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ORIGINAL ARTICLE

FUNCTIONAL STATUS OF PATIENTS WITH CARDIOVASCULAR DISEASE IN CARDIOLOGY ICU

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Contextualization: Patients hospitalized in an Intensive Care Unit (ICU) may present functional independence, prolonging hospitalization. **Objective:** To evaluate the functional independence of patients with cardiovascular diseases during ICU stay until hospital discharge. **Methods:** A prospective cohort study that included subjects of both genders ≥ 18 years, hospitalized for more than 24 hours in the ICU. The functional independence of the individuals was evaluated through the Functional Independence Measure (FIM) scale in three moments (ICU admission, ICU discharge and hospital discharge). Variance Analysis (ANOVA) was used for repeated measures with the post hoc comparisons performed by the Bonferroni test. The Spearman correlation coefficient was used for the statistical relationships considering a significance level of 5%. **Results:** The mean age was 64.26 ± 12.58 years, of which 25 (59.5%) were male, with a predominance of acute myocardial infarction patients (57.1%). There was a reduction in functionality across all evaluated domains of the scale. The mean score upon admission was 119.40 ± 11.37 points, at ICU discharge was 106.36 ± 16.36 points, and at hospital discharge it was 112.12 ± 15.19 points (p <0.001). The greatest functional loss was in the self-care domain in relation to the other domains in all ICU admission, ICU discharge and hospital discharge (p = 0.003). There was an inverse and moderate correlation observed between the three moments of FIM evaluation with the length of ICU stay (r = -0.532, p <0.001) and in the hospital (r = -0.506, p <0.001). **Conclusion:** The ICU hospitalization process led to reduced functionality of the patients according to the FIM scale.

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INTRODUCTON

Cardiovascular diseases (CVD) begin at an early age and are part of chronic non-transmissible diseases, being among the leading causes of death in developing countries, accounting for 31% of deaths in Brazil.[1-4] Risk factors for developing CVD are high blood pressure, smoking, alcohol consumption, high blood glucose levels, being overweight, and/or genetic predisposition in sedentary individuals with inadequate diet.[5,6] Such factors contribute to the impact caused by the mortality rate, number of hospital admissions, as well as functional limitations and dependencies that directly influence the quality of life. [7,8]

Prolonged rest post-acute myocardial infarction (AMI) in a bed may cause decreased muscle tone and blood volume, postural hypotension, and increased heart rate responses and blood pressure efforts. Cardiac rehabilitation assists in the recovery of these individuals and can be initiated 24 hours after the acute effect.[8,9]

Therefore, the evaluation of the functionality is important in measuring the impact of the disease on the patient's life, and it is also a diagnostic and prognostic factor, allowing health care to be scaled, extending to the desired recovery. [10-15] In this sense and with the objective of a treatment plan which is favorable to these individuals, the use of questionnaires and score systems to instrumentalize and quantify the difficulties caused by the functional decrease after the hospitalization period are required.[13, 16-20]

Although the implications of immobility are reported in the literature, there is a shortage of studies that assess functional independence during ICU admission. Therefore, the objective of this study was to investigate the functional status of patients with cardiovascular diseases before and during the stay in the intensive care unit until hospital discharge, as well as to correlate the functionality with the length of ICU stay and hospital admission.

METHODS

A prospective cohort study is justified by the selection of a specific sample and from this the follow-up of subjects over time which could predict subsequent outcomes was evaluated. The study was carried out at the ICU of the Institute of Cardiology (*ICFUC*) - Porto Alegre/RS, from November 2015 to January 2016, with patients aged ≥18 years of both genders who were hospitalized for more than 24 hours in the ICU, excluding patients with neuromuscular diseases, motor deficit or functional impairment prior to hospitalization. All patients had previously signed the Informed Consent Form (ICF), and if they were willing to participate in the study and authorized the informed data for research purposes. The study was approved by the hospital ethics and research committee (*ICFUC*) - Porto Alegre/RS, with registration number UP:5136/15.

In the present study, a record was used to collect data containing patient identification (name, age and gender), medical diagnosis, associated diseases, date of hospitalization and discharge from the ICU, date of beginning and end of mechanical ventilation, whether or not they underwent physiotherapy, date of hospitalization and hospital discharge and death. No correlation was observed with mechanical ventilation time because the sample consists of younger patients in which the great majority of the individuals had the main reason of hospitalization being AMI, which only required a brief stay in the ICU without requiring the use of mechanical ventilation. Additionally, undergoing physical therapy or not, since most of these patients did not have a prescription due to the high turnover of patients in the unit as well as professionals.

Patients were evaluated by a physiotherapist using a Functional Independence Measure (FIM) questionnaire on the first day of ICU admission, in which the patient or his or her closest supervisor answered items corresponding to their ability to perform independent activities, or if there was a need of assistance of another person or adaptation resource regarding their state before the hospitalization. MIF was reapplied in two more moments, being at discharge from the ICU and before discharge. All evaluations were performed by the same evaluator, obtaining a tolerance of 72 hours for ICU collections.

The functional independence measure (FIM) is an evaluation instrument validated in Brazil, developed for classifying the patient in his/her ability to perform an independent activity or with the assistance of another person to perform motor and cognitive tasks of daily life.[5] Among the evaluated activities are self-care, transference, movement, sphincter control, communication and social

cognition, which includes memory, social interaction and problem solving.

This functional evaluation instrument was translated into Portuguese in Brazil in 2000, and at that time reproducibility and reliability tests were obtained which obtained good results.[20] Each dimension is analyzed by the sum of its referring categories from 1 to 7, being that the lower the score, the greater the degree of dependence, and in adding the points of the instrument dimensions, there is a total score of at least 18 and a maximum of 126 points, which characterize the levels of dependence for the subscores. The evaluated domains are situations of daily life such as personal care which check the acts of eating, doing personal hygiene; dressing and going to the bathroom, sphincter control by checking the bladder and bowel control; transferring from the bed to the chair or wheelchair, to the toilet, to the bath or shower; movement to check if the patient walked or used stairs; communication which verified how the patient's understanding and expression were; and social cognition aimed at knowing how their social interaction, problem solving and memory were functioning.

Data were expressed as mean and standard deviation or median and interquartile range (25-75% percentile). For comparison of means, Variance Analysis (ANOVA) was used for repeated measures with post hoc comparisons using the Bonferroni test. The Spearman correlation coefficient was applied for correlation analysis. The Statistical Package for Social Sciences (SPSS) version 21.0 with a significance level of 5% was used.

RESULTS

In the pre-established period for data collection, 48 patients were eligible for the study, with 6 individuals lost in the course of the study (3 to death and 3 for having a Stroke during hospital stay), thus 42 patients were included in the sample according to (Figure 1).

The mean age of participants was 64.26 ± 12.58 years, of which 25 (59.5%) were male, with a predominance of patients with acute myocardial infarction (57.1%). The median ICU length of stay was 4.5 days and the hospital stay was 10 days. For comorbidities, a high prevalence of hypertensive patients (52.4%) was shown (Table 1).

Figure 1. Flowchart of patients included in the study.
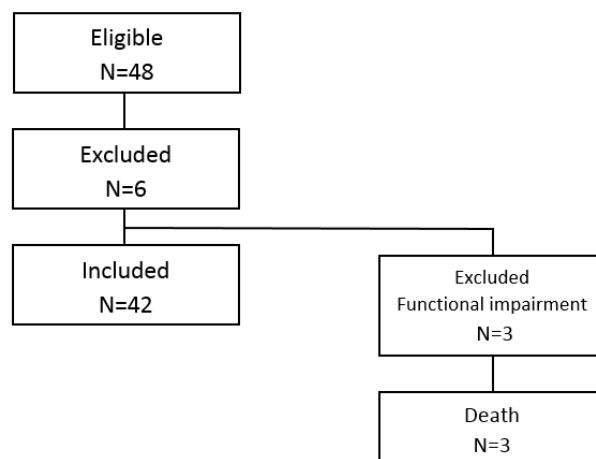

Table 2 shows the results according to the FIM domains in the three moments collected from the study. There was reduced functionality in all the evaluated domains of the scale when comparing the functional independence of patients admitted to the ICU with those discharged from the unit, since the mean score at admission was 119.40 ± 11.37 points, and when verified at discharge from the ICU, it was 106.36 ± 16.56 points, achieving a significant reduction (p <0.001) with a functional loss of 13.4%. However, these patients were predisposed to functional improvement when compared to admission to the ICU (119.40 ± 11.37 points), and with hospital discharge totaling 112.12 ± 15.19 points on the scale, a reduction of 7.2%, with the presence of functional impairment being caused by the stay upon discharge from the ICU observed, but there is recovery during hospitalization; however, these individuals do not return to the functional status of admission.

In the self-care domain there was a 5-point reduction in the mean FIM score on admission to discharge from the unit, and an increase of 2 points at hospital discharge, but subjects did not return to the established admission score. Movement presented a mean of 12.40 ± 4.2 points.

Table 1 - Sample characterization

Variables	n=42
Age (years) - mean ± standard deviation	64.26±12.58
Gender - n (%)	
Female	17 (40.5)
Male	25 (59.5)
Reason for hospitalization - n (%)	
AMI	24 (57.1)
Congestive Heart Failure	7 (16.7)
Unstable angina	5 (11.9)
TVAB	2 (4.8)
Bradycardia	1 (2.4)
ALE	1(4.2)
TEP	1 (2.1)
Ventricular Tachycardia	1 (2.1)
Comorbidities - n (%)	
SAH	22 (52.4)
DM	12 (28.6)
COPD	16 (38.1)
FH CAD	13 (31)
Dyslipidemia	7 (16.7)
Physiotherapy - n (%)	10 (23.8)
Time in ICU (days) - median (IQR)	4.5 (2.7- 6.0)
Time in hospital (days - median (IQR)	10 (6.0- 18.2)

Mean ± standard deviation, absolute and relative numbers (%) AMI - Acute Myocardial Infarction, CHF - Congestive Heart Failure, TVAB - Total Ventricular Atrial Block, ALE - Acute Lung Edema, PTE - Pulmonary Thromboembolism, SAH - Systemic arterial hypertension, DM - Diabetes Mellitus, COPD - Chronic Obstructive Pulmonary Disease, FH CAD - Family history of coronary artery disease, ICU - Intensive Care Unit.

Table 2 - Results of the different domains of functional independence measurement scale at ICU admission, after discharge from the ICU, and hospital discharge

Variables	ICU Admission	ICU discharge	Hospital discharge	P-value
Self-care	39.59±5.11[c]	34.35±6.91[a]	36.80±6.38[b]	<0.001
Control	14.00±0	13.71±0.83	13.95±0.30	0.079
Mobility	19.61±2.6[c]	15.97±4.5[a]	17.45±4.2[b]	<0.001
Movement	12.40±2.8[c]	8.8±3.8[a]	9.9±3.6[b]	<0.001
Communication	13.90±0.61	13.80±0.86	13.80±0.86	0.323
Social Cognition	20.14±1.6	20.14±1.7	20.14±1.7	1.000
Total	119.40±11.37[c]	106.36±16.56[a]	112.12±15.19[b]	<0.001

ICU - Intensive Care Unit. Results expressed as mean ± standard deviation, * Analysis of Variance (ANOVA) for repeated measures; [a, b, c] ICU admission x high ICU, [b] Hospital admission x high ICU, [c] ICU discharge x hospital discharge. The letters present significant difference by the Bonferroni test at 5% of significance.

The domain that presented the lowest functional impairment was communication (p = 0.323), since social cognition did not present alteration in the score (p = 1.000), and that of sphincter control showed a discrete change, but did not present statistical significance (p = 0.079). Table 3 shows the relationship between the three FIM evaluation moments with the length of ICU and

Table 3 - Results related to the relationship between the three moments of FIM evaluation with length of stay in the ICU and hospital.

Variables	r	P-value
FIM admission X hospitalization time	-0.434	0.004
FIM admission X ICU time	-0.407	0.007
FIM ICU discharge X ICU time	-0.607	<0.001
FIM ICU discharge X hospitalization time	-0.565	<0.001
FIM hospital discharge X ICU time	-0.535	<0.001
FIM hospital discharge X hospitalization time	-0.558	<0.001

FIM – Functional independence measurement, MV - Mechanical ventilation, ICU – Intensive Care Unit

hospital stay. A moderate inverse correlation was observed between the analyzed variables.

There was a statistically significant inverse association between the FIM variation of admission to hospital discharge and hospital stay (r = -0.506; p <0.001), meaning that the patients who reduced FIM more were those who stayed longer in the hospital (Figure 2). Likewise, there was a statistically significant inverse association between the FIM variation from admission to ICU discharge and ICU admission time (r = -0.532; p <0.001), meaning that patients who reduced FIM more were those who stayed in the ICU longer (Figure 3)

Figure 2 - FIM evaluation during hospital stay.
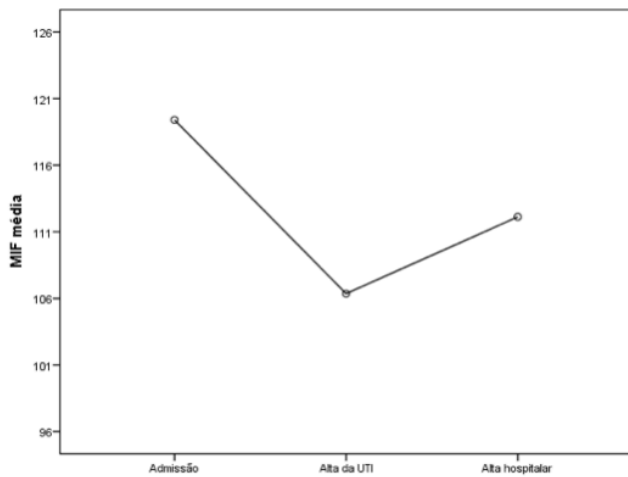
FIM: functional independence measurement; ICU: intensive care unit.

Figure 3. Association between FIM variation in admission to hospital discharge and length of hospital stay (a) and association between FIM variation from admission to ICU discharge and length of ICU stay (b).
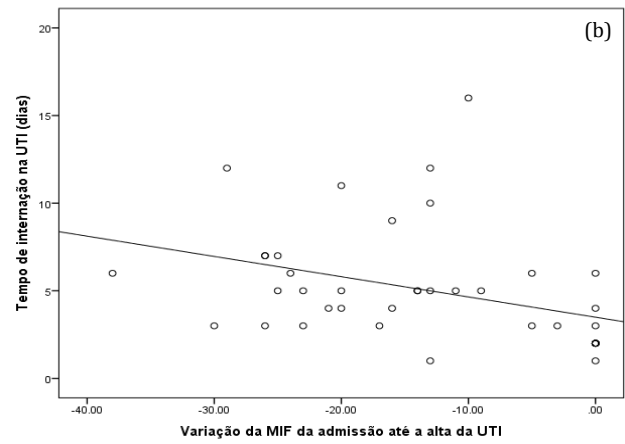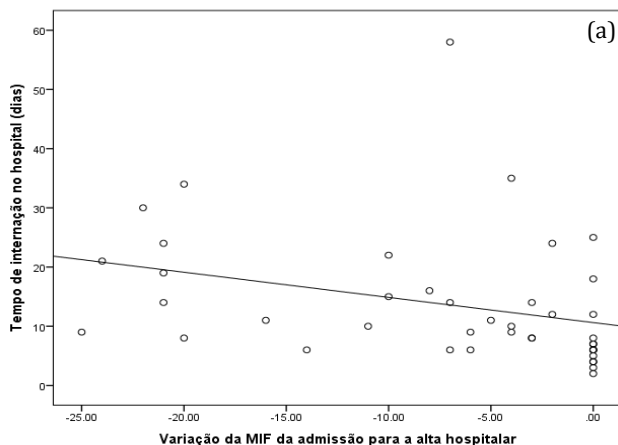
DISCUSSION

Through this study it was verified that there is functional decline in patients with cardiovascular disease during hospitalization. Via the FIM functional assessment scale the study demonstrated that the patients had reduced functionality after their stay in the ICU, extending functional deficits until hospital discharge.

It was verified that the median ICU stay was 4.5 days and the hospital 10 days. These results are similar to those of the study by Oliveira et al.[22] with a sample of 102 patients, which compared the average number of days of hospitalization among a group of young people with that of older adults, and the mean in the younger population (between 18 and 60 years) ranged from 2 days in the ICU to 4 days in the hospital. On the other hand, in the older adults group (> 60 years), ICU stay was longer, adding up to 8 days, but the other articles mention longer times in both the ICU and the hospital. This is due to the profile of hospitalized patients being more chronic at a later age.[23,24]

The data from this study showed that the functional independence of patients admitted to the ICU when compared to the discharge of the unit decreased in all the evaluated domains of the scale, but there was improvement in the functionality when compared with the hospital discharge; however, they did not return to the the ICU admission score. Martinez et al.[25] carried out a prospective observational cohort study in the ICU of the public hospital in Salvador (BA), with 54 individuals with a surgical profile (74.1%), with a minimum of 24 hours of stay in the unit, using the FIM scale evaluation at the ICU admission to the discharge of the unit. They observed a reduction in all

domains of the FIM when comparing the ICU admission values with the discharge of the unit.

In the study by Morais et al.[26], the recovery of 22 cardiac patients submitted to elective surgery by sternal thoracotomy were studied in individuals admitted to the *Fundação Beneficência Hospital de Cirurgia*. The FIM questionnaire was used for functionality. It was verified that there was a loss of functional performance in the preoperative period for the 2nd/3rd DPO, and a gain in this for the 5th/6th DPO.

In the study by Santos et al.[27], there was functional decline in the evaluated moments when compared to the normative data. However, there was recovery at the time of hospital discharge regarding admission and discharge from the ICU.

In the present study, it was evidenced that the domains of self-care, mobility and movement presented a significant difference when compared to the three moments evaluated, since these patients had a decline in FIM scores from admission to the ICU being postponed until hospital discharge. In the same way as described in the study by Kawasaki et al.[28], where the functionality of 28 older adults hospitalized for clinical treatment through FIM was assessed at the time of hospitalization, during hospitalization, at discharge and one month after discharge, there was a decline in FIM task scores for self-care, transfers, and movement when compared to FIM values at ICU discharge, and there was functional improvement after hospital discharge.

However, in the study by Curzel et al.[10], a prospective cohort was performed including patients who were discharged from the ICU and who underwent physiotherapy and were evaluated with the FIM scale upon discharge from the ICU and 30 days after that period by telephone. It was observed that the variable that showed the least impairment with the limitations imposed was self-care, in which the scores were the highest compared to the other FIM variables, and that the movement variable had the lowest scores on the scale at the time of the discharge, as well as 30 days after.

In the study by Christmann et al.[29] performed in a public hospital with 28 patients of both genders over 18 years of age, quality of life was assessed using the Short-Form 36 questionnaire (SF36), in which some evaluated domains were functional capacity and limitation by physical aspects.

It was notable that the functional capacity item had a low value when analyzed by the SF36 scores, demonstrating that there was impairment in the individuals which limited their normal physical activities, and that the domain for physical aspects presented lower scores, verifying that there was significant influence on the quality of life of the studied patients in this group.

Regarding the results found in the present study, there was a moderate inverse correlation observed, with a variation between the FIM scale upon discharge from the ICU and the ICU time, and also between the FIM at ICU discharge with the length of hospital stay, proposing that more functionally affected individuals stay longer in the hospital, as patients with better FIM scores upon hospital discharge remained for less time in the ICU, as well as in the hospital.

Moreover, the study by Oliveira et al.[30] in which a prospective cohort was performed with patients over 40 years of age hospitalized for myocardial revascularization surgeries. Spirometry was performed preoperatively and on the 5th postoperative day, and 6-minute walk test (6MWT) for walking ability. There was no significant correlation in pre and postoperative pulmonary function with the time of postoperative hospitalization. Only the distance covered in the 6MWT showed a significant negative correlation with the time of postoperative hospitalization, suggesting that patients with greater postoperative ambulation ability present shorter hospitalization time, and that the distance in the 6MWT may better represent the functional capacity of these patients than pulmonary function alone.

Similarly, in the study by Murakami et al.[31] it was observed that the length of hospital stay was significantly higher in the group in which the patients had a lower early mobilization protocol on discharge from the ICU in relation to admission. Likewise, in the study by Dantas et al.[32], there was a reduction in ICU and hospital length of stay in patients who underwent early mobilization protocol. Other studies reinforce the importance of physiotherapy in recovering the decrease in functionality caused by hospitalization.[33-37]

It should be noted that only 23.8% of the patients in the present study underwent physiotherapeutic care, which is an unusual fact since it is known that physiotherapy is highly requested in critical units, but physical therapy was

absent in the intensive care unit as well as in the hospitalization unit. Although these limitations cannot clarify a possible relationship between non-physical therapy during hospital stay and the loss of functionality of patients during ICU stay when compared to admission as well as hospital discharge, based on other studies it is possible to state that physiotherapy can recover as well as delay functional loss during hospitalization. Therefore, physical therapy is important in the follow-up of this inpatient profile and early mobilization is an indispensable component in the care of these individuals because it is safe and effective, promoting improvement in functional results, increasing the degree of functionality and favoring recovery and quality of life.[38]

As a limitation of this study we had some factors that hindered the study, with the profile of hospitalized patients in the work period, the sample heterogeneity and the fact that the population is not critically chronic, as mentioned in other studies. The vast majority of patients had previous motor deficits and little use of invasive mechanical ventilation, so it was not possible to enter ventilatory data in the present study since they would have fallen into the exclusion criteria. The high turnover of patients in the ICU in a short hospitalization time led to there being margin for failure in some cases, and transfers to other hospitals and specialized centers.

CONCLUSION

The hospitalization process in the ICU leads to a reduction in the functional status of patients according to the FIM scale. In addition, we found that the lower the FIM score upon discharge from the ICU, the longer the hospital stay in the ICU and the hospital. Early rehabilitation protocols should be implemented in order to minimize the functional decline of these critical patients. However, it is necessary to do more studies about the functionality of cardiopathy, since the literature encompasses a general public and is not specific, as there are repercussions of the diseases on functional capacity which cause worsening in the quality of life.

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