Correlation between Status and Functional Mobility in Intensive Care Unit

Correlação entre Status e Mobilidade Funcional em Unidade de Terapia Intensiva

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Abstract

Generalized muscle weakness when related to the critical patient is an important and common complication in patients admitted to the intensive care unit (ICU). It is known that inactivity can lead to secondary dysfunctions and the main system is the osteomyelitis that may undergo muscle strength decrease by up to 30% in 7 days, and 20% in each additional week. The objective of the study was to correlate the functional status at admission with functional mobility at ICU discharge. It is an exploratory, longitudinal study developed in a school hospital. Patients underwent evaluation through functional independence measure (FIM) at admission. Afterwards, an early evolutionary mobilization protocol was applied, divided into three phases. At the time of discharge, the patients were reassessed by the functional mobility scale in the ICU (FMS). There was a significant (p=0.0001) correlation (r=0.5) between the admission FIM and the FMS at the time of ICU discharge from the critical patients included. There was a significant correlation (p<0.0001) positive (r=0.5) in the female patients and positive and weak (r=0.4) in the male patients. There was a correlation between the functional status at admission and the level of mobility at discharge in patients admitted to the ICU, i.e. , the higher the functionality before admission, the greater the functional mobility at discharge.

Keywords: Mobility Limitation. Intensive Care Units. Physical Therapy Specialty

Resumo

A fraqueza muscular generalizada quando relacionada ao doente crítico é uma complicação importante e comum em pacientes internados em unidade de terapia intensiva (UTI). Sabe-se que a inatividade pode acarretar disfunções secundarias e o principal sistema acometido é o osteomioarticular que pode sofrer diminuição da força muscular em até 30% em 7 dias, e 20% a cada semana adicional. O objetivo do estudo foi correlacionar o status funcional na admissão com a mobilidade funcional na alta de pacientes na UTI. Trata-se de um estudo do tipo exploratório, longitudinal, desenvolvido em um hospital-escola. Os pacientes foram submetidos a avaliação por meio da medida de independência funcional (MIF) na admissão. Após, foi aplicado um protocolo de mobilização precoce evolutivo dividido em três fases. No momento da alta, os pacientes foram submetidos a uma nova avaliação pela escala de mobilidade funcional em UTI (EMF). Verificou-se correlação significativa (p<0,0001) positiva (r=0,5) entre a MIF de admissão e a EMF no momento da alta da UTI dos pacientes críticos incluídos. Houve correlação significativa (p<0,0001) positiva (r=0,5) nas pacientes do sexo feminino e positiva e fraca (r=0,4) nos pacientes do sexo masculino. Houve correlação entre o status funcional na admissão com o nível de mobilidade na alta de pacientes internados em UTI, isto é quanto maior a funcionalidade antes da internação, maior a mobilidade funcional na alta.

Palavras-chave: *Limitação de Mobilidade. Unidades de Terapia Intensiva. Fisioterapia.*

1 Introduction

Development of generalized muscle weakness when related to the critical patient is an important and common complication in patients admitted to the intensive care unit (ICU). Its incidence occurs in 30% to 60% of all the critical patients in ICU[1]. Several clinical situations subject patients to prolonged decubitus position on the bed, but regardless of the condition, the immobile time is directly proportional to complications in various systems of the organism[2].

It is known that inactivity can cause secondary dysfunctions such as pressure lesions, thrombotic diseases, hemodynamic, respiratory and osteomioarticular changes, such as muscle weakness and atrophy. The main system affected is the osteomyelitis system that may undergo muscle strength decrease by up to 30% in 7 days, and 20% in each additional week. With total paralysis, patients may have a loss of half of the muscle mass in two weeks and, when associated with sepsis, a decline of 1,5 kg per day can be observed[4]. It may affect not only the osteoarticular system, but also the cardiorespiratory, metabolic and cutaneous system, which contributes to the prolonged hospital stay[3].

Acquired skeletal muscle weakness has a multifactorial cause, but it has favorable outcomes with early mobilization intervention. Early mobilization intervention is safe and feasible for critical patients[5]. Among the benefits of early mobilization are improved cardiac and respiratory function, decreased adverse effects of immobility, length of hospital

stay and mechanical ventilation (MV), prevention of acquired muscle weakness, stimulation of level of consciousness and functional independence, increased emotional and psychological satisfaction[6] as well as stimulation and acceleration of the recovery process seeking better independence for the patient in his or her discharge process.

Functional independence can be defined as the ability of the individual to perform his/her daily life activities (ADLs), Patients admitted to the ICU may present a decrease in the role of ADLs and a factor that contributes to this is the prolonged length of hospital stay and the use of MV 4. Thus, the objective of this study was to analyze the correlation between functional status at admission and functional mobility at discharge of ICU patients.

2 Material and Methods

This is an exploratory, longitudinal study with a quantitative approach, developed at the Hospital de Base, in the city of Sao Jose de Rio Preto, SP, Brazil. Patients admitted to the General ICU were selected 7th floor SUS, from June to October 2018, all individuals admitted from 14 years of age were included, excluding individuals who died during the hospitalization period and those whose data collection was not complete.

The study project was approved by the Research Ethics Committee of the Medical School of São José do Rio Preto (FAMERP) under protocol number 3.069.342/2018. The study followed the ethical precepts of Resolution 196/96 of the National Health Council. In order to be part of the study, patients or legal guardians signed an informed consent form (WCT).

Patients underwent evaluation through Functional Independence Measure (FIM) at the admission ad ICU. From this evaluation, the respective goals were drawn to achieve the maximum possible functional rehabilitation during hospitalization. The instrument used to analyze the functionality is a scale that evaluates several functional components, such as motor, cognitive and social evaluation in the aspects of feeding, personal hygiene, bath, dressing, use of toilet and shower, transfer to bed, chair, wheelchair, among others[7]. In the present study, the Mobility components, divided into three sub-items were used: transfers to chair or wheelchair; transfers to toilet basin; transfers to bath or shower; and locomotion, divided into two sub-items: gait/ wheelchair of FIM. Each sub-item of each component analyzed was scored at a score of one to seven points, with score seven corresponding to the total independence level and score one corresponding to the total dependence level[7]. The total score of the two FIM domains ranged from 4 points – complete dependence, to 28 points – complete independence.

After defining the functionality at admission, the patients underwent an early mobilization protocol divided into three phases, phase I being composed of: decubitus changes,

functional positioning, passive joint mobilization and passive sedestation outside the bed; phase II: active-assisted and active exercises in the bed, cardiovascular exercise with a cycle ergometer in the bed or armchair, sedestation at the bedside, transfer from the bed to the armchair and active exercises in the armchair; Phase III: orthostatism, stationary gait and/or ambulation.

For evaluation and measurement of the functionality of patients admitted to the ICU at discharge, the functional mobility scale (FMS) in the ICU was used, an instrument developed and validated for the ICU environment, which has a score ranging from 0 to 10 points, 0 expressed low mobility, only passive exercises in the bed, and 10 expressed maximum mobility scores, which are characterized by patients who present independent walking without assistance[8].

Descriptive statistical analysis was performed and the data were presented in means, standard deviations, percentages and absolute numbers. Inferential statistical analysis was also applied with Kolmogorov-Smirnov test to verify the normality of data distribution and nonlinear correlation test of Spearman to analyze the association between functionality at admission and discharge. Values of $p \leq 0.05$ were considered significant. The analyzes were performed in *the Graph Pad Instant* program version 3.0 for Windows.

3 Results and Discussion

The present study analyzed a total of 174 patients (Figure 1).

Figure 1 - study Patient Selection Flowchart
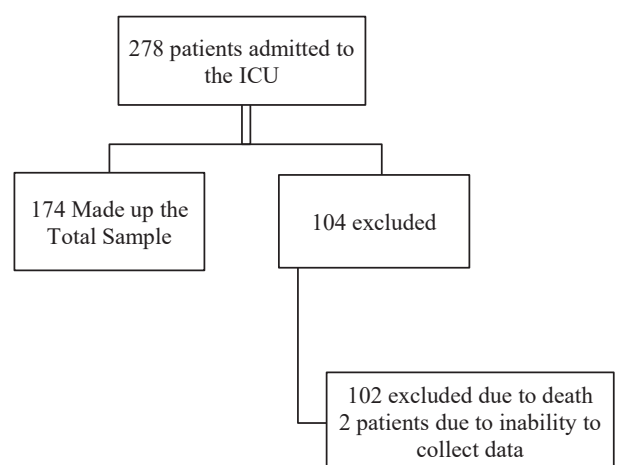
Source: Research data.

There was a prevalence of males (53%) and the mean age was 52.72 ± 17.14 years (Chart 1).

**Table 1 -** Sociodemographic and clinical characteristics of patients

Variable	N (%)
Sex M / F	M – 93 (53%) / F – 81 (47%)
Age (years)	52.72±17.14
Length of hospital stay (days)	7.1±7.4
FIM (admission)	25.25±5.83
FMS (high)	7.28±3.23
Specialty Admission	
Neurology	34 (19,5%)
Pneumology	36 (21%)
Gastroenterology	33 (19%)
Polytrauma	20 (11.5%)
Others	51 (29%)

M – Male; F – Female; FIM – functional independence measure; FMS – functional mobility scale in ICU.

Source: Search data.

There was a significant (p=0.0001) correlation (r=0.5) between the admission FIM and the FMS at the time of ICU discharge from the critical patients included (Figure 2).

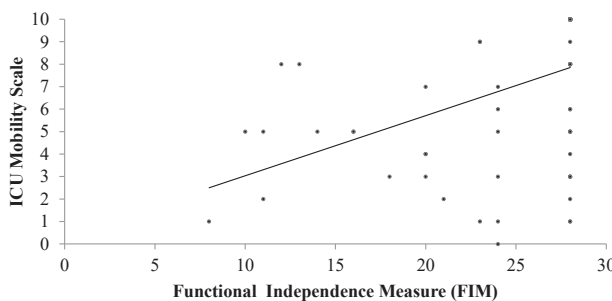**Figure 2 -** Correlation between FIM at admission and FMS at ICU discharge
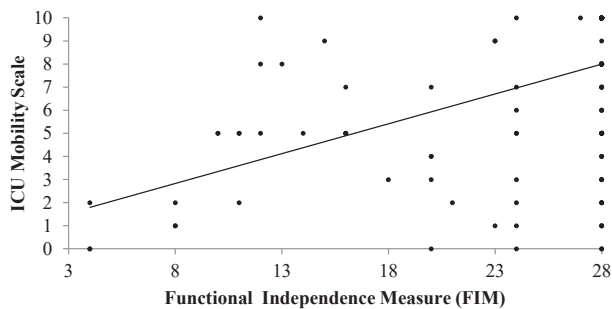
*Spearman's non-linear correlation.

Source: Search data.

The presence of a correlation between admission FIM and FMS was also verified at the time of ICU discharge according to genders.

Figure 3 - Correlation between FIM at admission and EMF at ICU discharge among the female patients
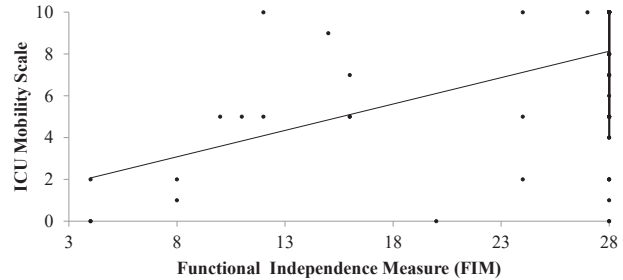

*Spearman's non-linear correlation.

Source: Search data.

There was a significant correlation (p<0.0001), positive (r+0.5) in the female patients (Figure 3) and positive and weak (r+0.4) in the male patients (Figure 4).

Figure 4 - Correlation between FIM at admission and FMS at ICU discharge among the male patients

*Spearman's non-linear correlation.

Source: Search data.

With the results of this study, a significant correlation was observed between admission FIM and EMF at the discharge of all patients admitted to ICU. There is also a correlation between the functional scales between genders, obtaining a moderate significant correlation in females and a weak significant correlation in males.

Marines et al. [9] demonstrated that total FIM at admission was 79.5±18.8 and at discharge 58.9±20.0, and a statistically significant difference (p<0.005) was observed with a functional loss of 25.9%. In all areas of FIM, a reduction in independence was observed when admission values and discharge values were compared [9]. These results are contradictory to those of the present study, regarding the transfer and locomotion domains, as adequate functional independence scores were verified since admission. This finding can be explained by the heterogeneous profile of patients admitted, because it is a General ICU.

A recent systematic review has shown that there is a decrease in functionality and a consequent decrease in the quality of life of patients after discharge from the ICU, especially in terms of locomotion and quality of life compared to the general population [10]. In correlation with these findings, a greater functional impairment was identified in the ICU discharge in patients who already presented deficit at the time of hospitalization, and thus it is realized the need for greater attention by the multidisciplinary team when addressing patients who have already entered the ICU with altered functionality[10].

Garcia et al. [11] observed a significant reduction in functional independence of the patients evaluated after ICU discharge, remaining a significant decrease until 30th day, with recovery observed on the 60th day of evaluation. These evidences point to the impact of ICU admission on patients' functionality and reinforce the importance of early mobilization in this environment in order to minimize this commitment and reintegrate physically active individuals into society.

A prospective study was observed with a total sample of 70 patients, mean age of 56,1±3,4 years, predominance of surgical patients, comparing the domains of bed transfer to chair and locomotion, a significant reduction of 14.3% between admission and ICU discharge[12] . When compared to

the loss in these domains in the group that was hospitalized for up to 48 hours and those that remained for more than 48 hours, a greater reduction was observed in those who remained for longer in the unit (p=0007), as well as those who used vasopressor drugs in the locomotion domain (p 0,041) [12]. These findings corroborate the present study, which used the same domains as the same functional evaluation instrument, demonstrating the importance of the previous stratification of the functional level of critical patients and of the factors that interfere with the improvement of this outcome during ICU admission.

According to the study by Jesus et al. [12], when evaluating the changes in the total FIM scores according to the study variables, it was evident that there were no statistically significant differences in the comparison among gender, age, clinical diagnosis, length of ICU stay, invasive mechanical ventilation time and presence of sepsis in the period. These results suggest that such variables do not interfere with the rehabilitation process of the critical patient, but more studies are necessary to confirm or refute such evidence.

Other authors evaluated the functionality by means of FIM after immediate ICU discharge and compared with FIM 30 days later. 44 patients were included with a mean age of 55.4±10.5 years, 27 of the female gender and 15 admitted for pulmonary disease. The patients presented 84.1±24.2 FIM at discharge. When this measurement was compared to 30 days after discharge, functional independence was improved, except for the variable that related to sphincter control. There was no statistical significance when comparing gender, age, clinical diagnosis, length of ICU stays, time of mechanical ventilation, and the presence of sepsis during this period.

In this context, it was emphasized with the results observed in the present study, which aimed to evaluate whether there is interference in the physiotherapeutic treatment, knowing the patient's previous functional status and comparing it with discharge, thus stimulating the physiotherapist to trace the maximum rehabilitation to the possible functional level.

The unavailability of family members, alteration of the patients' level of consciousness and their clinical status, were adverse events found to perform data collection, in addition, the absence of evidence that analyze the relationship between functionality prior to hospitalization and functional status at ICU discharge, were the main limitations found in this research.

This study was carried out in order to establish whether a functional evaluation at admission, followed by an early mobilization protocol, according to previous evaluation, there would be correlation with mobility at discharge, in order to try to show whether functional status at admission can predict maximum rehabilitation for the critical patient. However, many variables may influence the rehabilitation process of the critical patient during his or her stay in the ICU, which may interfere with the functional prognosis, making it impossible to predict the level of rehabilitation that the patient can achieve.

4 Conclusion

There was correlation between the functional status at the admission with the mobility level at the patients' discharge who here hospitalized the intensive care unit, that is the higher the functionality at the admission time the higher the functional mobility score at the discharge from the unit.

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