying out work or previous activities.

We found no correlation between the role limitation scores and the baseline characteristics considered in this study. A prolonged time to recovery following COVID-19 infection as well as the difficulty to access pulmonary and vocational rehabilitation might have contributed to this delay in returning to previous roles, independently from the baseline variables being considered.

Cognitive difficulties, particularly memory and concentration deficits, have been described in the spectrum of the post COVID-19 persistent symptoms.[5] Although our study did not include any cognitive evaluation, the presence of cognitive difficulties and the presence of mental fatigue could have certainly affected the efficiency in carrying out tasks.[25] The restrictions imposed by the policies to contain the COVID-19 pandemic might have been an additional barrier for functioning in the social context. It is relevant in this regard that two thirds of the patients were below 65 years-old and hence in the working age range so that their delayed return to work could have caused a significant financial loss for the patients themselves, their families and employers.

A lower physical functioning scale significantly correlated to a higher CIRS as well as a poorer performance in the sit to stand test, suggesting that people with a higher burden of co-morbidities and who experienced a more pronounced physical weakness during their hospital admission, found it more difficult to resume their performance in daily activities.

Surprisingly, we found age positively correlated to physical functioning and vitality. We argue that younger patients might have experienced a bigger change in comparison to their premorbid level of functioning, hence with a more pronounced effect on their perceived quality of life.

A lower level of functioning and impaired performance in activities of daily life in COVID-19 survivors has been recently described as well as the benefit of an early inpatient rehabilitation intervention.[5]

Similarly to our study, Chen et al[17] describe HRQL at 1-month post COVID-19 reporting SF-36 sub-scores (RP, SF and RE) significantly lower than in the Chinese population norm. Interestingly the scores reported by these authors are higher in comparison to the scores of our population across all the sub-scores, however the domains more affected are analogous to our findings. We wonder if the younger age of their population in comparison to ours (mean age 47.2 versus 60 years old) might reflect a less severe presentation of the COVID-19 related illness, hence a more limited impact on HRQL.

Other authors[6] have reported the results of the SF-36 questionnaire administered to elderly (over 65 year) COVID-19 survivors who underwent 6-week pulmonary rehabilitation, showing an improvement of the HRQL along with pulmonary function. In this study, it is unclear the time when the baseline SF-36 was administered making the findings difficult to compare.

About a third of the patients in our study scored in the range for anxiety and depression, similarly to the patients described by Mazza et al.[26] Anxiety and depression scores did not correlate to any of the SF-36 domains. Although this lack of correlation could be likely due to the limited sample size, it is also possible that anxiety and depression might have improved following people returning home and that other kinds of emotional difficulties such as feelings of frustration or isolation, rather than anxiety or depression, could have impacted on their return to activities and roles and on the perception of emotional wellbeing.

Our study's main limitation is the small sample size, which does not allow strong conclusions or generalizations. Furthermore, the Nave Ospedale unit admits a specific group of patients discharged from the acute setting, including those with mild-moderate symptoms requiring further social isolation in absence of alternative accommodation. This suggests a possible social background bias as patients who are more socially disadvantaged may have greater difficulty in finding an alternative suitable environment and therefore may be more likely to be admitted.

More in-depth questions regarding patients' jobs and activities on top of the SF-36 could have given a broader insight as well as repeated evaluations of the SF-36 to monitor changes of the HRQL over time.

Conclusions
We describe the severe impact across the physical and psychological domains of HRQL in COVID-19 survivors about one month following their discharge from acute hospitals receiving no support from rehabilitation community services.

Muscle weakness and the number of co-morbidities at the time of discharge appeared to be associated with lower physical functioning. Interestingly younger patients were more affected in their perceived physical functioning, as well as in vitality. Despite the small sample size, our study clearly highlights the substantial difficulties that COVID-19 survivors experience after their hospital discharge and stimulates a reflection on the individual and social cost of their delayed return to previous roles and jobs. We suggest that dedicated community-based pulmonary and vocational rehabilitation might not only improve these patients' outcome but could also be socially and financially strategic.

Data availability

Underlying data

Zenodo: Health Related Quality of life in CoViD 19 survivors discharged from acute hospitals Results of a Short-Form 36-Item survey. https://doi.org/10.5281/zenodo.4540215.[27]

This project contains the following underlying data:

- Raw survey data in .xlsx file

Data are available under the terms of the Creative Commons Attribution 1.0 Generic (CC BY 1.0).

Acknowledgements

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