

## Evaluation of functional independence and quality of life after discharge of intensive care unit: a prospective cohort study

### Avaliação da independência funcional e da qualidade de vida após a alta da unidade de terapia intensiva: um estudo do coorte prospectivo

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**ABSTRACT | INTRODUCTION:** Critically ill patients may experience functional, social, and mental changes, including impaired cognition, memory, and concentration after admission to the intensive care unit (ICU) and hospital discharge. Despite the knowledge about the impact of the hospital stay on functionality and quality of life, there is still little recognition in the literature of this impact in the long term. **OBJECTIVE:** To verify functional independence and quality of life (QOL) in patients over 1 year after discharge from the Intensive Care Unit (ICU). **METHODS:** This is a prospective cohort study, were admitted to the ICU and under mechanical ventilation for more than 48 hours, up to 24 hours after discharge from the ICU, over 18 years of age, of both sexes and who agreed to participate in the study. Those with neurological sequelae and recurrent trauma that made functional assessment impossible were excluded. Functional independence (Functional Independence Measure-FIM) and QOL variables were measured using the Short Form 36 questionnaire (SF-36) at the time of discharge from the ICU (period I), 30 days (period II), and 1 year after (period III). **RESULTS:** 33 patients were included in the study with a mean age of 49.13±16.3, and the main cause of hospitalization was neurological disorders, of which 5(14.70%) died, and two did not complete the evaluations, resulting in a total of 26 patients evaluated 1 year after discharge. The length of ICU stay (days) was 16 (7 - 22) and the Mechanical Ventilation time (days) was 8,5 (2 - 13). Ten patients there were diagnosed with sepsis. The following values over these three moments were found for the variables IF (I-51 [47-64.5]; II-80[59.5-108]; III-104[82.8-123]) and QOL(I-67.4[57.3-81.1]; II-80.2[70.1-99.2]; III-93.5[88.5-96.5]). Functional independence and QOL increased significantly between moments II and III compared to moments I ( $p < 0.05$ ), with no difference, when comparing period II in relation to III. **CONCLUSION:** Patients recover their functionality and quality of life after thirty days of discharge from the ICU. However, this patient's functionality and quality of life do not change after 1 year of discharge from the ICU in relation to the period of 30 days after discharge from the ICU.

**KEYWORDS:** Functionality. Intensive Care Unit. Quality of Life. Physiotherapy.

**RESUMO | INTRODUÇÃO:** Os pacientes criticamente doentes podem sofrer alterações funcionais, sociais e mentais, incluindo deficiência de conhecimento, memória e concentração após a admissão na unidade de terapia intensiva (UTI) e alta hospitalar. Apesar do conhecimento sobre o impacto da internação hospitalar na funcionalidade e qualidade de vida, ainda há pouco reconhecimento na literatura sobre este impacto a longo prazo. **OBJETIVO:** Verificar a independência funcional e a qualidade de vida (QOL) em pacientes acima de 1 ano após a alta da Unidade de Tratamento Intensivo (UTI). **MÉTODOS:** Este é um estudo de coorte prospectivo, foram admitidos na UTI e sob ventilação mecânica por mais de 48 horas, até 24 horas após a alta da UTI, acima de 18 anos de idade, de ambos os sexos e que concordaram em participar do estudo. Foram excluídos aqueles com sequelas neurológicas e traumas recorrentes que impossibilitavam a avaliação funcional. As variáveis independência funcional (Medida de Independência Funcional - FIM) e QOL foram medidas utilizando o questionário do formulário curto 36 (SF-36) no momento da alta da UTI (período I), 30 dias (período II), e 1 ano após (período III). **RESULTADOS:** 33 pacientes foram incluídos no estudo com uma idade média de 49,13±16,3 anos, e a principal causa de hospitalização foi distúrbios neurológicos, dos quais 5(14,70%) morreram, e dois não completaram as avaliações, resultando em um total de 26 pacientes avaliados 1 ano após a alta. A duração da internação na UTI (dias) foi de 16 (7 - 22) e o tempo de ventilação mecânica (dias) foi de 8,5 (2 - 13). Dez pacientes lá foram diagnosticados com sepse. Foram encontrados os seguintes valores nesses três momentos para as variáveis IF (I-51 [47-64,5]; II-80[59,5-108]; III-104[82,8-123]) e QOL(I-67,4[57,3-81,1]; II-80,2[70,1-99,2]; III-93,5[88,5-96,5]). A independência funcional e QOL aumentou significativamente entre os momentos II e III, em comparação com os momentos I ( $p < 0,05$ ), sem diferença na comparação do período II em relação ao III. **CONCLUSÃO:** Os pacientes recuperam sua funcionalidade e qualidade de vida após trinta dias de alta da UTI. Entretanto, a funcionalidade e a qualidade de vida deste paciente não mudam após 1 ano de alta da UTI em relação ao período de 30 dias após a alta da UTI.

**PALAVRAS-CHAVE:** Funcionalidade. Unidade de Terapia Intensiva. Qualidade de Vida. Fisioterapia.

Submitted 10/22/2021, Accepted 01/10/2022, Published 03/07/2022

J. Physiother. Res., Salvador, 2022;12:e4189

<http://dx.doi.org/10.17267/2238-2704rpf.2022.e4189>

ISSN: 2238-2704

Assigned editors: Rafael Mesquita, Cristiane Dias, Ana Lúcia Góes

*How to cite this article:* Cordeiro AI, Peixoto F, Menezes M, Norberto F, Kutchak FM, Rieder M, et al. Evaluation of functional independence and quality of life after discharge of intensive care unit: a prospective cohort study. J Physiother Res. 2022;12:e4189. <http://dx.doi.org/10.17267/2238-2704rpf.2022.e4189>



## Introduction

Critically ill patients may experience functional, social, and mental changes, including impaired cognition, memory, and concentration after admission to the intensive care unit (ICU) and hospital discharge.<sup>1</sup> Recovery is often slow, prolonged and changes may persist after the hospital stay. Patients often need continuous support from family and caregivers after returning home, especially those mechanically ventilated during ICU stay.<sup>2,3</sup> In addition to all changes related to ICU stay, increased survival is accompanied by an impact on short- and long-term quality of life (QOL) after discharge.<sup>4</sup>

The application of functionality scales for the assessment of critical patients is extremely important for the physiotherapist, as this has the main objective of minimizing the acquired functional loss, in addition to preserving the ability to maintain the skills necessary to perform activities of daily living (ADLs), with an emphasis on transfer and locomotion.<sup>5</sup> Functional performance assessment is increasingly seen as a valuable measure of clinical test results. It is commonly used to identify the diagnosis, prognosis, compare the response to treatment of patients, and verify and monitor the performance of the functionality to guide the therapist in the elaboration of treatments and prevention of physical disabilities.<sup>6,7</sup> One variable that promotes impact on functionality is overall muscle strength, which can be measured through the palmar grip strength.

It is known that functional independence at discharge can be related to worse quality of life and mortality after hospital discharge and the monitoring of these variables in the post-discharge is of paramount importance to better understand these outcomes.<sup>8,9</sup> However, despite the knowledge about the impact of the hospital stay on functionality and quality of life, there is still little recognition in the literature of this impact in the long term. Thus, the present study aimed to assess the variation in functional independence and quality of life over 1 year after discharge from the

ICU, comparing the moments of immediate discharge from the ICU, thirty days, and 1 year after discharge from the ICU. As a secondary objective, handgrip strength was assessed to identify muscle weakness at the time of discharge from the ICU.

## Methods

A prospective cohort study was carried out in the ICU of Hospital Cristo Redentor and wards of the hospital itself, belonging to the Hospitalar Conceição Group, in Porto Alegre. The evaluations were carried out from March 2014 to September 2016. The study was approved by both Research Ethics Committees (opinion No. 866.267), and all patients signed the Free and Informed Consent Form (ICF).

### Eligibility Criteria

The study included patients admitted to the ICU and under mechanical ventilation for more than 48 hours, up to 24 hours after discharge from the ICU, over 18 years of age, of both sexes, and who agreed to participate in the study. We excluded those patients with neurological and traumatological changes prior to admission. Patients who died before 30 days or were transferred to another hospital were considered losses. Participants in the research were patients discharged from the ICU within the first 24 hours after leaving, already in the patient's bed, 30 days after discharge, and 1 year after discharge.

### Study Protocol

The patients who were discharged from the ICU were invited to participate in the study (at the time of discharge or when they were up to 24 hours after discharge in the ward). After the acceptance and signature of the ICF, the evaluation form was filled in, and the data of identification, clinical diagnosis, length of stay in the ICU, time on MV, and whether there was a diagnosis of sepsis during the period of hospitalization.

After assessing functional independence using the Functional Independence Measure (FIM)<sup>10</sup>, and quality of life was verified by Short-Form 36 (SF-36)<sup>11</sup> and handgrip strength.<sup>12</sup> The interviews to assess the quality of life, FIM in 30 days and one year after discharge, were conducted by telephone contact. It is noteworthy that a blind examiner always performed the evaluations.

## Collection Instruments

### Functional Independence Measure

The Functional Independence Measurement aims to measure what the person really accomplishes, regardless of the diagnosis, generating a valid score for the limitation or not. This scale assesses the patient's ability to develop body care, sphincter control, transfer, locomotion, and cognitive functions such as communication and memory. A score from 1 to 7 is assigned, with the lowest value corresponding to the patient totally dependent, and the maximum value was that patient completely independent from the functional point of view, reaching a maximum value of 126 points when all variables were added together.<sup>10</sup>

### Quality of life

The Medical Outcomes Short-Form Health Survey (SF-36) is a generic Health assessment instrument created in English, easy to administer, and understand. It consists of 36 questions, covering eight components, functional capacity, physical aspects, pain, general health status, vitality, social aspects, emotional aspects, and mental health evaluated by 35 questions and one more comparative question between current and health one-year ago.<sup>11</sup>

### Hand grip

The maneuver used to measure strength by means of a dynamometer was following the recommendations of the American Society of Hand Therapists, which recommends that the subject be seated with the shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in a neutral position, and the wrist between 0° and 30° of extension and 0° to 15° of ulnar deviation.<sup>12</sup>

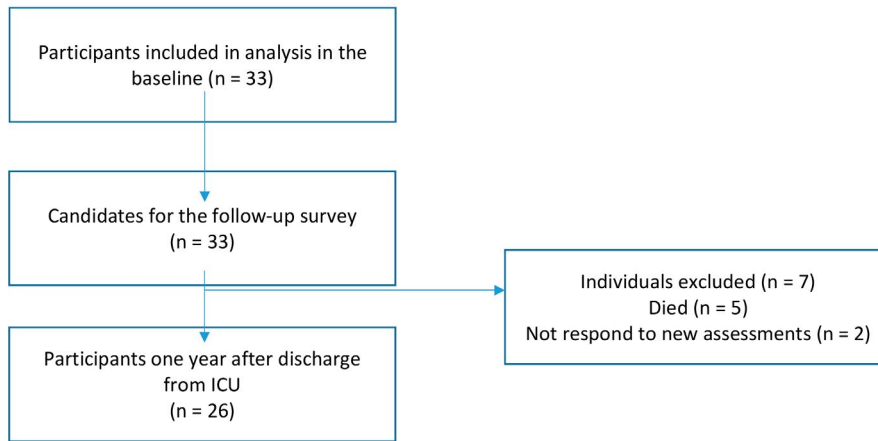
### Statistical analysis

Categorical variables were expressed as absolute and percentage values, whereas continuous variables were described using means and standard deviations or medians and interquartile ranges. The normality of the data was assessed using the Shapiro-Wilk test. To compare the different study periods, we used the Kruskal-Wallis test with Dunn's Post-hoc. The analyzes were performed using the Statistical Package for Social Science 20.0 (SPSS) program.

## Results

During the period established for data collection, 33 patients were included in the study, and during the study 5 (14.7%) patients died, two patients did not respond to new assessments, totaling the number of patients assessed for 26 in one year after discharge from the ICU (Figure 1).

**Figure 1.** Flowchart of the inclusion of participants in the study



The patients had a mean age of  $49.13 \pm 16.3$  years, with the female gender being predominant and the neurological condition as the main cause of hospitalization, according to table 1.

**Table 1.** Characteristics of the patients included in the study (n = 33)

Variable	Results
<b>Age (years)</b>	49,13±16,3
<b>Total Hospitalization Time (days)</b>	36,76 ± 12,70
<b>Length of ICU stay (days)</b>	16 (7 - 22)
<b>MV time (days)</b>	8,5 (2 - 13)
<b>Number of physiotherapeutic sessions in the ICU</b>	39 (30 - 48)
<b>Gender</b>	
<b>Female</b>	18 (56,25)
<b>Male</b>	14 (43,75)
<b>Causes of Hospitalization</b>	
<b>Neurological</b>	14 (43,76)
<b>Polytrauma</b>	9 (28,12)
<b>Others</b>	9 (28,12)
<b>Sepsis</b>	10 (31,25)
<b>Deep vein thrombosis</b>	5 (15,62)

Data expressed as means +/- standard deviation and n (%). ICU: intensive care unit; MV: mechanical ventilation.

The assessment of peripheral muscle strength at discharge from the ICU showed values of  $13.5 \pm 8.2$  kg for the dominant limb. When analyzing the FIM, we observed that 30 days after discharge from the ICU, the only item that did not show significant improvement was communication, which showed improvement one year after discharge when compared to discharge from the ICU, with no difference in the 30-day comparison after discharge at one year.

The analysis of quality of life showed that even if there was an improvement in the total value between the ICU discharge time and thirty days and one year later, it was observed that some factors did not increase significantly (Table 2).

**Table 2.** Evaluation of the FIM scale, quality of life and Barthel scale at the time after discharge from the ICU and 30 days after and one year after (n = 33)

Variable	ICU discharge	After 30 days	After one year
<b>Functional Independence Measure</b>			
Self-care	14,28 ± 6,0	24,40 ± 10,6 <sup>a</sup>	34,48±17,04 <sup>b</sup>
Sphincter control	9,22 ± 4,4	11,90 ± 3,6 <sup>a</sup>	12±3,4 <sup>b</sup>
Mobility	5,50 ± 3,1	11,53 ± 6,2 <sup>a</sup>	14,96±4,8 <sup>b</sup>
Locomotion	2,94 ± 1,7	5,97 ± 4,0 <sup>a</sup>	7,72±3,38 <sup>b</sup>
Communication	12,25 ± 5,8	14,60 ± 5,9	18,56±7,16 <sup>b</sup>
Social cognition	9,72 ± 5,7	13,23 ± 5,5 <sup>a</sup>	16,44±4,08 <sup>b</sup>
Total	51 (47 – 64,5)	80 (59,5 – 108) <sup>a</sup>	104 (82,8 – 123) <sup>b</sup>
<b>Quality of Life (SF-36)</b>			
Functional capacity	3,75 ± 6,1	26,17 ± 23,9 <sup>a</sup>	16,5 ± 5,63
Limitations due to physical aspects	11,72 ± 25,0	15 ± 20,0	5,86 ± 1,42
Pain	14,66 ± 17,7	41,23 ± 26,1 <sup>a</sup>	7,68 ± 2,47
General health status	43,63 ± 22,3	40,53 ± 22,0	13,31 ± 3,19
Vitality	26,72 ± 20,9	36,83 ± 24,1	12,81 ± 3,40
Social aspects	21,88 ± 24,0	38,75 ± 24,0 <sup>a</sup>	6,40 ±1,61
Limitations due to emotional aspects	13,46 ± 29,8	16,65 ± 23,9	4,27 ± 1,28
Mental health	47,94 ± 22,6	63,47 ± 23,1 <sup>a</sup>	20 ± 4,23
Total	67,4 (57,3 – 81,1)	80,2 (70,1 – 99,2) <sup>a</sup>	93,5 (88,5 – 96,5) <sup>b</sup>

Data expressed as mean ± standard deviation and median (minimum - maximum). a p <0.05 30 days vs. ICU discharge. b p <0.05 1 year vs. ICU discharge.

## Discussion

In the present study, we observed patients' functional and quality of life improvement thirty days and one year later compared to discharge from the ICU. This is not related to the length of stay, mechanical ventilation, or the presence of sepsis in comparison to immediate discharge from the ICU. We also demonstrate no difference in the quality of life and functionality when comparing 30 days and one after discharge. After thirty days, variables such as self-care, Sphincter control, Mobility, Locomotion, and social cognition were significant compared to the time of hospital discharge. All continued to have significance after one year, with the addition of communication. In terms of quality of life, Functional capacity, Pain, Social aspects, and Mental health were significant compared to high in the ICU.

When evaluating the functionality through the FIM and Barthel scales on quality of life through the SF-36, we demonstrate the improvement in both conditions in the period of 30 days and one year after discharge from the ICU. In a cohort study<sup>13</sup>, evaluated 116 patients who were mechanically ventilated for more than 48 hours throughout 3, 6, and 12 months. The authors used the Sickness Impact Profile method and demonstrated that 1 year after discharge from the ICU, about 69% of the patients still have restrictions in their ADLs and that only 50% of the patients returned to work-related activities. According to our study, there was a significant improvement in functional independence and quality of life after one year, which disagrees with the authors, as mentioned earlier. This divergence may reside in the assessment tool used and in the sample size, and type I statistical error may have occurred in the present study.

Another study, which evaluated patients undergoing MV for prolonged periods, demonstrated that after hospital discharge, only 9% of them had obtained positive results in relation to social functional and cognitive independence.<sup>14</sup>

According to the authors, this fact may be related to mechanical ventilation, which causes systemic complications such as pulmonary, peripheral muscle, and multiple organ mechanics, causing great morbidity to these patients. The negative impact is high, which can expose patients to inadequate levels of care, resulting in unexpected deaths or readmissions to the ICU during the same hospitalization.<sup>15</sup> Our study found that thirty days after hospital discharge, there were changes in cognition and social aspects, but this change was less sensitive after one year. This can be explained by the patient's profile included in this research and the lack of understanding of the level of physical activity performed by them after hospital discharge.

Detting-Ihnenfeldt et al. on functionality show us how much these patients' early mobilization improves in the long run. In an analysis of 133 patients evaluated during 3, 6, and 12 months after discharge, they presented impaired functional health status at 3 months after discharge from the ICU, not at 6 and 12 months.<sup>16</sup> One of the reasons that can modify the functional outcome of patients admitted to the ICU is physical therapy performance. It aims to promote recovery and preservation of functionality, reducing weaning time, mechanical ventilation, and hospitalization.<sup>17,18</sup> Thus, physiotherapy helps to improve functionality and post-discharge quality of life.

We did not show any correlation between the number of visits and the outcomes evaluated during our study. However, the literature shows that patients diagnosed with muscle weakness acquired in the ICU (FMA-ICU) have a worse functional prognosis, from 3 to 12 months, after discharge.<sup>14,19</sup>

In another study on functionality and mortality, patients had significantly greater impairment of functional status at hospital discharge than patients with shorter ICU stays, and this difference persisted after three months.<sup>20</sup> Furthermore, the levels of independence in the one-year follow-up were never

similar to the baseline, corroborating our study where the variable FIM communication increased in one year, in contrast to the functional capacity variable of the SF36 questionnaire, which decreased considerably. A possible alternative for this population of critically ill patients after discharge from the ICU could be a multicomponent rehabilitation program combining cognitive, physical, and functional training, thus improving cognitive performance, and improving functional results.<sup>21</sup>

The present study has limitations the small sample size and the absence of an assessment of severity at admission to the ICU. Another limitation was the collection of the measure of functional independence based on self-report, which can lead to measurement bias and the non-control of interventions performed in the home environment, which may impact the outcomes evaluated.

## Conclusion

Patients recover their functionality and quality of life after thirty days of discharge from the ICU, however the functionality and quality of life of this patient does not change after 1 year of discharge from the ICU in relation to the period of 30 days after discharge from the ICU.

## Authors' contributions

Cordeiro ALL contributed to the analysis and interpretation of the data, writing the manuscript, and critical revision of the manuscript for intellectual content. Peixoto F, Menezes M, and Norberto F participated in the conception and design of the research, data collection, data analysis and interpretation, and manuscript writing. Kutchak FM and Rieder M participated in research conception and design, data acquisition, data analysis and interpretation, manuscript writing, and critical manuscript revision for important intellectual content. Martinez BP participated in writing the manuscript and critical revision to the intellectual content. Forgiarini Junior LA participated in the conception and design of the research, acquisition of data, analysis and interpretation of data, writing of the manuscript, and critical revision of the manuscript as to intellectual content.

## Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, corporations, and private foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to grants and funding, advisory board participation, study design, preparation of manuscript, statistical analysis, etc.).

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