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REVIEW

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Effects of hospitalization on functional status and health-related quality of life of patients with COVID-19 complications: a literature review

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ABSTRACT

Background: Due to the clinical situations faced, patients with COVID-19 who survive the intensive care unit (ICU) are at greater risk of developing post-intensive care syndrome (PICS), characterized by typical physical, psychological and cognitive consequences in the post hospital discharge. Given this situation, it is important to assess these patients for the presence of musculoskeletal and psychosocial changes, so that they are referred to an outpatient and/or home rehabilitation program. **Objective:** to identify in the scientific literature the effects of hospitalization on the functional status and health-related quality of life of patients with complications from COVID-19. **Methods:** Searches were performed for scientific articles indexed in the MEDLINE database (accessed by Pubmed), between the years 2019 to 2022. Articles that met the inclusion and exclusion criteria determined to compose this study were included. **Results**: from a total of 524 articles found in the literature, only 15 met the inclusion criteria and were included in the study. The sample was represented by eight cross-sectional studies and seven cohort studies, and the main outcomes found to assess functional status were the six minute walking test the Post-COVID-19 Functional Status scale and for quality of life the EuroQol visual analogue scale and the Short form-36. **Conclusion:** With this literature review, it can be concluded that patients hospitalized for complications of COVID-19 showed a significant decline in functional status and health-related quality of life.However, updates are necessary to characterize the symptoms and persistent sequelae in the post-COVID-19.

Keywords: COVID-19; Intensive care units; Post-intensive care syndrome; Functional status; Health-related quality of life.

BACKGROUND

Social distancing, isolation and long periods of hospitalization compromise the homeostasis of the human body, especially in an intensive care unit (ICU)[(1,2)]. Prolonged hospital stay causes a large percentage of surviving patients to develop significant complications and, depending on personal genotypes, symptoms may reflect immunological alterations[(3,4)]. In this context, the post-intensive care syndrome (PICS) is characterized by physical, psychological and cognitive consequences present after discharge from the ICU and which can last for 5 to 15 years[(5-7)].

Data prior to the pandemic already showed that at least 20% of patients who were admitted to ICU and about 50% of these underwent mechanical ventilation (MV) develop PICS[(8)]. Patients with COVID-19 show that this incidence has increased dramatically, with a range of 28-87% of cases related to physical damage, 6-60% related to psychological changes and about 20-57% presented cognitive damage 1 to 6 months after discharge from ICU[(9)].

The clinical profile of patients who develop PICS is similar to that of patients infected with COVID-19 who are admitted to the ICU, considering that most are older people and have at least one comorbidity[(10-12)]. Among the main risk factors for the development of PICS, MV, prolonged immobility, acute respiratory distress syndrome (ARDS), use of neuromuscular blockers, use of corticosteroids, hyperglycemia, delirium, sepsis, renal failure and multiple organ failure[(6,9)]. Physical impairment, one of the main components of PICS, is present in 25 to 80% of patients hospitalized for long periods in the ICU. Acquired muscle weakness, fatigue, dyspnea, decreased lung function, compromised exercise tolerance, respiratory failure, sexual dysfunction, myopathies and neuropathies are also observed, which constantly lead to a decline in activities of daily living (ADL's) and considerable quality impairment of life[(5,13-18)]. The scientific literature shows that ICU-acquired weakness (ICUAW) has a multifactorial etiology, being a growing problem in hospitalized patients, mainly with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), directly compromising the musculoskeletal system[(19-20)].During the hospitalization phase, the metabolic alterations are responsible for the increase in the involvement of the striated muscles, presenting themselves in diffuse and symmetrical patterns[(21)]. The presence of an inflammatory condition is linked to immobility, which is greater in this phase. The disuse of the limbs, especially the lower ones, caused by prolonged physical inactivity causes the individual to lose functionality[(22)]. Due to the period of hospitalization, the muscles do not receive mechanical discharges, with

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this a reduction in neuromuscular activity is observed, inducing an adaptive reaction characterized by slow protein synthesis, increased protein degradation and apoptosis of muscle cells, triggering a reduction in the volume and number of fibers and consequent loss of muscle strength, mainly in the muscles of the lower limbs (LL)(1).

Patients with COVID-19 who survive hospitalization in ICUs may be at even greater risk of developing PICS due to the restrictions they face, so it is extremely important that these patients are evaluated for the extent of possible physical, psychological and cognitive impairments(5,9,23). Using the ICU daily check sheet and the ABCDEF bundle (daily pain assessment, analgesia, breathing tests and spontaneous awakening, sedation, delirium, early mobility and family involvement) is a way to prevent PICS complications, although the component of the ABCDEF bundle is not sufficiently provided (16-52%) due to the highly transmissible nature of the virus(24). This guide was designed, based on evidence, to direct treatment within the ICU and thereby reduce the risk of subsequent hospitalizations, in addition to the excessive health-related costs of outpatient consultations(24,25).

In view of the impairments caused by COVID-19 and the prolonged period of hospitalization, the rehabilitation of patients who were affected by the virus should start at hospital admission and continue in the post-discharge phase(20,26). Interventions should be targeted according to the manifestations. Regarding physical and pulmonary rehabilitation, the beginning of an early program contributes to the overall optimization of the patient, shortening the length of stay in the ICU, in addition to its clinical and functional sequelae(27-31).

The proposed outpatient and home rehabilitation programs range from 6 to 12 weeks after discharge, with individualized and dynamic care, starting with low-intensity physical exercises and progressing according to the patient's tolerance and adaptation, always with monitoring of oxygen saturation. and fatigue(23,32). This study aimed to identify in the scientific literature the effects of hospitalization on the functional status and health-related quality of life (HRQoL) of patients with complications from COVID-19.

METHODS

Research strategy and selection of studies

This study is characterized as a literature review. The search for scientific articles was performed in the MEDLINE database (accessed by PubMed) from October 2020 to March 2022. A search strategy that combines MeSH terms and free words was adopted, according to Figure 1. This study followed the methodological guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) represented in Figure 2.

Figure 1. Search strategy of PubMed

Search	Query
#1	“COVID-19” [Mesh Terms]
#2	“SARS-CoV-2”[Mesh Terms]
#3	“COVID-19”[Title/Abstract] OR “SARS-CoV-2”[Title/Abstract]
#4	#1 OR #2 OR #3
#5	“critical care”[Mesh Terms]
#6	“Intensive Care Units”[Mesh Terms]
#7	“post-acute COVID-19 syndrome”[Supplementary Concept]
#8	“intensive care unit” [Title/Abstract] OR “ICU”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “ventilator”[Title/Abstract] OR “Intensive care center”[Title/Abstract] OR “Mechanical ventilation”[Title/Abstract] OR “ARDS”[Title/Abstract] OR "acute respiratory distress syndrome”[Title/Abstract] OR “intensive care unit acquired weakness” [Title/Abstract] OR “post-intensive care syndrome”[Title/Abstract] OR “chronic fatigue syndrome”[Title/Abstract] "Hospital”[Title/Abstract] OR “Hospitalization”[Title/Abstract] OR "Hospital internment”[Title/Abstract] OR “Hospital Admission”[Title/Abstract] OR “Nursery”[Title/Abstract]
#9	“Functional assessment”[Title/Abstract] OR "Physical assessment”[Title/Abstract] OR “Physical therapy evaluantion”[Title/Abstract] OR “Musculoskeletal evaluation”[Title/Abstract] OR “Functional measurements”[Title/Abstract] OR “Physical measurements”[Title/Abstract] OR “Quality of life”[Title/Abstract] OR “Health-related quality of life”[Title/Abstract] OR “Capacity of exercise”[Title/Abstract]
#10	#5 OR #6 OR #7 OR #8 OR #9

Eligibility Criteria

For the composition of this study, cross-sectional observational and prospective and retrospective cohort studies were eligible, which included adult patients (≥ 18 years), of any race and gender, with a positive diagnosis for COVID-19 through laboratory tests and who received were hospitalized in hospital environments, both wards and ICUs. Only complete articles published between 2019 and 2022 in the PubMed database and in English were included. In addition, it was also observed that the studies met the following criteria: to assess the functional status and quality of life after hospital discharge through scales, tests and assessment instruments with reliability reported in the literature. Articles published in the gray literature, research protocols, comments, editorials, consensus reports, articles with missing data on physical assessment or quality of life were excluded.

Outcomes

1. Symptom assessment: modified Medical Research Committee Questionnaire (mMRC); Dyspnoea Medical Research Council (MRC) dyspnoea score; Post-COVID-19 Functional Status (PCFS) Scale; Saint George's Respiratory Questionnaire (SGRQ); University of California San Diego Shortness of Breath Questionnaire (UCSD).
2. Functional exercise capacity: 6 minute walk test (6MWT); incremental and endurance shuttle walk tests (ISWT and ESWT); 1-min sit-to-stand test (1-MSTST).
3. Health-related quality of life (HRQL): Short Form Health Survey 12-item (SF-12); Short-Form Health Survey 36 (SF-36), EuroQol 5 Dimension 5 Level (EQ-5D-5L), EuroQol 5 Dimension 3 Level (EQ-5D-3L); EuroQol visual analogue scale (EQ-VAS).

Data extraction

The phases of article selection were carried out independently by two reviewers and, in cases of disagreement, they were resolved by consensus between two authors (MCO and MEML). In the title and abstract selection phase, a standardized Microsoft Excel spreadsheet was filled out, containing the reason for the inclusion and exclusion of each article. After this procedure, the full texts were read, and studies that met the criteria were included, regardless of the type of study.

Information on the study design, country of study, time after hospital discharge, sample size, participant characteristics (sample size, need for intensive care, use of IMV, total hospital stay and in the ICU, age and sex) and descriptions of outcomes. After completing the data extraction, a third reviewer was responsible for resolving the discrepancies found (LVFO). These data were expressed as absolute numbers, percentage, mean, standard deviation, median and interquartile range.

RESULTS

Description of studies

A total of 524 articles were found in the researched database, however only 15 manuscripts met the inclusion criteria and remained for the composition of this study (Figure 2). Regarding the study design, this sample was represented by eight cross-sectional studies and seven cohort studies. The sample size found was between 18 and 303 patients, totaling all studies, the number of participants was 1,201 individuals, of which 611 (50.9%) were male and 590 (49.1%) were female. The studies were carried out in different countries, and the evaluation of these patients also took place at different times after hospital discharge. Regarding the main outcomes observed to assess the functional status, the 6MWT and the PCFS scale were the most frequent and for quality of life, the EQ-VAS and the SF-36 (Table 1).

Figure 2. Prisma Flowchart- Selection of studies.

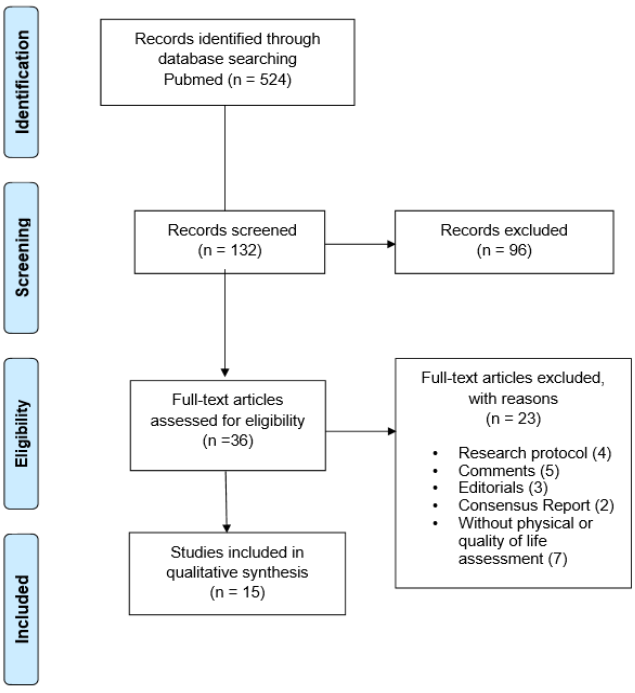

Table 1. Functional status outcomes and health-related quality of life in COVID-19 survivors

Author(s), publication year	Study design	Country	Sample size N	Male/ Female N (%)	Age (years) Mean (SD) or Median (IQR)	Follow-up period after hospital discharge (months)	Hospitalization period (HP)/ HP ICU/ HP IMV (days) Mean (SD) or Median (IQR)	Hospitalization ICU/ IMV N (%)	Outcomes	Results Mean (SD) or Median (IQR)
Betschar et al. 2021[33]	Prospective cohort	Switzerland	43	30 (70%)/ 13 (30%)	60 ± 14	0, 3 and 12	10 ± 9/ N/A/ N/A	43 (100%)/ N/A		**0 month** **3 months** **6 months**
									6MWD m	529 ± 118 578 ± 129 563 ± 124
									6MWD % pred	94 ± 21 102 ± 21 100 ± 22
									mMRC ≥2	9 (24%) 5 (13%) 7 (17%)
									PCFS ≥2	75 (16) 82 (16) 75 (19)
									EQ-VAS	14 (44%) 10 (26%) 12 (29%)
Carenzo, et al. 2021[34]	Prospective cohort	Italy	47	37 (79%)/ 10 (21%)	59 ± 10	2 and 6	29 (19-35)/ 15 (9-19)/ 12 (6-17)	47 (100%) / 47 (100%)		**2 months** **6 months**
									6MWD m	470 (406-516)
									6MWD % pred	83 (67-99)%
									EQ-VAS	80 (70-90) 85 [77,5-90]
Erber, et al. 2021[35]	Prospective cohort	Germany	18	14 (77,8%)/ 4 (22,2%)	54 ± 12.3	1 and 7	21,5 (8-71)/ 10 (1-71) / N/A	18 (100%)/13 (72.2%)	Sf-36	**1 month** **7months**
									RP	16,1 ± 31,9 54,2 ± 43,7
									PF	33,3 ± 31,7 51,9 ± 36,0
									MH	69,5 ± 17,6 70,6 ± 17,7
									RE	58,3 ± 47,4 66,7 ± 40,8
									SF	60,7 ± 27,2 68,3 ± 30,5
									VT	45,0 ± 11,9 59,6 ± 20
									GH	51,8 ± 13,5 45,2 ± 11,1
									BP	64,6 ± 22,1 61,9 ± 26,7
									symptoms SGRQ	35,4 ± 22,5 19,3 ± 18,5
									impact SGRQ	21,9 ± 14,7 16,7 ± 14,6
Gianella, et al. 2021[36]	Prospective, cross-sectional	Switzerland	39	30 (76,9%)/ 9 (23,1%)	62,5 (3-71)	3	15 (12-22)/ N/A /N/A	10 (25,6%) / 7 (17,9%)	6MWT m	539.3 ± 102.8
									mMRC (≥ 2)	6 (15,4%)
									symptoms SGRQ	21,7 ± 18,6
									activity SGRQ	27,1 ± 24,1
									impact SGRQ	9,8 ± 17,9
									SF-12	31 ± 1,6
									Abnormal SF-12	39 (100%)
Hazarika, et al. 2021[37]	Prospective, cross-sectional	India	74	48 (64,9%)/ 26 (35,1%)	50 ± 13.7	3	N/A/ 10 (8-14,2)/ N/A	N/A	6MWT m	480.14 ± 85.7
									SF-12	
									PCS	51.53 (41.9-54.92)
									MCS	57.38 (54.69,59.82)
Johnsen, et al. 2021[38]	Prospective, cross-sectional	Denmark	34	21 (62%)/ 13 (38%)	57 ± 10	3	13,3 ± 21,9/ N/A/ N/A	N/A/ 1 (2,9%)	Dyspnoea MRC	2 (2-2)
									PCFS	1 (1-3);
									1-MSTST	18 (52,9%)
									>25th percentile:	14 (41,2%)
									≤25th percentile:	0,79 (0,65-0,86)
									Index value	75 (59-90)

									EQ-VAS	
Labarca, et al. 2021[39]	Prospective, cross-sectional	Chile	42	26 (61,9%)/ 16 (38,1%)	48,7 ± 10,6	4	19,65 ± 14,8/ 13,0 ± 8,3/ 10,2 ± 7,5	42 (100,0%)/ 25 (59,5%)	6MWT m 6MWT % pred SF-12 PCS HRQoL at baseline HRQoL final Change in HRQoL >10%	513,5 ± 114,5 92,3 ± 112,5 39,1 ± 12,1 89,0 ± 9,0 65,3 ± 20,9 31 (73,8%)
Lombardi et al. 2021[40]	Prospective, cross-sectional	Italy	87	58 (67%)/ 29 (33%)	58 ± 13	1	13 ± 10/ N/A/ N/A	15 (17%)/ 6 (7%)	6MWT m	500 ± 88
Shah, et al. 2021[41]	Prospective cohort	Canada	73	44 (60%)/ 29 (40%)	65 (53-72)	3 and 6	N/A	N/A		**3 months** **6 months**
									UCSD	11 (3-26) 9 (3-31)
									EQ-5D-5L	0,87 (0,79-0,95) 0,90 (0,81-0,95)
									EQ-VAS	75 (68-90) 80 (75-90)
Zhang, et al. 2021[42]	Retrospective cohort	China	40	21(52,5%)/ 19 (47,5%)	57 (40-68)	8	N/A	2 (0,8%)/ 0 (0,0%)	6MWT m PCFS ≥ 1 PCFS ≥ 2	563 ± 87,15 22 (55%) 9 (22,5%)
Zhao, et al. 2021[43]	Prospective cross-sectional	China	94	54 (57,4%)/ 40 (42,6%)	48,11 ± 6,3	12	15,08 ± 5,71/ N/A/ N/A	11 (11,70%)/ N/A	6MWT mMRC SF-36 PF RP BP GH VT SF RE MH	504 (486,4-540) 22 (23,4%) 95 (90-100) 100 (75-100) 74 (61,7-100) 66 (47-80) 75 (63,7-90) 70 (40-80) 100 (66,6-00) 76 (60-92)
Demoule, et al. 2022[44]	Prospective cohort	France	94	67 (71%)/ 27 (29%)	63 (49-70)	2 and 12	N/A/ 30 (20-41)/ 30 (20-41)	94 (100%)/ 73 (78%)		**2 month** **12 months**
									6MWT m	392 322-484) 506 (440-562)
									6MWT % pred	58 (47-69) 506 (440-562
									mMRC	1 (0-2) 1 (1-2)
									EQ-5D-3L	7 (5–9) 6 (5–8)
Liao, et al. 2022[45]	Prospective, cross-sectional	China	303	59 (19,5%)/ 244 (80,5%)	39,0 (33,0-48,0)	12	15,00 (9,00-26,00)/ N/A / N/A	N/A	6MWT m 6MWT % pred symptoms SGRQ activity SGRQ impact SGRQ mMRC ≥ 1	555,00 (516,00–591,00) 87,00 (81,00–94,00) 17,25 (6,32–34,83) 35,24 (11,94–47,69) 13,65 (3,83–32,31) 143 (60.59%)
Magdy, et al. 2022[46]	Prospective cohort	Egypt	85	48 (56,5%)/ 37 (43.5%)	34,6 ± 9,9	3 and 6	18,5 ± 5,6/ N/A/ N/A	25 (29,4%)/ 6 (7%)		**3 month** **6 months**
									6MWD m	458,2 ± 86,8 519,7 ± 101,4

										SF-36	**18-40y/41-60y**	**18-40y/41-60y**
										PF	80±12/89±10	68±21/74±24
										RP	35±35/75±30	12±29/30±37
										BP	72±27/74±20	60±31/69±27
										GH	52±16/52±15	42±12/50±18
										VT	50±8/53±12	46±10/47.9±12
										SF	52±26/75±15	58±25/70±19
										RE	54±43/82±25	22±30/47±48
										MH	63±13/67±12	61±20/68±19
Vejen, et al. 2022[47]	Prospective, cross-sectional	Denmark	128	54 (42%)/ 74 (58%)	64.5 (51,0-75,0)	4	5 (3–8)/ N/A/ N/A	5 (3,9%)/ N/A		6MWD m	463 (357–540)	
										PCFS mild to severe	65 (51%)	
										EQ-5D-5L	78 (61%)	
										pain and discomfort	69 (54%)	
										usual activities	65 (51%)	
										mobility	51 (40%)	
										Mental health	75 (50–90)	
										EQ-VAS		

*__Note:__ SD: standard deviation; IQR: Interquartile Range; ICU: intensive care unit; IMV: invasive mechanical ventilation; N/A: not available; 6MWT m: six minute walking test meters; pred: predicted; mMRC: modified Medical Research Council; PCFS: Post-COVID-19 Functional Status; EQ-VAS: EuroQol visual analogue scale; SF-36: Short form-36; RP: Role physical; PF: Physical functioning; MH: Mental health; RE: Role emotional; SF: Social functioning; VT: Vitality; GH: General health; BP: Body pain; Saint George's Respiratory Questionnaire (SGRQ); SF-12: Short Form Health Survey 12-item; PCS: physical component score; MCS: mental component score; MRC: Medical Research Council; 1-MSTST: 1-min sit-to-stand test; UCSD: University of California San Diego Shortness of Breath Questionnaire; EQ-5D-5L: EuroQol 5 Dimension 5 Level; EQ-5D-3L: EuroQol 5 Dimension 3 Level; y: yaers.

DISCUSSION

Following up on COVID-19 survivors after hospital discharge is now the new challenge of the pandemic, as the extent of the functional and psychosocial damage that persists after infection is still unclear. It is believed that permanent sequelae will be more pronounced in patients who were admitted to the ICU and for this reason, there is a need for studies that describe the outcomes of symptoms and persistent sequelae. In this review, articles with different methods of functional assessment and health-related quality of life in hospitalized patients with complications resulting from COVID-19 infection and possible ways to identify patients with compromised health condition were included.It is worth mentioning that several specialists recognized the importance of creating measures to obtain results that will help in identifying the needs of these patients, in order to direct, plan and conduct more appropriate interventions and resources.

A systematic review mapped physical performance assessments in patients with COVID-19 that can help professionals in the structuring of post-discharge consultations and in the creation of outpatient and/or home rehabilitation programs[48,49]. As noted in ARDS, an increase in the incidence of ICUAW can be anticipated in both the short and long term. According to the literature, patients with septic conditions in intensive care develop a loss of up to 20% of the muscle mass of the thighs in the first week of hospitalization, and this time of bed rest is enough to cause a decline in muscle strength by up to 30%, adding an additional 20% loss of remaining strength every seven days. Healthy people, when submitted to immobilization, lose about 14% of muscle mass and 16% of muscle strength[50].

The inflammatory process generated by the infection associated with prolonged rest leads to muscle loss that is up to 10 times more pronounced than in healthy individuals, directly reflecting the functional capacity of patients[1]. The most frequent exercise functional capacity measure observed in this review was the 6MWT, probably due to its good reliability, low cost, simple and safe application to measure exercise tolerance in patients with cardiorespiratory changes, which can be performed in a flat and rigid space of 30 meters. This test correlates very

well with the morbidity and mortality rate[51,52]. Thus, it is an objective tool for measuring exercise capacity, valid for expressing the degree of disability, observing exercise limitations and formulating the basis for a subsequent rehabilitation program[48,53].

In the study by Wu et al. (2021), patients hospitalized for COVID-19 showed improvements in dyspnea and exercise capacity in a cohort followed for 12 months. The median distance traveled on the 6MWT significantly increased from 535 m (IQR 490–565) at 3 months to 585 m (552–626) at 6 months (p<0.0001). On the other hand, dyspnea symptoms evaluated by the mMRC scale were very frequent in patients at 3 months, of these 67 (81%) had the mMRC score of at least 1 and five (6%) patients had an mMRC score of at least. The number of patients with various levels of dyspnea symptoms progressively and significantly reduced at 6 months, 9 months and 12 months[54].

According to the study by Liao et al. (2022), 303 healthcare workers from China were evaluated for the long-term consequences of COVID-19. A comparison of patients with mild/moderate illness and those with critical/severe illness showed a shorter walking distance at 6MWT (549.50, IQR 514.0–582.0 vs. 564.0, 525.0–603, 0). The median was found below the lower limit of normality in 19.4%. The SGRQ and mMRC scores of survivors, especially those with critical/severe illness, were also significantly higher than those of the normal population[45].

Dyspnoea induced by ADLs or exercise was also frequently measured mainly by mMRC and Dyspnoea MRC, which has been widely used in individuals with sequelae of COVID-19. These scales are traditionally used and cited in the international literature mainly because they are easy to apply and understand[55].

The PCFS scale is also a tool that was adapted and validated to assess the impact of COVID-19 on functional status as it covers most limitations in ADLs, but this should be a supporting measure to the other instruments, not a substitute[56,57].

Existing data demonstrate that patients requiring intensive care or invasive mechanical ventilation (IMV) are at high risk of developing PICS. This is a phenomenon commonly observed in cases recovered from the ICU and among different age groups, being constantly described as prolonged disability resulting from muscle changes, lethargy, pain and dyspnea[58,59]. Another study observed that the functional status measured by PCFS was shown to be reduced in 87 (47.5%) patients in the sample. Patients who went to the ICU reported a greater reduction in their functional status compared to patients who did not go to the ICU (81.3% vs 40.4%, p<0.001). Two degrees of reduction in functional status were also observed in ICU patients in relation to the others (56.3% vs 6%, p<0.001). Limitation in ADLs (grade II-IV) was reported in 56.4% of patients who went to the ICU compared with 17.9% in patients who were not admitted to the ICU (p<0.001). Dyspnea on minor exertion was reported in only 19 patients (10.4%), however ICU patients reported dyspnea more frequently compared to non-ICU patients (37.5% vs 4.6%, p<0.001)[60].

In a study with 444 patients infected with COVID-19 evaluated between four and eight weeks after hospital discharge, it was shown that 80% of recovered cases had varying degrees of functional restrictions, ranging from insignificant (63.1%), mild (14.4 %), moderate (2%) to severe (0.5%) based on the PCFS scale[58].

Another study carried out six months after discharge, involving 91 critically ill patients admitted to the ICU, demonstrated a reduction in the functional status on the PCFS scale, in 57 (63%) patients. initial period after discharge and 41 (45%) reported persistent functional limitations (grade II-IV). A decrease in HRQoL was also observed in[61] patients (67%). The distributions of patients with moderate to severe problems across the five dimensions of the EQ-5D-3L were mobility (56%), usual activities (37%), self-care (13%), pain/discomfort (48%), and anxiety/depression (46%)[62].

Demoule et al. (2022) observed that even twelve months after ICU discharge for COVID-19 and subsequent rehabilitation, a considerable proportion of patients reported changes in HRQoL, dyspnea, and symptoms that were not present before admission, these factors associated with a worse rate of HRQoL at 12 months can help to identify patients at risk[44].

Advanced age, male gender, smoking, body mass index, need and length of hospitalization, use and time of MV during ICU stay, need and length of ICU stay are often associated with decreased health-related quality of life., decreased functional status at 6 months after ICU admission, or both[60-62,44]. Other scales that categorize individuals according to health-related HRQoL were the SF-12, SF-36, EQ-5D-5L and the EQ-VAS. In a study involving 18 patients with COVID-19 admitted to the ICU, followed up prospectively, a median of 36, 75.5,

122 and 222 days after discharge was observed. The HRQL assessment showed that physical functionality was reduced, as well as the impact incidence of the SGRQ and symptom scores, which improved over time, but when compared to the reference groups, they remained impaired[35].

In the SF-36 assessment of the HRQL, the greatest changes in the initial visit were in the domain 'function limitation due to physical problems (16.1 ± 31.9) and physical functioning (33.3 ± 31.7). When compared with predicted values for the healthy population, impairments in the domains of social functioning (60.7 ± 27.2), role limitations due to emotional problems (58.3 ± 47.4) and general health (60.7 ± 47.4) 27.2) were more pronounced. While impairment in the general health dimension remained impaired during follow-up, limitations due to physical problems, as well as impairment in physical functioning, also decreased significantly in relation to reference values[35].

The study by Gianella et al (2021) involving 39 patients who were hospitalized due to SARS-CoV-2 pneumonia evaluated three months after hospital discharge. In this study, it was observed that 31 patients (79.5%) reported a poor health perception due to respiratory symptoms assessed by the SGRQ and that all 39 patients showed a decrease in HRQoL measured by the SF-12. In this same study, both the 6MWD and the sensation of dyspnea measured by the mMRC were also different according to the division of groups based on chest computed tomography[36].

The American Thoracic Society (ATS) and European Respiratory Society (ERS) international task force suggests that the follow-up of a patient with COVID-19 after hospitalization should include a robust physical and psychosocial assessment allowing the identification of possible sequelae and persistent symptoms[49]. A set of baseline results consistently evaluated using accurate measurement instruments allows essential data to be pooled and draw credible conclusions. With that, it was possible to perceive that in all the studies used for the composition of the sample of this research, the result of the evaluations presented, in a certain way, the same pattern: the decline of the functional status, mainly increase of the fatigue; decreased muscle strength, balance and mobility; impaired independence; consequently causing harm to HRQoL and functional capacity.

Thus, pre-existing data from patients surviving viral pneumonia and chronic obstructive pulmonary disease (COPD) indicate a variety of challenges that these patients may present. An acute inflammatory response in the lungs, in addition to some extrapulmonary manifestations, such as peripheral skeletal and respiratory muscle dysfunction, contribute to exercise intolerance[63-65].

It is recommended that these post-COVID-19 patients, especially those who required hospitalization, have a formal assessment of physical capacity to identify unmet rehabilitation needs due to changes that continue to be present in physical functioning[46,66]. While initially COVID-19 was also considered a respiratory disease, it is now clear that it affects a variety of systems, making it unlikely that a one-dimensional physical training program will meet the needs of COVID-19 survivors.

There is still a small number of scientific studies in the literature and the absence of a standardization in the way of expressing the results, which limits and complicates the composition of a systematic review. In view of the studies presented, it can be observed that there was a decrease in the functional status and HRQoL of hospitalized patients after COVID-19. Therefore, it is necessary to develop more studies properly designed to verify the real dimension of the repercussions on the physical and psychosocial health of these patients and, consequently, how rehabilitation can minimize these sequelae.

CONCLUSION

With this literature review, it can be concluded that patients hospitalized for complications of COVID-19 showed a significant decline in functional status and health-related quality of life. However, updates are needed to characterize the clinical signs, functional variables and HRQoL in COVID-19 survivors, in addition to studies that guide the most effective approach to assess and rehabilitate these patients.

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