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## **Do Patients with Covid-19 Benefit from Rehabilitation?**

### ***Functional outcomes of the first 100 patients in a Covid-19 rehabilitation unit***

Violaine Piquet<sup>1,2</sup>, MBS, Cédric Luczak<sup>1,2</sup>, MBS, Fabien Seiler<sup>1,2</sup>, PT, Jordan Monaury<sup>1,2</sup>, PET, Alexandre Martini<sup>1,2</sup>, MD, Anthony B Ward<sup>3</sup>, MD, Jean-Michel Gracies<sup>1,2</sup>, MD, Damien Motavasseli<sup>1,2</sup>, MD; on behalf of the Covid Rehabilitation Study Group

1) AP-HP, Service de Rééducation Neurolocomotrice, Unité de Neuroréducation, Hôpitaux Universitaires Henri Mondor, Créteil F-94010 France

2) UR 7377 BIOTN, Laboratoire *Analyse et Restauration du Mouvement*, Université Paris Est Créteil (UPEC), France

3) North Staffordshire Rehabilitation Centre, Haywood Hospital, High Lane, Burslem, Stoke on Trent, UK-ST6 7AG, United Kingdom

#### **Corresponding author for review and publication:**

*Damien Motavasseli, MD*  
*Service de Rééducation Neurolocomotrice*  
*AP-HP, Hôpitaux Universitaires Henri Mondor*  
*51 Avenue du Maréchal de Lattre de Tassigny*  
*94000 Créteil, France*  
*Phone: +33-1-49-81-38-80*  
*Fax : +33-1-49-81-30-69*  
*E-mail: [damien.motavasseli@aphp.fr](mailto:damien.motavasseli@aphp.fr)*

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# 1 Do Patients with Covid-19 Benefit from Rehabilitation?

## 2 *Functional outcomes of the first 100 patients in a Covid-19 rehabilitation unit*

3

4

5 **ABSTRACT (274/275 words)**

6

7 **Objective:** To determine the benefits associated with brief inpatient rehabilitation for Covid-  
8 19 patients.

9 **Design:** Retrospective chart review.

10 **Setting:** A newly created specialized rehabilitation unit in a tertiary care medical center

11 **Participants:** Consecutive sample of the first 100 patients with Covid-19 infection admitted  
12 to rehabilitation.

13 **Intervention:** Inpatient rehabilitation for post-acute care Covid-19 patients

14 **Main Outcome Measures:** Measurements, at admission and discharge, comprised a Barthel  
15 Activities of Daily Living Index (including baseline value before Covid-19 infection), time to  
16 perform 10 sit-to-stands with associated cardio-respiratory changes, and grip strength  
17 (dynamometry). Correlations between these outcomes and the time spent in ICU were  
18 explored.

19 **Results:** Patient characteristics upon admission to rehabilitation were: men 66%, age 66±22  
20 years, mean delay from symptom onset 20.4±10.0 days, BMI 26.0±5.4 kg/m<sup>2</sup>, hypertension  
21 49%, diabetes 29%, with 26% having >50% pulmonary damage on CT-scans. Mean length of  
22 rehabilitation stay was 9.8±5.6 days. From admission to discharge, the Barthel index (/100)  
23 increased from 77.3±26.7 to 88.8±24.5 ( $p<0.001$ ), without recovering baseline values  
24 (94.5±16.2;  $p<0.001$ ). There was a 37% improvement in sit-to-stand frequency (0.27±0.16 to  
25 0.37±0.16 Hz;  $p<0.001$ ), a 13% decrease in post-test respiratory rate (30.7±12.6 to 26.6±6.1;  
26  $p=0.03$ ), and a 15% increase in grip strength (18.1±9.2 to 20.9±8.9 kg;  $p<0.001$ ). At both

27 admission and discharge, Barthel score correlated with grip strength ( $\rho=0.39-0.66$ ;  $p<0.01$ ),  
28 which negatively correlated with time spent in ICU ( $\rho=-0.57$  to  $-0.49$ ,  $p<0.05$ ).

29 **Conclusions:** Inpatient rehabilitation for Covid-19 patients was associated with substantial  
30 motor, respiratory and functional improvement, especially in severe cases, even though there  
31 remained mild persistent autonomy loss upon discharge. Following acute stages, Covid-19,  
32 primarily a respiratory disease, might convert into a motor impairment correlated with the  
33 time spent in intensive care.

34

35 Keywords: Covid-19, Pandemic, Rehabilitation

36

37 List of abbreviations:

38 CT-scan: Computerized Tomography scan

39 D14: Day 14

40 D24: Day 24

41 ICU: Intensive Care Unit

42 IQ: InterQuartile

43 PM&R: Physical Medicine and Rehabilitation

44 PT: Physical Therapy

45 RNA: Ribonucleic Acid

46 RT-PCR: Reverse Transcriptase Polymerase Chain Reaction

47

48 **INTRODUCTION**

49

50 The Covid-19 pandemic forced healthcare systems to rapidly adjust to constantly evolving  
51 situations. Traditional acute care units were converted into Covid-19 units with concerns  
52 about overwhelming hospital capacities. The rapid development of specific rehabilitation  
53 units was essential in response to the high level of dependence observed in many patients and  
54 the need to prevent outbreaks in other departments. Several authors have highlighted the need  
55 to prepare for post-acute care, but few functional outcomes after Covid rehabilitation have  
56 been reported. [1-7]

57 Covid-19 rehabilitation not only needs to address cardiorespiratory and motor deconditioning,  
58 as seen in acute respiratory distress syndrome, but also neurological deterioration, aggravation  
59 of comorbidities, and consequences of prolonged bed rest. [8-11]

60

61 In this work, we quantified the changes in functional parameters from admission to discharge,  
62 for the first 100 patients of a specifically designed Covid-19 rehabilitation unit, comparing  
63 non-intensive care unit (ICU) with post ICU patients and those after short vs long prior stay in  
64 acute care.

65

66

67 **MATERIAL AND METHODS**

68

69 *Creation of the unit - Target patients*

70

71

72 A unit of thirty-five single rooms dedicated to Covid rehabilitation was opened to meet the  
73 needs of our hospital group during the Spring 2020 epidemic wave, all patients coming from  
74 its acute care units. Admission criteria in the rehabilitation unit comprised:  
75 -positive RT-PCR or CT-scan supporting Covid-19 infection (as RT-PCR sensitivity has been  
76 reported to range from 66% to 80%, patients having highly evocative clinical signs and CT-  
77 scans were considered as Covid-19 patients, as in acute care departments) [12];  
78 -no >6 liters/min oxygen requirement (patients requiring more than 6 liters/min of oxygen  
79 were deemed unstable and remained under acute care);  
80 -clinical impression of stability;  
81 -no current endotracheal intubation or tracheotomy;  
82 -and need for rehabilitation and/or extensive social work to optimize a return home.

83

#### 84 *Nursing and medical care*

85

86

87 The ward was organized into sub-units of 8-9 patients, each operated by a team of two  
88 physicians, one nurse, two nursing assistants, and two physical therapists. Full personal  
89 protective equipment were donned by the staff for patients <14 days after symptom onset.  
90 Patients remained in their room at all times, including for their rehabilitation treatments.  
91 Following evidence suggesting the persistence of viral RNA on nasopharyngeal swabs for  
92 over 20 days, rehabilitation stays were extended up to D24 and further. [13] For >D14  
93 patients, less strict prevention procedures were implemented, involving the sole use of  
94 medical masks and hand disinfection with hydro-alcoholic gel.

95

#### 96 *Logistics and Equipment*

97

98

99 A physiotherapy space was arranged at the floor level for the >D14 patients to minimize  
100 patient transportations and to ease access to therapy activities. In addition, individual  
101 rehabilitation equipment was made available in each patient room, including dumb-bells,  
102 training bands, pedal-boards, hand-cycles, and chairs of standardized height. Eight bicycle-  
103 ergometers were available: five for the  $\leq$ D14 patient rooms and three for the >D14  
104 physiotherapy space.

105

106 ***Organization of the rehabilitation activities***

107

108

109 Two physical therapy (PT) sessions per day were provided for each patient but were kept  
110 short (<20 minutes) given the compromised cardio-respiratory condition and high levels of  
111 fatigability in post Covid patients. The therapy program primarily included overall motor  
112 strengthening with body weight exercises (sit-to-stand, tiptoe stands, squats), elastics and  
113 weights, with about three series of ten repetitions for each exercise, according to the patient  
114 abilities. Respiratory rehabilitation exercises were associated, including controlled  
115 diaphragmatic breathing, with work on the inspiratory and expiratory times. Aerobic work  
116 included bicycle-ergometer sessions at submaximal intensity, with monitoring of vital  
117 parameters. Finally, an individualized self-rehabilitation program was taught to patients, who  
118 were strongly advised to pursue these exercises after discharge, using specific workbooks.

119

120 In addition to this PT work, a physical education teacher organized small group sessions for  
121 >D14 patients who had become able to handle one-hour long workshops (4 patients at a time,  
122 at least 4 meters apart). Two occupational therapists, one speech therapist, and one  
123 psychologist were also dedicated to the 35-bed unit. To be medically authorized, speech  
124 therapy sessions had to be provided beyond D24, after two consecutive negative RT-PCR  
125 tests. The psychologist also cared for the staff.

126

### 127 *Discharge process*

128

129

130 To consider discharge home, patients had to be >D14 from symptom onset and no longer  
131 symptomatic for Covid-19 infection for at least 48h. Suitable home accommodation with  
132 temporary possibility of a private space was also required, as well as personal assistance if  
133 needed, and no at-risk relative at home. A specific mobile discharge team comprising one  
134 PM&R physician, one social worker and one occupational therapist helped detect early and  
135 solve any social issues encountered towards returning home. The physician of the mobile  
136 discharge team systematically provided tele-consultations after discharge. In addition, a  
137 dedicated physiotherapist insured proper execution of the self-rehabilitation exercises by  
138 visio-consultations. When discharge home was not possible at D24 from symptom onset, a  
139 Covid-free rehabilitation unit was sought.

140

### 141 *Ethics*

142

143



144 The local ethics committee approved the study (UPEC IRB 0011558 n°2020-064). Non-  
145 opposition to utilization of patient data was systematically pursued.

146

### 147 *Study design and participants*

148

149

150 A retrospective chart review of the first 100 patients admitted to the Covid-19 rehabilitation  
151 department was conducted since its opening on March 25, 2020.

152

153 Inclusion criteria included age  $\geq 18$  years, and the ability and willingness to participate in two  
154 daily PT sessions five days a week. Among included patients, functional outcome criteria  
155 were analyzed for lengths of stay  $\geq 72$  hours.

156

157 Demographics and clinical characteristics were recorded, including age, sex, date of  
158 admission, medical history, Covid-19 severity factors, clinical signs, biological and  
159 radiological data from the acute stay, drug treatments, date of discharge, length of stay,  
160 destination at discharge, and personal assistance at home if any. The following outcomes were  
161 assessed by only two physiotherapists to limit variability:

162 - Barthel Index of Activities of Daily Living (also retrospectively assessed before the Covid  
163 episode by questioning the patient or family); [14,15]

164 - Time to perform 10 full sit-to-stands as quickly as possible from a standardized 40-cm  
165 height chair, arms folded over the chest, with respiratory rate, oxygen saturation, heart rate,  
166 and Borg scale of perceived exertion, recorded before and after. [16-18] When 10 sit-to-  
167 stands could not be completed, the number of completions in one minute was collected;

168 - Hand grip strength, using dynamometry. The forearm was resting on the thigh, palm  
169 upwards, elbow to the body at 90° flexion. The best result of two tries was kept for each side.  
170 [19,20]

171 Changes in these outcomes from admission to discharge were measured in all patients, and  
172 then compared between:

173 - Patients who stayed in ICU *versus* patients who did not.

174 - Patients who stayed in acute care longer than the median length of stay *versus* those who  
175 stayed less.

176 Correlations between outcomes were also explored.

177

## 178 ***Data analysis***

179

180

181 Descriptive statistics were used for quantitative continuous variables using mean±SD or  
182 median (IQ). Qualitative data were compared using  $\chi^2$ -tests. Comparisons between admission  
183 and discharge values were carried out by paired sample *t*-tests or Wilcoxon signed ranked  
184 tests. Correlations between Barthel total score and other functional tests, and between  
185 functional scores and time spent in acute care were explored by Spearman or Pearson tests.  
186 Between-group comparisons were made using independent samples *t*-tests or Mann-Whitney  
187 U tests. Patients with missing data, upon admission or discharge, were excluded from the  
188 statistical analysis for the relevant parameter. All statistical analyses were performed  
189 according to conditions of normality on Shapiro-Wilk tests. SPSS v25 software was used,  
190 with a significance set at 0.05.

191

## 192 **RESULTS**

193

194

195 ***Population description***

196

197

198 The descriptive characteristics of the 100 patients are presented in Table 1. On admission,  
199 median age was 66 (41% were >70) with 66% men; mean BMI was 26 kg/m<sup>2</sup>; mean delay  
200 post-onset was 20.4±10.0 days. At the time of diagnosis, the main clinical symptoms were  
201 dyspnea with fever and 26% had >50% pulmonary damage on CT-scans. There was a high  
202 prevalence of hypertension (48%) and diabetes (29%). In terms of prior drug treatment, 37%  
203 had received hydroxychloroquine, 9% had received liponavir, 5% had received tocilizumab  
204 and 6% had received corticosteroids.

205 23% of patients had been admitted to intensive care and 77% had needed oxygen. Upon  
206 admission in rehabilitation, 58% still required oxygen, administered with nasal cannula (*Table*  
207 *2*). The severity of admitted patients worsened over the course of the epidemic wave as the  
208 proportion of ICU and intubated patients gradually increased to reach 60% and 50%  
209 respectively by May 15, 2020, the date of the admission of the 100<sup>th</sup> patient. Of note, there  
210 was a discrepancy between the number of patients hospitalized in intensive care and those  
211 who were intubated (*Supplemental Figure 1*). Indeed, the general consensus was to limit  
212 orotracheal intubation to a strict minimum to avoid complications related to this procedure.  
213 [21] In parallel, the number of days since the onset of infection at admission also gradually  
214 increased (*Supplemental Figure 1A*). The number of weekly admissions followed the spring  
215 pandemic's curve, peaking at 25 (*Supplemental Figure 1B & 2*).

216 The mean length of stay in the rehabilitation unit was 9.8±5.6 days, with 79% of discharges  
217 home or to a relative's and 15% transfers to Covid-free units for further inpatient  
218 rehabilitation. The proportion of patients needing personal assistance at home increased by

219 26% ( $p<0.001$ ) as compared with before the infection, and 3% of patients still needed oxygen  
220 at discharge (*Table 2*).

221

### 222 ***Overall functional outcomes***

223

224

225 - The total Barthel score improved from admission to discharge ( $77.3\pm 26.7$  vs  $88.8\pm 24.5$   
226 respectively;  $p<0.001$ ), in particular in terms of personal care and motor skills (transfers,  
227 walking, and use of stairs). However, independence for personal tasks of daily living at  
228 discharge remained lower than prior to infection ( $88.8\pm 24.5$  vs  $94.5\pm 16.2$  respectively;  
229  $p=0.001$ ) (*Figure 1*).

230 - Sit-to-stand frequency increased by 37% ( $0.27\pm 0.16$  to  $0.37\pm 0.16$  Hz;  $p<0.001$ ; *Figure 2A*);

231 - Post sit-to-stand test respiration rate dropped by 9% ( $30.1\pm 12.0$  to  $28.0\pm 7.5$ ;  $p=0.029$ ;  
232 *Figure 2A*);

233 - Borg exertion score after the sit-to-stand test improved by 30% ( $3.0\pm 2.4$  to  $2.1\pm 1.5$ ;  
234  $p=0.023$ ; *Figure 2B*);

235 - Grip strength among right-handed people (92% of patients) increased by 15% ( $18.1\pm 9.25$  to  
236  $20.9\pm 8.9$  kg,  $p<0.001$ ; *Figure 2C*).

237

### 238 ***Correlations between length of acute stay, motor parameters and functional autonomy***

239

240

241 Barthel total score correlated with sit-to-stand frequency, both at admission and discharge  
242 ( $\rho=0.66$ ,  $p<0.001$  and  $\rho=0.53$ ,  $p<0.001$  respectively; *Figure 3A*) and with grip strength  
243 both at admission and discharge ( $\rho=0.43$ ,  $p=0.003$  and  $\rho=0.39$ ,  $p=0.007$  respectively;

244 *Figure 3B*). Grip strength was negatively correlated with the number of days spent in ICU,  
245 both at admission and discharge ( $\rho=-0.49$ ,  $p=0.053$  and  $\rho=-0.57$ ,  $p=0.021$  respectively;  
246 *Figure 3C*), as was post-test Borg at discharge ( $\rho=-0.51$ ,  $p=0.042$ ).

247

### 248 ***Between-group comparisons***

249

250

251 Prior to admission into rehabilitation, the median length of stay in acute care was 14 days.  
252 The patient groups considered for comparison were therefore: 1) ICU *versus* non-ICU stays;  
253 2)  $\geq 14$  days *versus*  $< 14$  in acute care. The mean length of stay in the Covid rehabilitation  
254 department was not different between these groups: post-ICU patients ( $n=23$ ) had spent  
255  $9.4 \pm 4.2$  days in our unit *versus*  $9.9 \pm 5.3$  days in non-ICU patients ( $n=77$ ) ( $p=0.86$ ), and  
256 patients who spent  $\geq 14$  days in acute care ( $n=50$ ) had spent  $10.1 \pm 5.1$  days in our unit *versus*  
257  $9.5 \pm 5.0$  days for those who spent  $< 14$  days in acute care ( $n=50$ ) ( $p=0.54$ ). There was also no  
258 difference in functional parameters upon admission into rehabilitation between these same  
259 groups, including for grip strength and Barthel index. Yet, comparisons of changes in  
260 functional outcomes from admission to discharge revealed two differences between the  
261 groups:

262 - Grip strength improved more in post-ICU patients ( $+3.3 \pm 3.1$  kg;  $n=13$ ) *versus* patients who  
263 did not require ICU ( $+0.99 \pm 3.7$  kg;  $n=31$ ;  $p=0.049$ ; data not shown);

264 - The score for transfers on the Barthel Index improved more in patients who stayed  $\geq 14$  days  
265 in acute care ( $+30.0 \pm 60.7\%$ ;  $n=45$ ) than in patients who stayed  $< 14$  days ( $+8.7 \pm 22.3\%$ ,  $n=45$ ;  
266  $p=0.041$ ; data not shown).

267

268

269 **DISCUSSION**

270

271

272 In this retrospective study on the first 100 patients with Covid-19 infection admitted into a  
273 specialized rehabilitation unit, inpatient therapy was associated with substantial functional,  
274 motor, and cardio-respiratory improvement, particularly in those patients who had undergone  
275 severe acute disease. Nonetheless, loss of autonomy and motor weakness persisted at  
276 discharge, which occurred about a month after the onset of Covid-19.

277

278 *Usefulness of a Covid rehabilitation unit*

279

280

281 To our knowledge, the present article is the first to report quantified, systematically collected  
282 data on rehabilitation effects in such a large cohort of Covid patients. It is worth mentioning  
283 that this work came in the midst of a trend to convert many rehabilitation facilities into acute  
284 departments in several countries. [22] In that context, the present study still suggests the  
285 importance of early inpatient Covid rehabilitation, within 3 weeks of disease onset, including  
286 sustained motor exercises. Our findings confirmed early reports from around the world: a  
287 recent Japanese case report showed a comparable improvement on grip strength and Barthel  
288 index in one patient with early rehabilitative care, while an Italian review of post Covid  
289 clinical status upon admission into rehabilitation also observed low Barthel Index total scores  
290 (<50, see below). [23,24] More recently, two studies compared functional data between  
291 admission and discharge from a specialized rehabilitation unit, from smaller sample sizes. The  
292 first study mainly provided respiratory data for 23 subjects, while the second provided other  
293 functional data for 41 patients. As in the present work, both studies showed an improvement

294 in Barthel index and suggested that the neurological consequences of Covid infection could  
295 be long-lasting. [6,7]

296

297 In this study, most patients admitted to the rehabilitation unit were elderly, male, with a high  
298 prevalence of cardiovascular comorbidities, all characteristics consistent with Covid-19  
299 infection risk and severity factors previously reported. [25-27] The estimated Barthel index  
300 prior to the episode was >90/100, showing that these patients were free of prior limitation of  
301 daily activities. Barthel at admission in rehabilitation was thus notably low ( $77.3 \pm 26.7$ ), 5%  
302 of the patients having even lost all autonomy for daily activities (i.e. Barthel <30). Upon  
303 admission, there was marked motor weakness in this non-geriatric population mostly free of  
304 pre-morbid neurological disability, with a mean grip strength and a sit-to-stand frequency  
305 both at 80% of normal values in that age range. At discharge, mean grip strength remained  
306 10% below normal. [17,18,28] Therefore, in this study much of the post-acute functional  
307 consequences seemed to be motor. The question may arise as to whether such motor  
308 impairment may be attributable to sole deconditioning in patients who were hospitalized for  
309 several days, or to direct Covid-19 aggression of neurological pathways. [29-33]

310

311 Any impact of Covid-19 on the nervous system is being scrutinized in the literature. A  
312 literature review with meta-analysis outlines possible neurological symptomatology. [34] The  
313 sole known neurological disorders observed in the present series were probable ICU-acquired  
314 weakness – unfortunately however, electroneuromyography was not systematically performed  
315 in the present cohort – and few post-intubation swallowing disorders. We did not note any  
316 emerging confusion related to the Covid-19 infection in a context where some of our patients  
317 did have pre-existing cognitive impairments. One patient suffered from an acute stroke for

318 which he was initially hospitalized and was then incidentally diagnosed with Covid-19. In the  
319 presence of other risk factors, this stroke was not attributed to the ongoing Covid infection.  
320 Most of the rehabilitative therapy involved motor exercises and few pure respiratory  
321 exercises. Accordingly, motor progression was dramatic during the hospital stay and  
322 functional autonomy highly correlated with motor performance. This made sense since the sit-  
323 to-stand test and grip strength have been shown to correlate with overall strength and global  
324 physical functioning, thus assumingly with the Barthel Index. [15,17] The mean length of  
325 rehabilitation stay ( $9.8\pm 5.0$  days) was notably shorter than in a traditional inpatient  
326 rehabilitation setting. This may have resulted from both the intensity of the rehabilitative care  
327 provided and the effectiveness of the mobile team specifically dedicated to accelerate the  
328 discharge process.

329 Recovery was incomplete at discharge, which may imply the need to continue with outpatient  
330 rehabilitation beyond discharge. To this end, since outpatient physiotherapy was forbidden  
331 during the spring pandemic, patients were taught guided self-rehabilitation exercises and were  
332 provided with a workbook containing an individualized program, similarly to what exists in  
333 other indications [35]. A more prolonged stay might have allowed a more complete recovery.

334

### 335 *Effect of motor rehabilitation on severe Covid cases*

336

337

338 The findings suggest that an ICU or longer acute stay did not hamper responsiveness to  
339 rehabilitation. In fact, responsiveness was even enhanced for some outcomes in these severely  
340 affected patients. Admittedly, motor function may have started from lower values in these  
341 cases, even though differences upon admission into rehabilitation were not statistically  
342 significant between the groups. Nevertheless, these findings are reassuring, since they support



343 the reversibility of much of the motor consequences of longer stays in acute care or of ICU  
344 stays.

345

### 346 *Study limitations*

347

348

349 The present study is not controlled. In the context of the health crisis of the Spring 2020, it  
350 was not considered ethical to carry out a clinical trial of rehabilitation *versus* a "sham  
351 rehabilitation" control group. The lack of hindsight in this disease and the emergencies that  
352 professionals were faced with also made it impossible to design a control group with a real  
353 but different rehabilitation protocol. Another limitation was the proportion of missing  
354 functional data (*see Tables & Figures*). Due to rapid patient turnover, functional assessments  
355 could not be always carried out. Data were however sufficient to show pre-post and between-  
356 group statistical differences. Respiratory data was also incomplete although these would have  
357 allowed to better characterize and follow up patients: spirometry was not assessed as there  
358 was concern about the infectious risk of its use, and Pa/FiO<sub>2</sub> measurements were not possible  
359 since patients admitted in rehabilitation were not ventilated, as per inclusion criteria.

360

### 361 *Conclusions*

362

363

364 When the Covid-19 health crisis began, a number of reports emphasized the need to be  
365 prepared for post-acute care management. [1-5] The objective, quantified functional  
366 improvement from admission to discharge suggests the usefulness of rehabilitation in a  
367 specialized unit after Covid-19 infection, with even greater improvement for some outcomes

368 in patients who had undergone ICU or stayed longer in acute care. However, the  
369 consequences of severe Covid-19 infection on dependence appear to be long lasting and  
370 predominantly related to motor limitation. Once the acute hospital situation has subsided,  
371 prospective and randomized blinded studies comparing the effectiveness of different types of  
372 rehabilitation and including specific respiratory assessments may further knowledge on Covid  
373 rehabilitation.

374

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376

377

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380

### 381 *Declaration of interests*

382

383

384 The authors declare no competing interests.

385

386

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484

485 **Figure 1. Changes in Barthel index (n=89)**

486 **A.** Barthel index items; Items laid out in order to highlight motor tasks. **B.** Barthel index total  
487 score. Data expressed in mean±SEM.

488 \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

489

490 **Figure 2. Functional data upon admission and at discharge**

491 **A.** Sit-to-stand parameters; **B.** Borg scale before and after Sit-to-stand test; **C.** Grip strength in  
492 right-handed patients. Data expressed in mean±SEM.

493 \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

494

495 **Figure 3. Correlations between motor/functional tests and Barthel index or number of**  
496 **ICU days**

497 **A.** Barthel total score and Sit-to-stand frequency at admission and at discharge.

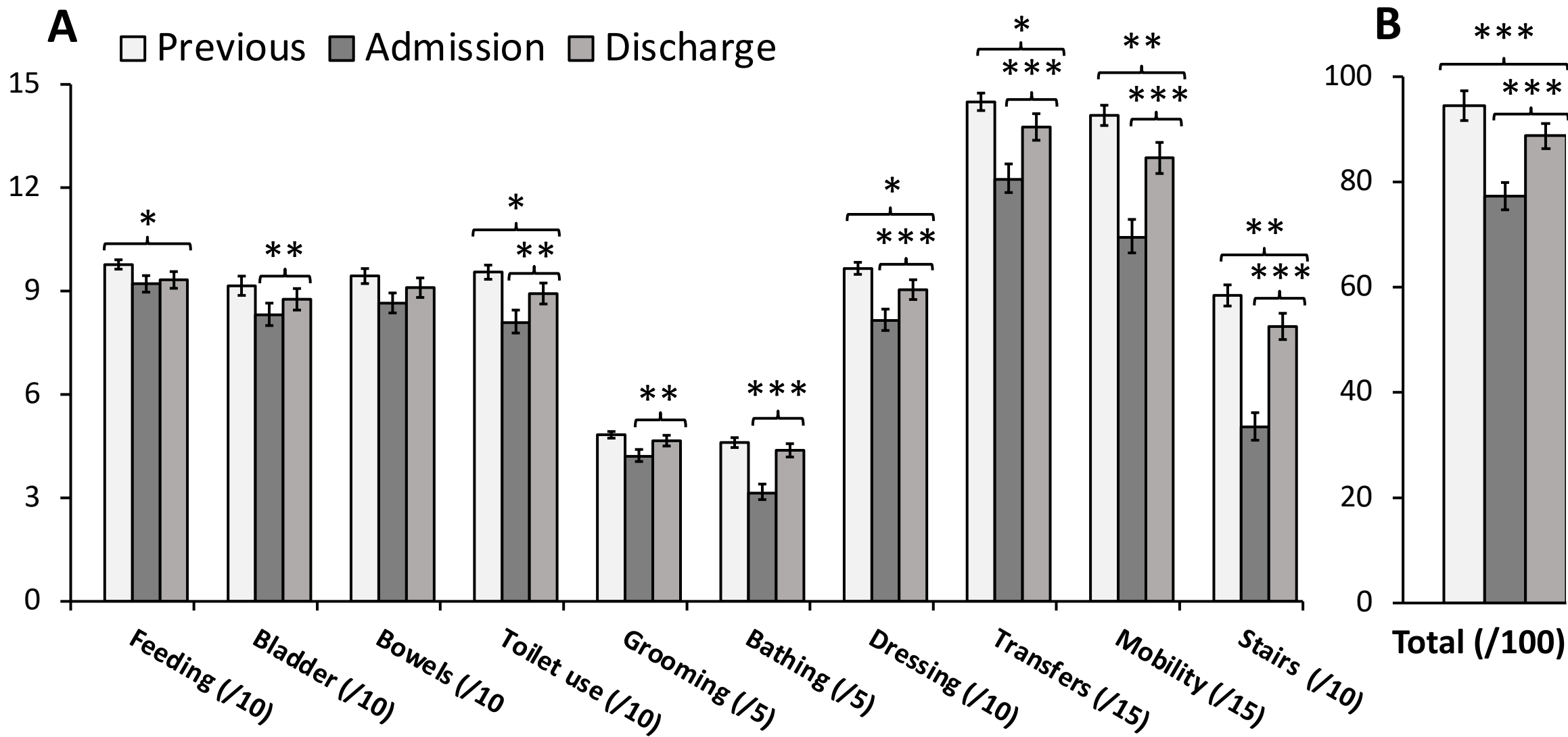
498 **B.** Barthel total score and mean grip strength at admission and at discharge.

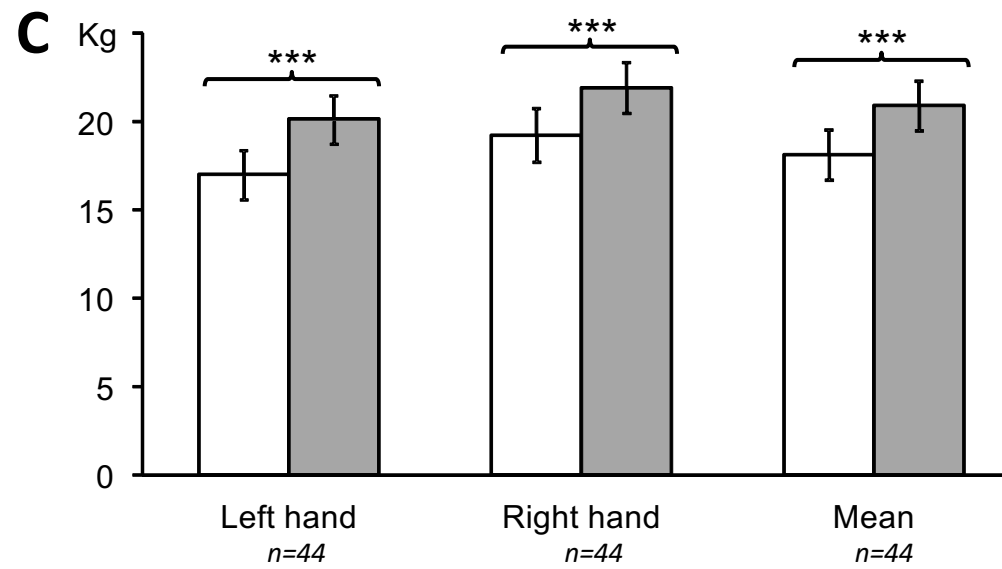
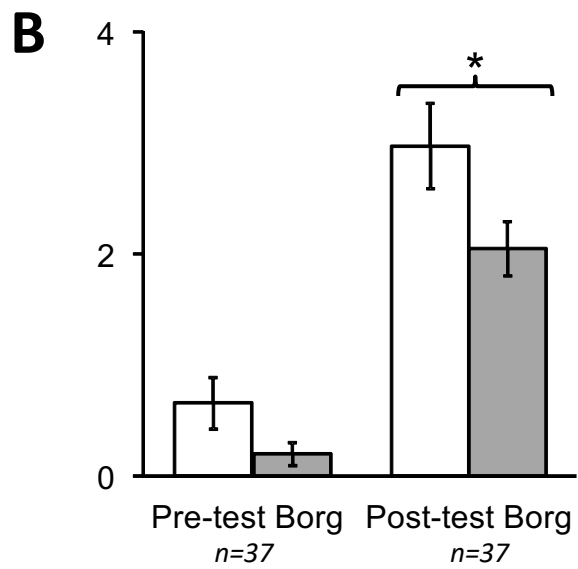
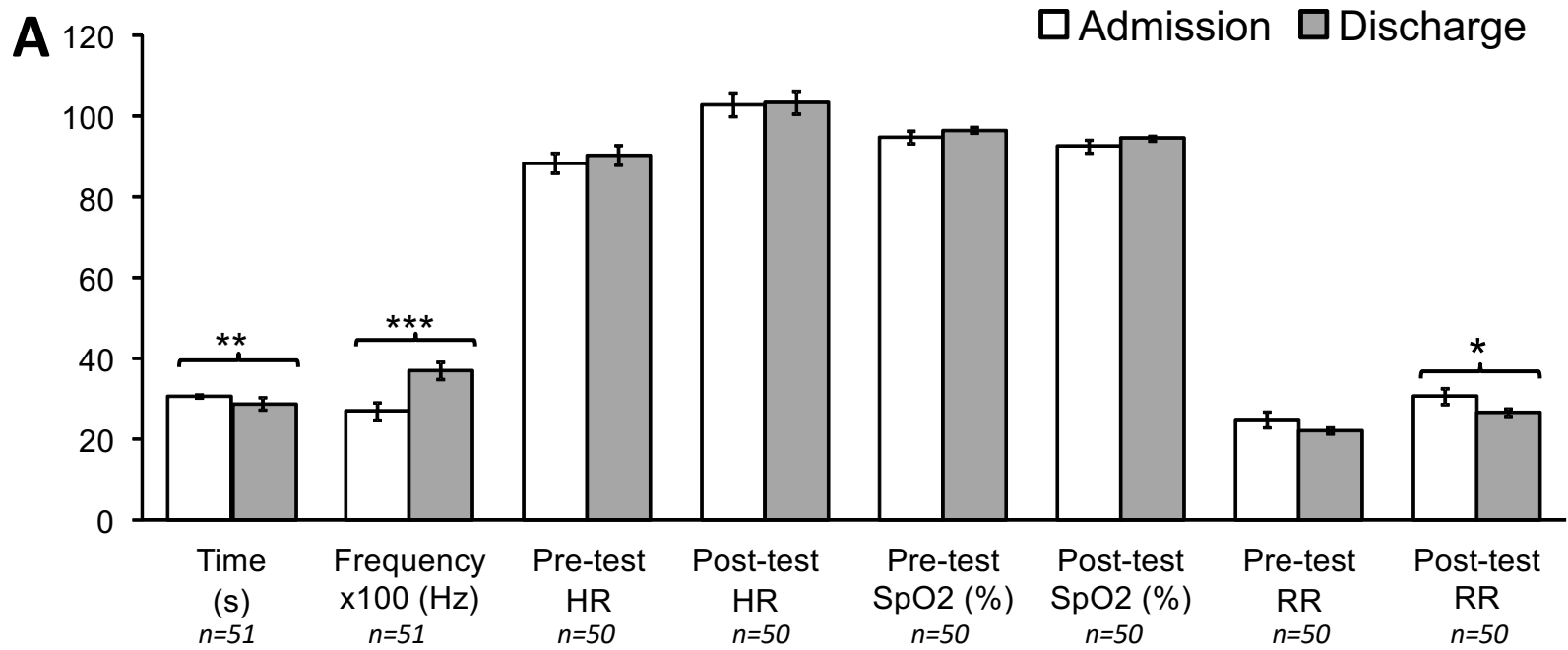
499 **C.** Grip strength and the number of days spent in ICU at admission and at discharge.

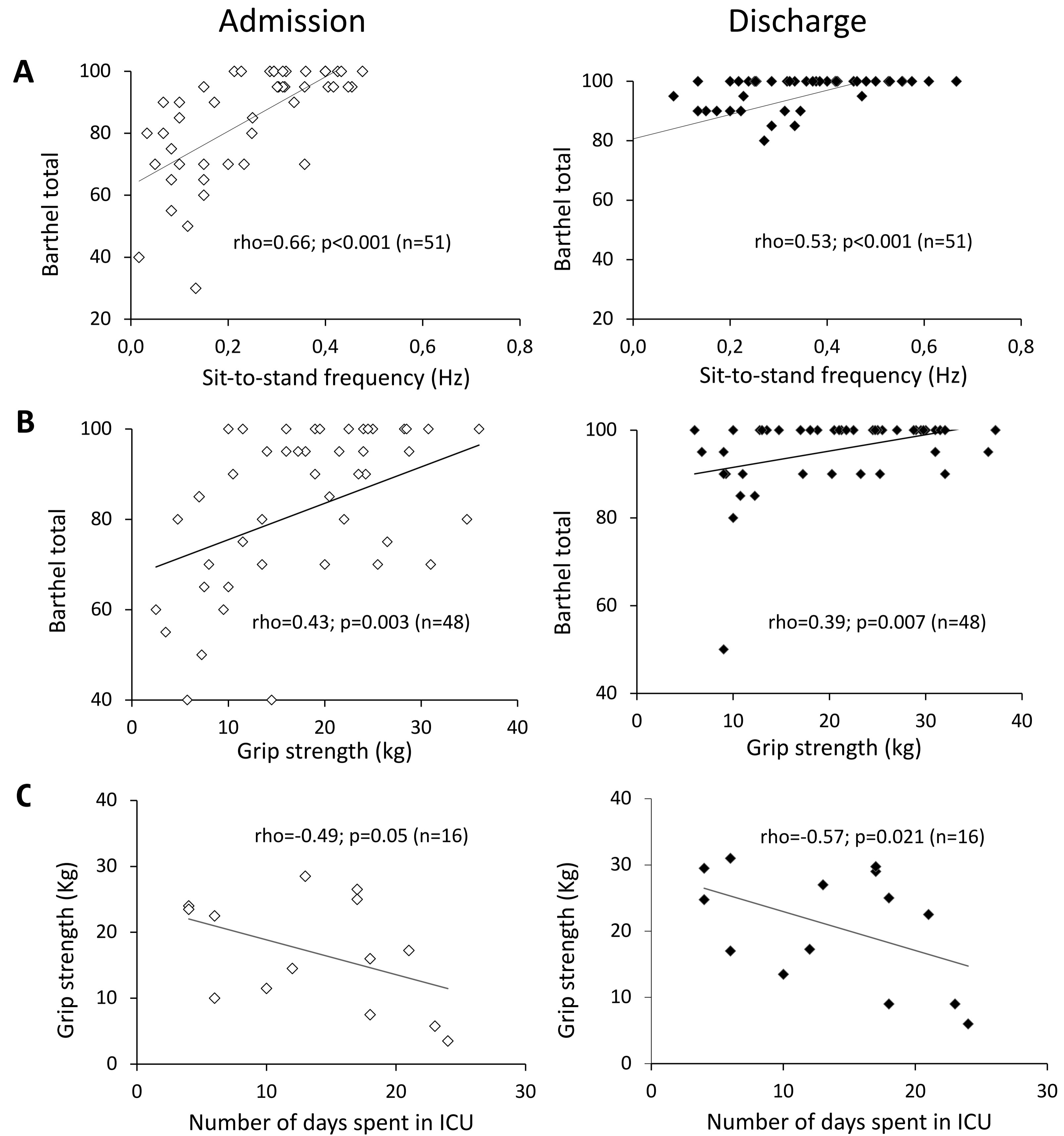
500 Spearman or Pearson tests were used according to conditions of normality on Shapiro Wilk  
501 tests. Outliers beyond 2SD on Z-tests were excluded.

502









**TABLE 1 Population characteristics (n=100)**

n≥95 for all collected data. Delays expressed in days.

n [%] unless specified otherwise.

<b>Demographics</b>	
Age [median±IQ]	66±22
Sex (Male)	66 [66%]
Mean delay post-onset at admission	20.4±10.0
Mean delay post-onset at discharge	32.7±10.7
BMI [mean±SD]	26.0±5.4
<b>Clinical characteristics at time of diagnosis</b>	
Dyspnea	79 [79%]
Asthenia	76 [76%]
Fever	73 [73%]
Cough	64 [64%]
Myalgia	33 [33%]
Diarrhea	25 [25%]
Ageusia	16 [16%]
Headache	14 [14%]
Anosmia	13 [13%]
Pulmonary embolism	4 [4%]
Thrombosis	1 [1%]
<b>Background and comorbidities</b>	
High blood pressure	48 [48%]
Age >70	41 [41%]
Diabetes	29 [29%]
BMI >30	17 [17%]
Renal failure	13 [13%]
Coronaropathy	1 [1%]
Stroke	9 [9%]
Immunosuppression	3 [3%]

**TABLE 2 Characteristics of hospital stays (n=100)**

n≥99 for all collected data. Duration and lengths of stay expressed in days.

n [%] unless specified otherwise.

<b>Acute care</b>	
Prior intensive care	23 [23%]
Intubation	13 [13%]
Duration of intubation [mean±SD]	8.2±8.5
Nasal O2 at admission	77 [77%]
Nasal O2 at discharge	58 [58%]
Overall length of stay in acute care [mean±SD]	14.4±8.7
In intensive care [mean±SD]	13.8±9.0
In acute care after ICU [mean±SD]	10.22±4.87
In acute care if no ICU stay [mean±SD]	11.65±6.48
<b>Rehabilitation care</b>	
Length of stay [mean±SD]	9.8±5.1
Deaths	2 [2%]
<b>At discharge</b>	
Overall duration of O2 dependency [mean±SD]	17.4±11.1
O2 dependency at discharge	3 [3%]
Discharge home	75 [75%]
Discharge to a relative's home	4 [4%]
Transfer to a Covid-free rehabilitation unit	15 [15%]
Transfer to acute care	8 [8%]
Personal assistance before Covid	19 [19%]
Personal assistance after Covid	24 [24%]